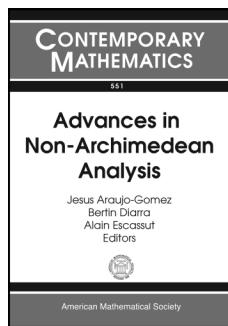


New Publications Offered by the AMS

To subscribe to email notification of new AMS publications, please go to <http://www.ams.org/bookstore-email>.

Algebra and Algebraic Geometry



Advances in Non-Archimedean Analysis

Jesus Araujo-Gomez,
*Universidad de Cantabria,
Santander, Spain, Bertin Diarra,
Université Blaise Pascal, Aubière,
France, and Alain Escassut,
Université Blaise Pascal, Aubière,
France, Editors*

This volume contains papers based on lectures given at the Eleventh International Conference on p -adic Functional Analysis, which was held from July 5–9, 2010, in Clermont-Ferrand, France.

The articles collected here feature recent developments in various areas of non-Archimedean analysis: Hilbert and Banach spaces, finite dimensional spaces, topological vector spaces and operator theory, strict topologies, spaces of continuous functions and of strictly differentiable functions, isomorphisms between Banach function spaces, and measure and integration.

Other topics discussed in this volume include p -adic differential and q -difference equations, rational and non-Archimedean analytic functions, the spectrum of some algebras of analytic functions, and maximal ideals of the ultrametric corona algebra.

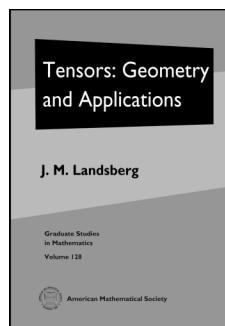
This item will also be of interest to those working in analysis.

Contents: C. Perez-Garcia and W. H. Schikhof, Remembering Nicole De Grande-De Kimpe (1936–2008); V. Anashin, A. Khrennikov, and E. Yurova, Using van der Put basis to determine if a 2-adic function is measure-preserving or ergodic w.r.t. Haar measure; N. Boudjrida, A. Boutabaa, and S. Medjerab, q -difference equations in ultrametric fields; K. Boussaf, A. Escassut, and J. Ojeda, Primitives of p -adic meromorphic functions; W. Cherry, Existence of GCD's and factorization in rings of non-Archimedean entire functions; G. Christol, The radius of convergence function for first order differential equations; B. Diarra, The Lipschitz condition for rational functions on ultrametric valued fields; A. Escassut, Differential and maximal

ideals of the ultrametric Corona algebra; A. K. Katsaras, Linear topologies on non-Archimedean function spaces; A. K. Katsaras, L. A. Khan, and A. R. Khan, On maximal closed ideals in topological algebras of continuous vector-valued functions over non-Archimedean valued fields; H. A. Keller and H. Ochsenius, Perturbations of bounded linear operators on orthomodular Hilbertian spaces; A. Kubzda, On some geometrical properties of linear subspaces of l^∞ ; M. L. Lapidus and L. Hung, The geometry of p -adic fractal strings: A comparative survey; H. Maiga, Identities and congruences for Genocchi numbers; H. M. Moreno, Toward an ultrametric calculus in a field K with an infinite rank valuation; E. Olivos and W. H. Schikhof, Extending the multiplication of a totally ordered group to its completion; S. Priess-Crampe, Norm Hilbert spaces with uncountable orthogonal basis; K. Shamseddine, Absolute and relative extrema, the mean value theorem and the inverse function theorem for analytic functions on a Levi-Civita field; F. Tangara, Some p -adic q -difference equations on $C(\mathbb{Z}_p, K)$.

Contemporary Mathematics, Volume 551

September 2011, 280 pages, Softcover, ISBN: 978-0-8218-5291-0, LC 2011018720, 2010 *Mathematics Subject Classification*: 11D88, 11S80, 12J25, 15A63, 26E30, 32P05, 44A10, 46S10, 47S10, 81Q65, **AMS members US\$79.20**, List US\$99, Order code CONM/551



Tensors: Geometry and Applications

J. M. Landsberg, Texas A&M University, College Station, TX

Tensors are ubiquitous in the sciences. The geometry of tensors is both a powerful tool for extracting information from data sets, and a beautiful subject in its own right. This book has three intended uses: a classroom textbook, a reference work for researchers in the sciences, and an account of classical and modern results in (aspects of) the theory that will be of interest to researchers in geometry. For classroom use, there is a modern introduction to multilinear algebra and to the geometry and representation theory needed to study tensors, including a large number of exercises. For researchers in the sciences, there is information on tensors in table format for easy reference and a summary of the state of the art in elementary language. This is the first book containing many classical results regarding tensors. Particular applications treated in the book include the

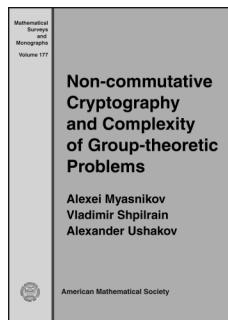
complexity of matrix multiplication, **P** versus **NP**, signal processing, phylogenetics, and algebraic statistics. For geometers, there is material on secant varieties, G -varieties, spaces with finitely many orbits and how these objects arise in applications, discussions of numerous open questions in geometry arising in applications, and expositions of advanced topics such as the proof of the Alexander-Hirschowitz theorem and of the Weyman-Kempf method for computing syzygies.

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

Contents: Motivation from applications, multilinear algebra and elementary results; Introduction; Multilinear algebra; Elementary results on rank and border rank; Geometry and representation theory; Algebraic geometry for spaces of tensors; Secant varieties; Exploiting symmetry; Representation theory for spaces of tensors; Tests for border rank; Equations for secant varieties; Additional varieties useful for spaces of tensors; Rank; Normal forms for small tensors; Applications: The complexity of matrix multiplication; Tensor decomposition; P v. NP; Varieties of tensors in phylogenetics and quantum mechanics; Advanced topics: Overview of the proof of the Alexander-Hirschowitz theorem; Representation theory; Weyman's method; Hints and answers to selected exercises; Bibliography; Index.

Graduate Studies in Mathematics, Volume 128

December 2011, approximately 438 pages, Hardcover, ISBN: 978-0-8218-6907-9, 2010 *Mathematics Subject Classification*: 15-01, 15A69, 68Q17, 14M17, 94A12, 94A13, 20G05, 62E10, 14N05, **AMS members US\$59.20**, List US\$74, Order code GSM/128



Non-Commutative Cryptography and Complexity of Group-Theoretic Problems

Alexei Myasnikov, Stevens Institute of Technology, Hoboken, NJ, Vladimir Shpilrain, City College of New York, NY, and Alexander Ushakov, Stevens Institute of Technology, Hoboken, NJ
with an Appendix by Natalia Mosina

This book is about relations between three different areas of mathematics and theoretical computer science: combinatorial group theory, cryptography, and complexity theory. It explores how non-commutative (infinite) groups, which are typically studied in combinatorial group theory, can be used in public key cryptography. It also shows that there is remarkable feedback from cryptography to combinatorial group theory because some of the problems motivated by cryptography appear to be new to group theory, and they open many interesting research avenues within group theory.

In particular, a lot of emphasis in the book is put on studying search problems, as compared to decision problems traditionally studied in combinatorial group theory. Then, complexity theory, notably generic-case complexity of algorithms, is employed for cryptanalysis of various cryptographic protocols based on

infinite groups, and the ideas and machinery from the theory of generic-case complexity are used to study asymptotically dominant properties of some infinite groups that have been applied in public key cryptography so far.

This book also describes new interesting developments in the algorithmic theory of solvable groups and another spectacular new development related to complexity of group-theoretic problems, which is based on the ideas of compressed words and straight-line programs coming from computer science.

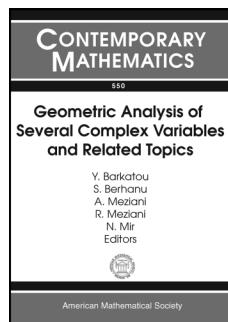
This item will also be of interest to those working in applications.

Contents: Introduction; Background on groups, complexity, and cryptography; Background on public key cryptography; Background on combinatorial group theory; Background on computational complexity; Non-commutative cryptography; Canonical non-commutative cryptography; Platform groups; More protocols; Using decision problems in public key cryptography; Authentication; Generic complexity and cryptanalysis; Distributional problems and the average case complexity; Generic case complexity; Generic complexity of NP-complete problems; Generic complexity of undecidable problems; Strongly, super, and absolutely undecidable problems; Asymptotically dominant properties and cryptanalysis; Asymptotically dominant properties; Length based and quotient attacks; Word and conjugacy search problems in groups; Word search problem; Conjugacy search problem; Word problem in some special classes of groups; Free solvable groups; Compressed words; Probabilistic group-based cryptanalysis; Bibliography; Abbreviations and notation; Index.

Mathematical Surveys and Monographs, Volume 177

November 2011, approximately 413 pages, Hardcover, ISBN: 978-0-8218-5360-3, LC 2011020554, 2010 *Mathematics Subject Classification*: 94A60, 20F10, 68Q25, 94A62, 11T71, **AMS members US\$84**, List US\$105, Order code SURV/177

Analysis



Geometric Analysis of Several Complex Variables and Related Topics

Y. Barkatou, Université de Poitiers, Futuroscope, France, S. Berhanu, Temple University, Philadelphia, PA, A. Meziani, Florida International University, Miami, FL, R. Meziani, Ibn Tofail University, Kenitra, Morocco, and N. Mir, University of Rouen, France, Editors

This volume contains the proceedings of the Workshop on Geometric Analysis of Several Complex Variables and Related Topics, which was held from May 10–14, 2010, in Marrakesh, Morocco.

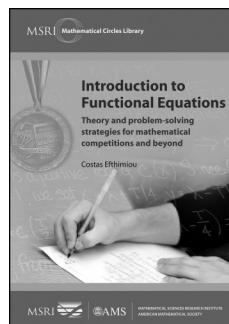
The articles in this volume present current research and future trends in the theory of several complex variables and PDE. Of note

are two survey articles: The first presents recent results on the solvability of complex vector fields with critical points while the second concerns the Lie group structure of the automorphism groups of CR manifolds. The other articles feature original research in major topics of analysis dealing with analytic and Gevrey regularity, existence of distributional traces, the $\bar{\partial}$ -Neumann operator, automorphisms of hypersurfaces, holomorphic vector bundles, spaces of harmonic forms, and Gysin sequences.

Contents: R. F. Barostichi, P. D. Cordaro, and G. Petronilho, Analytic vectors in locally integrable structures; M. Derridj and B. Helffer, Subellipticity and maximal hypoellipticity for two complex vector fields in $(2+2)$ -variables; J. Hounie and E. R. da Silva, Existence of trace for solutions of locally integrable systems of vector fields; M. Kolář and F. Meylan, Chern-Moser operators and weighted jet determination problems; B. Lamel, Jet embeddability of local automorphism groups of real-analytic CR manifolds; J. Leiterer, Splitting of holomorphic cocycles with estimates. Several variables; G. A. Mendoza, A Gysin sequence for manifolds with \mathbb{R} -action; S. Şahutoğlu, A potential theoretic characterization of compactness of the $\bar{\partial}$ -Neumann problem; M.-C. Shaw, Duality between harmonic and Bergman spaces; F. Treves, On the solvability and hypoellipticity of complex vector fields.

Contemporary Mathematics, Volume 550

September 2011, 196 pages, Softcover, ISBN: 978-0-8218-5257-6, LC 2011014591, 2010 *Mathematics Subject Classification*: 32L05, 32Q99, 32V20, 32W05, 35A07, 35B20, 35B65, 35F05, 35F15, **AMS members** US\$55.20, List US\$69, Order code CONM/550



Introduction to Functional Equations

Theory and problem-solving strategies for mathematical competitions and beyond

Costas Efthimiou, University of Central Florida, Orlando, FL

Functions and their properties have been part of the rigorous precollege curriculum for decades. And functional equations have been a favorite topic of the leading national and international mathematical competitions. Yet the subject has not received equal attention by authors at an introductory level. The majority of the books on the topic remain unreachable to the curious and intelligent precollege student. The present book is an attempt to eliminate this disparity.

The book opens with a review chapter on functions, which collects the relevant foundational information on functions, plus some material potentially new to the reader. The next chapter presents a working definition of functional equations and explains the difficulties in trying to systematize the theory. With each new chapter, the author presents methods for the solution of a particular group of equations. Each chapter is complemented with many solved examples, the majority of which are taken from mathematical competitions and professional journals. The book ends with a chapter of unsolved problems and some other auxiliary material.

The book is an invaluable resource for precollege and college students who want to deepen their knowledge of functions and their properties, for teachers and instructors who wish to enrich

their curricula, and for any lover of mathematical problem-solving techniques.

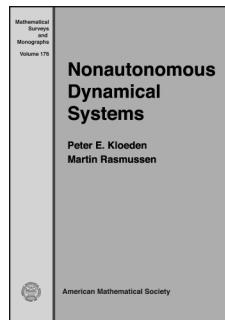
Titles in this series are co-published with the Mathematical Sciences Research Institute (MSRI).

Contents: *Background*: Functions; *Basic equations*: A primer on functional relations; Equations for arithmetic functions; Equations reducing to algebraic systems; Cauchy's equations; Cauchy's NQR method; Equations for trigonometric functions; *Generalizations*: The Pexider, Vincze and Wilson equations; Vector and matrix variables; Systems of equations; *Changing the rules*: Less than continuity; More than continuity; Functional equations for polynomials; Conditional functional equations; Functional inequalities; *Equations with no parameters*: Iterations; Solving by invariants and linearization; More on fixed points; *Getting additional experience*: Miscellaneous problems; Additional problems; *Auxiliary material*: Acronyms and abbreviations; Set conventions; Named equations; Bibliography; Index.

MSRI Mathematical Circles Library, Volume 6

October 2011, approximately 346 pages, Softcover, ISBN: 978-0-8218-5314-6, LC 2011020089, 2010 *Mathematics Subject Classification*: 00-01, 00A07, 26-01, 26A06, 26A18, 26B05, **AMS members** US\$41.60, List US\$52, Order code MCL/6

Differential Equations



Nonautonomous Dynamical Systems

Peter E. Kloeden, Goethe University Frankfurt am Main, Germany, and **Martin Rasmussen**, Imperial College, London, England

The theory of nonautonomous dynamical systems in both of its formulations as processes and skew product flows is developed systematically in this book. The focus is on dissipative systems and nonautonomous attractors, in particular the recently introduced concept of pullback attractors. Linearization theory, invariant manifolds, Lyapunov functions, Morse decompositions and bifurcations for nonautonomous systems and set-valued generalizations are also considered as well as applications to numerical approximations, switching systems and synchronization. Parallels with corresponding theories of control and random dynamical systems are briefly sketched.

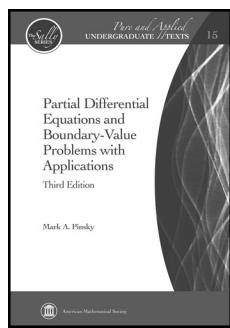
With its clear and systematic exposition, many examples and exercises, as well as its interesting applications, this book can serve as a text at the beginning graduate level. It is also useful for those who wish to begin their own independent research in this rapidly developing area.

Contents: Autonomous dynamical systems; Nonautonomous dynamical systems; Attractors; Morse decompositions; Linear systems; Invariant manifolds; Lyapunov functions; Bifurcations; Set-valued nonautonomous dynamical systems; Nonautonomous semi-dynamical systems; Approximation and perturbation of attractors; Infinite-dimensional systems; Switching and control

systems; Random dynamical systems; Synchronization; Appendix; Bibliography; Index.

Mathematical Surveys and Monographs, Volume 176

September 2011, 264 pages, Hardcover, ISBN: 978-0-8218-6871-3, LC 2011020550, 2010 *Mathematics Subject Classification*: 37B55, 37C60, 37H05, 37B25, 37C75, 37D10, 37G35, **AMS members US\$67.20**, List US\$84, Order code SURV/176



Partial Differential Equations and Boundary-Value Problems with Applications

Third Edition

Mark A. Pinsky, Northwestern University, Evanston, IL

Building on the basic techniques of separation of variables and Fourier series, the book presents the solution of boundary-value problems for basic partial differential equations: the heat equation, wave equation, and Laplace equation, considered in various standard coordinate systems—rectangular, cylindrical, and spherical. Each of the equations is derived in the three-dimensional context; the solutions are organized according to the geometry of the coordinate system, which makes the mathematics especially transparent. Bessel and Legendre functions are studied and used whenever appropriate throughout the text. The notions of steady-state solution of closely related stationary solutions are developed for the heat equation; applications to the study of heat flow in the earth are presented. The problem of the vibrating string is studied in detail both in the Fourier transform setting and from the viewpoint of the explicit representation (d'Alembert formula). Additional chapters include the numerical analysis of solutions and the method of Green's functions for solutions of partial differential equations. The exposition also includes asymptotic methods (Laplace transform and stationary phase).

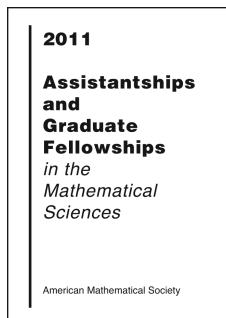
With more than 200 working examples and 700 exercises (more than 450 with answers), the book is suitable for an undergraduate course in partial differential equations.

Contents: Preliminaries; Fourier series; Boundary-value problems in rectangular coordinates; Boundary-value problems in cylindrical coordinates; Boundary-value problems in spherical coordinates; Fourier transforms and applications; Asymptotic analysis; Numerical analysis; Green's functions; Appendixes; Answers to selected exercises; Index.

Pure and Applied Undergraduate Texts, Volume 15

August 2011, 526 pages, Hardcover, ISBN: 978-0-8218-6889-8, LC 2011012736, 2010 *Mathematics Subject Classification*: 35-01, **AMS members US\$63.20**, List US\$79, Order code AMSTEXT/15

General Interest



Assistantships and Graduate Fellowships in the Mathematical Sciences, 2011

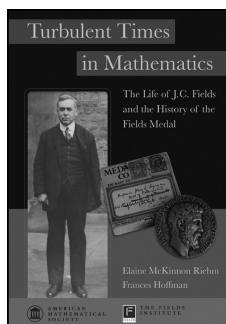
From a review of a previous edition:

This directory is a tool for undergraduate mathematics majors seeking information about graduate programs in mathematics. Although most of the information can be gleaned from the Internet, the usefulness of this directory for the prospective graduate student is the consistent format for comparing different mathematics graduate programs without the hype. Published annually, the information is up-to-date, which is more than can be said of some websites. Support for graduate students in mathematics is a high priority of the American Mathematical Society ... The book is highly recommended for academic and public libraries.

—American Reference Books Annual

This valuable reference source brings together a wealth of information about resources available for graduate study in mathematical sciences departments in the U.S. and Canada.

November 2011, approximately 80 pages, Softcover, ISBN: 978-0-8218-6897-3, **Individual member US\$19.20**, List US\$24, Order code ASST/2011



Turbulent Times in Mathematics

The Life of J. C. Fields and the History of the Fields Medal

Elaine McKinnon Riehm and Frances Hoffman

Despite the renown of the Fields Medals, J. C. Fields has been until now a rather obscure figure, and recovering details about his professional activities and personal life was not at all a simple task. This work is a triumph of persistence with far-flung archival and documentary sources, and provides a rich non-mathematical portrait of the man in all aspects of his life and career. Highly readable and replete with period detail, the book sheds useful light on the mathematical and scientific world of Fields' time, and is sure to remain the definitive biographical study.

—Tom Archibald, Simon Fraser University, Burnaby, BC, Canada

Drawing on a wide array of archival sources, Riehm and Hoffman provide a vivid account of Fields' life and his part in the founding of the highest award in mathematics. Filled with intriguing detail—from a childhood on the shores of Lake Ontario, through the mathematics seminars of late 19th century Berlin, to the post-WW1

years of the fragmented international mathematical community—it is a richly textured story engagingly and sympathetically told. Read this book and you will understand why Fields never wanted the medal to bear his name and yet why, quite rightly, it does.

—June Barrow-Green, Open University, Milton Keynes, United Kingdom

One of the little-known effects of World War I was the collapse of international scientific cooperation. In mathematics, the discord continued after the war's end and after the Treaty of Versailles had been signed in 1919. Many distinguished scientists were involved in the war and its aftermath, and from their letters and papers, now almost a hundred years old, we learn of their anguished wartime views and their struggles afterwards either to prolong the schism in mathematics or to end it.

J. C. Fields, the foremost Canadian mathematician of his time, was educated in Canada, the United States, and Germany, and championed an international spirit of cooperation to further the frontiers of mathematics. It was during the awkward post-war period that J. C. Fields established the Fields Medal, an international prize for outstanding research, which soon became the highest award in mathematics. J. C. Fields intended it to be an international medal, and a glance at the varying backgrounds of the fifty-two Fields medallists shows it to be so.

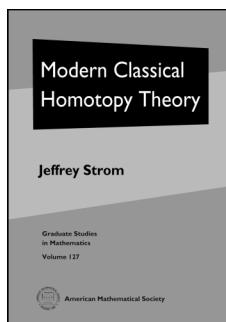
Who was Fields? What carried him from Hamilton, Canada West, where he was born in 1863, into the middle of this turbulent era of international scientific politics? A modest mathematician, he was an unassuming man. This biography outlines Fields' life and times and the difficult circumstances in which he created the Fields Medal. It is the first such published study.

A co-publication of the AMS and Fields Institute.

Contents: Childhood of John Charles Fields; Toronto and Baltimore; Post-doctoral years in Europe, 1892–1900; Return to Canada; Fields and research; Mathematics before 1914: The golden years; Science responds to war; The politics of avoidance; International Mathematical Congress, Toronto 1924; “Sub-turbulent politics”: Pincherle and Bologna; The Fields Medal; Late years; Publications of J. C. Fields; Fields Medallists, 1936–2010; Fields’ colleagues and friends; Bibliography; Acknowledgments; Index.

October 2011, approximately 255 pages, Softcover, ISBN: 978-0-8218-6914-7, 2010 *Mathematics Subject Classification*: 01-XX, 01A05, 01A55, 01A60, 01A70, 01A73, 01A99, 97-02, 97A30, 97A80, 97A40, **AMS members US\$36**, List US\$45, Order code MBK/80

Geometry and Topology



Modern Classical Homotopy Theory

Jeffrey Strom, Western Michigan University, Kalamazoo, MI

The core of classical homotopy theory is a body of ideas and theorems that emerged in the 1950s and was later largely codified in the notion of a model category. This core includes the notions of fibration and cofibration; CW complexes; long fiber and cofiber sequences; loop spaces and suspensions; and so on. Brown’s representability theorems show that homology and cohomology are also contained in classical homotopy theory.

This text develops classical homotopy theory from a modern point of view, meaning that the exposition is informed by the theory of model categories and that homotopy limits and colimits play central roles. The exposition is guided by the principle that it is generally preferable to prove topological results using topology (rather than algebra). The language and basic theory of homotopy limits and colimits make it possible to penetrate deep into the subject with just the rudiments of algebra. The text does reach advanced territory, including the Steenrod algebra, Bott periodicity, localization, the Exponent Theorem of Cohen, Moore, and Neisendorfer, and Miller’s Theorem on the Sullivan Conjecture. Thus the reader is given the tools needed to understand and participate in research at (part of) the current frontier of homotopy theory. Proofs are not provided outright. Rather, they are presented in the form of directed problem sets. To the expert, these read as terse proofs; to novices they are challenges that draw them in and help them to thoroughly understand the arguments.

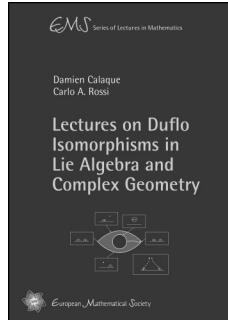
Contents: *The language of categories*: Categories and functors; Limits and colimits; *Semi-formal homotopy theory*: Categories of spaces; Homotopy; Cofibrations and fibrations; Homotopy limits and colimits; Homotopy pushout and pullback squares; Tools and techniques; Topics and examples; Model categories; *Four topological inputs*: The concept of dimension in homotopy theory; Subdivision of disks; The local nature of fibrations; Pullbacks of cofibrations; Related topics; *Targets as domains, domains as targets*: Constructions of spaces and maps; Understanding suspension; Comparing pushouts and pullbacks; Some computations in homotopy theory; Further topics; *Cohomology and homology*: Cohomology; Homology; Cohomology operations; Chain complexes; Topics, problems and projects; *Cohomology, homology and fibrations*: The Wang sequence; Cohomology of filtered spaces; The Serre filtration of a fibration; Application: Incompressibility; The spectral sequence of a filtered space; The Leray-Serre spectral sequence; Application: Bott periodicity; Using the Leray-Serre spectral sequence; *Vistas*: Localization and completion; Exponents for homotopy groups; Classes of spaces; Miller’s theorem; Some algebra; References; Index.

Graduate Studies in Mathematics, Volume 127

January 2012, approximately 834 pages, Hardcover, ISBN: 978-0-8218-5286-6, LC 2011019677, 2010 *Mathematics Subject Classification*: 55Nxx, 55Pxx, 55Qxx, 55Sxx, 55Uxx, **AMS members US\$76**, List US\$95, Order code GSM/127

New AMS-Distributed Publications

Algebra and Algebraic Geometry



Lectures on Duflo Isomorphisms in Lie Algebra and Complex Geometry

Damien Calaque, ETH, Zurich, Switzerland, and Carlo A. Rossi, Max Planck Institute for Mathematics, Bonn, Germany

The Duflo isomorphism first appeared in Lie theory and representation theory. It is an isomorphism between invariant polynomials of a Lie algebra and the center of its universal enveloping algebra, generalizing the pioneering work of Harish-Chandra on semi-simple Lie algebras. Kontsevich later refined Duflo's result in the framework of deformation quantization and also observed that there is a similar isomorphism between Dolbeault cohomology of holomorphic polyvector fields on a complex manifold and its Hochschild cohomology. This book, which arose from a series of lectures by Damien Calaque at ETH, derives these two isomorphisms from a Duflo-type result for Q -manifolds.

All notions mentioned above are introduced and explained in this book. The only prerequisites are basic linear algebra and differential geometry. In addition to standard notions such as Lie (super) algebras, complex manifolds, Hochschild and Chevalley-Eilenberg cohomologies, spectral sequences, Atiyah and Todd classes, the graphical calculus introduced by Kontsevich in his seminal work on deformation quantization is addressed in detail.

This book is well suited for graduate students in mathematics and mathematical physics as well as researchers working in Lie theory, algebraic geometry, and deformation theory.

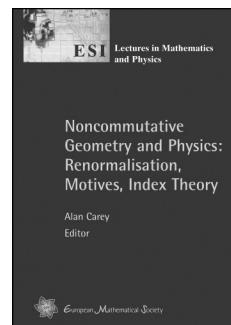
A publication of the European Mathematical Society (EMS). Distributed within the Americas by the American Mathematical Society.

Contents: Lie algebra cohomology and the Duflo isomorphism; Hochschild cohomology and spectral sequences; Dolbeault cohomology and the Kontsevich isomorphism; Superspaces and Hochschild cohomology; The Duflo-Kontsevich isomorphism for Q -spaces; Configuration spaces and integral weights; The map \mathcal{U}_Q and its properties; The map \mathcal{H}_Q and the homotopy argument; The explicit form of \mathcal{U}_Q ; Fedosov resolutions; Appendix: Deformation-theoretical interpretation of Hochschild cohomology; Bibliography; Index.

EMS Series of Lectures in Mathematics, Volume 14

May 2011, 114 pages, Softcover, ISBN: 978-3-03719-096-8, 2010
Mathematics Subject Classification: 13D03, 17B56, 14F43, **AMS members US\$25.60**, List US\$32, Order code EMSSERLEC/14

Analysis



Noncommutative Geometry and Physics: Renormalisation, Motives, Index Theory

Alan Carey, Australian National University, Canberra, Australia, Editor

This collection of expository articles grew out of the workshop "Number Theory and Physics" held in March 2009 at The Erwin Schrödinger International Institute for Mathematical Physics, Vienna. The common theme of the articles is the influence of ideas from noncommutative geometry (NCG) on subjects ranging from number theory to Lie algebras, index theory, and mathematical physics.

Matilde Marcolli's article gives a survey of relevant aspects of NCG in number theory, building on an introduction to motives for beginners by Jorge Plazas and Sujatha Ramdorai. A mildly unconventional view of index theory, from the viewpoint of NCG, is described in the article by Alan Carey, John Phillips, and Adam Rennie. As developed by Alain Connes and Dirk Kreimer, NCG also provides insight into novel algebraic structures underlying many analytic aspects of quantum field theory. Dominique Manchon's article on pre-Lie algebras fits into this developing research area. This interplay of algebraic and analytic techniques also appears in the articles by Christoph Bergbauer, who introduces renormalization theory and Feynman diagram methods, and Sylvie Paycha, who focuses on relations between renormalization and zeta function techniques.

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

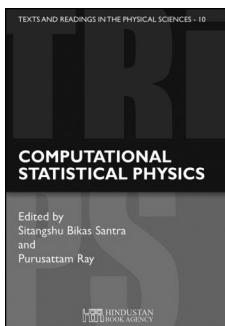
A publication of the European Mathematical Society (EMS). Distributed within the Americas by the American Mathematical Society.

Contents: C. Bergbauer, Notes on Feynman integrals and renormalization; S. Ramdorai, J. Plazas, and M. Marcolli, Introduction to motives. With an appendix by Matilde Marcolli; D. Manchon, A short survey on pre-Lie algebras; S. Paycha, Divergent multiple sums and integrals with constraints: A comparative study; A. Carey, J. Phillips, and A. Rennie, Spectral triples: Examples and index theory; List of contributors; Index.

ESI Lectures in Mathematics and Physics, Volume 8

June 2011, 280 pages, Softcover, ISBN: 978-3-03719-008-1, 2010
Mathematics Subject Classification: 58B34, 11M55, 11G09, 11M06, 11M32, 47G30, 81T15, 17A30, 16T30, 18D50, 46L80, 46L87, 19K33, 19K56, 58J42, 58J20, 81Q30, **AMS members US\$62.40**, List US\$78, Order code EMSESILEC/8

Mathematical Physics



Computational Statistical Physics

Lecture Notes, Guwahati SERC School

Sitangshu Bikas Santra, Indian Institute of Technology, Guwahati, India, and Purusattam Ray, Institute of Mathematical Sciences, Chennai, India, Editors

This book is a result of the SERC School on Computational Statistical Physics, held at the Indian Institute of Technology, Guwahati.

Numerical experimentation has played an extremely important role in statistical physics in recent years. Lectures given at the school covered a large number of topics of current and continuing interest.

Based on lectures by active researchers in the field—Bikas Chakrabarti, Samrath Lal Chaplot, Deepak Dhar, Sanjay Kumar, Prabal Maiti, Sanjay Puri, Purusattam Ray, Sitangshu Santra, and Subir Sarkar—the book's nine chapters deal with topics that range from the fundamentals of the field to problems and questions that are at the very forefront of current research.

This book aims to expose graduate students to basic as well as advanced techniques in computational statistical physics. Following a general introduction to statistical mechanics and critical phenomena, the various chapters cover Monte Carlo and molecular dynamics simulation methodology, along with a variety of applications. These include the study of coarsening phenomena and diffusion in zeolites.

In addition, graphical enumeration techniques are covered in detail, with applications to percolation and polymer physics. Methods for optimization are also discussed.

Beginning graduate students and young researchers in the area of statistical physics will find this book useful. In addition, it will also be a valuable general reference for students and researchers in other areas of science and engineering.

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

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

Contents: S. B. Santra and P. Ray, Statistical mechanics and critical phenomena: A brief overview; D. Dhar, Graphical enumeration techniques: Series expansions and animal problems; S. Kumar, Graphical enumeration techniques: Application to polymers; S. B. Santra and P. Ray, Classical Monte Carlo simulation; S. Puri, Kinetics of phase transitions: Numerical techniques and simulations; H. Kumar and P. K. Maiti, Introduction to molecular dynamics simulation; S. Mitra and S. L. Chaplot, Applications of molecular dynamics simulations; S. K. Sarkar, The conjugate gradient method for unconstrained minimization; A. K. Chandra and B. K. Chakrabarti, Optimization and quantum annealing; List of authors; Index.

Hindustan Book Agency

July 2011, 298 pages, Softcover, ISBN: 978-93-80250-15-1, 2010
Mathematics Subject Classification: 82-XX, 82-02, 82-08, AMS members US\$44, List US\$55, Order code HIN/49

Now providing support for travel to the January Joint Mathematics Meetings or the AMS Sectional Meetings

- For doctoral students
- Check program announcements for eligibility requirements
- Application deadlines:

2012 Joint Mathematics Meetings
September 30, 2011

2012 Spring Sectional Meetings
October 27, 2012

2012 Fall Sectional Meetings
May 17, 2012

Learn more at:
www.ams.org/student-travel