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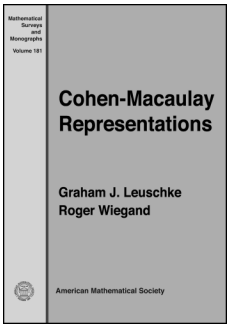
Algebra and Algebraic Geometry



Cohen-Macaulay Representations

Graham J. Leuschke, *Syracuse University, NY*, and **Roger Wiegand**, *University of Nebraska-Lincoln, NE*

This book is a comprehensive treatment of the representation theory of maximal Cohen-Macaulay (MCM) modules over local rings. This topic is at the intersection of commutative algebra, singularity theory, and representations of groups and algebras.

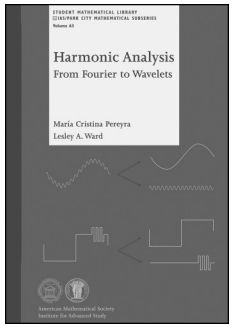
Two introductory chapters treat the Krull-Remak-Schmidt Theorem on uniqueness of direct-sum decompositions and its failure for modules over local rings. Chapters 3–10 study the central problem of classifying the rings with only finitely many indecomposable MCM modules up to isomorphism, i.e., rings of finite CM type. The fundamental material—ADE/simple singularities, the double branched cover, Auslander-Reiten theory, and the Brauer-Thrall conjectures—is covered clearly and completely. Much of the content has never before appeared in book form. Examples include the representation theory of Artinian pairs and Burban-Drozd's related construction in dimension two, an introduction to the McKay correspondence from the point of view of maximal Cohen-Macaulay modules, Auslander-Buchweitz's MCM approximation theory, and a careful treatment of nonzero characteristic. The remaining seven chapters present results on bounded and countable CM type and on the representation theory of totally reflexive modules.

Contents: The Krull-Remak-Schmidt theorem; Semigroups of modules; Dimension zero; Dimension one; Invariant theory; Kleinian singularities and finite CM type; Isoalted singularities and classification in dimension two; The double branched cover; Hypersurfaces with finite CM type; Ascent and descent; Auslander-Buchweitz theory; Totally reflexive modules; Auslander-Reiten theory; Countable Cohen-Macaulay type; The Brauer-Thrall conjectures; Finite CM type in higher dimensions; Bounded CM type; Basics and background; Ramification theory; Bibliography; Index.

Mathematical Surveys and Monographs, Volume 181

June 2012, 367 pages, Hardcover, ISBN: 978-0-8218-7581-0, LC 2012002344, 2010 *Mathematics Subject Classification:* 13C14, 16G50; 13B40, 13C05, 13C60, 13H10, 16G10, 16G60, 16G70, **Individual member US$76.80, AMS members US$76.80**, List US$96, Order code SURV/181

Analysis



Harmonic Analysis

From Fourier to Wavelets

María Cristina Pereyra, *The University of New Mexico, Albuquerque, NM*, and **Lesley A. Ward**, *University of South Australia, Mawson Lakes Campus, Adelaide, Australia*

In the last 200 years, harmonic analysis has been one of the most influential bodies of mathematical ideas, having been exceptionally significant both in its theoretical implications and in its enormous range of applicability throughout mathematics, science, and engineering.

In this book, the authors convey the remarkable beauty and applicability of the ideas that have grown from Fourier theory. They present for an advanced undergraduate and beginning graduate student audience the basics of harmonic analysis, from Fourier's study of the heat equation, and the decomposition of functions into sums of cosines and sines (frequency analysis), to dyadic harmonic analysis, and the decomposition of functions into a Haar basis (time localization). While concentrating on the Fourier and Haar cases, the book touches on aspects of the world that lies between these two different ways of decomposing functions: time–frequency analysis (wavelets). Both finite and continuous perspectives are presented, allowing for the introduction of discrete Fourier and Haar transforms and fast algorithms, such as the Fast Fourier Transform (FFT) and its wavelet analogues.

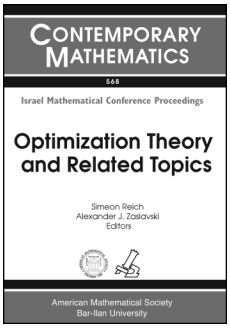
The approach combines rigorous proof, inviting motivation, and numerous applications. Over 250 exercises are included in the text. Each chapter ends with ideas for projects in harmonic analysis that students can work on independently.

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

Contents: Fourier series: Some motivation; Interlude: Analysis concepts; Pointwise convergence of Fourier series; Summability methods; Mean-square convergence of Fourier series; A tour of discrete Fourier and Haar analysis; The Fourier transform in paradise; Beyond paradise; From Fourier to wavelets, emphasizing Haar; Zooming properties of wavelets; Calculating with wavelets; The Hilbert transform; Useful tools; Bibliography; Index of names; Subject index.

Student Mathematical Library, Volume 63

June 2012, approximately 411 pages, Softcover, ISBN: 978-0-8218-7566-7, 2010 *Mathematics Subject Classification:* 42-01; 42-02, 42Axx, 42B25, 42C40, **Individual member US$46.40**, **AMS members US$46.40**, List US$58, Order code STML/63



Optimization Theory and Related Topics

Simeon Reich and **Alexander J. Zaslavski**, *Technion-Israel Institute of Technology, Haifa, Israel*, Editors

This volume contains the proceedings of the workshop on Optimization Theory and Related Topics, held in memory of Dan Butnariu, from January 11–14, 2010, in Haifa, Israel. An active researcher in various fields of applied mathematics, Butnariu published over 80 papers. His extensive bibliography is included in this volume.

The articles in this volume cover many different areas of Optimization Theory and its applications: maximal monotone operators, sensitivity estimates via Lyapunov functions, inverse Newton transforms, infinite-horizon Pontryagin principles, singular optimal control problems with state delays, descent methods for mixed variational inequalities, games on MV-algebras, ergodic convergence in subgradient optimization, applications to economics and technology planning, the exact penalty property in constrained optimization, nonsmooth inverse problems, Bregman distances, retraction methods in Banach spaces, and iterative methods for solving equilibrium problems.

This volume will be of interest to both graduate students and research mathematicians.

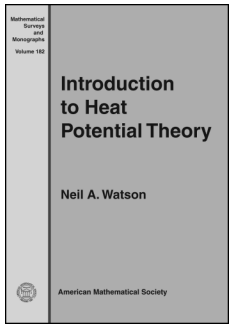
This item will also be of interest to those working in applications.

This book is co-published with Bar-Ilan University (Ramat-Gan, Israel).

Contents: Z. Artstein, Sensitivity estimates via Lyapunov functions and Lyapunov metrics; **H. H. Bauschke**, **X. Wang**, and **L. Yao**, On the maximal monotonicity of the sum of a maximal monotone linear relation and the subdifferential operator of a sublinear function; **A. Ben-Israel**, An inverse Newton transform; **J. Blot**, Infinite-horizon discrete-time Pontryagin principles via results of Michel; **S. D. Flåm**, On sharing of risk and resources; **M. Gabour** and **S. Reich**, The expected retraction method in Banach spaces; **V. Y. Glizer**, Solution of a singular optimal control problem with state delays: A cheap control approach; **I. Ioslovich**, **P.-O. Gutman**, and **A. Lichtsinder**, Robust reduction of dimension of a linear programming problem with uncertainties: Implication for robust production and technology planning; **I. V. Konnov**, Descent methods for mixed variational inequalities with non-smooth mappings; **T. Kroupa**, A generalized Möbius transform of games on MV-algebras and its application to a Cimmino-type algorithm for the core; **T. Larsson**, **M. Patriksson**, and **A.-B. Strömberg**, Ergodic convergence in subgradient optimization with application to simplicial decomposition of convex programs; **O. Mangoubi**, Strategic behavior in multiple-period financial markets; **D. Reem**, The Bregman distance without the Bregman function II; **S. Reich** and **S. Sabach**, Three strong convergence theorems regarding iterative methods for solving equilibrium problems in reflexive Banach spaces; **E. Resmerita**, Towards using coderivatives for convergence rates in regularization; **A. J. Zaslavski**, Existence of exact penalty in constrained optimization and the Mordukhovich basic subdifferential; **A. Zaslavski**, Weakly agreeable programs for the Robinson-Solow-Srinivasan (RSS) model.

Contemporary Mathematics, Volume 568

May 2012, 271 pages, Softcover, ISBN: 978-0-8218-6908-6, LC 2011051454, 2010 *Mathematics Subject Classification:* 34-XX, 39-XX, 46-XX, 47-XX, 49-XX, 52-XX, 65-XX, 90-XX, 91-XX, 93-XX, **Individual member US$77.60**, **AMS members US$77.60**, List US$97, Order code CONM/568



Introduction to Heat Potential Theory

Neil A. Watson, *University of Canterbury, Christchurch, New Zealand*

This book is the first to be devoted entirely to the potential theory of the heat equation, and thus deals with time dependent potential theory. Its purpose is to give a logical, mathematically precise introduction to a subject where previously many proofs were not written in detail, due to their similarity with those of the potential theory of Laplace's equation.

The approach to subtemperatures is a recent one, based on the Poisson integral representation of temperatures on a circular cylinder. Characterizations of subtemperatures in terms of heat balls and modified heat balls are proved, and thermal capacity is studied in detail. The generalized Dirichlet problem on arbitrary open sets is given a treatment that reflects its distinctive nature for an equation of parabolic type. Also included is some new material on caloric measure for arbitrary open sets.

Each chapter concludes with bibliographical notes and open questions. The reader should have a good background in the calculus of functions of several variables, in the limiting processes and inequalities of analysis, in measure theory, and in general topology for Chapter 9.

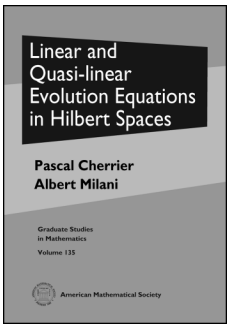
This item will also be of interest to those working in differential equations.

Contents: The heat operator, temperatures and mean values; The Poisson integral for a circular cylinder; Subtemperatures and the Dirichlet problem on convex domains of revolution; Temperatures on an infinite strip; Classes of subtemperatures on an infinite strip; Green functions and heat potentials; Polar sets and thermal capacity; The Dirichlet problem on arbitrary open sets; The thermal fine topology; Bibliography; Index.

Mathematical Surveys and Monographs, Volume 182

May 2012, 266 pages, Hardcover, ISBN: 978-0-8218-4998-9, LC 2012004904, 2010 *Mathematics Subject Classification:* 31-02, 31B05, 31B20, 31B25, 31C05, 31C15, 35-02, 35K05, 31B15, **Individual member US$68.80**, **AMS members US$68.80**, List US$86, Order code SURV/182

Differential Equations



Linear and Quasi-linear Evolution Equations in Hilbert Spaces

Pascal Cherrier, *Université Pierre et Marie Curie, Paris, France*, and **Albert Milani**, *University of Wisconsin, Milwaukee, WI*

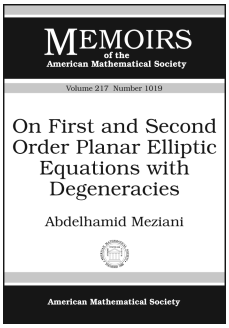
This book considers evolution equations of hyperbolic and parabolic type. These equations are studied from a common point of view, using elementary methods, such as that of energy estimates, which prove to be quite versatile. The authors emphasize the Cauchy problem and present a unified theory for the treatment of these equations. In particular, they provide local and global existence results, as well as strong well-posedness and asymptotic behavior results for the Cauchy problem for quasi-linear equations. Solutions of linear equations are constructed explicitly, using the Galerkin method; the linear theory is then applied to quasi-linear equations, by means of a linearization and fixed-point technique. The authors also compare hyperbolic and parabolic problems, both in terms of singular perturbations, on compact time intervals, and asymptotically, in terms of the diffusion phenomenon, with new results on decay estimates for strong solutions of homogeneous quasi-linear equations of each type.

This textbook presents a valuable introduction to topics in the theory of evolution equations, suitable for advanced graduate students. The exposition is largely self-contained. The initial chapter reviews the essential material from functional analysis. New ideas are introduced along with their context. Proofs are detailed and carefully presented. The book concludes with a chapter on applications of the theory to Maxwell's equations and von Karman's equations.

Contents: Functional framework; Linear equations; Quasi-linear equations; Global existence; Asymptotic behavior; Singular convergence; Maxwell's and von Karman's equations; List of function spaces; Bibliography; Index.

Graduate Studies in Mathematics, Volume 135

August 2012, approximately 378 pages, Hardcover, ISBN: 978-0-8218-7576-6, LC 2012002958, 2010 *Mathematics Subject Classification:* 35L15, 35L72, 35K15, 35K59, 35Q61, 35Q74, **Individual member US$60**, **AMS members US$60**, List US$75, Order code GSM/135



On First and Second Order Planar Elliptic Equations with Degeneracies

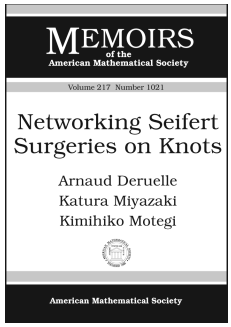
Abdelhamid Meziani, *Florida International University, Miami, FL*

Contents: Introduction; Preliminaries; Basic Solutions; Example; Asymptotic behavior of the basic solutions of $\mathcal{L}$; The kernels; The homogeneous equation $\mathcal{L}u = 0$; The nonhomogeneous equation $\mathcal{L}u = F$; The semilinear equation; The second order equation: Reduction; The homogeneous equation $Pu = 0$; The nonhomogeneous equation $Pu = F$; Normalization of a class of second order equations with a singularity; Bibliography.

Memoirs of the American Mathematical Society, Volume 217, Number 1019

April 2012, 77 pages, Softcover, ISBN: 978-0-8218-5312-2, LC 2011051781, 2010 *Mathematics Subject Classification:* 35J70; 35F05, 30C20, **Individual member US$36**, List US$60, Institutional member US$48, Order code MEMO/217/1019

Geometry and Topology



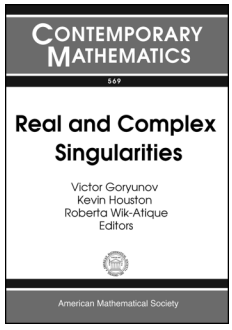
Networking Seifert Surgeries on Knots

Arnaud Deruelle, *Nihon University, Tokyo, Japan*, **Katura Miyazaki**, *Tokyo Denki University, Japan*, and **Kimihiko Motegi**, *Nihon University, Tokyo, Japan*

Contents: Introduction; Seiferters and Seifert Surgery Network; Classification of seiferters; Geometric aspects of seiferters; S-linear trees; Combinatorial structure of Seifert surgery network; Asymmetric seiferters and Seifert surgeries on knots without symmetry; Seifert surgeries on torus knots and graph knots; Paths from various known Seifert surgeries to those on torus knots; Bibliography.

Memoirs of the American Mathematical Society, Volume 217, Number 1021

April 2012, 130 pages, Softcover, ISBN: 978-0-8218-5333-7, LC 2011051783, 2010 *Mathematics Subject Classification:* 57M25, 57M50; 57N10, **Individual member US$42.60**, List US$71, Institutional member US$56.80, Order code MEMO/217/1021



Real and Complex Singularities

Victor Goryunov, *University of Liverpool, United Kingdom*, **Kevin Houston**, *University of Leeds, United Kingdom*, and **Roberta Wik-Atique**, *ICMC/USP-São Carlos, Brazil*, Editors

This volume is a collection of papers presented at the 11th International Workshop on Real and Complex Singularities, held July 26–30, 2010, in São Carlos, Brazil, in honor of David Mond's 60th birthday. This volume reflects the high level of the conference discussing the most recent results and applications of singularity theory. Articles in the first part cover pure singularity theory: invariants, classification theory, and Milnor fibres. Articles in the second part cover singularities in topology and differential geometry, as well as algebraic geometry and bifurcation theory: Artin-Greenberg function of a plane curve singularity, metric theory of singularities, symplectic singularities, cobordisms of fold maps,

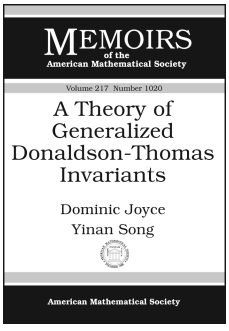
Goursat distributions, sections of analytic varieties, Vassiliev invariants, projections of hypersurfaces, and linearity of the Jacobian ideal.

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

Contents: J. L. Cisneros-Molina, **J. Seade**, and **J. Snoussi**, Milnor fibrations and the concept of d-regularity for analytic map germs; **J. C. F. Costa**, **M. J. Saia**, and **C. H. Soares Júnior**, Bi-Lipschitz $\mathcal{G}$-triviality and Newton polyhedra, $\mathcal{G} = \mathcal{R}, C, \mathcal{K}, \mathcal{R}_V, C_V, \mathcal{K}_V$; **W. Domitrz** and **Ż. Trębska**, Symplectic S_μ singularities; **R. Araújo dos Santos**, **D. Dreibelbis**, and **N. Dutertre**, Topology of the real Milnor fiber for isolated singularities; **C. Maquera** and **W. T. Huaraca**, Compact 3-manifolds supporting some $\mathbb{R}^2$-actions; **M. Kasedou**, Timelike canal hypersurfaces of spacelike submanifolds in a de Sitter space; **D. Lehmann**, Residues in K-theory; **Y. Mizota** and **T. Nishimura**, Multicusps; **P. Mormul**, Small growth vectors of the compactifications of the contact systems on $J^r(1,1)$; **T. Ohmoto**, Vassiliev type invariants for generic mappings, revisited; **B. Oréfice** and **J. N. Tomazella**, Sections of analytic variety; **S. Saleh**, The Artin-Greenberg function of a plane curve singularity; **M. Shubladze**, Singularities with critical locus a complete intersection and transversal type A_1.

Contemporary Mathematics, Volume 569

June 2012, 202 pages, Softcover, ISBN: 978-0-8218-5359-7, LC 2011052531, 2010 *Mathematics Subject Classification:* 58Kxx, 57Rxx, 57Qxx, 32Sxx, 14Pxx, 37Cxx, **Individual member US$59.20**, **AMS members US$59.20**, List US$74, Order code CONM/569



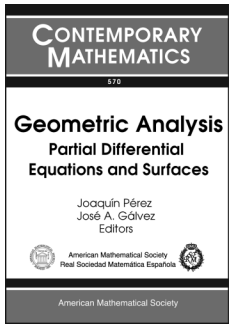
A Theory of Generalized Donaldson-Thomas Invariants

Dominic Joyce, *The Mathematical Institute, Oxford, United Kingdom*, and **Yinan Song**, *Budapest, Hungary*

Contents: Introduction; Constructible functions and stack functions; Background material from [**51, 52, 53, 54**]; Behrend functions and Donaldson-Thomas theory; Statements of main results; Examples, applications, and generalizations; Donaldson-Thomas theory for quivers with superpotentials; The proof of Theorem 5.3; The proofs of Theorems 5.4 and 5.5; The proof of Theorem 5.11; The proof of Theorem 5.14; The proofs of Theorems 5.22, 5.23 and 5.25; The proof of Theorem 5.27; Bibliography; Glossary of Notation; Index.

Memoirs of the American Mathematical Society, Volume 217, Number 1020

April 2012, 199 pages, Softcover, ISBN: 978-0-8218-5279-8, LC 2011051782, 2010 *Mathematics Subject Classification:* 14N35; 14J32, 14F05, 14J60, 14D23, **Individual member US$51.60**, List US$86, Institutional member US$68.80, Order code MEMO/217/1020



Geometric Analysis

Partial Differential Equations and Surfaces

Joaquín Pérez and **José A. Gálvez**, *Universidad de Granada, Spain*, Editors

This volume contains research and expository articles from the courses and talks given at the RSME Lluis A. Santaló Summer School, "Geometric Analysis", held June 28–July 2, 2010, in Granada, Spain.

The goal of the Summer School was to present some of the many advances currently taking place in the interaction between partial differential equations and differential geometry, with special emphasis on the theory of minimal surfaces.

This volume includes expository articles about the current state of specific problems involving curvature and partial differential equations, with interactions to neighboring fields such as probability. An introductory, mostly self-contained course on constant mean curvature surfaces in Lie groups equipped with a left invariant metric is provided.

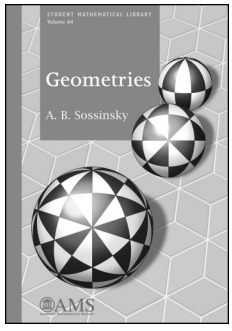
The volume will be of interest to researchers, post-docs, and advanced Ph.D. students in the interface between partial differential equations and differential geometry.

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

Contents: J. A. Gálvez and **P. Mira**, Geometric PDEs in the presence of isolated singularities; **W. H. Meeks III** and **J. Pérez**, Constant mean curvature surfaces in metric Lie groups; **R. W. Neel**, Stochastic methods for minimal surfaces; **F. Pacard**, The role of minimal surfaces in the study of the Allen-Cahn equation; **G. Tinaglia**, On curvature estimates for constant mean curvature surfaces.

Contemporary Mathematics, Volume 570

June 2012, approximately 191 pages, Softcover, ISBN: 978-0-8218-4992-7, 2010 *Mathematics Subject Classification:* 53A10; 35B33, 35B40, 35J20, 35J25, 35J96, 35J60, 49Q05, 53C42, 53C45, **Individual member US$59.20**, **AMS members US$59.20**, List US$74, Order code CONM/570



Geometries

A. B. Sossinsky, *Independent University of Moscow, Russia*

The book is an innovative modern exposition of geometry, or rather, of geometries; it is the first textbook in which Felix Klein's Erlangen Program (the action of transformation groups) is systematically used as the basis for defining various geometries. The course of study presented is dedicated to the proposition that all geometries are created equal—although some, of course, remain more equal than others. The author concentrates on several of the more distinguished and beautiful ones, which include what he terms "toy geometries", the geometries of Platonic bodies, discrete geometries, and classical continuous geometries.

The text is based on first-year semester course lectures delivered at the Independent University of Moscow in 2003 and 2006. It is by no means a formal algebraic or analytic treatment of geometric topics, but rather, a highly visual exposition containing upwards of 200 illustrations. The reader is expected to possess a familiarity with elementary Euclidean geometry, albeit those lacking this knowledge may refer to a compendium in Chapter 0. Per the author's predilection, the book contains very little regarding the axiomatic approach to geometry (save for a single chapter on the history of non-Euclidean geometry), but two Appendices provide a detailed treatment of Euclid's and Hilbert's axiomatics. Perhaps the most important aspect of this course is the problems, which appear at the end of each chapter and are supplemented with answers at the conclusion of the text. By analyzing and solving these problems, the reader will become capable of thinking and working geometrically, much more so than by simply learning the theory.

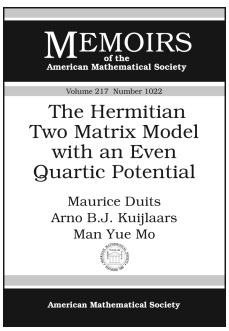
Ultimately, the author makes the distinction between concrete mathematical objects called "geometries" and the singular "geometry", which he understands as a way of thinking about mathematics. Although the book does not address branches of mathematics and mathematical physics such as Riemannian and Kähler manifolds or, say, differentiable manifolds and conformal field theories, the ideology of category language and transformation groups on which the book is based prepares the reader for the study of, and eventually, research in these important and rapidly developing areas of contemporary mathematics.

Contents: About Euclidean geometry; Toy geometries and main definitions; Abstract groups and group presentations; Finite subgroups of $SO(3)$ and the platonic bodies; Discrete subgroups of the isometry group of the plane and tilings; Reflection groups and Coxeter geometries; Spherical geometry; The Poincaré disk model of hyperbolic geometry; The Poincaré half-plane model; The Cayley-Klein model; Hyperbolic trigonometry and absolute constants; History of non-Euclidean geometry; Projective geometry; "Projective geometry is all geometry"; Finite geometries; The hierarchy of geometries; Morphisms of geometries; Excerpts from Euclid's "Elements"; Hilbert's axioms for plane geometry; Answers & hints; Bibliography; Index.

Student Mathematical Library, Volume 64

June 2012, 301 pages, Softcover, ISBN: 978-0-8218-7571-1, LC 2012002357, 2010 *Mathematics Subject Classification:* 51-01; 51-02, 01A20, 01A55, 18-01, **Individual member US$38.40**, **AMS members US$38.40**, List US$48, Order code STML/64

Mathematical Physics



The Hermitian Two Matrix Model with an Even Quartic Potential

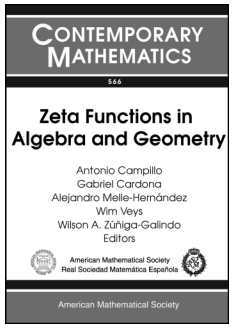
Maurice Duits, *California Institute of Technology, Pasadena, CA*, **Arno B.J. Kuijlaars**, *Katholieke Universiteit Leuven, Belgium*, and **Man Yue Mo**, *University of Bristol, United Kingdom*

Contents: Introduction and statement of results; Preliminaries and the proof of Lemma 1.2; Proof of Theorem 1.1; A Riemann surface; Pearcey integrals and the first transformation; Second transformation $X \mapsto U$; Opening of lenses; Global parametrix; Local parametrices and final transformation; Bibliography; Index.

Memoirs of the American Mathematical Society, Volume 217, Number 1022

April 2012, 105 pages, Softcover, ISBN: 978-0-8218-6928-4, LC 2011051784, 2010 *Mathematics Subject Classification:* 30E25, 60B20; 15B52, 30F10, 31A05, 42C05, 82B26, **Individual member US$42**, List US$70, Institutional member US$56, Order code MEMO/217/1022

Number Theory



Zeta Functions in Algebra and Geometry

Antonio Campillo, *Universidad de Valladolid, Spain*, **Gabriel Cardona**, *Universitat de les Illes Balears, Palma de Mallorca, Spain*, **Alejandro Melle-Hernández**, *Universidad Complutense de Madrid, Spain*, **Wim Veys**, *University of Leuven, Belgium*, and **Wilson A. Zúñiga-Galindo**, *Cinvestav I.P.N., Mexico City, Mexico*, Editors

The volume contains the proceedings of the "Second International Workshop on Zeta Functions in Algebra and Geometry", held May 3–7, 2010 at the Universitat de les Illes Balears, Palma de Mallorca, Spain.

Zeta functions can be naturally attached to several mathematical objects, including fields, groups, and algebras. The conference focused on the following topics: arithmetic and geometric aspects of local, topological, and motivic zeta functions, Poincaré series of valuations, zeta functions of groups, rings, and representations, prehomogeneous vector spaces and their zeta functions, and height zeta functions.

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

Contents: *L-functions of varieties over finite fields and Artin L-functions:* **P. Bayer**, Computational aspects of Artin L-functions; **A. Frühbis-Krüger** and **S. Kadir**, Zeta-functions for families of Calabi-Yau n-folds with singularities; **A. Rojas-León**, Estimates for exponential sums with a large automorphism group; *Height zeta functions and arithmetic:* **D. Essouabri**, Height zeta functions on generalized projective toric varieties; **Yu. I. Manin**, Combinatorial cubic surfaces and reconstruction theorems; **S. Tanimoto** and **Y. Tschinkel**, Height zeta functions of equivariant compactifications of semi-direct products of algebraic groups; *Motivic zeta functions, Poincaré series, complex monodromy and knots:* **N. Budur**, Singularity invariants related to Milnor fibers: Survey; **C. Galindo** and **F. Monserrat**, Finite families of plane valuations: Value semigroup, graded algebra and Poincaré series; **E. Gorsky**, q,t-Catalan numbers and knot homology; **L. H. Halle** and **J. Nicaise**, Motivic zeta functions for degenerations of abelian varieties and Calabi-Yau varieties;

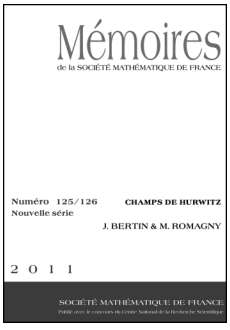
A. Némethi and **F. Román**, The lattices cohomology of $S^3_{-d}(K)$; *Zeta functions for groups and representations:* **N. Avni**, **B. Klopsch**, **U. Onn**, and **C. Voll**, Representation zeta functions of some compact p-adic analytic groups; **A. Shalev**, Applications of some zeta functions in group theory.

Contemporary Mathematics, Volume 566

May 2012, approximately 347 pages, Softcover, ISBN: 978-0-8218-6900-0, LC 2011050434, 2010 *Mathematics Subject Classification:* 11F66, 11G25, 11L07, 11G50, 14D10, 14E18, 14G40, 22E50, 32S40, 57M27, **Individual member US$86.40**, **AMS members US$86.40**, List US$108, Order code CONM/566

New AMS-Distributed Publications

Algebra and Algebraic Geometry



Champs de Hurwitz

J. Bertin and **M. Romagny**, *University Pierre et Marie Curie, Paris, France*

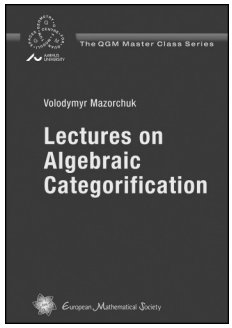
In this work, the authors give a thorough study of Hurwitz stacks and associated Hurwitz moduli spaces, both in the Galois and the non-Galois case, with particular attention to correspondances between these moduli spaces. They compare their construction to those proposed by Abramovich-Corti-Vistoli, Harris-Mumford, and Mochizuki-Wewers. They apply their results to revisit some classical examples, particularly the stacks of stable curves equipped with an arbitrary level structure, and the stacks of tamely ramified cyclic covers. In a second part they exhibit some tautological bundles and cohomology classes naturally living on Hurwitz stacks, and give some universal relations, in particular a higher analogue of the Riemann-Hurwitz formula, between these classes. Applications are given to the stack of cyclic covers of the projective line, with special attention to Cornalba-Harris type relations and to cyclic, in particular hyperelliptic Hodge integrals.

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

Contents: Introduction; Classification des revêtements; Familles de G-courbes lisses et Théorème de Chevalley-Weil; Familles de G-courbes stables; Déformations des revêtements modérément ramifiés; Champs de Hurwitz; Graphes et revêtements; Structures de niveau sur les courbes stables; Revêtements cycliques; Classes tautologiques; Index; Bibliographie.

Mémoires de la Société Mathématique de France, Number 125/126

January 2012, 219 pages, Softcover, ISBN: 978-2-85629-333-1, 2010 *Mathematics Subject Classification:* 14H10, 14H30, 14H37, 14A20, 14C17, 11G20, 11G30, 14C40, **Individual member US$67.50**, List US$75, Order code SMFMEM/125/126



Lectures on Algebraic Categorification

Volodymyr Mazorchuk, *Uppsala University, Sweden*

The term "categorification" was introduced by Louis Crane in 1995 and refers to the process of replacing set-theoretic notions by the corresponding category-theoretic analogues.

This text mostly concentrates on algebraical aspects of the theory, presented in the historical perspective, but also contains several topological applications, in particular, an algebraic (or, more precisely, representation-theoretical) approach to categorification. It consists of fifteen sections corresponding to fifteen one-hour lectures given during a Master Class at Aarhus University, Denmark in October 2010. There are some exercises collected at the end of the text and a rather extensive list of references. Video recordings of all (but one) lectures are available from the Master Class website.

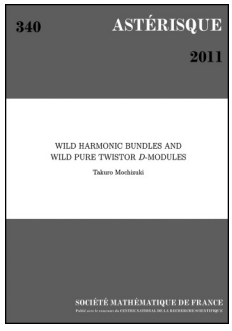
The book provides an introductory overview of the subject rather than a fully detailed monograph. The emphasis is made on definitions, examples and formulations of the results. Most proofs are either briefly outlined or omitted. However, complete proofs can be found by tracking references. It is assumed that the reader is familiar with the basics of category theory, representation theory, topology, and Lie algebra.

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

Contents: Basics: decategorification and categorification; Basics: from categorification of linear maps to 2-categories; Basics: 2-representations of finitary 2-categories; Category $\mathcal{O}$: definitions; Category $\mathcal{O}$: projective and shuffling functors; Category $\mathcal{O}$: twisting and completion; Category $\mathcal{O}$: grading and combinatorics; $\mathbb{S}_n$-categorification: Soergel bimodules, cells and Specht modules; $\mathbb{S}_n$-categorification: (induced) cell modules; Category $\mathcal{O}$: Koszul duality; $\mathfrak{sl}_2$-categorification: simple finite-dimensional modules; Application: categorification of the Jones polynomial; $\mathfrak{sl}_2$-categorification of Chuang and Rouquier; Application: blocks of $\mathbb{F}[\mathbb{S}_n]$ and Broué's conjecture; Applications of $\mathbb{S}_n$-categorifications; Exercises; Bibliography; Index.

The QGM Master Class Series, Volume 2

March 2012, 128 pages, Softcover, ISBN: 978-3-03719-108-8, 2010 *Mathematics Subject Classification:* 18-01, 18D05, 17B10, 17B55, 18A40, 18E30, 57M27, **Individual member US$28.80**, **AMS members US$28.80**, List US$36, Order code EMSQGM/2



Wild Harmonic Bundles and Wild Pure Twistor D-Modules

Takuro Mochizuki, *Kyoto University, Japan*

The author studies (i) the asymptotic behaviour of wild harmonic bundles, (ii) the relation between semisimple meromorphic flat connections and wild harmonic bundles, (iii) the relation between wild harmonic bundles and polarized wild pure twistor D-modules. As an application, he shows the hard

Lefschetz theorem for algebraic semisimple holonomic D-modules, conjectured by M. Kashiwara and also studies resolution of turning points for algebraic meromorphic flat bundles.

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

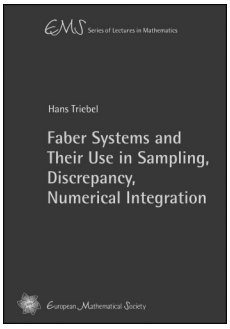
A publication of the Société Mathématique de France, Marseilles (SMF), distributed by the AMS in the U.S., Canada, and Mexico. Orders from other countries should be sent to the SMF. Members of the SMF receive a 30% discount from list.

Contents: Introduction; *Part I. Good meromorphic ϱ-flat bundles:* Good formal property of a meromorphic ϱ-flat bundle; Stokes structure of a good ϱ-meromorphic flat bundle; Full Stokes data and Riemann-Hilbert-Birkhoff correspondence; L^2-cohomology of filtered λ-flat bundle on curves; Meromorphic variation of twistor structure; *Part II. Prolongation of wild harmonic bundle:* Prolongments $\mathcal{P}\mathcal{E}^{\lambda}$ for unramifiedly good wild harmonic bundles; Some basic results in the curve case; Associated family of meromorphic λ-flat bundles; Smooth divisor case; Prolongation and reduction of variations of polarized pure twistor structures; Prolongation as $\mathcal{R}$-triple; *Part III. Kobayashi-Hitchin correspondence:* Preliminaries; Construction of an initial metric and preliminary correspondence; Preliminaries for the resolution of turning points; Kobayashi-Hitchin correspondence and some applications; *Part IV. Application to wild pure twistor D-modules:* Wild pure twistor D-modules; The Hard Lefschetz Theorem; Correspondences; *Part V. Appendix:* Preliminaries from analysis on multi-sectors; Acceptable bundles; Review on $\mathcal{R}$-modules, $\mathcal{R}$-triples and variants; Bibliography; Index.

Astérisque, Number 340

January 2012, 607 pages, Softcover, ISBN: 978-2-85629-332-4, 2010 *Mathematics Subject Classification:* 14J60, 32C38, 53C07, **Individual member US$121.50**, List US$135, Order code AST/340

Analysis



Faber Systems and Their Use in Sampling, Discrepancy, Numerical Integration

Hans Triebel, *Friedrich-Schiller University of Jena, Germany*

This book deals first with Haar bases, Faber bases and Faber frames for weighted function spaces on the real line and the plane. It extends results in the author's book, "Bases in Function Spaces, Sampling, Discrepancy, Numerical Integration" (EMS, 2010), from unweighted spaces (preferably in cubes) to weighted spaces.

The obtained assertions are used to study sampling and numerical integration in weighted spaces on the real line and weighted spaces with dominating mixed smoothness in the plane. A short chapter deals with the discrepancy for spaces on intervals.

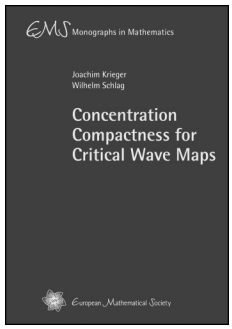
A publication of the European Mathematical Society (EMS). Distributed within the Americas by the American Mathematical Society.

Contents: Introduction, definitions, basic assertions; Spaces on intervals; Spaces on the real line; Spaces on the plane; Bibliography; Symbols; Index.

EMS Series of Lectures in Mathematics, Volume 16

March 2012, 115 pages, Softcover, ISBN: 978-3-03719-107-1, 2010 *Mathematics Subject Classification:* 46-02, 46E35, 42C40, 42B35, 68Q17, 41A55, **Individual member US$28.80**, **AMS members US$28.80**, List US$36, Order code EMSSERLEC/16

Differential Equations



Concentration Compactness for Critical Wave Maps

Joachim Krieger, *EPFL, Lausanne, Switzerland*, and **Wilhelm Schlag**, *University of Chicago, IL*

Wave maps are the simplest wave equations taking their values in a Riemannian manifold (M, g). Their Lagrangian is the same as for the scalar equation, the only difference being that lengths are measured with respect to the metric g. By Noether's theorem, symmetries of the Lagrangian imply conservation laws for wave maps, such as conservation of energy.

In coordinates, wave maps are given by a system of semilinear wave equations. Over the past 20 years important methods have emerged which address the problem of local and global wellposedness of this system. Due to weak dispersive effects, wave maps defined on Minkowski spaces of low dimensions, such as $\mathbb{R}^{2+1}_{t,x}$, present particular technical difficulties. This class of wave maps has the additional important feature of being energy critical, which refers to the fact that the energy scales exactly like the equation.

Around 2000 Daniel Tataru and Terence Tao, building on earlier work of Klainerman-Machedon, proved that smooth data of small energy lead to global smooth solutions for wave maps from 2+1 dimensions into target manifolds satisfying some natural conditions. In contrast, for large data, singularities may occur in finite time for $M = \mathbb{S}^2$ as target. This monograph establishes that for $\mathbb{H}$ as target the wave map evolution of any smooth data exists globally as a smooth function.

While the authors restrict themselves to the hyperbolic plane as target the implementation of the concentration-compactness method, the most challenging piece of this exposition, yields more detailed information on the solution. This monograph will be of interest to experts in nonlinear dispersive equations, in particular to those working on geometric evolution equations.

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

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

Contents: Introduction and overview; The spaces $S[k]$ and $N[k]$; Hodge decomposition and null-structures; Bilinear estimates involving S and N spaces; Trilinear estimates; Quintilinear and higher nonlinearities; Some basic perturbative results; BMO, A_p, and weighted commutator estimates; The Bahouri–Gérard concentration compactness method; The proof of the main theorem; Appendix; References; Index.

EMS Monographs in Mathematics, Volume 5

February 2012, 490 pages, Hardcover, ISBN: 978-3-03719-106-4, 2010 *Mathematics Subject Classification:* 35L05, 35L52, 53Z05, **Individual member US$94.40**, **AMS members US$94.40**, List US$118, Order code EMSMONO/5