Books Catalogue 2023–24

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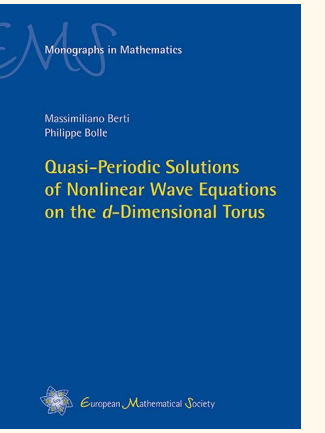
Quasi-Periodic Solutions of Nonlinear Wave Equations on the *d*-Dimensional Torus

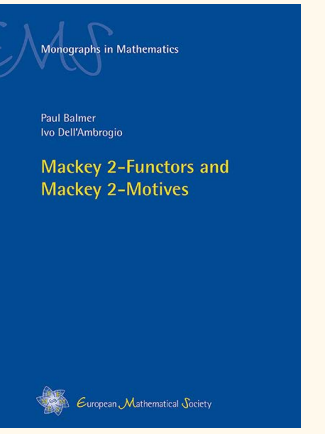


Massimiliano Berti (SISSA, Trieste, Italy), Philippe Bolle (Avignon Université, France)

ISBN 978-3-03719-211-5 | eISBN 978-3-03719-711-0
374pp | Hardcover | €69.00 | $74.00

This monograph deals with partial differential equations (PDEs) and infinite-dimensional Hamiltonian systems, in particular with the existence of time quasi-periodic solutions. It provides an updated introduction to the now rich KAM theory for PDEs before focusing on the nonlinear wave equation with periodic boundary conditions. Its main part deals with the proof of bifurcation of small amplitude finite-dimensional invariant tori for this equation, in any space dimension, combining tools like Nash–Moser and KAM theory, reduction techniques in Hamiltonian dynamics, and multiscale analysis for quasi-periodic linear operators.

Mackey 2-Functors and Mackey 2-Motives

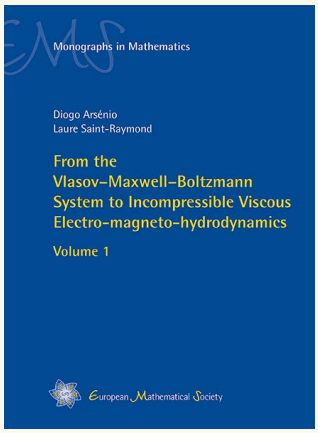


Paul Balmer (University of California, Los Angeles, USA), Ivo Dell'Ambrogio (Université de Lille, France)

ISBN 978-3-03719-209-2 | eISBN 978-3-03719-709-7
235pp | Hardcover | €59.00 | $64.00

This book is dedicated to equivariant mathematics, specifically the study of additive categories of objects with actions of finite groups. The framework of Mackey 2-functors axiomatizes the variance of such categories as a function of the group. In other words, it provides a categorification of the widely used notion of Mackey functor, familiar to representation theorists and topologists. The book contains an extended catalogue of examples of such Mackey 2-functors that are already in use in many mathematical fields from algebra to topology, from geometry to KK-theory.

From the Vlasov–Maxwell–Boltzmann System to Incompressible Viscous Electro-magneto-hydrodynamics

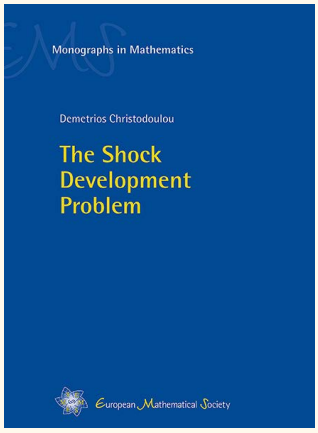


Diogo Arsénio (Université Paris Diderot, France), Laure Saint-Raymond (École Normale Supérieure, France)

ISBN 978-3-03719-193-4 | eISBN 978-3-03719-693-9
418pp | Hardcover | €78.00 | $84.00

This work studies in a systematic way the Vlasov–Maxwell–Boltzmann system for the dynamics of charged particles subject to self-induced electromagnetic forces. Its first part is devoted to the formal analysis of viscous hydrodynamic limits, leading to a precise classification of physically relevant models for viscous incompressible plasmas. In the second part, the convergence results are made precise and rigorous, assuming the existence of renormalized solutions. The third and fourth parts, dealing with a weaker notion of solutions to the system, will be published in a second volume.

The Shock Development Problem



Demetrios Christodoulou (ETH Zürich, Switzerland)

ISBN 978-3-03719-192-7 | eISBN 978-3-03719-692-2
932pp | Hardcover | €128.00 | $137.00

This monograph addresses the problem of the development of shocks in the context of the Eulerian equations of the mechanics of compressible fluids. The mathematical problem is that of an initial-boundary value problem for a nonlinear hyperbolic system of partial differential equations with a free boundary and singular initial conditions, and new geometric and analytic methods are introduced to solve the problem. The developed methods are also relevant in fields like magnetohydrodynamics, nonlinear elasticity, and the electrodynamics of nonlinear media through the ubiquitous nature of shocks in physics.

EMS SERIES IN INDUSTRIAL AND APPLIED MATHEMATICS

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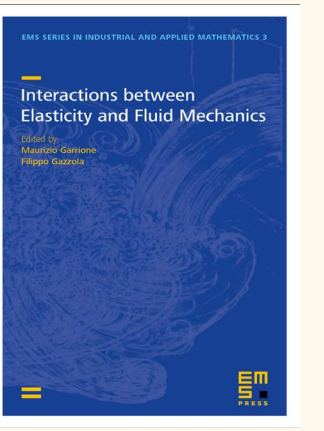
Interactions between Elasticity and Fluid Mechanics



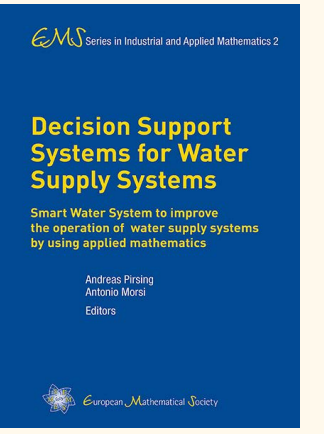
Editors: Maurizio Garrione (Politecnico di Milano, Italy), Filippo Gazzola (Politecnico di Milano, Italy)

ISBN 978-3-98547-027-3 | eISBN 978-3-98547-527-8
248pp | Hardcover | €69.00 | $75.00

This book collects several contributions and points of view on phenomena where fluid mechanics, elasticity, and their interactions are at play. It is addressed both to junior researchers entering the field as well as to experienced professionals aiming to expand their scientific knowledge to closely related disciplines. The book also aims to bring closer the mathematical and engineering communities working on fluid-structure interactions in order to create a common language and to encourage future collaborations.

Decision Support Systems for Water Supply Systems

Smart Water System to Improve the Operation of Water Supply Systems by Using Applied Mathematics



Editors: Antonio Morsi (Universität Erlangen-Nürnberg, Germany), Andreas Pirsing (Siemens AG, Germany)

ISBN 978-3-03719-207-8 | eISBN 978-3-03719-707-3
243pp | Hardcover | €69.00 | $74.00

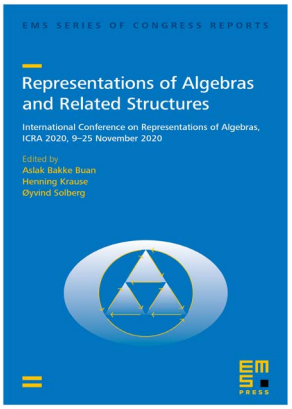
This book summarizes the results of a research project funded by the German Federal Ministry of Education and Research, which was initiated to develop an innovative Decision Support System for water supply companies. Combining mixed-integer linear and nonlinear mathematical optimization methods, as well as simulation methods to verify the physics, the contents of this book will be useful to automation experts in water supply companies as well as to mathematicians working in the infrastructure industry.

EMS SERIES OF CONGRESS REPORTS

The *EMS Series of Congress Reports* publishes volumes originating from conferences or seminars focusing on any field of pure or applied mathematics. The individual volumes include an introduction into their subject and review of the contributions in this context. Articles are required to undergo a refereeing process and are accepted only if they contain a survey or significant results not published elsewhere in the literature.

Representations of Algebras and Related Structures

International Conference on Representations of Algebras, ICRA 2020, 9–25 November 2020



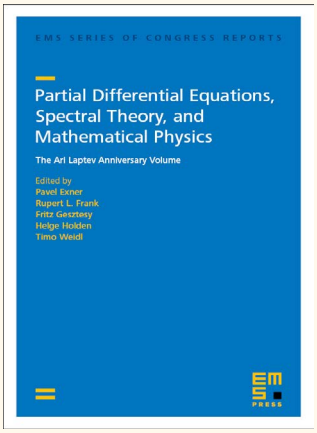
Editors: Aslak Bakke Buan (Norwegian University of Science and Technology, Norway), Henning Krause (Universität Bielefeld, Germany), Oeyvind Solberg (Norwegian University of Science and Technology, Norway)

ISBN 978-3-98547-054-9 | eISBN 978-3-98547-554-4
428pp | Hardcover | €89.00 | $95.00

This volume presents a collection of articles devoted to representations of algebras and related topics. Distinguished experts in this field presented their work at the International Conference on Representations of Algebras in 2020. The book reflects recent trends in the representation theory of algebras and its interactions with other central branches of mathematics, including combinatorics, commutative algebra, algebraic geometry, topology, data analysis, Lie algebras, quantum groups, homological algebra, and theoretical physics. There are thirteen independent articles, written by leading experts in the field.

Partial Differential Equations, Spectral Theory, and Mathematical Physics

The Ari Laptev Anniversary Volume



Editors: Pavel Exner (Czech Technical University, Prague and Czech Academy of Sciences, Czech Republic), Rupert L. Frank (California Institute of Technology, USA and Ludwig-Maximilians-Universität München, Germany), Fritz Gesztesy (Baylor University, USA), Helge Holden (Norwegian University of Science and Technology, Norway), Timo Weidl (Universität Stuttgart, Germany)

ISBN 978-3-98547-007-5 | eISBN 978-3-98547-507-0
494pp | Hardcover | €89.00 | $96.00

This volume is dedicated to Ari Laptev on the occasion of his 70th birthday. It collects original contributions by his numerous colleagues sharing with him research interests in analysis and spectral theory. Topics covered include, among others, functional and entropy inequalities, eigenvalue bounds and asymptotics, heat kernel estimates, Schrödinger operators, Feshbach–Schur maps, scattering theory, stability of matter, homogenization, Bose–Einstein condensation, Bogoliubov theory, Brezis–Nirenberg problems, electron density estimates etc.

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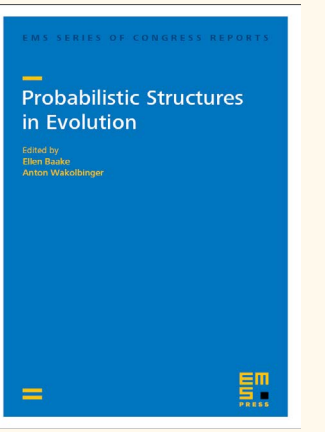
Probabilistic Structures in Evolution

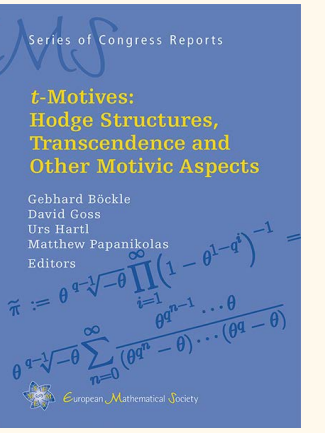


Editors: Ellen Baake (Universität Bielefeld, Germany), Anton Wakolbinger (Goethe-Universität, Germany)

ISBN 978-3-98547-005-1 | eISBN 978-3-98547-505-6
502pp | Hardcover | €89.00 | $96.00

Evolution is a complex phenomenon driven by various processes with intrinsically random elements which give rise to a wealth of phenomena that cannot be explained by deterministic models. The present volume collects twenty-one survey articles about probabilistic aspects of biological evolution, centred around the stochastic processes in population genetics and population dynamics. The contributions in this volume will be valuable to researchers interested in stochastic processes and their biological applications, or in mathematical population biology.

t-Motives: Hodge Structures, Transcendence and Other Motivic Aspects



Editors: Gebhard Böckle (Universität Heidelberg, Germany), David Goss†, Urs Hartl (Universität Münster, Germany), Matthew A. Papanikolas (Texas A&M University, USA)

ISBN 978-3-03719-198-9 | eISBN 978-3-03719-698-4
473pp | Hardcover | €89.00 | $96.00

This volume contains research and survey articles on Drinfeld modules, Anderson *t*-modules and *t*-motives. Much material that had not been easily accessible in the literature is presented, for example the cohomology theories and Pinks theory of Hodge structures attached to Drinfeld modules and *t*-motives. Also included are survey articles on the function field analogue of Fontaines theory of *p*-adic crystalline Galois representations and on transcendence methods over function fields, encompassing the theories of Frobenius difference equations, automata theory, and Mahlers method, as well as a small number of research articles.

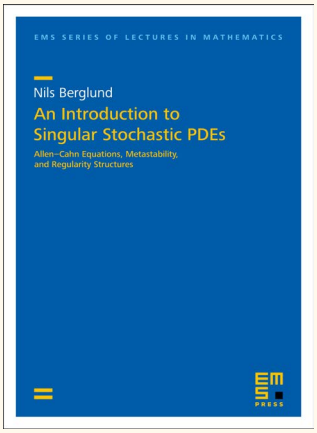
EMS SERIES OF LECTURES IN MATHEMATICS

The *EMS Series of Lectures in Mathematics* is a book series aimed at students, professional mathematicians and scientists. It publishes polished notes arising from seminars or lecture series in all fields of pure and applied mathematics, including the reissue of classic texts of continuing interest. The individual volumes are intended to give a rapid and accessible introduction into their particular subject, guiding the audience to topics of current research and the more advanced and specialized literature.

Edited by Ari Laptev (Imperial College London)

An Introduction to Singular Stochastic PDEs

Allen–Cahn Equations, Metastability, and Regularity Structures



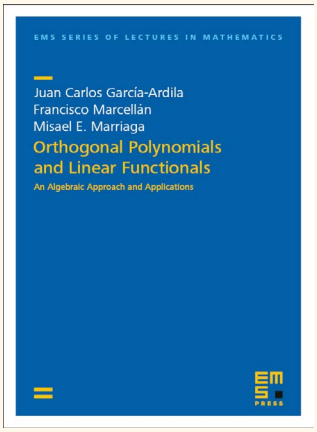
Nils Berglund (Institut Denis Poisson, Université d'Orleans, Université de Tours and CNRS)

ISBN 978-3-98547-014-38 | eISBN 978-3-98547-514-8
230pp | Softcover | €39.00 | $42.00

This book gives a largely self-contained exposition of the subject of regular and singular SPDEs in the particular case of the Allen–Cahn equation. Properties of the equation are discussed successively in one, two and three spatial dimensions, allowing to introduce new difficulties of the theory in an incremental way. In addition to existence and uniqueness of solutions, aspects of long-time dynamics such as invariant measures and metastability are discussed. For the three-dimensional case, the theory of regularity structures developed by Martin Hairer and co-authors is presented.

Orthogonal Polynomials and Linear Functionals

An Algebraic Approach and Applications

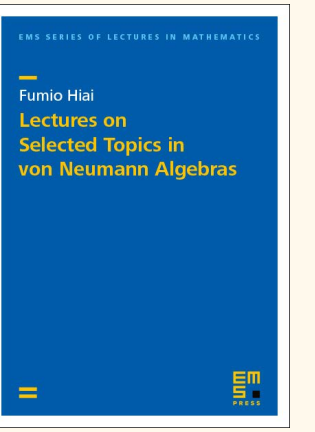


Juan Carlos García-Ardila (Universidad Politécnica de Madrid, Spain), Francisco Marcellán (Universidad Carlos III de Madrid, Spain), Misael E. Marriaga (Universidad Rey Juan Carlos, Spain)

ISBN 978-3-98547-008-2 | eISBN 978-3-98547-508-7
128pp | Softcover | €39.00 | $42.00

This book presents an introduction to orthogonal polynomials, with an algebraic flavor, based on linear functionals defining the orthogonality and the Jacobi matrices associated with them. The book's structure reflects the fact that its content is based on a set of lectures delivered by one of the authors at the first Orthonet Summer School in Seville, Spain in 2016. The presentation of the material is self-contained and will be valuable to students and researchers interested in a novel approach to the study of orthogonal polynomials, focusing on their analytic properties.

Lectures on Selected Topics in von Neumann Algebras

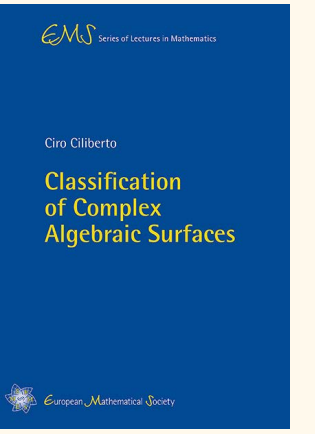


Fumio Hiai (Tohoku University, Japan)

ISBN 978-3-98547-004-4 | eISBN 978-3-98547-504-9
250pp | Softcover | €39.00 | $42.00

The theory of von Neumann algebras, originating with the work of F. J. Murray and J. von Neumann in the late 1930s, has grown into a rich discipline with connections to different branches of mathematics and physics. These lecture notes aim to present a fast-track study of some important topics in classical parts of von Neumann algebra theory that were developed in the 1970s. The self-contained presentation of the material makes this book useful not only to graduate students and researchers interested in von Neumann algebras, but also to undergraduates with a basic knowledge of functional analysis and measure theory.

Classification of Complex Algebraic Surfaces



Ciro Ciliberto (Università di Roma Tor Vergata, Italy)

ISBN 978-3-03719-210-8 | eISBN 978-3-03719-710-3
143pp | Softcover | €36.00 | $39.00

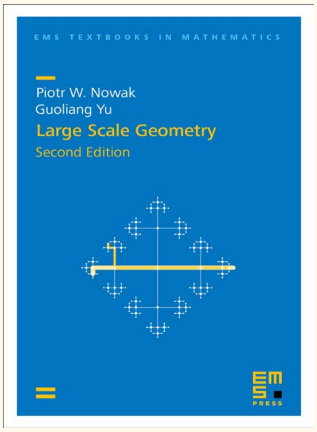
The classification of complex algebraic surfaces is a very classical subject which goes back to the old Italian school of algebraic geometry. The exposition in the present book is though modern and follows Mori's approach to the classification of algebraic varieties. The text includes the P12 theorem, the Sarkisov programme in the surface case and the Noether–Castelnuovo theorem in its classical version. This self-contained book serves as a relatively quick and handy introduction to the theory of algebraic surfaces and is intended for readers with a good knowledge of basic algebraic geometry.

EMS TEXTBOOKS IN MATHEMATICS

The *EMS Textbooks in Mathematics* is a book series aimed at students or professional mathematicians seeking an introduction into a particular field. The individual volumes are intended to provide not only relevant techniques, results and their applications, but afford insight into the motivations and ideas behind the theory. Suitably designed exercises help to master the subject and prepare the reader for the study of more advanced and specialized literature.

Large Scale Geometry

Second Edition



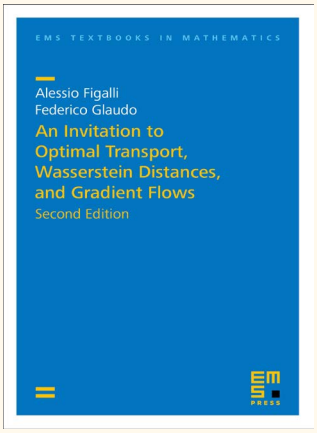
Piotr W. Nowak (Polish Academy of Sciences, Poland), Guoliang Yu (Texas A&M University, USA)

ISBN 978-3-98547-018-1 | eISBN 978-3-98547-518-6
213pp | Hardcover | €49.00 | $55.00

This book provides a friendly approach to the basic theory of large scale geometry and offers a glimpse of its applications to topology, geometry, and higher index theory. The authors have made a conscientious effort to make the book accessible to advanced undergraduate students, graduate students, and non-experts. The present second edition has been updated to cover recent developments involving constructions of groups and metric spaces with exotic properties as well as results charting new directions in index theory, and it also includes minor improvements in the presentation and an updated bibliography.

An Invitation to Optimal Transport, Wasserstein Distances, and Gradient Flows

Second Edition



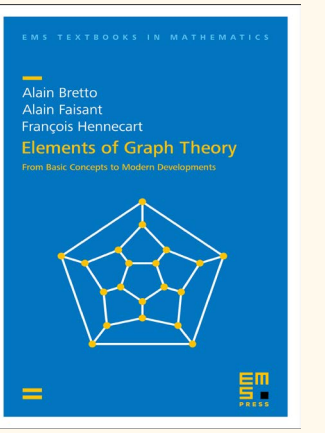
Alessio Figalli (ETH Zürich, Switzerland), Federico Glaudo (Institute for Advanced Study, USA)

ISBN 9978-3-98547-050-1 | eISBN 978-3-98547-550-6
152pp | Hardcover | €39.00 | $45.00

Coauthored by one of the leading experts in optimal transport, this book provides a self-contained introduction to this important topic presenting its essentials: Kantorovich duality, existence and uniqueness of optimal transport maps, Wasserstein distances, the JKO scheme, Ottos calculus, and Wasserstein gradient flows. The book is suitable for a course at the graduate level, and also includes an appendix with a series of exercises along with their solutions. The present second edition contains a number of additions, such as a new section on the Brunn–Minkowski inequality, new exercises, and various corrections throughout the text.

Elements of Graph Theory

From Basic Concepts to Modern Developments



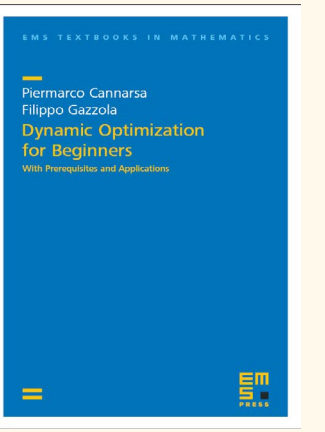
Alain Faisant (Université de Lyon – Université Jean Monnet Saint-Étienne, France), François Hennecart (Université de Lyon – Université Jean Monnet Saint-Étienne, France), Alain Bretto (Université de Caen Normandie, France)

ISBN 978-3-98547-017-4 | eISBN 978-3-98547-517-9
502pp | Hardcover | €59.00 | $65.00

This book is an introduction to graph theory, presenting most of its elementary and classical notions through an original and rigorous approach, including detailed proofs of most of the results. It covers all aspects of graph theory from an algebraic, topological and analytic point of view, while also developing the theory's algorithmic parts. The variety of topics covered aims to lead the reader in understanding graphs in their greatest diversity in order to perceive their power as a mathematical tool.

Dynamic Optimization for Beginners

With Prerequisites and Applications



Piermarco Cannarsa (Università di Roma, Italy), Filippo Gazzola (Politecnico di Milano, Italy)

ISBN 978-3-98547-012-9 | eISBN 978-3-98547-512-4
360pp | Hardcover | €49.00 | $53.00

The main purpose of this book is to give interested readers a friendly introduction to optimization problems for dynamical systems, providing them with the essential notions needed to handle most of the concrete situations they will be faced with. The main topics covered are calculus of variations, optimal control theory, and dynamic programming, along with many examples and exercises. Its intended readership includes both mathematics students and students or researchers in other disciplines such as economics and data science.

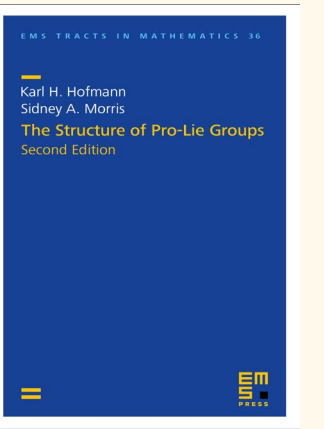
EMS TRACTS IN MATHEMATICS

This series includes advanced texts and monographs covering all fields in pure and applied mathematics. The Tracts will give a reliable introduction and reference to special fields of current research. The books in the series will in most cases be authored monographs, although edited volumes may be published if appropriate. They are addressed to graduate students seeking access to research topics as well as to the experts in the field working at the frontier of research.

Edited by Yann Bugeaud (Université de Strasbourg), Camillo De Lellis (Institute for Advanced Study), Michael Farber (Queen Mary University), Michael Röckner (Universität Bielefeld and Purdue University), and Alexander Varchenko (University of North Carolina at Chapel Hill)

The Structure of Pro-Lie Groups

Second Edition



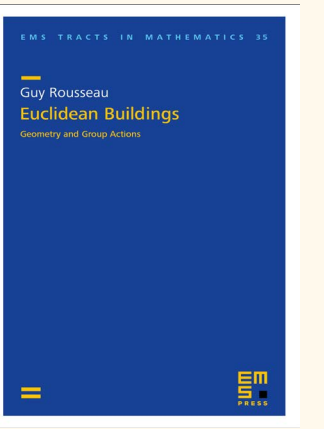
Karl H. Hofmann (Technische Universität Darmstadt, Germany; Tulane University, USA), Sidney A. Morris (La Trobe University, Bundoora; Federation University Australia, Australia)

ISBN 978-3-98547-048-8 | eISBN 978-3-98547-548-3
840pp | Hardcover | €119.00 | $129.00

This book exposes a Lie theory of almost connected pro-Lie groups (and hence of almost connected locally compact groups) and illuminates the variety of ways in which their structure theory reduces to that of compact groups on the one hand and of finite dimensional Lie groups on the other. It is therefore a continuation of the authors' monograph on the structure of compact groups and is an invaluable tool for researchers and graduate students working in topological groups, Lie theory, harmonic analysis and representation theory.

Euclidean Buildings

Geometry and Group Actions



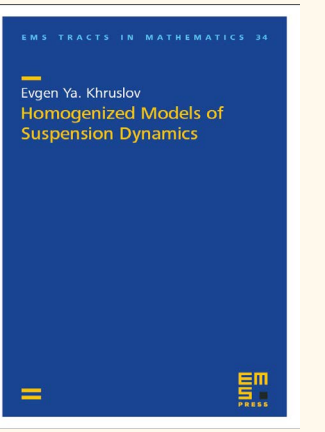
Guy Rousseau (Université de Lorraine, IECL, France)

ISBN 978-3-98547-039-6 | eISBN 978-3-98547-539-1
607pp | Hardcover | €99.00 | $109.00

The theory of buildings lies at the interplay between geometry and group theory, and is one of the main tools for studying the structure of many groups. The present book develops the general abstract theory of Euclidean buildings (that is, buildings with Euclidean affine spaces as apartments). It is largely self-contained and emphasizes the metric aspects of these objects, as CAT(0) spaces very similar to Riemannian symmetric spaces of non-compact type. The book studies their compactifications, their links with groups, many classical examples, and some applications (for example, to Hecke algebras).

EMS TRACTS IN MATHEMATICS

Homogenized Models of Suspension Dynamics



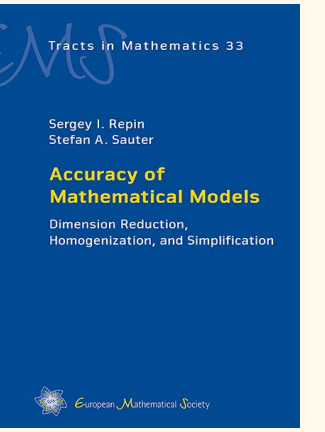
Evgen Ya. Khruslov (B. Verkin Institute for Low Temperature Physics and Engineering of the National Academy of Sciences, Ukraine)

ISBN 978-3-98547-009-9 | eISBN 978-3-98547-509-4
288pp | Hardcover | €59.00 | $64.00

This book studies the motion of suspensions, that is, of mixtures of a viscous incompressible fluid with small solid particles that can interact with each other through forces of non-hydrodynamic origin. Being one of the first mathematically rigorous treatises on suspensions from the viewpoint of homogenization theory, it will be useful to graduate students and researchers in applied analysis and partial differential equations as well as to physicists and engineers interested in the theory of complex fluids with microstructure.

Accuracy of Mathematical Models

Dimension Reduction, Homogenization, and Simplification



Sergey I. Repin (Russian Academy of Sciences, Russian Federation), Stefan A. Sauter (Universität Zürich, Switzerland)

ISBN 978-3-03719-206-1 | eISBN 978-3-03719-706-6
333pp | Hardcover | €59.00 | $64.00

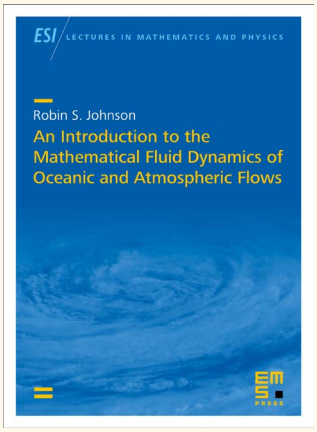
This book presents a unified approach to the analysis of accuracy of deterministic mathematical models described by variational problems and elliptic partial differential equations. It is based on new mathematical methods developed to estimate the distance between a solution of a boundary value problem and any function in the admissible functional class associated with it. The theory is presented for a wide class of elliptic variational problems and it is applied to the investigation of modelling errors arising in dimension reduction, homogenization, simplification, and various conversion methods.

ESI LECTURES IN MATHEMATICS AND PHYSICS

The purpose of the series *ESI Lectures in Mathematics and Physics* is to make selected texts arising from its research programme better known to a wider community and easily available to a worldwide audience. It publishes lecture notes of courses given by internationally renowned experts on highly active research topics. In order to make the series attractive to graduate students as well as researchers, special emphasis is given to concise and lively presentations with a level and focus appropriate to a student's background and at prices commensurate with a student's means.

Edited by Christoph Dellago and Ilaria Perugia (Universität Wien)

An Introduction to the Mathematical Fluid Dynamics of Oceanic and Atmospheric Flows

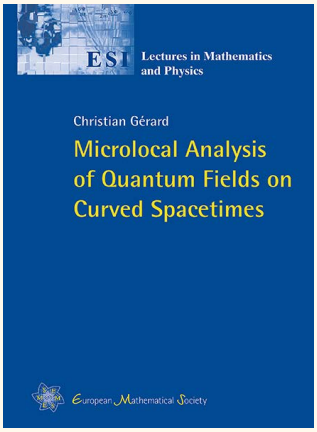


Robin S. Johnson (Newcastle University, United Kingdom)

ISBN 978-3-98547-029-7 | eISBN 978-3-98547-529-2
176pp | Softcover | €49.00 | $55.00

The study of the movement of the atmosphere and the oceans is intriguing, challenging and important, particularly in the context of current concerns about the climate. This text presents a single, over-arching modelling approach which uses the thin-shell approximation – and nothing more – applied to the general equations of fluid dynamics. It is suitable for researchers, and students, in the oceanic and atmospheric sciences, and for mathematicians with an interest in the application of fluid dynamics to more complicated flow scenarios.

Microlocal Analysis of Quantum Fields on Curved Spacetimes



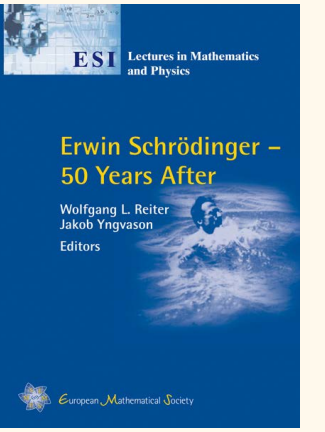
Christian Gérard (Université de Paris 11, France)

ISBN 978-3-03719-094-4 | eISBN 978-3-03719-594-9
228pp | Softcover | €48.00 | $52.00

This monograph is addressed to both mathematicians and mathematical physicists. The first will be able to use it as a rigorous exposition of free quantum fields on curved spacetimes and as an introduction to some interesting and physically important problems arising in this domain. The second may find this text a useful introduction and motivation to the use of more advanced tools of microlocal analysis in this area of research.

ESI LECTURES IN MATHEMATICS AND PHYSICS

Erwin Schrödinger – 50 Years After

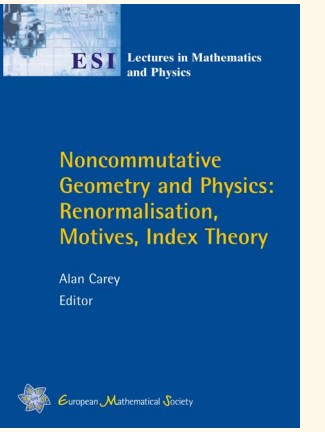


Editors: Wolfgang L. Reiter (University of Vienna, Austria), Jakob Yngvason (University of Vienna, Austria)

ISBN 978-3-03719-121-7 | eISBN 978-3-03719-621-2
195pp | Softcover | €69.00 | $74.00

This book contains lectures presented at the international symposium "Erwin Schrödinger – 50 Years After" held at the Erwin Schrödinger International Institute for Mathematical Physics in Vienna in January 2011 to commemorate the 50th anniversary of Schrödinger's death. A broad spectrum of topics is covered, ranging from personal reminiscences to foundational questions of quantum mechanics and historical accounts of Schrödinger's work. Besides the lectures presented at the symposium, the volume also contains articles specially written for this occasion.

Noncommutative Geometry and Physics: Renormalisation, Motives, Index Theory



Editors: Alan L. Carey (Australian National University, Canberra)

ISBN 978-3-03719-008-1 | eISBN 978-3-03719-508-6
280pp | Softcover | €69.00 | $74.00

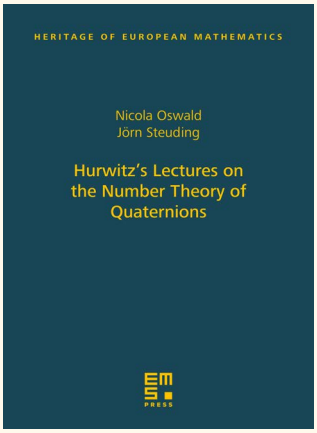
This collection of expository articles grew out of the workshop "Number Theory and Physics" held in March 2009 at the Erwin Schrödinger International Institute for Mathematical Physics in Vienna. The common theme of the articles is the influence of ideas from noncommutative geometry on subjects ranging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

HERITAGE OF EUROPEAN MATHEMATICS

This series features the selected or collected works of distinguished mathematicians. Biographies of and correspondence between outstanding mathematicians, as well as other texts of historico-mathematical interest are also included.

Advisory Board: Ciro Ciliberto (Università degli Studi di Roma "Tor Vergata"), Władysław Narkiewicz (Uniwersytet Wrocławski), Samuel J. Patterson (Universität Göttingen), and Rossana Tazzioli (Université de Lille).

Hurwitz's Lectures on the Number Theory of Quaternions

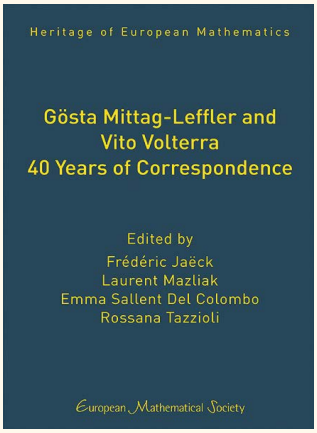


Nicola Oswald (Bergische Universität Wuppertal, Germany), Jörn Steuding (Julius-Maximilians Universität Würzburg, Germany),

ISBN 978-3-98547-011-2 | eISBN 978-3-98547-511-7
311pp | Hardcover | €79.00 | $85.00

This book contains an English translation of Adolf Hurwitz's 1919 textbook on the number theory of quaternions as well as his famous 1-2-3-4 theorem on composition algebras. In addition, the reader can find commentaries that shed historical light on the development of this number theory of quaternions, for example, the classical preparatory works (of Fermat, Euler, Lagrange and Gauss to name but a few), the different notions of quaternion integers in the works of Lipschitz and Hurwitz, analogies to the theory of algebraic numbers, and the further development (including Dicksons work in particular).

Gösta Mittag-Leffler and Vito Volterra. 40 Years of Correspondence



Editors: Frédéric Jaëck (École Normale Supérieure, France), Laurent Mazliak (Université Pierre et Marie Curie, France), Emma Sallent Del Colombo (Universitat de Barcelona, Spain), Rossana Tazzioli (Université Lille 1, France)

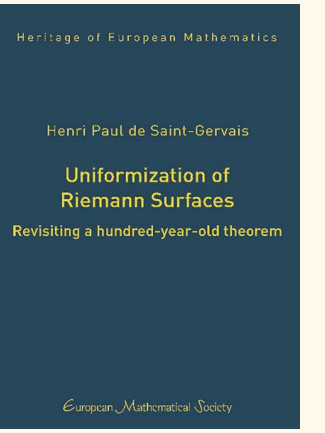
ISBN 978-3-03719-199-6 | eISBN 978-3-03719-699-1
438pp | Hardcover | €88.00 | $95.00

The present book contains the voluminous correspondence exchanged between the prominent mathematicians Gösta Mittag-Leffler and Vito Volterra, spanning a period of almost forty years at the end of the 19th and beginning of the 20th centuries. This vast set of letters provides a general overview of mathematical life at the turn of the 19th century and an appreciation of the European intellectual spirit which came to an end, or at least suffered a drastic turn, when the Great War broke out. An extensive general introduction as well as exhaustive annotations enhance the presentation of these captivating documents.

HERITAGE OF EUROPEAN MATHEMATICS

Uniformization of Riemann Surfaces

Revisiting a hundred-year-old theorem

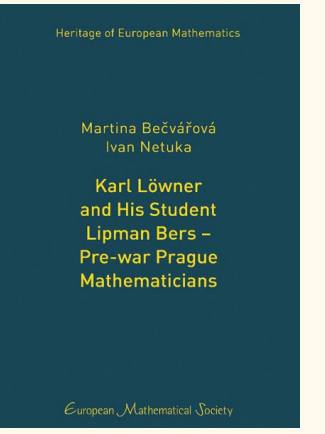


Henri Paul de Saint-Gervais (Paris)

ISBN 978-3-03719-145-3 | eISBN 978-3-03719-645-8
512pp | Hardcover | €79.00 | $85.00

The evolution of the uniformization theorem took place in parallel with the emergence of modern algebraic geometry, the creation of complex analysis, the first stirrings of functional analysis, and with the flowering of the theory of differential equations and the birth of topology. Rather than describing the history of a single theorem, the author returns to the original proofs through the eyes of modern mathematicians, to enquire as to their correctness, and to attempt to make them rigorous while respecting the state of mathematical knowledge at the time, or, if this should prove impossible, using modern mathematical tools.

Karl Löwner and His Student Lipman Bers – Pre-war Prague Mathematicians



Martina Bečvářová (Czech Technical University, Czech Republic), Ivan Netuka (Charles University, Czech Republic)

ISBN 978-3-03719-144-6 | eISBN 978-3-03719-644-1
310pp | Hardcover | €79.00 | $85.00

This monograph is devoted to two distinguished mathematicians, Karel Löwner and Lipman Bers, whose lives are dramatically interlinked with key historical events of the 20th century. It presents an in-depth account of the lives of both, with special emphasis on the pre-war period. Included are extensive commentaries of their works, tracing the origin and motivation of the problems studied, while paying special attention to the impact of their fundamental results on current research in mathematics. The text is based on an extensive archival search, and most of the archival findings appear here for the first time.

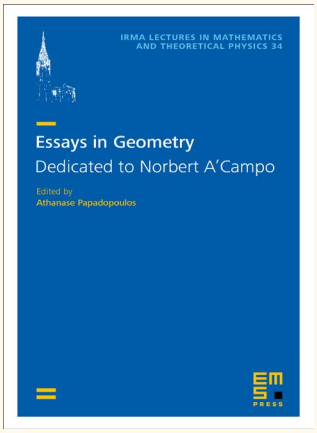
IRMA LECTURES IN MATHEMATICS AND THEORETICAL PHYSICS

This series is devoted to the publication of research monographs, conferences or workshops originating from the Institut de Recherche Mathématique Avancée (Strasbourg, France). The goal is to promote recent advances in mathematics and theoretical physics and make them accessible to a wide circle of professional and aspiring mathematicians and physicists.

Edited by: Olivier Guichard (Institut de Recherche Mathématique Avancée)

Essays in Geometry

Dedicated to Norbert A'Campo



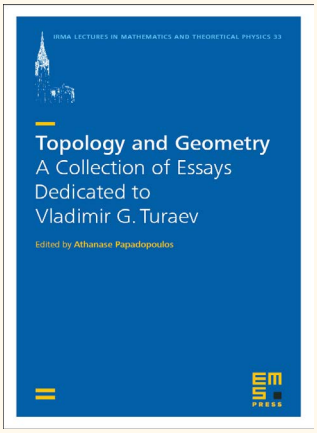
Editor: Athanase Papadopoulos (University of Strasbourg, France)

ISBN 978-3-98547-024-2 | eISBN 978-3-98547-524-7
1028pp | Hardcover | €129.00 | $139.00

This volume consists in a collection of essays dedicated to Norbert A'Campo on the occasion of his 80th birthday. The subject is geometry in the broadest sense. The topics include hyperbolic and super hyperbolic geometry, 3-manifolds, metric geometry, mapping class groups, linear groups, Riemann surfaces, Teichmüller spaces, high-dimensional complex geometry, differential topology, symplectic geometry, singularity theory, number theory, algebraic geometry, dynamics, mathematical physics and philosophy of mathematics. The book gives a fairly comprehensive overview of the wealth of current research in geometry.

Topology and Geometry

A Collection of Essays Dedicated to Vladimir G. Turaev



Editor: Athanase Papadopoulos (Université de Strasbourg and CNRS, France)

ISBN 9978-3-98547-001-3 | eISBN 978-3-98547-501-8
698pp | Hardcover | €99.00 | $106.00

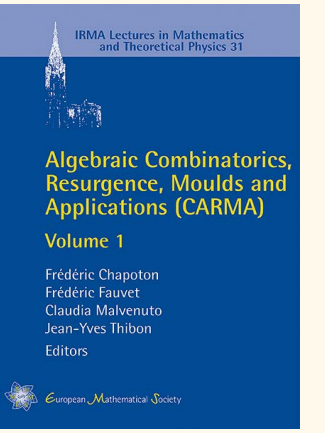
Vladimir Turaev's numerous contributions are revisited and celebrated in this collected volume. The included essays cover the large spectrum of topics in which Turaev has been interested, including knot and link invariants, quantum representations, TQFTs, state sum constructions, geometric structures on knot complements, Kleinian groups, geometric group theory and its relationship with 3-manifolds, mapping class groups, operads, mathematical physics, Grothendieck's program, the philosophy of mathematics, and several other topics.

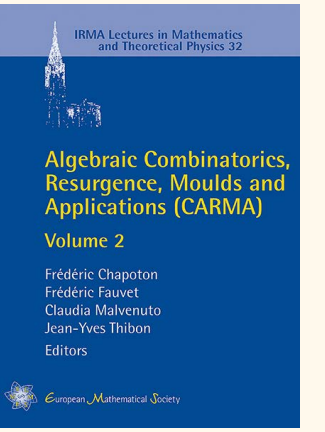
Algebraic Combinatorics, Resurgence, Moulds and Applications (CARMA)

Editors: Frédéric Chapoton (Université de Strasbourg, France), Frédéric Fauvet (Université de Strasbourg, France), Claudia Malvenuto (Università di Roma La Sapienza, Italy), Jean-Yves Thibon (Université Paris-Est Marne-la-Vallée, France)

Volume 1: ISBN 978-3-03719-205-4 | eISBN 978-3-03719-705-9
Volume 2: ISBN 978-3-03719-204-7 | eISBN 978-3-03719-704-2
396pp | Softcover | €58.00 | $63.00

This two-volume work comprises a total of 14 refereed research articles which stem from the CARMA Conference (Algebraic Combinatorics, Resurgence, Moulds and Applications), held at the Centre International de Rencontres Mathématiques in Luminy, France, from June 26 to 30, 2017. The conference did notably emphasise the role of Hopf algebraic techniques and related concepts which have lately proved pervasive in combinatorics, but also in many other fields, from multiple zeta values to the algebraic study of control systems and the theory of rough paths.





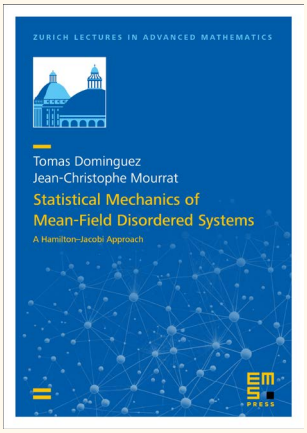
ZÜRICH LECTURES IN ADVANCED MATHEMATICS

Mathematics in Zürich has a long and distinguished tradition, in which the writing of lecture notes volumes and research monographs play a prominent part. The *Zürich Lectures in Advanced Mathematics* series aims to make some of these publications better known to a wider audience.

Edited by Habib Ammari (ETH Zürich), Alexander Gorodnik (Universität Zürich, managing editor), Urs Lang (ETH Zürich, managing editor), Michael Struwe (ETH Zürich)

Statistical Mechanics of Mean-Field Disordered Systems

A Hamilton–Jacobi Approach

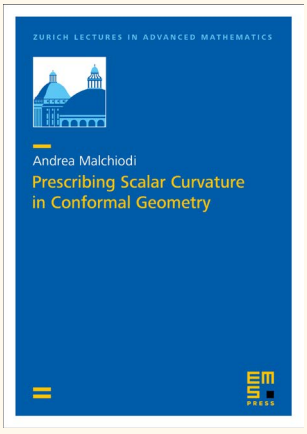


Tomas Dominguez (University of Toronto, Canada), Jean-Christophe Mourrat (École Normale Supérieure de Lyon, France)

ISBN 978-3-03719-204-7 | eISBN 978-3-98547-574-2
367pp | Softcover | €59.00 | $65.00

The goal of this book is to present new mathematical techniques for studying the behavior of mean-field systems with disordered interactions. The authors mostly focus on certain problems of statistical inference in high dimension, and on spin glasses. The presented techniques aim to determine the free energy of these systems, in the limit of large system size, by showing that they asymptotically satisfy a Hamilton–Jacobi equation.

Prescribing Scalar Curvature in Conformal Geometry



Andrea Malchiodi (Scuola Normale Superiore di Pisa, Italy)

ISBN 978-3-98547-052-5 | eISBN 978-3-98547-552-0
161pp | Softcover | €39.00 | $45.00

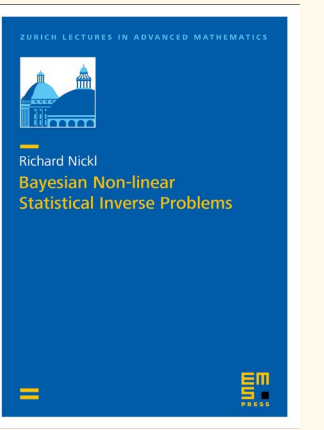
This book treats the classical problem, posed by Kazdan and Warner, of prescribing a given function on a closed manifold as the scalar curvature of a metric within a conformal class. Since both critical equations and obstructions to the existence of solutions appear, the problem is particularly challenging. Treating different aspects of the subject and containing several references to up-to-date research directions and perspectives, the book will be useful to graduate students and researchers interested in geometric analysis and partial differential equations.

ZÜRICH LECTURES IN ADVANCED MATHEMATICS

Bayesian Non-linear Statistical Inverse Problems

Richard Nickl (University of Cambridge, UK)

ISBN 978-3-98547-053-2 | eISBN 978-3-98547-553-7
171pp | Softcover | €39.00 | $45.00

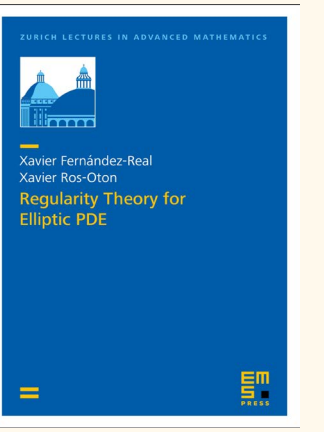


This book develops a general theory of Bayesian inference for non-linear forward maps and rigorously considers two PDE model examples arising with Darcy's problem and a Schrödinger equation. Starting with the statistical consistency of Gaussian process methods, it then treats local fluctuations and approximations of posterior distributions by Gaussian or log-concave measures whose curvature is described by PDE mapping properties of underlying 'information operators'. Applications to the algorithmic runtime of gradient-based MCMC methods are discussed as well as computation time lower bounds for worst case performance of some algorithms.

Regularity Theory for Elliptic PDE

Xavier Fernández-Real (École Polytechnique Fédérale de Lausanne, Switzerland), Xavier Ros-Oton (ICREA; Universitat de Barcelona; and Centre de Recerca Matemàtica, Spain)

ISBN978-3-98547-028-0 | eISBN 978-3-98547-528-5
236pp | Softcover | €49.00 | $55.00

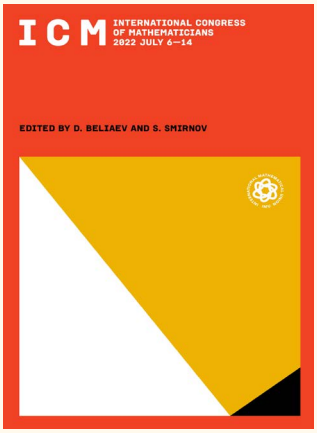


This book aims to provide a self-contained introduction to the regularity theory for elliptic PDE, focusing on the main ideas rather than proving all results in their greatest generality. It can be seen as a bridge between an elementary PDE course and more advanced books. The book starts with a short review of the Laplace operator and harmonic functions. The theory of Schauder estimates is developed next, but presented with various proofs of the results. Nonlinear elliptic PDE are covered in the following, both in the variational and non-variational setting and, finally, the obstacle problem is studied in detail, establishing the regularity of solutions and free boundaries.

STANDALONE TITLES

International Congress of Mathematicians

2022 July 6–14



Editors: Dmitry Beliaev (University of Oxford, United Kingdom), Stanislav Smirnov (Université de Genève, Switzerland)

ISBN 978-3-98547-058-7 | eISBN 978-3-98547-558-2
5940pp | Hardcover | €949.00 | $999.00

Following the long and illustrious tradition of the International Congress of Mathematicians, these proceedings include contributions based on the invited talks that were presented at the Congress in 2022. The seven volumes present the most important developments in all fields of mathematics and its applications in the past four years. In particular, they include laudations and presentations of the 2022 Fields Medal winners and of the other prestigious prizes awarded at the Congress.

European Congress of Mathematics

Portorož, 20–26 June, 2021

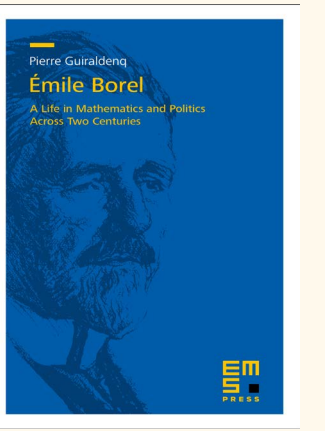
Editors: Ademir Hujdurović, Klavdija Kutnar, Dragan Marušić, Štefko Miklavić, and Tomaž Pisanski (University of Primorska, Slovenia), Primož Šparl (University of Ljubljana, Slovenia)

ISBN 9978-3-98547-051-8 | eISBN 978-3-98547-551-3
982pp | Hardcover | €149.00 | $159.00

These proceedings provide a permanent record of current mathematics of highest quality by presenting extended versions of seven plenary, six prize, and fourteen invited lectures as well as eleven lectures from minisymposia keynote speakers, all of which were delivered during the 8th European Congress of Mathematics held in Portorož in 2021.

Émile Borel

A Life in Mathematics and Politics Across Two Centuries

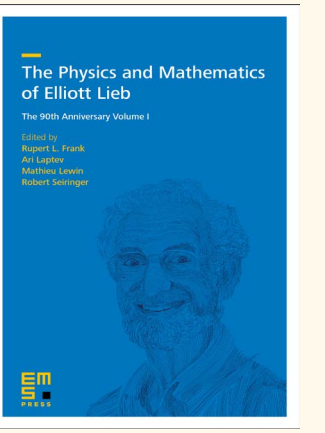


Pierre Guiraldenq (École Centrale de Lyon, France)

ISBN 978-3-98547-013-6 | eISBN 978-3-98547-513-1
122pp | Softcover | €19.00 | $22.00

The book follows Borel, one of France's leading scientific and political figures of the first half of the twentieth century, through the various stages and the most significant events of his life, across two centuries and two wars. Originally published in French, this new English edition of the book will appeal primarily to mathematicians and those with an interest in the history of science, but it should not disappoint anyone wishing to explore, through the life of an exceptional scientist and man, a chapter of history from the Franco-Prussian War of 1870 to the beginnings of contemporary Europe.

The Physics and Mathematics of Elliott Lieb

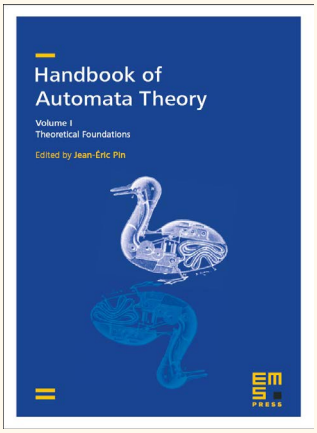


Editors: Rupert L. Frank (Ludwig-Maximilians-Universität München, Germany), Ari Laptev (Imperial College London, United Kingdom), Mathieu Lewin (Université Paris Dauphine, France), Robert Seiringer (Institute of Science and Technology Austria, Austria)

ISBN 978-3-98547-019-8 | eISBN 978-3-98547-519-3
1372pp | Hardcover | €179.00 | $189.00

These two volumes are dedicated to Elliott Lieb on the occasion of his 90th birthday. They celebrate his fundamental contributions to the fields of mathematics, physics and chemistry. Around fifty chapters give an extensive account of Liebs impact on a very broad range of topics and the resulting subsequent developments. Many contributions are of an expository character and are accessible to a non-expert audience of researchers in mathematics, physics and chemistry. A non-exhaustive list of topics covered includes the problem of stability of matter, quantum many-body systems, density functional theory, topics in statistical mechanics, entropy inequalities and matrix analysis, functional inequalities and sharp constants.

Handbook of Automata Theory



Editors: Jean-Éric Pin (Université de Paris and CNRS, France)

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