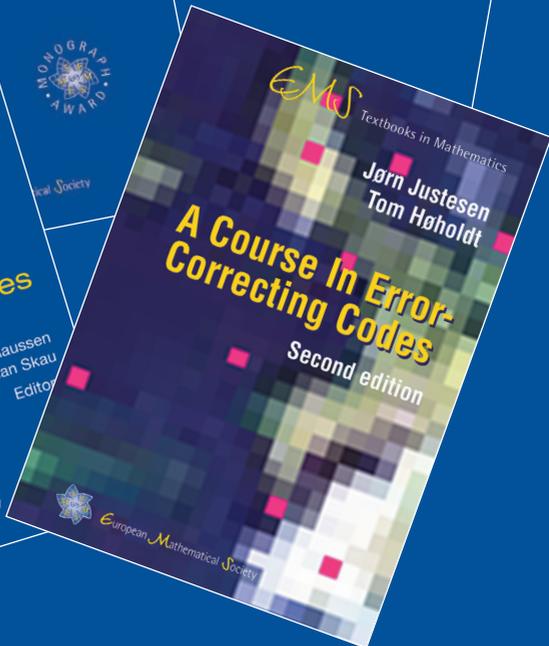
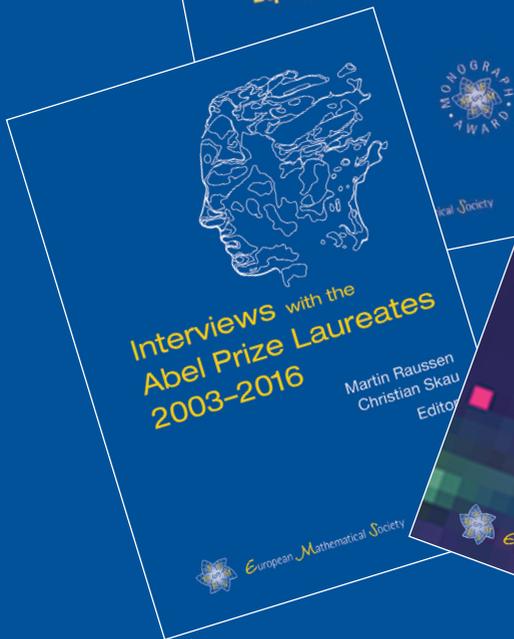
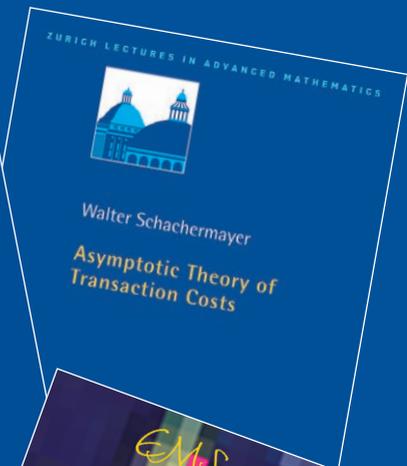
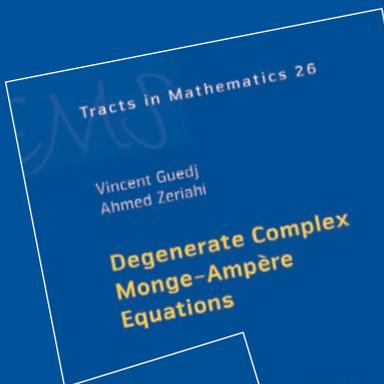


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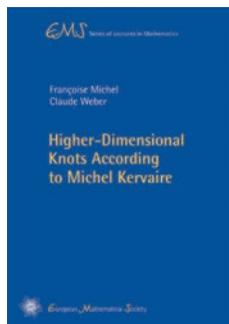
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Edited by:

Ari Laptev (Imperial College London, UK)

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.



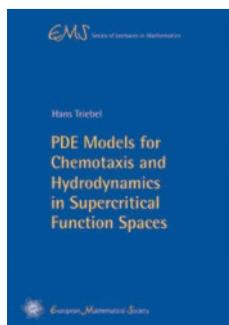
Françoise Michel (Université Paul Sabatier, Toulouse, France)
Claude Weber (Université de Genève, Switzerland)

Higher-Dimensional Knots According to Michel Kervaire

ISBN 978-3-03719-180-4
2017. 144 pages. Softcover. 17 x 24 cm
32.00 €

Michel Kervaire wrote six papers which can be considered fundamental to the development of higher-dimensional knot theory. They are not only of historical interest but naturally introduce to some of the essential techniques in this fascinating theory.

This book is written to provide graduate students with the basic concepts necessary to read texts in higher-dimensional knot theory and its relations with singularities. The first chapters are devoted to a presentation of Pontrjagin's construction, surgery and the work of Kervaire and Milnor on homotopy spheres. We pursue with Kervaire's fundamental work on the group of a knot, knot modules and knot cobordism. We add developments due to Levine. Tools (like open books, handlebodies, plumbings, ...) often used but hard to find in original articles are presented in appendices. We conclude with a description of the Kervaire invariant and the consequences of the Hill–Hopkins–Ravenel results in knot theory.



Hans Triebel (University of Jena, Germany)

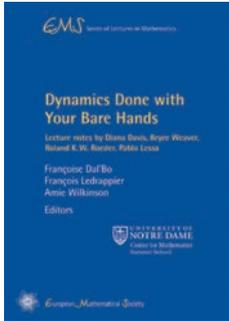
PDE Models for Chemotaxis and Hydrodynamics in Supercritical Function Spaces

ISBN 978-3-03719-172-9
2017. 138 pages. Softcover. 17 x 24 cm
32.00 €

This book deals with PDE models for chemotaxis (the movement of biological cells or organisms in response of chemical gradients) and hydrodynamics (viscous, homogeneous, and incompressible fluid filling the entire space). The underlying Keller–Segel equations (chemotaxis), Navier–Stokes equations (hydrodynamics), and their numerous modifications and combinations are treated in the context of inhomogeneous spaces of Besov–Sobolev

type paying special attention to mapping properties of related nonlinearities. Further models are considered, including (deterministic) Fokker–Planck equations and chemotaxis Navier–Stokes equations.

These notes are addressed to graduate students and mathematicians having a working knowledge of basic elements of the theory of function spaces, especially of Besov–Sobolev type and interested in mathematical biology and physics.



Dynamics Done with Your Bare Hands

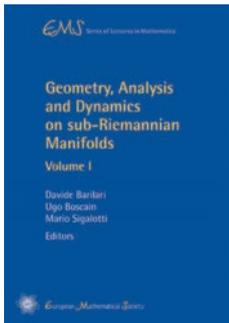
Lecture notes by Diana Davis, Bryce Weaver, Roland K. W. Roeder, Pablo Lessa

Françoise Dal'Bo (Université de Rennes I, France)
François Ledrappier (University of Notre Dame, USA)
Amie Wilkinson (University of Chicago, USA), Editors

ISBN 978-3-03719-168-2
2016. 214 pages. Softcover. 17 x 24 cm
36.00 €

This book arose from 4 lectures given at the Undergraduate Summer School of the Thematic Program *Dynamics and Boundaries* held at the University of Notre Dame. It is intended to introduce (under)graduate students to the field of dynamical systems by emphasizing elementary examples, exercises and bare hands constructions.

The lecture of Diana Davis is devoted to billiard flows on polygons, a simple-sounding class of continuous time dynamical system for which many problems remain open. Bryce Weaver focuses on the dynamics of a 2×2 matrix acting on the flat torus. This example introduced by Vladimir Arnold illustrates the wide class of uniformly hyperbolic dynamical systems, including the geodesic flow for negatively curved, compact manifolds. Roland Roeder considers a dynamical system on the complex plane governed by a quadratic map with a complex parameter. These maps exhibit complicated dynamics related to the Mandelbrot set defined as the set of parameters for which the orbit remains bounded. Pablo Lessa deals with a type of non-deterministic dynamical system – a simple walk on an infinite graph, obtained by starting at a vertex and choosing a random neighbor at each step. The central question concerns the recurrence property. When the graph is a Cayley graph of a group, the behavior of the walk is deeply related to algebraic properties of the group.



Geometry, Analysis and Dynamics on sub-Riemannian Manifolds Volume I and Volume II

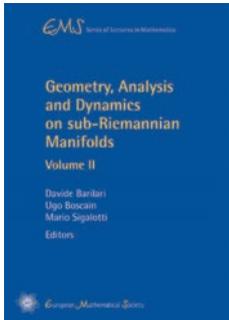
Davide Barilari (Université Paris 7 Denis Diderot, Paris, France)
Ugo Boscain (École Polytechnique, Palaiseau, France)
Mario Sigalotti (École Polytechnique, Palaiseau, France), Editors

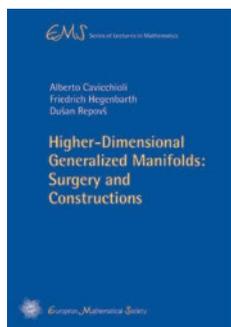
2016. Softcover. 17 x 24 cm
Volume I: ISBN 978-3-03719-162-0. 332 pages. 44.00 €
Volume II: ISBN 978-3-03719-163-7. 307 pages. 44.00 €

Sub-Riemannian manifolds model media with constrained dynamics: motion at any point is only allowed along a limited set of directions, which are prescribed by the physical problem. From the theoretical point of view, sub-Riemannian geometry is the geometry underlying the theory of hypoelliptic operators and degenerate diffusions on manifolds.

In the last twenty years, sub-Riemannian geometry has emerged as an independent research domain, with extremely rich motivations and ramifications in several parts of pure and applied mathematics, such as geometric analysis, geometric measure theory, stochastic calculus and evolution equations together with applications in mechanics, optimal control and biology.

The aim of the lectures collected here is to present sub-Riemannian structures for the use of both researchers and graduate students.





Alberto Cavicchioli (Università degli Studi di Modena e Reggio Emilia, Italy),
Friedrich Hegenbarth (Università degli Studi di Milano, Italy)
Dušan Repovš (University of Ljubljana, Slovenia)

Higher-Dimensional Generalized Manifolds: Surgery and Constructions

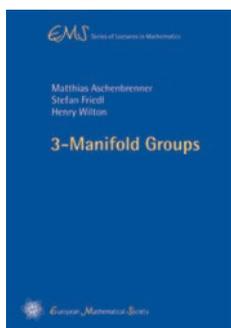
ISBN 978-3-03719-156-9
2016. 154 pages. Softcover. 17 x 24 cm
32.00 €

Generalized manifolds are a most fascinating subject to study. They were introduced in the 1930s, when topologists tried to detect topological manifolds among more general spaces (this is nowadays called the manifold recognition problem). As such, generalized manifolds have served to understand the nature of genuine manifolds. However, it soon became more important to study the category of generalized manifolds itself. A breakthrough was made in the 1990s, when several topologists discovered a systematic way of constructing higher-dimensional generalized manifolds, based on advanced surgery techniques. In fact, the development of controlled surgery theory and the study of generalized manifolds developed in parallel. In this process, earlier studies of geometric surgery turned out to be very helpful.

Generalized manifolds will continue to be an attractive subject to study, for there remain several unsolved fundamental problems. Moreover, they hold promise for new research, e.g. for finding appropriate structures on these spaces which could bring to light geometric (or even analytic) aspects of higher-dimensional generalized manifolds.

This is the first book to systematically collect the most important material on higher-dimensional generalized manifolds and controlled surgery. It is self-contained and its extensive list of references reflects the historic development. The book is based on our graduate courses and seminars, as well as our talks given at various meetings, and is suitable for advanced graduate students and researchers in algebraic and geometric topology.

Review: The book covers a large amount of material in detail while also referencing other sources for some details. The result is a somewhat challenging book that nonetheless provides an excellent introduction to difficult material. (zbMATH)



Matthias Aschenbrenner (University of California, Los Angeles, USA)
Stefan Friedl (University of Regensburg)
Henry Wilton (University of Cambridge, UK)

3-Manifold Groups

ISBN 978-3-03719-154-5
2015. 230 pages. Softcover. 17 x 24 cm
34.00 €

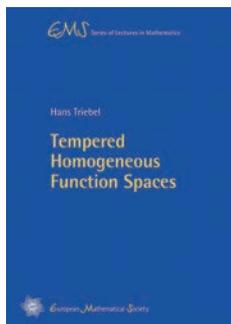
The field of 3-manifold topology has made great strides forward since 1982, when Thurston articulated his influential list of questions. Primary among these is Perelman's proof of the Geometrization Conjecture, but other highlights include the Tameness Theorem of Agol and Calegari–Gabai, the Surface Subgroup Theorem of Kahn–Markovic, the work of Wise and others on special cube complexes, and finally Agol's proof of the Virtual Haken Conjecture. This book summarizes all these developments and provides an exhaustive account of the current state of the art of 3-manifold topology, especially focussing on the consequences for fundamental groups of 3-manifolds.

As the first book on 3-manifold topology that incorporates the exciting progress of the last two decades, it will be an invaluable resource for researchers in the field who need a reference for these developments. It also gives a fast-paced introduction to this material – although some familiarity with the fundamental group is recommended, little other previous knowledge is assumed, and the book is accessible to graduate students.

The book closes with an extensive list of open questions, which will also be of interest to graduate students and established researchers alike.

Reviews: ...this is a very useful guide to some of the most exiting recent developments in low-dimensional topology and geometric group theory, even more to appreciate since many of the results are quite recent, various not even yet published, and hence still in considerable fluctuation. It is the first text presenting these results and their group-theoretical consequences in a systematic way (the result is a kind of handbook on 3-manifolds and their fundamental groups)... (zbMATH)

This book performs an invaluable service to the mathematical community by carefully documenting the topics in 3-manifold theory in a relatively concise and digestible manner. This service is important in light of the stupendous speed at which the theory has been developing. (Math Reviews)



Hans Triebel (University of Jena, Germany)

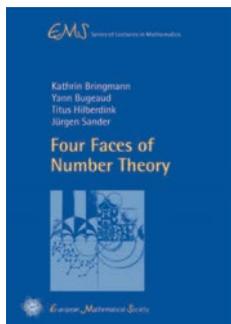
Tempered Homogeneous Function Spaces

ISBN 978-3-03719-155-2
2015. 143 pages. Softcover. 17 x 24 cm
32.00 €

This book deals with homogeneous function spaces of Besov–Sobolev type within the framework of tempered distributions in Euclidean n -space based on Gauss–Weierstrass semi-groups. Related Fourier-analytical descriptions and characterizations in terms of derivatives and differences are incorporated afterwards as so-called domestic norms. This approach avoids the usual ambiguities modulo polynomials when homogeneous function spaces are considered in the context of homogeneous tempered distributions.

These notes are addressed to graduate students and mathematicians having a working knowledge of basic elements of the theory of function spaces, especially of Besov-Sobolev type. In particular it might be of interest for researchers dealing with (nonlinear) heat and Navier-Stokes equations in homogeneous function spaces.

Review: This book is meticulously presented and makes a careful distinction between several types of norms including admissible, regional, domestic and community norms. ... This is surely a useful book for those who are interested in function spaces and their applications in PDEs such as the heat and Navier-Stokes equations. (zbMATH)

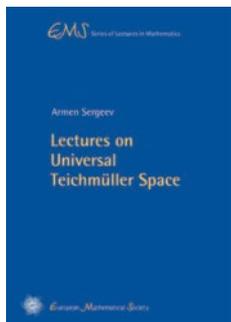


Kathrin Bringmann (Universität zu Köln, Germany)
Yann Bugeaud (IRMA, Strasbourg, France)
Titus Hilberdink (University of Reading, UK)
Jürgen Sander (Institut für Mathematik und Angewandte Informatik, Hildesheim, Germany)

Four Faces of Number Theory

ISBN 978-3-03719-142-2
2015. 198 pages. Softcover. 17 x 24 cm
32.00 €

This book arose from courses given at the International Summer School organized in August 2012 by the number theory group of the Department of Mathematics at the University of Würzburg. It consists of four essentially self-contained chapters and presents recent research results highlighting the strong interplay between number theory and other fields of mathematics, such as combinatorics, functional analysis and graph theory. The book is addressed to (under)graduate students who wish to discover various aspects of number theory. Remarkably, it demonstrates how easily one can approach frontiers of current research in number theory by elementary and basic analytic methods.



Armen Sergeev (Steklov Mathematical Institute, Moscow, Russia)

Lectures on Universal Teichmüller Space

ISBN 978-3-03719-141-5
2014. 111 pages. Softcover. 17 x 24 cm
24.00 €

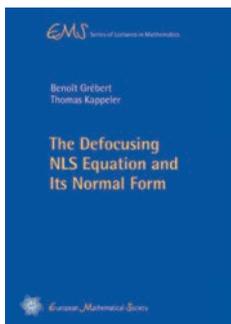
This book is based on a lecture course given by the author at the Educational Center of Steklov Mathematical Institute in 2011. It is designed for a one semester course for undergraduate students, familiar with basic differential geometry, complex and functional analysis.

The universal Teichmüller space \mathcal{T} is the quotient of the space of quasymmetric homeomorphisms of the unit circle modulo Möbius transformations. The first part of the

book is devoted to the study of geometric and analytic properties of \mathcal{T} . It is an infinite-dimensional Kähler manifold which contains all classical Teichmüller spaces of compact Riemann surfaces as complex submanifolds which explains the name "universal Teichmüller space".

Apart from classical Teichmüller spaces, \mathcal{T} contains the space \mathcal{S} of diffeomorphisms of the circle modulo Möbius transformations. The latter space plays an important role in the quantization of the theory of smooth strings. The quantization of \mathcal{T} is presented in the second part of the book. In contrast with the case of diffeomorphism space \mathcal{S} , which can be quantized in frames of the conventional Dirac scheme, the quantization of \mathcal{T} requires an absolutely different approach based on the noncommutative geometry methods. The book concludes with a list of 24 problems and exercises which can be used during the examinations.

Review: The book under review ... consists of fourteen beautiful lectures written with extreme care. Only principal knowledge of differential geometry and complex and functional analysis are required to follow these lectures, which makes the book accessible and useful to both undergraduate students and professional mathematicians whose expertise is somewhat distant from this area. (Math Reviews)



Benoît Grébert (Université de Nantes, France)
Thomas Kappeler (University of Zürich, Switzerland)

The Defocusing NLS Equation and Its Normal Form

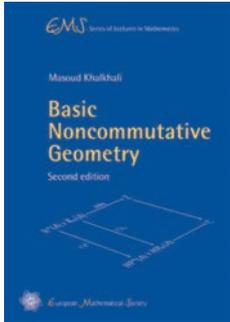
ISBN 978-3-03719-131-6
2014. 176 pages. Softcover. 17 x 24 cm
32.00 €

The theme of this monograph is the nonlinear Schrödinger equation. This equation models slowly varying wave envelopes in dispersive media and arises in various physical systems such as water waves, plasma physics, solid state physics and nonlinear optics. More specifically, this book treats the defocusing nonlinear Schrödinger (dNLS) equation on the circle with a dynamical systems viewpoint. By developing the normal form theory it is

shown that this equation is an integrable partial differential equation in the strongest possible sense. In particular, all solutions of the dNLS equation on the circle are periodic, quasi-periodic or almost-periodic in time and Hamiltonian perturbations of this equation can be studied near solutions far away from the equilibrium.

The book is not only intended for specialists working at the intersection of integrable PDEs and dynamical systems, but also for researchers farther away from these fields as well as for graduate students. It is written in a modular fashion, each of its chapters and appendices can be read independently of each other.

Review: In addition to its particular goal ... the book is an excellent example of the construction of the action-angle and Birkhoff coordinates for a highly nontrivial infinite-dimensional integrable system. The book is very clearly written. The six appendices ... make the book available for graduate students and non-specialists. (Math Reviews)



Masoud Khalkhali (The University of Western Ontario, London, Canada)

Basic Noncommutative Geometry. Second edition

ISBN 978-3-03719-128-6
2013. 257 pages. Softcover. 17 x 24 cm
38.00 €

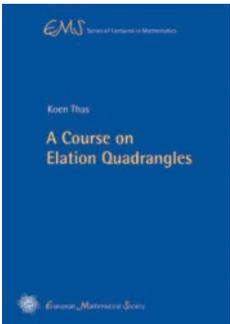
This text provides an introduction to noncommutative geometry and some of its applications. The book can be used either as a textbook for a graduate course on the subject or for self-study. It will be useful for graduate students and researchers in mathematics and theoretical physics and all those who are interested in gaining an understanding of the subject. One feature of this book is the wealth of examples and exercises that help the reader to navigate through the subject. While background material

is provided in the text and in several appendices, some familiarity with basic notions of functional analysis, algebraic topology, differential geometry and homological algebra at a first year graduate level is helpful.

Two new sections have been added to this second edition: one concerns the Gauss–Bonnet theorem and the definition and computation of the scalar curvature of the curved noncommutative two torus, and the second is a brief introduction to Hopf cyclic cohomology. The bibliography has been extended and some new examples are presented.

Reviews of the first edition: ... I believe that this book by Khalkhali is both well-conceived and well-timed. Additionally Basic Noncommutative Geometry is well-written, if necessarily compact (but certainly not closed!), and looks to be quite accessible – again modulo the reader's willingness to go at the book the way a serious mathematics monograph should be approached, namely, with pen(cil) and paper at the ready. But, given what's being offered by NCG, it'll all be well worth the effort. (MAA Reviews)

... This is not a short book, but it is a real joy to read, and the reviewer sped through it. ... The index is very useful, and there are plenty of interesting exercises. ... This is a technical subject, and the book is sprinkled with nice applications. The bibliography is large, and, while not perfect, gives plenty of pointers for further reading. In the end, this is only an 'introduction', and in that sense I think it succeeds admirably. (Bull. London Math. Soc.)



Koen Thas (Ghent University, Belgium)

A Course on Elation Quadrangles

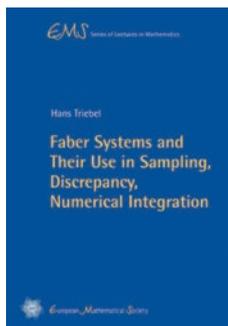
ISBN 978-3-03719-110-1
2012. 132 pages. Softcover. 17 x 24 cm
28.00 €

The notion of *elation generalized quadrangle* is a natural generalization to the theory of generalized quadrangles of the important notion of translation planes in the theory of projective planes. Almost any known class of finite generalized quadrangles can be constructed from a suitable class of elation quadrangles.

In this book the author considers several aspects of the theory of elation generalized quadrangles. Special attention is given to local Moufang conditions on the foundational level, exploring for instance a question of Knarr from the 1990s concerning the very notion of elation quadrangles. All the known results on Kantor's prime power conjecture for finite elation quadrangles are gathered, some of them published here for the first time. The structural theory of elation quadrangles and their groups is heavily emphasized. Other related topics, such as p -modular cohomology, Heisenberg groups and existence problems for certain translation nets, are briefly touched.

The text starts from scratch and is essentially self-contained. Many alternative proofs are given for known theorems. Containing dozens of exercises at various levels, from very easy to rather difficult, this course will stimulate undergraduate and graduate students to enter the fascinating and rich world of elation quadrangles. The more accomplished mathematician will especially find the final chapters challenging.

Review: ... These results show that the author is the world expert on finite elations quadrangles, and he now sets the beacons for further research. ... The present book is a very nice presentation of the subject and it should motivate more people to work in this beautiful area. (zbMATH)



Hans Triebel (University of Jena, Germany)

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

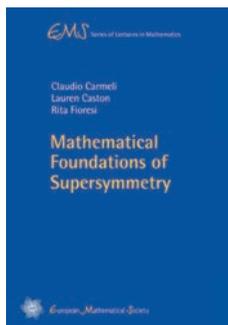
ISBN 978-3-03719-107-1
2012. 115 pages. Softcover. 17 x 24 cm
28.00 €

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.

The book is addressed to graduate students and mathematicians having a working knowledge of basic elements of function spaces and approximation theory.

Review: The monograph adds important information to problems of sampling, discrepancy and numerical integration in function spaces, and thus it contributes to a better understanding of sampling. (zbMATH)



Claudio Carmeli (University of Genova, Italy)
Lauren Caston (RAND Corporation, Santa Monica, CA, USA)
Rita Fiorese (University of Bologna, Italy)

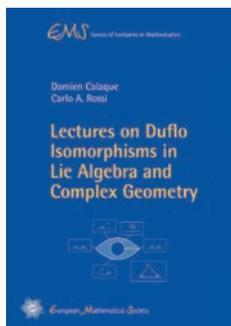
Mathematical Foundations of Supersymmetry

ISBN 978-3-03719-097-5
2011. 300 pages. Softcover. 17 x 24 cm
42.00 €

Supersymmetry is a highly active area of considerable interest among physicists and mathematicians. It is not only fascinating in its own right, but there is also indication that it plays a fundamental role in the physics of elementary particles and gravitation.

The purpose of the book is to lay down the foundations of the subject, providing the reader with a comprehensive introduction to the language and techniques, with a special attention to giving detailed proofs and many clarifying examples. It is aimed ideally at a second year graduate student. After the first three introductory chapters, the text divides into two parts: the theory of smooth supermanifolds and Lie supergroups, including the Frobenius theorem, and the theory of algebraic superschemes and supergroups. There are three appendices, the first introducing Lie superalgebras and representations of classical Lie superalgebras, the second collecting some relevant facts on categories, sheafification of functors and commutative algebra, and the third explaining the notion of Fréchet space in the super context.

Review: This is an excellent book. ... This monograph has grown out of the desire to present a moderately brief and focused account of the mathematical foundations of supersymmetry both in the differential and algebraic categories. ... This book is rich in content, and clear in argument. This book can very well be used as a one-semester course or a seminar on supersymmetry, directed to second and third year graduate students. (zbMATH)



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

Lectures on Duflo Isomorphisms in Lie Algebra and Complex Geometry

ISBN 978-3-03719-096-8
2011. 114 pages. Softcover. 17 x 24 cm
24.00 €

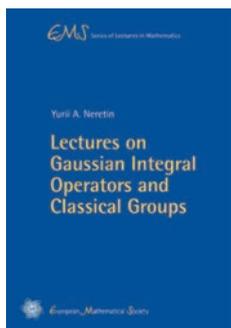
Duflo isomorphism first appeared in Lie theory and representation theory. It is an isomorphism between invariant polynomials of a Lie algebra and the center of its universal enveloping algebra, generalizing the pioneering work of Harish-Chandra on semi-simple Lie algebras. Later on, Duflo's result was refound by Kontsevich in the framework of deformation quantization, who also observed that there is a similar isomorphism between

Dolbeault cohomology of holomorphic polyvector fields on a complex manifold and its Hochschild cohomology. The present book, which arose from a series of lectures by the first author at ETH, derives these two isomorphisms from a Duflo-type result for Q -manifolds.

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

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

Review: ...And who should read the book? Well, in the mathematical sense, everybody! This is truly wonderful stuff, and the authors have taken pains to make it all quite accessible (and I think they succeed beautifully). (MAA Reviews)



Yuri Neretin (University of Vienna, Austria and Institute for Theoretical and Experimental Physics, Moscow, Russia)

Lectures on Gaussian Integral Operators and Classical Groups

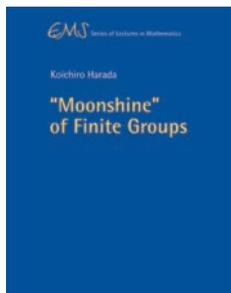
ISBN 978-3-03719-080-7
2010. 571 pages. Softcover. 17 x 24 cm
58.00 €

This book is an elementary self-contained introduction to some constructions of representation theory and related topics of differential geometry and analysis.

Topics covered include the theory of various Fourier-like integral operators as Segal–Bargmann transforms, Gaussian integral operators in L^2 and in the Fock space, integral operators with theta-kernels, the geometry of real and p -adic classical groups and symmetric spaces. The heart of the book is the Weil representation of the symplectic group (real and complex realizations, relations with theta-functions and modular forms, p -adic and adelic constructions) and representations in Hilbert spaces of holomorphic functions of several complex variables.

The book is addressed to graduate students and researchers in representation theory, differential geometry, and operator theory. The reader is supposed to be familiar with standard university courses in linear algebra, functional analysis, and complex analysis.

Review: The text works well not only as an introduction, but as a fairly extensive survey as well. Overall it looks to be a useful reference for continued consultation and study. (Math Reviews)



Koichiro Harada (Ohio State University, Columbus, USA)

"Moonshine" of Finite Groups

ISBN 978-3-03719-090-6
2010. 83 pages. Softcover. 17 x 24 cm
24.00 €

This is an almost verbatim reproduction of the author's lecture notes written in 1983–84 at the Ohio State University, Columbus, Ohio, USA. An substantial update is given only in the bibliography.

Over the last 20 plus years, there has been an energetic activity in the field of finite simple group theory related to the monster simple group. Most notably, influential works have been produced in the theory of vertex operator algebras whose research was

stimulated by the moonshine of the finite groups. Still, we can ask the same questions now just as we did some 30–40 years ago: What is the monster simple group? Is it really related to the theory of the universe as it was vaguely so envisioned? What lays behind the moonshine phenomena of the monster group? It may appear that we have only scratched the surface. The lecture notes are geared towards young readers with the same but renewed questions in mind.

Review: ... "Moonshine" of Finite Groups is truly tantalizing and should indeed serve well to seduce fledgling researchers into this field. (MAA Reviews)

Previous titles published in this series

Helge Holden, Kenneth H. Karlsen, Knut-Andreas Lie and Nils Henrik Risebro, *Splitting Methods for Partial Differential Equations with Rough Solutions. Analysis and MATLAB programs*

ISBN 978-3-03719-078-4. 2010. 234 pages. Softcover. 17 cm x 24 cm. 36.00 €

Stanley E. Payne and Joseph A. Thas, *Finite Generalized Quadrangles. Second edition*

ISBN 978-3-03719-066-1. 2009. 298 pages. Softcover. 17 cm x 24 cm. 44.00 €

Review: The first edition being out of print for many years, the new edition makes again available this classical reference in the rapidly increasing field of finite geometries. (zbMATH)

Iskander A. Taimanov, *Lectures on Differential Geometry*

ISBN 978-3-03719-050-0. 2008. 219 pages. Softcover. 17 cm x 24 cm. 34.00 €

Review: ... this is a wonderfully diverse and challenging introduction to one of the central topics in both mathematics and physics. It's certainly a terrific text to keep handy as a supplement when teaching the subject. And of course, it would a very handy text for graduate students come prelim time. (MAA Reviews)

Martin J. Mohlenkamp and María Cristina Pereyra, *Wavelets, Their Friends, and What They Can Do for You*

ISBN 978-3-03719-018-0. 2008. 109 pages. Softcover. 17 cm x 24 cm. 24.00 €

Review: ... The book is written in a vivid and fresh style and provides for the beginning reader a very good survey about many different developments in the area of wavelet analysis and its applications. (Math Reviews)

Reto Müller, *Differential Harnack Inequalities and the Ricci Flow*

ISBN 978-3-03719-030-2. 2006. 99 pages. Softcover. 17 cm x 24 cm. 24.00 €

Review: The very interesting book under review is a revised and extended version of the author's diploma thesis written in the winter semester 2004/05 at ETH Zürich under the guidance of Michael Struwe. Its main goal is to explain some of the theory of Perelman's first Ricci flow paper as well as its thematic context, presenting in details the underlying analytic methods to non-experts or students who are new to the subject... The book is very well written and self-contained. Highly recommended text! (zbMATH)

Eustasio del Barrio, Paul Deheuvels and Sara van de Geer, *Lectures on Empirical Processes. Theory and Statistical Applications*

ISBN 978-3-03719-027-2. 2007. 263 pages. Softcover. 17 cm x 24 cm. 39.50 €

Review: This book gives an excellent overview on the broad scope of the theory of empirical processes. It can be recommended for students and researchers interested in an advanced and well-documented approach to the selected topics. (zbMATH)

Joseph C. Várilly, *An Introduction to Noncommutative Geometry*

ISBN 978-3-03719-024-1. 2006. 121 pages. Softcover. 17 cm x 24 cm. 28.00 €

Review: This excellent introduction to noncommutative geometry gives a precise 'current state of affairs' of the subject. Ever since the invention of noncommutative geometry by Alain Connes in the 1980s, more and more applications of it have been found in both mathematics and physics. In this book, the author succeeds in giving the reader a broad and accessible overview of these. In the meanwhile, the book remains within the scope of the EMS lecture series by giving a rapid introduction to the subject and providing an extensive guide to the more advanced literature... (Math Reviews)

Sergey V. Matveev, *Lectures on Algebraic Topology*

ISBN 978-3-03719-023-4. 2006. 106 pages. Softcover. 17 cm x 24 cm. 28.00 €

Review: There are many exercises in both parts of the book. At the end there is a section "Answers, hints, solutions". The intention of the author is seemingly not so much to present detailed proofs but to give the reader an idea about what is going on, referring to some other places in the literature for further reading and deeper insights. (zbMATH)

Torsten Ekedahl, *One Semester of Elliptic Curves*

ISBN 978-3-03719-015-9. 2006. 138 pages. Softcover. 17 cm x 24 cm. 32.00 €

Review: Overall, this is a very nice introduction to elliptic curves; although the approach is analytic, it is useful also for computer scientists interested in cryptographic applications because techniques needed for point counting (division polynomials) or for constructing curves with certain properties (complex multiplication) are discussed here. (zbMATH)

Katrin Wehrheim, *Uhlenbeck Compactness*

ISBN 978-3-03719-004-3. 2004. 219 pages. Softcover. 17 cm x 24 cm. 39.50 €

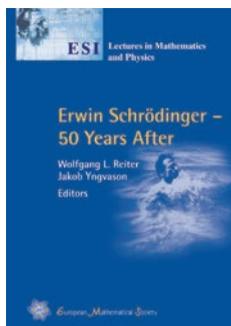
Review: Given the analytical subject, one cannot expect this book to be leisure reading. But it is getting quite close. An excellent introduction provides a good guideline through the book; ideas are always explained before the actual proofs; and the proofs are complete without being overly technical. This book should become the standard future reference for Uhlenbeck compactness. (Jahresbericht DMV 109, 2007)

Edited by:

Christoph Dellago and Ilaria Perugia (University of Vienna, Austria)

The Erwin Schrödinger International Institute is a meeting place for leading experts in mathematical physics and mathematics, nurturing the development and exchange of ideas in the international community, particularly stimulating intellectual exchange between scientists from Eastern Europe and the rest of the world.

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 on 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.



Erwin Schrödinger – 50 Years After

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

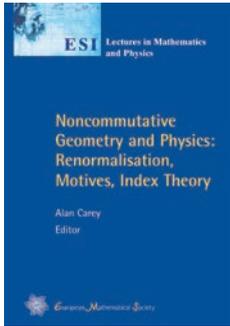
ISBN 978-3-03719-0121-7
2013. 195 pages. Softcover. 17 x 24 cm
58.00€

Erwin Schrödinger (1887–1961) was an Austrian physicist famous for the equation named after him and which earned him the Nobel Prize in 1933. 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 January 2011 to commemorate the 50th anniversary of Schrödinger's death.

The text covers a broad spectrum of topics 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.

The contributions give an overview of Schrödinger's legacy to the sciences from the standpoint of some of present day's leading scholars in the field.

The book addresses students and researchers in mathematics, physics and the history of science.



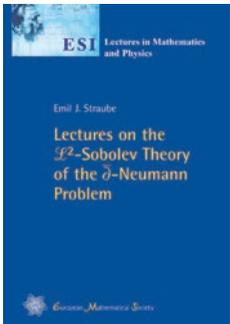
Noncommutative Geometry and Physics: Renormalisation, Motives, Index Theory

Alan L. Carey (Australian National University, Canberra, Australia), Editor

ISBN 978-3-03719-008-1
2011. 280 pages. Softcover. 17 x 24 cm
58.00€

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

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



Emil E. Straube (Texas A&M University, College Station, USA)

Lectures on the L^2 -Sobolev Theory of the $\bar{\partial}$ -Neumann Problem

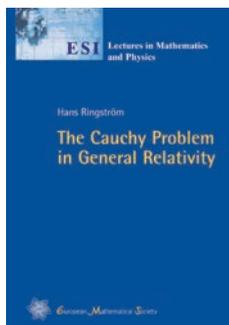
ISBN 978-3-03719-076-0
2010. 214 pages. Softcover. 17 x 24 cm
42.00€

This book provides a thorough and self-contained introduction to the $\bar{\partial}$ -Neumann problem, leading up to current research, in the context of the L^2 -Sobolev theory on bounded pseudoconvex domains in \mathbb{C}^n . It grew out of courses for advanced graduate students and young researchers given by the author at the Erwin Schrödinger International Institute for Mathematical Physics and at Texas A&M University.

The introductory chapter provides an overview of the contents and puts it in historical perspective. The second chapter presents the basic L^2 -theory. Following is a chapter on the subelliptic estimates on strictly pseudoconvex domains. The two final chapters on compactness and on regularity in Sobolev spaces bring the reader to the frontiers of research.

Prerequisites are a solid background in basic complex and functional analysis, including the elementary L^2 -Sobolev theory and distributions. Some knowledge in several complex variables is helpful. Concerning partial differential equations, not much is assumed. The elliptic regularity of the Dirichlet problem for the Laplacian is quoted a few times, but the ellipticity results needed for elliptic regularization in the third chapter are proved from scratch.

Review: This book is well written, well organized, and scholarly, with an extensive bibliography. ... It is an excellent exposition of its chosen material, and its references will guide the reader to works on many related topics. (Math Reviews)



Hans Ringström (KTH Mathematics, Stockholm, Sweden)

The Cauchy Problem in General Relativity

ISBN 978-3-03719-053-1
2009. 307 pages. Softcover. 17 x 24 cm
42.00 €

The general theory of relativity is a theory of manifolds equipped with Lorentz metrics and fields which describe the matter content. Einstein's equations equate the Einstein tensor (a curvature quantity associated with the Lorentz metric) with the stress energy tensor (an object constructed using the matter fields). In addition, there are equations describing the evolution of the matter. Using symmetry as a guiding principle, one is naturally led to the Schwarzschild and Friedmann–Lemaître–Robertson–Walker solutions, modelling an

isolated system and the entire universe respectively. In a different approach, formulating Einstein's equations as an initial value problem allows a closer study of their solutions. This book first provides a definition of the concept of initial data and a proof of the correspondence between initial data and development. It turns out that some initial data allow non-isometric maximal developments, complicating the uniqueness issue. The second half of the book is concerned with this and related problems, such as strong cosmic censorship.

The book presents complete proofs of several classical results that play a central role in mathematical relativity but are not easily accessible to those wishing to enter the subject. Prerequisites are a good knowledge of basic measure and integration theory as well as the fundamentals of Lorentz geometry. The necessary background from the theory of partial differential equations and Lorentz geometry is included.

Review: ...The book under review is certain to become a standard reference in mathematical relativity. It will also be valuable for those working on other aspects of geometric evolution equations. The author is to be congratulated for having created an excellent resource for the research community by writing this book. (Jahresber. DMV)

Previous titles published in this series

Giovanni Gallavotti, Wolfgang L. Reiter and Jakob Yngvason, *Boltzmann's Legacy*

ISBN 978-3-03719-057-9. 2008. 284 pages. Softcover. 17 cm x 24 cm. 58.00 €

Dmitri V. Alekseevsky and Helga Baum, *Recent Developments in Pseudo-Riemannian Geometry*

ISBN 978-3-03719-051-7. 2008. 549 pages. Softcover. 17 cm x 24 cm. 58.00 €

Christian Bär, Nicolas Ginoux and Frank Pfäffle, *Wave Equations on Lorentzian Manifolds and Quantization*

ISBN 978-3-03719-037-1. 2007. 202 pages. Softcover. 17 cm x 24 cm. 38.00 €

Werner Ballmann, *Lectures on Kähler Manifolds*

ISBN 978-3-03719-025-8. 2006. 182 pages. Softcover. 17 cm x 24 cm. 38.00 €

Arkady L. Onishchik, *Lectures on Real Semisimple Lie Algebras and Their Representations*

ISBN 978-3-03719-002-9. 2004. 95 pages. Softcover. 17 cm x 24 cm. 24.00 €

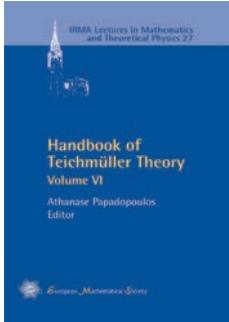
Review: These notes are a very clear and concise exposition of the classification of real simple Lie groups and of the theory of finite dimensional representations of real semisimple Lie algebras and real semisimple Lie groups... (Math Reviews)

Edited by:

Christian Kassel (IRMA, Strasbourg) and

Vladimir Turaev (IRMA, Strasbourg, and Indiana University, Bloomington)

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.



Vol. 27

Handbook of Teichmüller Theory, Volume VI

Athanase Papadopoulos (IRMA, Strasbourg, France), Editor

ISBN 978-3-03719-161-3

2016. 652 pages. Hardcover. 17 x 24 cm

88.00 €

This multi-volume set deals with Teichmüller theory in the broadest sense, namely, as the study of moduli space of geometric structures on surfaces, with methods inspired or adapted from those of classical Teichmüller theory. The aim is to give a complete panorama of this generalized Teichmüller theory and of its applications in various fields of mathematics. The volumes consist of chapters, each of which is dedicated to a specific topic. All the chapters, written by leading experts in the subject, are self-contained and have a pedagogical character. The handbook is thus useful to specialists in the field, to graduate students, and more generally to mathematicians who want to learn about the subject.

The sixth volume is divided into five parts: Part A: The metric and the analytic theory. Part B: The group theory. Part C: Representation theory and generalized structures. Part D: The Grothendieck–Teichmüller theory. Part D: Sources.

The topics surveyed include Grothendieck's construction of the analytic structure of Teichmüller space, identities on the geodesic length spectrum of hyperbolic surfaces (including Mirzakhani's application to the computation of Weil–Petersson volumes), moduli spaces of configurations spaces, the Teichmüller tower with the action of the Galois group on dessins d'enfants, and several others actions related to surfaces. The last part contains three papers by Teichmüller, translated into English with mathematical commentaries, and a document that contains H. Grötzsch's comments on Teichmüller's famous paper *Extremale quasikonforme Abbildungen und quadratische Differentiale*.

Vol. 26 **Handbook of Teichmüller Theory, Volume V**

Athanase Papadopoulos (IRMA, Strasbourg, France), Editor

ISBN 978-3-03719-160-6. 2016. 596 pages. Hardcover. 17 x 24 cm. 88.00 €

Vol. 19 **Handbook of Teichmüller Theory, Volume IV**

Athanase Papadopoulos (IRMA, Strasbourg, France), Editor

ISBN 978-3-03719-117-0. 2014. 874 pages. Hardcover. 17 x 24 cm. 98.00 €

Vol. 17 **Handbook of Teichmüller Theory, Volume III**

Athanase Papadopoulos (IRMA, Strasbourg, France), Editor

ISBN 978-3-03719-103-3. 2012. 874 pages. Hardcover. 17 x 24 cm. 98.00 €

Vol. 13 **Handbook of Teichmüller Theory, Volume II**

Athanase Papadopoulos (IRMA, Strasbourg, France), Editor

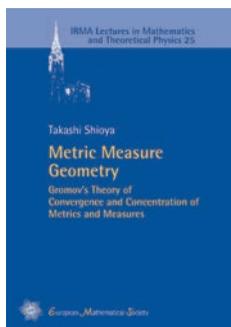
ISBN 978-3-03719-055-5. 2009. 884 pages. Hardcover. 17 x 24 cm. 98.00 €

Vol. 11 **Handbook of Teichmüller Theory, Volume I**

Athanase Papadopoulos (IRMA, Strasbourg, France), Editor

ISBN 978-3-03719-029-6. 2007. 802 pages. Hardcover. 17 x 24 cm. 98.00 €

Review: I'm amazed at the span of this subject. This is truly a vast edifice. These Handbooks are anything but light reading, even as they deal with a plethora of different aspects of a gorgeous part of mathematics. The level of scholarship is obviously uniformly high, ... and Papadopoulos' editing is superb. His introduction alone suffices not only to enlighten any interested mathematician about the sweep of Teichmüller theory and its current developments, but to whet the reader's appetite dramatically for what lies ahead. (MAA Reviews)



Vol. 25

Takashi Shioya (Tohoku University, Sendai, Japan)

Metric Measure Geometry

Gromov's Theory of Convergence and Concentration of Metrics and Measures

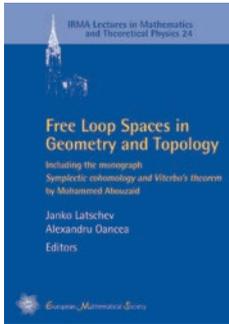
ISBN 978-3-03719-158-3

2016. 194 pages. Hardcover. 17 x 24 cm

42.00 €

This book studies a new theory of metric geometry on metric measure spaces, originally developed by M. Gromov in his book "Metric Structures for Riemannian and Non-Riemannian Spaces" and based on the idea of the concentration of measure phenomenon due to Lévy and Milman. A central theme in this text is the study of the observable distance between metric measure spaces, defined by the difference between 1-Lipschitz functions on one space and those on the other. The topology on the set of metric measure spaces induced by the observable distance function is weaker than the measured Gromov–Hausdorff topology and allows to investigate a sequence of Riemannian manifolds with unbounded dimensions. One of the main parts of this presentation is the discussion of a natural compactification of the completion of the space of metric measure spaces. The stability of the curvature-dimension condition is also discussed.

This book makes advanced material accessible to researchers and graduate students interested in metric measure spaces.



Vol. 24

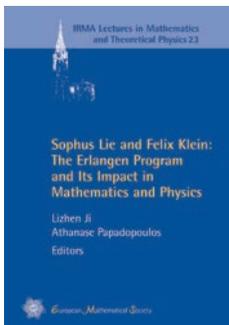
Free Loop Spaces in Geometry and Topology Including the monograph *Symplectic cohomology and Viterbo's theorem* by Mohammed Abouzaid

Janko Latschev (University of Hamburg, Germany)
Alexandru Oancea (Université Paris 6, France), Editors

ISBN 978-3-03719-153-8
2015. 496 pages. Hardcover. 17 x 24 cm
78.00 €

One of the main purposes of this book is to facilitate communication between topologists and symplectic geometers thinking about free loop spaces. It was written by active researchers coming to the topic from both perspectives and provides a concise overview of many of the classical results, while also beginning to explore the new directions of research that have emerged recently. As one highlight, it contains a research monograph by M. Abouzaid which proves a strengthened version of Viterbo's isomorphism between the homology of the free loop space of a manifold and the symplectic cohomology of its cotangent bundle, following a new strategy.

The book grew out of a learning seminar on free loop spaces held at Strasbourg University and should be accessible to a graduate student with a general interest in the topic. It focuses on introducing and explaining the most important aspects rather than offering encyclopedic coverage, while providing the interested reader with a broad basis for further studies and research.



Vol. 23

Sophus Lie and Felix Klein: The Erlangen Program and Its Impact in Mathematics and Physics

Lizhen Ji (University of Michigan, Ann Arbor, USA)
Athanasios Papadopoulos (IRMA, Strasbourg, France), Editors

ISBN 978-3-03719-148-4
2015. 348 pages. Hardcover. 17 x 24 cm
48.00 €

The Erlangen program expresses a fundamental point of view on the use of groups and transformation groups in mathematics and physics. The present volume is the first modern comprehensive book on that program and its impact in contemporary mathematics and physics. Klein spelled out the program, and Lie, who contributed to its formulation, is the first mathematician who made it effective in his work. The theories that these two authors developed are also linked to their personal history and to their relations with each other and with other mathematicians, including Hermann Weyl, Élie Cartan, Henri Poincaré, and many others. All these facets of the Erlangen program appear in the present volume. Written by well-known experts, it is addressed to mathematicians, to graduate students, and to all those interested in the development of mathematical ideas.

Vol. 22

Handbook of Hilbert Geometry

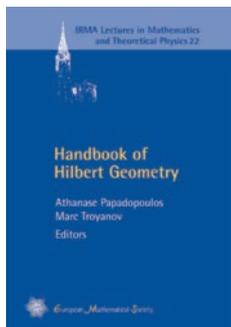
Athanase Papadopoulos (IRMA, Strasbourg, France)
Marc Troyanov (Ecole Polytechnique Fédérale de Lausanne, Switzerland), Editors

ISBN 978-3-03719-147-7
2014. 460 pages. Hardcover. 17 cm x 24 cm
78.00 €

This volume contains surveys on the various aspects of Hilbert geometry, including the classical and the modern aspects. The subject is considered from several points of view: Finsler geometry, the calculus of variations, projective geometry, dynamical systems, etc.

At several places, the fruitful relations between Hilbert geometry and other subjects in mathematics are highlighted, including Teichmüller spaces, convexity theory, Perron–Frobenius theory, representation theory, partial differential equations, coarse geometry, ergodic theory, algebraic groups, Coxeter groups, geometric group theory, Lie groups and discrete group actions.

The *Handbook* is addressed to both students who want to learn the theory and researchers working in the area. The various chapters are written by well-known experts in the field.



Vol. 21

Faà di Bruno Hopf Algebras, Dyson–Schwinger Equations, and Lie–Butcher Series

Kuruschi Ebrahimi-Fard (ICMAT, Madrid, Spain)
Frédéric Fauvet (IRMA, Strasbourg, France), Editors

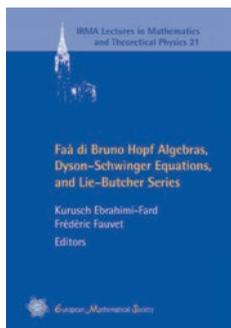
ISBN 978-3-03719-143-9
2015. 470 pages. Softcover. 17 x 24 cm
48.00 €

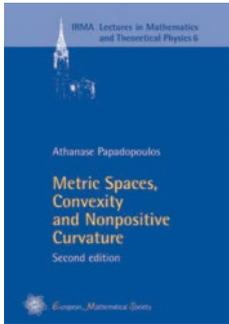
Since the early works of G.-C. Rota and his school, Hopf algebras have been instrumental in algebraic combinatorics. In a seminal 1998 paper, A. Connes and D. Kreimer presented a Hopf algebraic approach to renormalization in perturbative Quantum Field Theory (QFT). This work triggered an abundance of new research on applications of Hopf algebraic techniques in QFT as well as other areas of theoretical physics. Furthermore, these new developments were complemented by progress made in other domains of applications, such as control theory, dynamical systems, and numerical integration methods. Especially in the latter context, it became clear that J. Butcher's work from the early 1970s was well ahead of its time.

The present volume emanated from a conference hosted in June 2011 by IRMA at Strasbourg University in France. Researchers from different scientific communities who share similar techniques and objectives gathered at this meeting to discuss new ideas and results on Faà di Bruno algebras, Dyson–Schwinger equations, and Butcher series.

The purpose of this book is to present a coherent set of lectures reflecting the state of the art of research on combinatorial Hopf algebras relevant to high energy physics, control theory, dynamical systems, and numerical integration methods. More specifically, connections between Dyson–Schwinger equations, Faà di Bruno algebras, and Butcher series are examined in great detail.

This volume is aimed at researchers and graduate students interested in combinatorial and algebraic aspects of QFT, control theory, dynamical systems and numerical analysis of integration methods. It contains introductory lectures on the various constructions that are emerging and developing in these domains.





Vol. 6

Athanase Papadopoulos (IRMA, Strasbourg, France)

Metric Spaces, Convexity and Nonpositive Curvature. Second edition

ISBN 978-3-03719-132-3

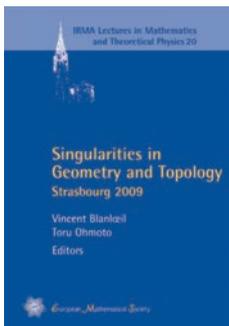
2014. 320 pages. Softcover. 17 cm x 24 cm

48.00 €

This book is about metric spaces of nonpositive curvature in the sense of Busemann, that is, metric spaces whose distance function satisfies a convexity condition. It also contains a systematic introduction to the theory of geodesics in metric spaces, as well as a detailed presentation of some facets of convexity theory that are useful in the study of nonpositive curvature. The concepts and the techniques are illustrated by many examples from classical hyperbolic geometry and from the theory of Teichmüller spaces. The book is useful for students and researchers in geometry, topology and analysis.

Review of the first edition:

...Papadopoulos does a fantastic job of bringing together all sorts of themes in geometry, from introductory material for beginners to intricate properties of moduli spaces of Riemann surfaces. ... The main body of the text is quite systematic, with digressions, examples and notes in various directions, and should prove a valuable resource for students in particular. The historical comments are fascinating. ... Papadopoulos' book is a treasure trove of ideas and examples that many may enjoy. (Bulletin (New Series) of the American Mathematical Society)



Vol. 20

Singularities in Geometry and Topology – Strasbourg 2009

Vincent Blanlœil (Université de Strasbourg, France)

Toru Ohmoto (Hokkaido University, Sapporo, Japan), Editors

ISBN 978-3-03719-118-7

2012. 370 pages. Softcover. 17 x 24 cm

48. 00 €

This volume arises from the 5th Franco-Japanese Symposium on Singularities, held in Strasbourg in August 2009. The conference brought together an international group of researchers working on singularities in algebraic geometry, analytic geometry and topology, mainly from France and Japan. Besides, it also organized a special session, JSPS Forum on Singularities and Applications, which was aimed at introducing some recent applications of singularity theory to physics and statistics.

This book comprises research papers and short lecture notes on advanced topics on singularities. Some surveys on applications that were presented in the Forum are also added.

Graduate students who wish to learn about various approaches to singularities, as well as experts in the field and researchers in other areas of mathematics and science will find the contributions to this volume a rich source for further study and research.

Vol. 18

Strasbourg Master Class on Geometry

Athanase Papadopoulos (IRMA, Strasbourg, France), Editor

ISBN 978-3-03719-105-7
2012. 461 pages. Softcover. 17 x 24 cm
48.00 €

This book contains carefully revised and expanded versions of eight courses that were presented at the University of Strasbourg, during two geometry master classes, in 2008 and 2009. The aim of the master classes was to give to fifth-year students and PhD students in mathematics the opportunity to learn new topics that lead directly to the current research in geometry and topology. The courses were held by leading experts. The subjects treated include hyperbolic geometry, three-manifold topology, representation theory of fundamental groups of surfaces and of three-manifolds, dynamics on the hyperbolic plane with applications to number theory, Riemann surfaces, Teichmüller theory, Lie groups and asymptotic geometry.

The text is addressed to students and mathematicians who wish to learn the subject. It can also be used as a reference book and as a textbook for short courses on geometry.

Previous titles published in this series

Vol. 16 *Handbook of Pseudo-Riemannian Geometry and Supersymmetry*, Vicente Cortés (Ed.)

ISBN 978-3-03719-079-1. 2010. 964 pages. Hardcover. 17 x 24 cm. 118.00 €

Vol. 15 *Renormalization and Galois Theories*, Alain Connes, Frédéric Fauvet and Jean-Pierre Ramis (Eds.)

ISBN 978-3-03719-073-9. 2009. 279 pages. Softcover. 17 x 24 cm. 42.00 €

Vol. 14 *Michel Weber, Dynamical Systems and Processes*

ISBN 978-3-03719-046-3. 2008. 773 pages. Softcover. 17 x 24 cm. 98.00 €

Vol. 12 *Quantum Groups*, Benjamin Enriquez (Ed.)

ISBN 978-3-03719-047-0. 2008. 141 pages. Softcover. 17 x 24 cm. 38.00 €

Vol. 10 *Physics and Number Theory*, Louise Nyssen (Ed.)

ISBN 978-3-03719-029-6. 2006. 274 pages. Softcover. 17 cm x 24 cm. 39.50 €

Vol. 9 *Differential Equations and Quantum Groups*, Andrey A. Bolibrukh Memorial Volume, D. Bertrand, B. Enriquez, C. Mitschi, C. Sabbah and R. Schäfke (Eds.)

ISBN 978-3-03719-020-3. 2006. 302 pages. Softcover. 17 cm x 24 cm. 44.50 €

Vol. 8 *AdS/CFT Correspondence: Einstein Metrics and Their Conformal Boundaries*, Olivier Biquard (Ed.)

ISBN 978-3-03719-013-5. 2005. 259 pages. Softcover. 17 cm x 24 cm. 38.00 €

Vol. 7 *Numerical Methods for Hyperbolic and Kinetic Problems*, Stéphane Cordier, Thierry Goudon, Michaël Gutnic and Eric Sonnendrücker (Eds.)

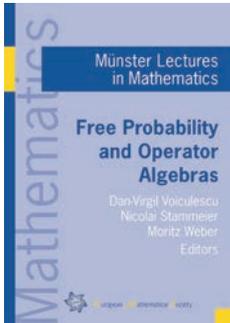
ISBN 978-3-03719-012-8. 2005. 367 pages. Softcover. 17 cm x 24 cm. 44.50 €

Volumes 1–5 of this series are available from de Gruyter (www.degruyter.de).

Edited by:

Christopher Deninger and Linus Kramer (Universität Münster, Germany)

Münster Lectures in Mathematics report on recent developments in mathematics. Material considered for publication includes monographs and lecture notes or seminars on a new field or a new angle at a classical field.



Free Probability and Operator Algebras

Dan-Virgil Voiculescu (University of California, Berkeley, USA), Nicolai Stammeier (University of Oslo, Norway) and Moritz Weber (Universität des Saarlandes, Saarbrücken, Germany), Editors

ISBN 978-3-03719-165-1

2016. 142 pages. Softcover. 17 x 24 cm

32.00 €

Free probability is a probability theory dealing with variables having the highest degree of noncommutativity, an aspect found in many areas (quantum mechanics, free group algebras, random matrices etc). Thirty years after its foundation, it is a well-established and very active field of mathematics. Originating from Voiculescu's attempt to solve the

free group factor problem in operator algebras, free probability has important connections with random matrix theory, combinatorics, harmonic analysis, representation theory of large groups, and wireless communication.

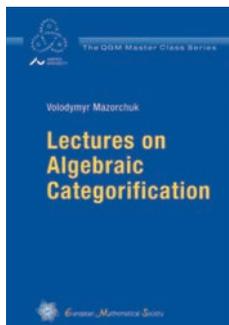
These lecture notes arose from a masterclass in Münster, Germany and present the state of free probability from an operator algebraic perspective. This volume includes introductory lectures on random matrices and combinatorics of free probability (Speicher), free monotone transport (Shlyakhtenko), free group factors (Dykema), free convolution (Bercovici), easy quantum groups (Weber), and a historical review with an outlook (Voiculescu). In order to make it more accessible, the exposition features a chapter on basics in free probability, and exercises for each part.

This book is aimed at master students to early career researchers familiar with basic notions and concepts from operator algebras.

Edited by:

Jørgen Ellegaard Andersen, Henning Haahr Andersen, Nigel Hitchin, Maxim Kontsevich, Robert C. Penner, Nicolai Reshetikhin

The Center for the Quantum Geometry of Moduli Spaces (QGM) in Aarhus, Denmark, focusses on collaborative cutting-edge research and training in the quantum geometry of moduli spaces at the interface between mathematics and theoretical physics. QGM organizes a series of master classes each year, continuing the tradition initiated by the former Center for the Topology and Quantization of Moduli Spaces (CTQM). In these events, prominent scientists lecture on their research topic. The courses are typically centered around quantum geometry of moduli spaces, various aspects of their quantization, and other related subjects such as topological quantum field theory and quantization in a more general context. This series contains lecture notes, textbooks and monographs arising from the master classes held at QGM.



Volodymyr Mazorchuk (Uppsala University, Sweden)

Lectures on Algebraic Categorification

ISBN 978-3-03719-108-8

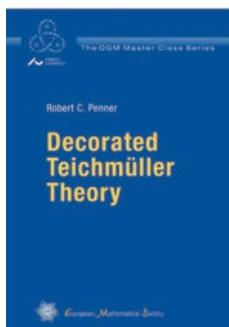
2012. 128 pages. Softcover. 17.0 x 24.0 cm

28.00 €

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. Emphasis is 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.



Robert C. Penner (Centre for Quantum Geometry of Moduli Spaces, Aarhus, Denmark, and Caltech, Pasadena, USA)

Decorated Teichmüller Theory

ISBN 978-3-03719-075-3

2012. 377 pages. Hardcover. 17.0 x 24.0 cm

58.00 €

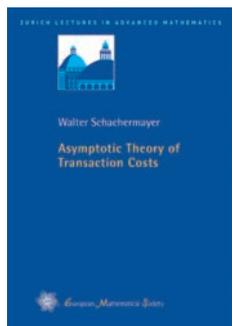
There is an essentially “tinker-toy” model of a trivial bundle over the classical Teichmüller space of a punctured surface, called the decorated Teichmüller space, where the fiber over a point is the space of all tuples of horocycles, one about each puncture. This volume gives the story and wider context of these decorated Teichmüller spaces as developed by the author over the last two decades in a series of papers, some of them in collaboration.

Sometimes correcting errors or typos, sometimes simplifying proofs and sometimes articulating more general formulations than the original research papers, this volume is self-contained and requires little formal background. Based on a master’s course at Aarhus University, it gives the first treatment of these works in monographic form.

Edited by:

Erwin Bolthausen (Managing Editor), Freddy Delbaen, Thomas Kappeler (Managing Editor), Christoph Schwab, Michael Struwe, Gisbert Wüstholz

Mathematics in Zurich has a long and distinguished tradition, in which the writing of lecture notes volumes and research monographs play a prominent part. The *Zurich Lectures in Advanced Mathematics* series aims to make some of these publications better known to a wider audience. Moderately priced, concise and lively in style, the volumes of this series will appeal to researchers and students alike, who seek an informed introduction to important areas of current research.



Walter Schachermayer (Universität Wien, Austria)

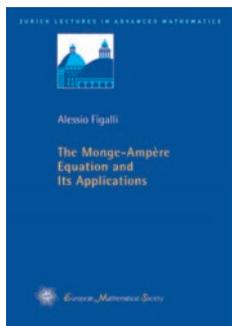
Asymptotic Theory of Transaction Costs

ISBN 978-3-03719-173-6
2017. 160 pages. Softcover. 17.0 x 24.0 cm
34.00 €

A classical topic in Mathematical Finance is the theory of portfolio optimization. Robert Merton's work from the early seventies had enormous impact on academic research as well as on the paradigms guiding practitioners.

One of the ramifications of this topic is the analysis of (small) proportional transaction costs, such as a Tobin tax. The lecture notes present some striking recent results of the asymptotic dependence of the relevant quantities when transaction costs tend to zero.

An appealing feature of the consideration of transaction costs is that it allows for the first time to reconcile the no arbitrage paradigm with the use of non-semimartingale models, such as fractional Brownian motion. This leads to the culminating theorem of the present lectures which roughly reads as follows: for a fractional Brownian motion stock price model we always find a shadow price process for given transaction costs. This process is a semimartingale and can therefore be dealt with using the usual machinery of mathematical finance.



Alessio Figalli (ETH Zürich, Switzerland)

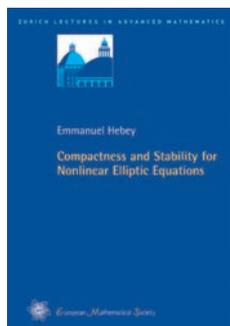
The Monge-Ampère Equation and its Applications

ISBN 978-3-03719-170-5
2017. 210 pages. Softcover. 17 x 24 cm.
34.00 €

The Monge-Ampère equation is one of the most important partial differential equations, appearing in many problems in analysis and geometry.

This monograph is a comprehensive introduction to the existence and regularity theory of the Monge-Ampère equation and some selected applications; the main goal is to provide the reader with a wealth of results and techniques he or she can draw from to understand current research related to this beautiful equation.

The presentation is essentially self-contained, with an appendix providing precise statements of all the results used from different areas (linear algebra, convex geometry, measure theory, nonlinear analysis, and PDEs). This book is intended for graduate students and researchers interested in nonlinear PDEs: explanatory figures, detailed proofs, and heuristic arguments make this book suitable for self-study and also as a reference.



Emmanuel Hebey (Université de Cergy-Pontoise, France)

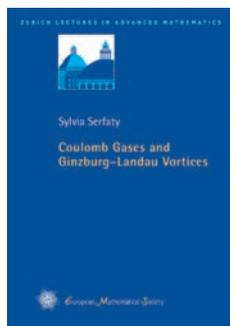
Compactness and Stability for Nonlinear Elliptic Equations

ISBN 978-3-03719-134-7
2014. 302 pages. Softcover. 17.0 x 24.0 cm
42.00 €

Compactness and stability for nonlinear elliptic equations in the inhomogeneous context of closed Riemannian manifolds are investigated, a field presently undergoing great development. The author describes blow-up phenomena and presents the progress made over the past years on the subject, giving an up-to-date description of the new ideas, concepts, methods, and theories in the field. Special attention is devoted to the nonlinear stationary Schrödinger equation and to its critical formulation.

Intended to be as self-contained as possible, the book is accessible to a broad audience of readers, including graduate students and researchers.

Review: This is an interesting book on the study of compactness and stability for nonlinear elliptic equations in the inhomogeneous context of closed Riemannian manifolds, which is a field presently undergoing great development. (zbMATH)



Sylvia Serfaty (Université Pierre et Marie Curie (Paris VI), France)

Coulomb Gases and Ginzburg–Landau Vortices

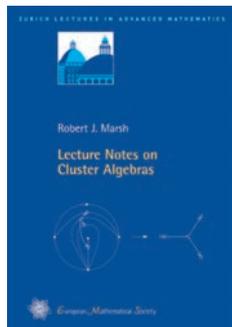
ISBN 978-3-03719-152-1
2015. 165 pages. Softcover. 17 x 24 cm.
34.00 €

The topic of this book is systems of points in Coulomb interaction, in particular, the classical Coulomb gas, and vortices in the Ginzburg–Landau model of superconductivity. The classical Coulomb and Log gases are classical statistical mechanics models, which have seen important developments in the mathematical literature due to their connection with random matrices and approximation theory. At low temperature, these systems are expected to “crystallize” to so-called Fekete sets, which exhibit microscopically a lattice structure. The Ginzburg–Landau model, on the other hand, describes superconductors. In superconducting materials subjected to an external magnetic field, densely packed point vortices emerge, forming perfect triangular lattice patterns, so-called Abrikosov lattices.

This book describes these two systems and explores the similarity between them. It presents the mathematical tools developed to analyze the interaction between the Coulomb particles or the vortices, at the microscopic scale, and describes a “renormalized energy” governing the point patterns. This is believed to measure the disorder of a point configuration, and to be minimized by the Abrikosov lattice in dimension 2.

The book gives a self-contained presentation of results on the mean field limit of the Coulomb gas system, with or without temperature, and of the derivation of the renormalized energy. It also provides a streamlined presentation of the similar analysis that can be performed for the Ginzburg–Landau model, including a review of the vortex-specific tools and the derivation of the critical fields, the mean-field limit and the renormalized energy.

Review: In total, the lecture notes are written on high physical and mathematical level. They state clear connection between the GL model of superconductivity and classical Coulomb gases. The book will be useful for graduate and PhD students, specializing in the scientific area, and also for scientists working in this and related areas of the physics of matter. (zbMATH)



Robert J. Marsh (University of Leeds, UK)

Lecture Notes on Cluster Algebras

ISBN 978-3-03719-130-9

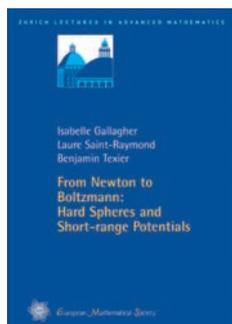
2014. 121 pages. Softcover. 17.0 x 24.0 cm

28.00 €

Cluster algebras are combinatorially defined commutative algebras which were introduced by S. Fomin and A. Zelevinsky as a tool for studying the dual canonical basis of a quantized enveloping algebra and totally positive matrices. The aim of these notes is to give an introduction to cluster algebras which is accessible to graduate students or researchers interested in learning more about the field, while giving a taste of the wide connections between cluster algebras and other areas of mathematics.

The approach taken emphasizes combinatorial and geometric aspects of cluster algebras. Cluster algebras of finite type are classified by the Dynkin diagrams, so a short introduction to reflection groups is given in order to describe this and the corresponding generalized associahedra. A discussion of cluster algebra periodicity, which has a close relationship with discrete integrable systems, is included. The book ends with a description of the cluster algebras of finite mutation type and the cluster structure of the homogeneous coordinate ring of the Grassmannian, both of which have a beautiful description in terms of combinatorial geometry.

Review: The book under review succeeds in all its goals: It is timely introduction to a fast growing field of mathematics that was discovered in the first years of this century; it also shows some of the beautiful and deep connections with other important areas of mathematics. All of these in just 100 pages! (MAA Reviews)



Isabelle Gallagher (Université Paris 7, France), Laure Saint-Raymond (Ecole Normale Supérieure, Paris, France) and Benjamin Texier (Université Paris 7, France)

From Newton to Boltzmann: Hard Spheres and Short-range Potentials

ISBN 978-3-03719-129-3

2014. 148 pages. Softcover. 17.0 x 24.0 cm

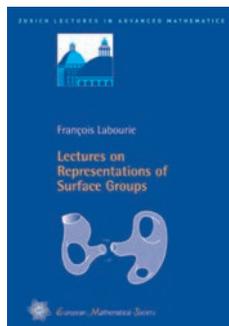
32.00 €

The question addressed in this monograph is the relationship between the time-reversible Newton dynamics for a system of particles interacting via elastic collisions, and the irreversible Boltzmann dynamics which gives a statistical description of the collision mechanism. Two types of elastic collisions are considered: hard spheres, and compactly supported potentials.

Following the steps suggested by Lanford in 1974, we describe the transition from Newton to Boltzmann by proving a rigorous convergence result in short time, as the number of particles tends to infinity and their size simultaneously goes to zero, in the Boltzmann-Grad scaling.

Boltzmann's kinetic theory rests on the assumption that particle independence is propagated by the dynamics. This assumption is central to the issue of appearance of irreversibility. For finite numbers of particles, correlations are generated by collisions. The convergence proof establishes that for initially independent configurations, independence is statistically recovered in the limit.

This book is intended for mathematicians working in the fields of partial differential equations and mathematical physics, and is accessible to graduate students with a background in analysis.



François Labourie (Université Paris Sud, Orsay, France)

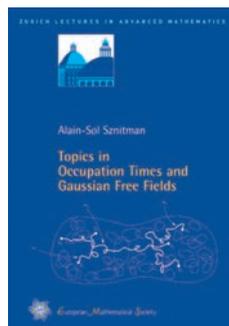
Lectures on Representations of Surface Groups

ISBN 978-3-03719-127-9
2013. 145 pages. Softcover. 17.0 x 24.0 cm
32.00 €

The subject of these notes is the character variety of representations of a surface group in a Lie group. We emphasize the various points of view (combinatorial, differential, algebraic) and are interested in the description of its smooth points, symplectic structure, volume and connected components. We also show how a three manifold bounded by the surface leaves a trace in this character variety.

These notes were originally designed for students with only elementary knowledge of differential geometry and topology. In the first chapters, we do not insist in the details of the differential geometric constructions and refer to classical textbooks, while in the more advanced chapters proofs occasionally are provided only for special cases where they convey the flavor of the general arguments. These notes could also be used by researchers entering this fast expanding field as motivation for further studies proposed in a concluding paragraph of every chapter.

Review: The European Mathematical Society has been publishing compact books like this one for a number of years now, and it is indeed a great service to all mathematicians. The books (at least the ones I've reviewed) are of a high quality and are eminently readable, modulo the right preparation. This book is no exception: it's very well-written and the topics covered are wonderful and deep. Furthermore, Labourie takes a fascinating approach to all this very sexy differential geometry by working in the graph theoretic and combinatorial angles, as indicated. It is an excellent book. (MAA Reviews)



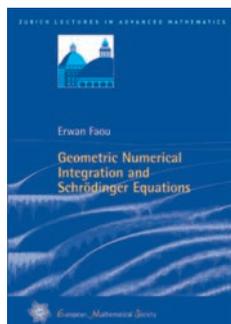
Alain-Sol Sznitman (ETH Zürich, Switzerland)

Topics in Occupation Times and Gaussian Free Fields

ISBN 978-3-03719-109-5
2012. 121 pages. Softcover. 17.0 x 24.0 cm
28.00 €

This book grew out of a graduate course at ETH Zurich during the Spring term 2011. It explores various links between such notions as occupation times of Markov chains, Gaussian free fields, Poisson point processes of Markovian loops, and random interacements, which have been the object of intensive research over the last few years. These notions are developed in the convenient set-up of finite weighted graphs endowed with killing measures.

The book first discusses elements of continuous-time Markov chains, Dirichlet forms, potential theory, together with some consequences for Gaussian free fields. Next, isomorphism theorems and generalized Ray-Knight theorems, which relate occupation times of Markov chains to Gaussian free fields, are presented. Markovian loops are constructed and some of their key properties derived. The field of occupation times of Poisson point processes of Markovian loops is investigated. Of special interest are its connection to the Gaussian free field, and a formula of Symanzik. Finally, links between random interacements and Markovian loops are discussed, and some further connections with Gaussian free fields are mentioned.



Erwan Faou (ENS Cachan Bretagne, France)

Geometric Numerical Integration and Schrödinger Equations

ISBN 978-3-03719-100-2

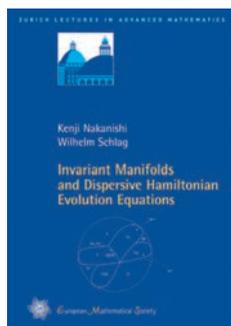
2012. 146 pages. Softcover. 17.0 x 24.0 cm

32.00 €

The goal of geometric numerical integration is the simulation of evolution equations possessing geometric properties over long times. Of particular importance are Hamiltonian partial differential equations typically arising in application fields such as quantum mechanics or wave propagation phenomena. They exhibit many important dynamical features such as energy preservation and conservation of adiabatic invariants over long time. In this setting, a natural question is how and to which extent the reproduction of such

long time qualitative behavior can be ensured by numerical schemes. Starting from numerical examples, these notes provide a detailed analysis of the Schrödinger equation in a simple setting (periodic boundary conditions, polynomial nonlinearities) approximated by symplectic splitting methods. Analysis of stability and instability phenomena induced by space and time discretization are given, and rigorous mathematical explanations for them.

The book grew out of a graduate level course and is of interest to researchers and students seeking an introduction to the subject matter.



Kenji Nakanishi (Kyoto University, Japan)
Wilhelm Schlag (University of Chicago, USA)

Invariant Manifolds and Dispersive Hamiltonian Evolution Equations

ISBN 978-3-03719-095-1

2011. 258 pages. Softcover. 17.0 x 24.0 cm

38.00 €

The notion of an invariant manifold arises naturally in the asymptotic stability analysis of stationary or standing wave solutions of unstable dispersive Hamiltonian evolution equations such as the focusing semilinear Klein–Gordon and Schrödinger equations. This is due to the fact that the linearized operators about such special solutions typically exhibit negative eigenvalues (a single one for the ground state), which lead to exponential

instability of the linearized flow and allows for ideas from hyperbolic dynamics to enter.

One of the main results proved here for energy subcritical equations is that the center-stable manifold associated with the ground state appears as a hyper-surface which separates a region of finite-time blowup in forward time from one which exhibits global existence and scattering to zero in forward time. Our entire analysis takes place in the energy topology, and the conserved energy can exceed the ground state energy only by a small amount.

This monograph is based on recent research by the authors and the proofs rely on an interplay between the variational structure of the ground states on the one hand, and the nonlinear hyperbolic dynamics near these states on the other hand. A key element in the proof is a virial-type argument excluding almost homoclinic orbits originating near the ground states, and returning to them, possibly after a long excursion.

These lectures are suitable for graduate students and researchers in partial differential equations and mathematical physics. For the cubic Klein–Gordon equation in three dimensions all details are provided, including the derivation of Strichartz estimates for the free equation and the concentration-compactness argument leading to scattering due to Kenig and Merle.

Reviews: This book is written by two leaders in the theory of nonlinear waves. It is particularly well written and organized. There are very clear preambles and summaries of the individual chapters. (Bull. AMS)

This is an excellent book, which also gives a very complete introduction to the modern theory of focusing nonlinear dispersive partial differential equations. (Math Reviews)

Previous titles published in this series

Shmuel Onn, *Nonlinear Discrete Optimization. An Algorithmic Theory*

ISBN 978-3-03719-093-7. 2010. 147 pages. Softcover. 17 cm x 24 cm. 32.00 €

Christian Lubich, *From Quantum to Classical Molecular Dynamics: Reduced Models and Numerical Analysis*

ISBN 978-3-03719-067-8. 2008. 153 pages. Softcover. 17 cm x 24 cm. 32.00 €

Review: On the whole the author's efforts here do deserve to be fully appreciated. The work meets well with the need to explore and master the relevant computational methods and various challenges of the day. (zbMATH)

Alexander Barvinok, *Integer Points in Polyhedra*

ISBN 978-3-03719-052-4. 2008. 199 pages. Softcover. 17 cm x 24 cm. 34.00 €

Review: The overall scope of the topics covered is fairly wide, ranging from classical results to some very recent advances. The book is well written, contains a large number of nice illustrations which help to develop reader's geometric intuition, and includes numerous exercises of varying degree of difficulty. The author also includes some useful references. This text requires a rather minimal background in algebra and analysis, and is likely to become a standard reference for graduate students and researchers alike. (zbMATH)

Michael Farber, *Invitation to Topological Robotics*

ISBN 978-3-03719-054-8. 2008. 143 pages. Softcover. 17 cm x 24 cm. 32.00 €

Alexander H.W. Schmitt, *Geometric Invariant Theory and Decorated Principal Bundles*

ISBN 978-3-03719-065-4. 2008. 396 pages. Softcover. 17 cm x 24 cm. 48.00 €

Paul Seidel, *Fukaya Categories and Picard–Lefschetz Theory (Winner of the 2010 Oswald Veblen Prize in Geometry)*

ISBN 978-3-03719-063-0. 2008. 336 pages. Softcover. 17 cm x 24 cm. 46.00 €

Camillo de Lellis, *Rectifiable Sets, Densities, and Tangent Measures*

ISBN 978-3-03719-044-9. 2008. 133 pages. Softcover. 17 cm x 24 cm. 26.00 €

Demetrios Christodoulou, *Mathematical Problems of General Relativity*

ISBN 978-3-03719-005-0. 2008. 157 pages. Softcover. 17 cm x 24 cm. 28.00 €

Guus Balkema and Paul Embrechts, *High Risk Scenarios and Extremes. A geometric approach*

ISBN 978-3-03719-036-4. 2007. 398 pages. Softcover. 17 cm x 24 cm. 48.00 €

Pavel Etingof, *Calogero–Moser systems and representation theory*

ISBN 978-3-03719-034-0. 2007. 102 pages. Softcover. 17 cm x 24 cm. 28.00 €

Sergei B. Kuksin, *Randomly forced nonlinear PDEs and statistical hydrodynamics in 2 space dimensions*

ISBN 978-3-03719-021-0. 2006. 102 pages. Softcover. 17 cm x 24 cm. 28.00 €

Sun-Yung Alice Chang, *Non-linear Elliptic Equations in Conformal Geometry*

ISBN 978-3-03719-006-7. 2004. 100 pages. Softcover. 17 cm x 24 cm. 24.00 €

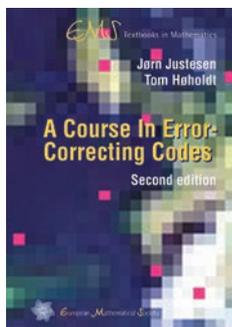
Review: This book is a lovely introduction to the subject and contains an excellent bibliographic introduction to the subject comprising approximately 100 entries. (zbMATH)

Yakov Pesin, *Lectures on partial hyperbolicity and stable ergodicity*

ISBN 978-3-03719-003-6. 2004. 128 pages. Softcover. 17 cm x 24 cm. 28.00 €

Review: The text would be ideal for an intermediate-level graduate dynamical systems topics course. (Math Reviews)

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.



Jørn Justesen (Technical University of Denmark, Lyngby, Denmark)
Tom Høholdt (Technical University of Denmark, Lyngby, Denmark)

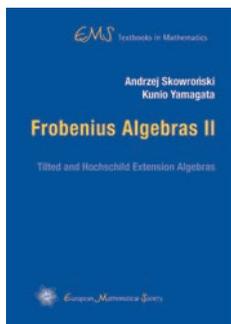
A Course In Error-Correcting Codes Second edition

ISBN 978-3-03719-179-8
2017. 226 pages. Hardcover. 16.5 x 23.5 cm
39.50 €

This book, updated and enlarged for the second edition, is written as a text for a course aimed at 3rd or 4th year students. Only some familiarity with elementary linear algebra and probability is directly assumed, but some maturity is required. The students may specialize in discrete mathematics, computer science, or communication engineering. The

book is also a suitable introduction to coding theory for researchers from related fields or for professionals who want to supplement their theoretical basis. The book gives the coding basics for working on projects in any of the above areas, but material specific to one of these fields has not been included. The chapters cover the codes and decoding methods that are currently of most interest in research, development, and application. They give a relatively brief presentation of the essential results, emphasizing the interrelations between different methods and proofs of all important results. A sequence of problems at the end of each chapter serves to review the results and give the student an appreciation of the concepts. In addition, some problems and suggestions for projects indicate direction for further work. The presentation encourages the use of programming tools for studying codes, implementing decoding methods, and simulating performance. Specific examples of programming exercises are provided on the book's home page.

Review of the 1st edition: The book material is illustrated with a set of example problems and their solutions. All of this makes the book a useful compendium of fundamentals on error-correcting codes. (zbMATH)



Andrzej Skowroński (Nicolaus Copernicus University, Toruń, Poland)
Kunio Yamagata (Tokyo University of Agriculture and Technology, Japan)

Frobenius Algebras II Tilted and Hochschild Extension Algebras

ISBN 978-3-03719-174-3
2017. 629 pages. Hardcover. 16.5 x 23.5 cm
58.00 €

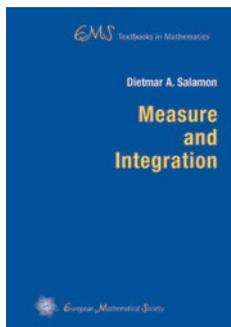
This is the second of three volumes which will provide a comprehensive introduction to the modern representation theory of Frobenius algebras. The first part of the book is devoted to fundamental results of the representation theory of finite dimensional hereditary algebras and their tilted algebras, which allow to describe the representation theory of prominent classes of Frobenius algebras.

The second part is devoted to basic classical and recent results concerning the Hochschild extensions of finite dimensional algebras by duality bimodules and their module categories. Moreover, the shapes of connected components of the stable Auslander-Reiten quivers of Frobenius algebras are described.

The only prerequisite in this volume is a basic knowledge of linear algebra and some results of the first volume. It includes complete proofs of all results presented and provides a rich supply of examples and exercises.

The text is primarily addressed to graduate students starting research in the representation theory of algebras as well mathematicians working in other fields.

See page 35 for a description and review of *Frobenius Algebras I: Basic Representation Theory*



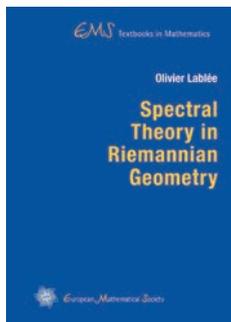
Dietmar A. Salamon (ETH Zürich, Switzerland)

Measure and Integration

ISBN 978-3-03719-159-0
2016. 363 pages. Hardcover. 16.5 x 23.5 cm
48.00 €

The book is intended as a companion to a one semester introductory lecture course on measure and integration. After an introduction to abstract measure theory it proceeds to the construction of the Lebesgue measure and of Borel measures on locally compact Hausdorff spaces, L^p -spaces and their dual spaces and elementary Hilbert space theory. Special features include the formulation of the Riesz Representation Theorem in terms of both inner and outer regularity, the proofs of the Marcinkiewicz Interpolation Theorem and the Calderon–Zygmund inequality as applications of Fubini's theorem and Lebesgue differentiation, the treatment of the generalized Radon–Nikodym theorem due to Fremlin, and the existence proof for Haar measures. Three appendices deal with Urysohn's Lemma, product topologies, and the inverse function theorem.

The book assumes familiarity with first year analysis and linear algebra. It is suitable for second year undergraduate students of mathematics or anyone desiring an introduction to the concepts of measure and integration.



Olivier Lablée (Université Joseph Fourier Grenoble 1, Saint Martin d'Hères, France)

Spectral Theory in Riemannian Geometry

ISBN 978-3-03719-151-4

2015. 197 pages. Hardcover. 16.5 x 23.5 cm

38.00 €

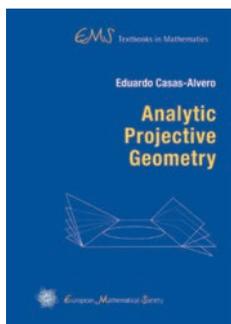
Spectral theory is a diverse area of mathematics that derives its motivations, goals and impetus from several sources. In particular, the spectral theory of the Laplacian on a compact Riemannian manifold is a central object in differential geometry. From a physical point of view, the Laplacian on a compact Riemannian manifold is a fundamental linear operator which describes numerous propagation phenomena: heat propagation, wave propagation, quantum dynamics, etc. Moreover, the spectrum of the Laplacian contains

vast information about the geometry of the manifold.

This book gives a self-contained introduction to spectral geometry on compact Riemannian manifolds. Starting with an overview of spectral theory on Hilbert spaces, the book proceeds to a description of the basic notions in Riemannian geometry. Then it makes its way to topics of main interests in spectral geometry. The topics presented include direct and inverse problems. Direct problems are concerned with computing or finding properties on the eigenvalues while the main issue in inverse problems is “knowing the spectrum of the Laplacian, can we determine the geometry of the manifold?”

Addressed to students or young researchers, the present book is a first introduction in spectral theory applied to geometry. For readers interested in pursuing the subject further, this book will provide a basis for understanding principles, concepts and developments of spectral geometry.

Review: The title by itself is tantalizing: this is very exciting mathematics on any number of counts... The book is arranged in a very appealing and effective fashion... (MAA Reviews)



Eduardo Casas-Alvero (Universitat de Barcelona, Spain)

Analytic Projective Geometry

ISBN 978-3-03719-138-5

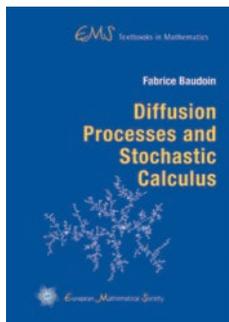
2014. 636 pages. Hardcover. 16.5 x 23.5 cm

58.00 €

This book contains a comprehensive presentation of projective geometry, over the real and complex number fields, and its applications to affine and Euclidean geometries. It covers central topics such as linear varieties, cross ratio, duality, projective transformations, quadrics and their classifications – projective, affine and metric –, as well as the more advanced and less usual spaces of quadrics, rational normal curves, line complexes and the classifications of collineations, pencils of quadrics and correlations. Two appendices are

devoted to the projective foundations of perspective and to the projective models of plane non-Euclidean geometries. The presentation uses modern language, is based on linear algebra and provides complete proofs. Exercises are proposed at the end of each chapter; many of them are beautiful classical results.

Review: All together, the book under review gives an utmost lucid, precise and rigorous presentation of the central topics of classical analytic projective geometry, with numerous instructive examples, elucidating remarks, and interesting applications. (zbMATH)



Fabrice Baudoin (Purdue University, West Lafayette, USA)

Diffusion Processes and Stochastic Calculus

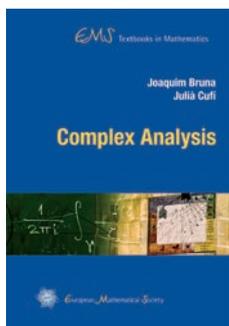
ISBN 978-3-03719-133-0
2014. 288 pages. Hardcover. 16.5 x 23.5 cm
48.00 €

The main purpose of the book is to present at a graduate level and in a self-contained way the most important aspects of the theory of continuous stochastic processes in continuous time and to introduce to some of its ramifications like the theory of semigroups, the Malliavin calculus and the Lyons' rough paths. It is intended for students, or even researchers, who wish to learn the basics in a concise but complete and rigorous manner. Several exercises are distributed throughout the text to test the understanding of the reader

and each chapter ends up with bibliographic comments aimed to those interested in exploring further the materials.

The stochastic calculus has been developed in the 1950s and the range of its applications is huge and still growing today. Besides being a fundamental component of modern probability theory, domains of applications include but are not limited to: mathematical finance, biology, physics, and engineering sciences. The first part of the text is devoted to the general theory of stochastic processes, we focus on existence and regularity results for processes and on the theory of martingales. This allows to quickly introduce the Brownian motion and to study its most fundamental properties. The second part deals with the study of Markov processes, in particular diffusions. Our goal is to stress the connections between these processes and the theory of evolution semigroups. The third part deals with stochastic integrals, stochastic differential equations and Malliavin calculus. Finally, in the fourth part we present an introduction to the very new theory of rough paths by Terry Lyons.

Review: This is a concise, elegant and well-executed introduction to stochastic calculus. The text is based on a graduate level lecture course given by the author. As a consequence it is fairly self-contained and written with a style that is easy to digest. (Math Reviews)



Joaquim Bruna
Julià Cufí (both Universitat Autònoma de Barcelona, Spain)

Complex Analysis

ISBN 978-3-03719-111-8
2012. 576 pages. Hardcover. 16.5 x 23.5 cm
58.00 €

The theory of functions of a complex variable is a central theme in mathematical analysis that has links to several branches of mathematics. Understanding the basics of the theory is necessary for anyone who wants to have a general mathematical training or for anyone who wants to use mathematics in applied sciences or technology.

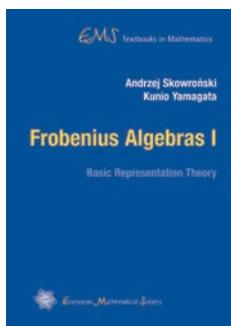
The book presents the basic theory of analytic functions of a complex variable and their points of contact with other parts of mathematical analysis. This results in some new approaches to a number of topics when compared to the current literature on the subject.

Some issues covered are: a real version of the Cauchy–Goursat theorem, theorems of vector analysis with weak regularity assumptions, an approach to the concept of holomorphic functions of real variables, Green's formula with multiplicities, Cauchy's theorem for locally exact forms, a study in parallel of Poisson's equation and the inhomogeneous Cauchy–Riemann equations, the relationship between Green's function and conformal mapping, the connection between the solution of Poisson's equation and zeros of holomorphic functions, and the Whittaker–Shannon theorem of information theory.

The text can be used as a manual for complex variable courses of various levels and as a reference book. The only prerequisites for reading it is a working knowledge of the topology of the plane and the differential calculus for functions of several real variables. A detailed treatment of harmonic functions also makes the book useful as an introduction to potential theory.

Reviews: ... This is a very strong book in complex analysis. Intentionally, the authors show the connections among a variety of subjects, such as vector analysis, homology, potential theory, mathematical physics, differential equations, approximation theory, and complex analysis. The book is self-contained and well written. It contains rigorous proofs of all statements. The authors have accomplished their goals. (Math Reviews)

... Thus, Bruna and Cufi have written an important and useful book, very readable, very elegant ... and pedagogically sound particularly as illustrated by their good choice of exercises. It will also serve well as a reference to professionals, particularly as regards what we do in the classroom, regardless of which principal texts we use in our complex analysis courses. Then again, there is no reason at all not to use the book under review itself: even its price is not out of reach. (MAA Reviews)



Andrzej Skowroński (Nicolaus Copernicus University, Toruń, Poland)
Kunio Yamagata (Tokyo University of Agriculture and Technology, Japan)

Frobenius Algebras I Basic Representation Theory

ISBN 978-3-03719-102-6
2011. 661 pages. Hardcover. 16.5 x 23.5 cm
58.00 €

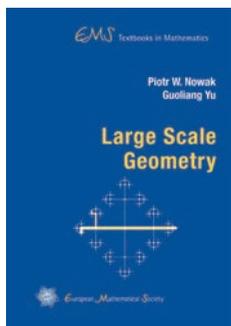
This is the first of two volumes which will provide a comprehensive introduction to the modern representation theory of Frobenius algebras. The first part of the book serves as a general introduction to basic results and techniques of the modern representation theory of finite dimensional associative algebras over fields, including the Morita theory of equivalences and dualities and the Auslander–Reiten theory of irreducible morphisms and almost split sequences.

The second part is devoted to fundamental classical and recent results concerning the Frobenius algebras and their module categories. Moreover, the prominent classes of Frobenius algebras, the Hecke algebras of Coxeter groups and the finite dimensional Hopf algebras over fields are exhibited.

This volume is self-contained and the only prerequisite is a basic knowledge of linear algebra. It includes complete proofs of all results presented and provides a rich supply of examples and exercises.

The text is primarily addressed to graduate students starting research in the representation theory of algebras as well as mathematicians working in other fields.

Review: ... The book is very well written and will be especially useful for graduate students and non-experts because of the detailed exposition and the wealth of examples and exercises, as well as the inclusion of more advanced results in order to bridge the gap to the research literature on the subject and to put the discussed material into perspective. (Math Reviews)



Piotr W. Nowak (Institute of Mathematics of the Polish Academy of Sciences and University of Warsaw, Poland)
Guoliang Yu (Texas A&M University, College Station, USA)

Large Scale Geometry

ISBN 978-3-03719-112-5
2012. 203 pages. Hardcover. 16.5 x 23.5 cm
38.00 €

Large scale geometry is the study of geometric objects viewed from a great distance. The idea of large scale geometry can be traced back to Mostow's work on rigidity and the work of Švarc, Milnor and Wolff on growth of groups. In the last decades, large scale geometry has found important applications in group theory, topology, geometry, higher index theory, computer science, and large data analysis. This book provides a friendly approach to the basic theory of this exciting and fast growing subject 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.

Review: This book will be very useful for people trying to enter this fascinating and currently very active research area, which has important connections with topology, group theory, and functional analysis. (Math Reviews)

Previous titles published in this series

Eduard Zehnder, Lectures on Dynamical Systems. Hamiltonian Vector Fields and Symplectic Capacities

ISBN 978-3-03719-081-4. 2010. 363 pages. Hardcover. 16.5 x 23.5 cm. 48.00 €

Reviews: ...Zehnder's book provides a thorough grounding in dynamical systems and offers a bit more than a glimpse at some applications of symplectic geometry. It would be an excellent text for a graduate course. (MAA Reviews)

The book is very well written. The proofs are presented in detail and are easy to follow. All the material is carefully introduced with a lot of recollection. Moreover, each chapter ends with a quick and helpful overview of the literature on the subject. ... The author manages to maintain the same level of difficulty throughout the whole book and makes very accessible several results in symplectic topology which are reputed to be very hard. (Math Reviews)

Mauro C. Beltrametti, Ettore Carletti, Dionisio Gallarati and Giacomo Monti Bragadin, Lectures on Curves, Surfaces and Projective Varieties. A Classical View of Algebraic Geometry

ISBN 978-3-03719-064-7. 2009. 506 pages. Hardcover. 16.5 x 23.5 cm. 58.00 €

Review: The book under review differs substantially from the recent avalanche of introductory textbooks in algebraic geometry. It is a very nice introduction to the subject of the classical methods in algebraic geometry, explained in a modern way. (Math Reviews)

Tammo tom Dieck, Algebraic Topology

ISBN 978-3-03719-048-7. 2008. 578 pages. Hardcover. 16.5 x 23.5 cm. 58.00 €

Review: I believe that the best students at the best universities will find this book to be the best path to learning modern algebraic topology. The book will also serve as an excellent reference for many mathematicians. (Math Reviews)

Wolfgang Woess, *Denumerable Markov Chains*

ISBN 978-3-03719-071-5. 2009. 368 pages. Hardcover. 16.5 x 23.5 cm. 48.00 €

Review: What sets this work apart from the multitude of available textbooks on the subject is the emphasis on some aspects that are usually not treated in much detail in introductory texts on Markov chains... The author has a very clear and pleasant style of writing. There are many examples and exercises throughout the text. (zbMATH)

Marek Jarnicki and Peter Pflug, *First Steps in Several Complex Variables: Reinhardt Domains*

ISBN 978-3-03719-049-4. 2008. 367 pages. Hardcover. 16.5 x 23.5 cm. 58.00 €

Review: The book is very nicely written and it is enriched by many useful exercises and various suggestions for further investigations. (zbMATH)

Oleg Bogopolski, *Introduction to Group Theory*

ISBN 978-3-03719-041-8. 2008. 187 pages. Hardcover. 16.5 cm x 23.5 cm. 38.00 €

Review: The book can be used for a graduate course in group theory, but it can also be read independently. In both cases, the student that manages to work through the book in detail will be rewarded with a working knowledge of advanced, mainstream topics in group theory. (MAA Reviews)

Thomas Timmermann, *An Invitation to Quantum Groups and Duality. From Hopf Algebras to Multiplicative Unitaries and Beyond*

ISBN 978-3-03719-043-2. 2008. 427 pages. Hardcover. 16.5 cm x 23.5 cm. 58.00 €

Review: The book is very well written and should be accessible and quite useful for graduate students and non-experts from other fields, especially because of its well chosen examples and a considerable effort to put the discussed material into perspective. (zbMATH)

Dorothee D. Haroske and Hans Triebel, *Distributions, Sobolev Spaces, Elliptic Equations*

ISBN 978-3-03719-042-5. 2007. 303 pages. Hardcover. 16.5 cm x 23.5 cm. 48.00 €

Review: The present text is very suitable for readers who wish to study elliptic equations with the help of the elaborate theory of function spaces that has been developed over the past 30 years. (zbMATH)

Markus Stroppel, *Locally Compact Groups*

ISBN 978-3-03719-016-6. 2006. 312 pages. Hardcover. 16.5 cm x 23.5 cm. 52.00 €

Reviews: This book is primarily written for students. The modern outlook and the friendly style and format are compatible with this goal, and I am confident that most students would benefit greatly from studying this book. (MAA Reviews)

The book is very well suited to give an interested student a good familiarity with the structure of locally compact groups. Researchers using locally compact groups as a tool in other disciplines will find the results of Chapter H particularly enlightening and useful. The book is very well organized, and the style of writing is clear and convenient to read. (zbMATH)

Peter Kunkel and Volker Mehrmann, *Differential-Algebraic Equations*

ISBN 978-3-03719-017-3. 2006. 385 pages. Hardcover. 16.5 cm x 23.5 cm. 58.00 €

Review: The book is addressed to graduate students and researchers in mathematics, engineering and sciences, as well as practitioners in industry. ... Numerous examples and exercises make the book suitable as a course textbook or for self-study. (zbMATH)

Editorial Board:

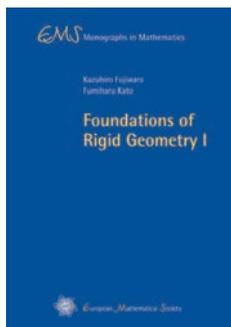
Hugo Duminil-Copin (Institut des Hautes Études Scientifiques (IHÉS), Bures-sur-Yvette, France)

Gerard van der Geer (University of Amsterdam, The Netherlands)

Thomas Kappeler (University of Zürich, Switzerland)

Paul Seidel (Massachusetts Institute of Technology, Cambridge, USA)

EMS Monographs in Mathematics is a book series aimed at mathematicians and scientists. It publishes research monographs from all fields of mathematics. The individual volumes are intended to give a reasonably comprehensive and self-contained account of their particular subject. They present mathematical results that are new or have not been accessible previously in the literature.



Kazuhiro Fujiwara (Nagoya University, Japan)

Fumiharu Kato (Kumamoto University, Japan)

Foundations of Rigid Geometry I

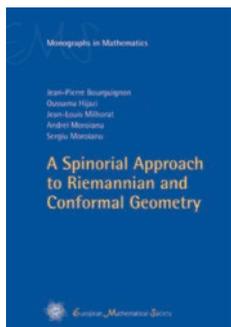
ISBN 978-3-03719-135-4

2017. Approx. 720 pages. Hardcover. 16.5 x 23.5 cm

108.00 €

Rigid geometry is one of the modern branches of algebraic and arithmetic geometry. It has its historical origin in J. Tate's rigid analytic geometry, which aimed at developing an analytic geometry over non-archimedean valued fields. Nowadays, rigid geometry is a discipline in its own right and has acquired vast and rich structures, based on discoveries of its relationship with birational and formal geometries.

In this research monograph, foundational aspects of rigid geometry are discussed, putting emphasis on birational and topological features of rigid spaces. Besides the rigid geometry itself, topics include the general theory of formal schemes and formal algebraic spaces, based on a theory of complete rings which are not necessarily Noetherian. Also included is a discussion on the relationship with Tate's original rigid analytic geometry, V.G. Berkovich's analytic geometry and R. Huber's adic spaces. As a model example of applications, a proof of Nagata's compactification theorem for schemes is given in the appendix. The book is encyclopedic and almost self-contained.



Jean-Pierre Bourguignon (IHÉS, Bures-sur-Yvette, France)

Oussama Hijazi (Université de Lorraine, Nancy, France)

Jean-Louis Milhorat (Université de Nantes, France)

Andrei Moroianu (Université de Versailles-St Quentin, France)

Sergiu Moroianu (Institute of Mathematics of the Romanian Academy, Bukarest, Romania)

A Spinorial Approach to Riemannian and Conformal Geometry

ISBN 978-3-03719-136-1

2015. 462 pages. Hardcover. 16.5 x 23.5 cm

78.00 €

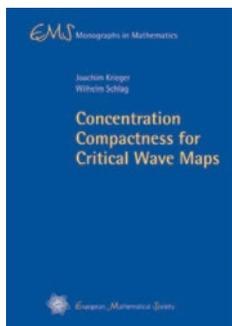
The book gives an elementary and comprehensive introduction to Spin Geometry, with particular emphasis on the Dirac operator which plays a fundamental role in differential geometry and mathematical physics.

After a self-contained presentation of the basic algebraic, geometrical, analytical and topological ingredients, a systematic study of the spectral properties of the Dirac operator on compact spin manifolds is carried out. The classical

estimates on eigenvalues and their limiting cases are discussed next, highlighting the subtle interplay of spinors and special geometric structures. Several applications of these ideas are presented, including spinorial proofs of the Positive Mass Theorem or the classification of positive Kähler–Einstein contact manifolds. Representation theory is used to explicitly compute the Dirac spectrum of compact symmetric spaces.

The special features of the book include a unified treatment of Spinc and conformal spin geometry (with special emphasis on the conformal covariance of the Dirac operator), an overview with proofs of the theory of elliptic differential operators on compact manifolds based on pseudodifferential calculus, a spinorial characterization of special geometries, and a self-contained presentation of the representation-theoretical tools needed in order to apprehend spinors.

This book will help advanced graduate students and researchers to get more familiar with this beautiful, though not sufficiently known, domain of mathematics with great relevance to both theoretical physics and geometry.



Joachim Krieger (EPFL Lausanne, Switzerland)
Wilhelm Schlag (University of Chicago, USA)

Concentration Compactness for Critical Wave Maps

ISBN 978-3-03719-106-4

2012. 490 pages. Hardcover. 16.5 x 23.5 cm

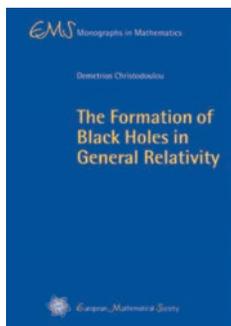
88.00 €

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 $\mathbb{R}_{t,x}^{2+1}$, 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}^1 as target the wave map evolution of any smooth data exists globally as a smooth function.

While we restrict ourselves 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.



Demetrios Christodoulou (ETH Zürich, Switzerland)

The Formation of Black Holes in General Relativity

ISBN 978-3-03719-068-5

2009. 598 pages. Hardcover. 16.5 x 23.5 cm

98.00 €

In 1965 Penrose introduced the fundamental concept of a trapped surface, on the basis of which he proved a theorem which asserts that a spacetime containing such a surface must come to an end. The presence of a trapped surface implies, moreover, that there is a region of spacetime, the black hole, which is inaccessible to observation from infinity.

A major challenge since that time has been to find out how trapped surfaces actually form, by analyzing the dynamics of gravitational collapse. The present monograph achieves this aim

by establishing the formation of trapped surfaces in pure general relativity through the focusing of gravitational waves.

The theorems proved in the present monograph constitute the first foray into the long-time dynamics of general relativity in the large, that is, when the initial data are no longer confined to a suitable neighborhood of trivial data. The main new method, the short pulse method, applies to general systems of Euler–Lagrange equations of hyperbolic type, and provides the means to tackle problems which have hitherto seemed unapproachable.

This monograph will be of interest to people working in general relativity, geometric analysis, and partial differential equations.

The author is a [Shaw Prize Laureate in Mathematical Sciences 2011](#) (together with Richard Hamilton) “for ... highly innovative works on nonlinear partial differential equations in Lorentzian and Riemannian geometry and their applications to general relativity and topology”.

Review: This is a remarkable book, clearly written and interesting. During the proofs there is some lengthiness, but this is necessary for clarity. The techniques described are of general interest in wide parts of mathematical physics. (zbMATH)

Previous titles published in this series

Demetrios Christodoulou, *The Formation of Shocks in 3-Dimensional Fluids*

ISBN 978-3-03719-031-9. 2007. 1000 pages. Hardcover. 16.5 x 23.5 cm. 148.00 €

Reviews: This is a well written monograph which contains valuable information on shock waves; it should be of interest to anyone interested on shock formation in a nonlinear medium. (zbMATH)

...an amazing “tour de force”... (Math Reviews)

Sergei Buyalo and Viktor Schroeder, *Elements of Asymptotic Geometry*

ISBN 978-3-03719-036-4. 2007. 212 pages. Hardcover. 16.5 cm x 23.5 cm. 58.00 €

Review: In view of the new ideas and the activity in this area, the book is a timely one and the authors are to be complimented for bringing together major threads of the subject in a very readable account. (zbMATH)

Richard Arratia, A. D. Barbour and Simon Tavaré, *Logarithmic Combinatorial Structures: a Probabilistic Approach*

ISBN 978-3-03719-000-5. 2004. 374 pages. Hardcover. 16.5 cm x 23.5 cm. 69.00 €

Review: This book ... represents the culmination of a decade-long research by the authors. It is very well-written and informative. Highly recommended. (zbMATH)

Editorial Board:

Carlos E. Kenig (University of Chicago, USA)

Michael Farber (Queen Mary University of London, UK)

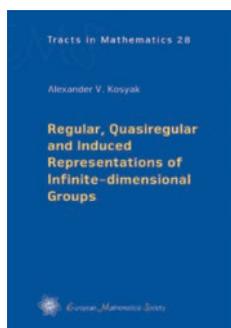
Michael Röckner (Universität Bielefeld, Germany, and Purdue University, USA)

Vladimir Turaev (Indiana University, Bloomington, USA)

Alexander Varchenko (University of North Carolina at Chapel Hill, USA)

This series includes advanced texts and monographs covering all fields in pure and applied mathematics. 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.

In particular, the winner of the EMS Monograph Award (see page 63) will appear in this series.



Vol. 28

Alexander V. Kosyak (National Academy of Science of Ukraine, Kiev, Ukraine)

Regular, Quasiregular and Induced Representations of Infinite-dimensional Groups

ISBN 978-3-03719-181-1

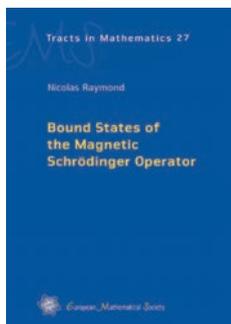
2018. Approx. 550 pages. Hardcover. 17 x 24 cm

Approx. 88.00 €

Almost all harmonic analysis on locally compact groups is based on the existence (and uniqueness) of a Haar measure. Therefore, it is very natural to attempt a similar construction for non-locally compact groups. The essential idea is to replace the non-existing Haar measure on an infinite-dimensional group by a suitable quasi-invariant measure on an appropriate completion of the initial group or on the completion of a homogeneous space.

The aim of the book is a systematic development, by example, of noncommutative harmonic analysis on infinite-dimensional (non-locally compact) matrix groups. We generalize the notion of regular, quasiregular and induced representations for arbitrary infinite-dimensional groups. The central idea to verify the irreducibility is the Ismagilov conjecture. We also extend the Kirillov orbit method for the group of upper triangular matrices of infinite order.

In order to make the content accessible to a wide audience of nonspecialists, the exposition is essentially self-contained and very few prerequisites are needed. The book is aimed at graduate and advanced undergraduate students, as well as mathematicians who wish an introduction to representations of infinite-dimensional groups.



Vol. 27
Nicolas Raymond (Université de Rennes I, France)

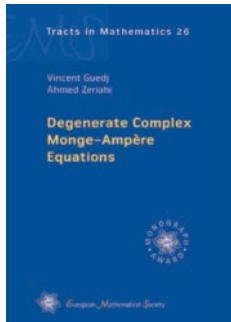
Bound States of the Magnetic Schrödinger Operator

ISBN 978-3-03719-169-9
2017. 394 pages. Hardcover. 17 x 24 cm
64.00 €

This book is a synthesis of recent advances in the spectral theory of the magnetic Schrödinger operator. It can be considered a catalog of concrete examples of magnetic spectral asymptotics.

Since the presentation involves many notions of spectral theory and semiclassical analysis, it begins with a concise account of concepts and methods used in the book and is illustrated by many elementary examples.

Assuming various points of view (power series expansions, Feshbach–Grushin reductions, WKB constructions, coherent states decompositions, normal forms) a theory of Magnetic Harmonic Approximation is then established which allows, in particular, accurate descriptions of the magnetic eigenvalues and eigenfunctions. Some parts of this theory, such as those related to spectral reductions or waveguides, are still accessible to advanced students while others (e.g., the discussion of the Birkhoff normal form and its spectral consequences, or the results related to boundary magnetic wells in dimension three) are intended for seasoned researchers.



Vol. 26
Vincent Guedj and
Ahmed Zeriahi (both Université Paul Sabatier, Toulouse, France)

Degenerate Complex Monge–Ampère Equations

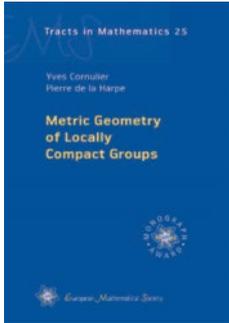
ISBN 978-3-03719-167-5
2017. 496 pages. Hardcover. 17 x 24 cm
88.00 €

Complex Monge–Ampère equations have been one of the most powerful tools in Kähler geometry since Aubin and Yau’s classical works, culminating in Yau’s solution to the Calabi conjecture. A notable application is the construction of Kähler–Einstein metrics on some compact Kähler manifolds. In recent years degenerate complex Monge–Ampère equations have been intensively studied, requiring more advanced tools.

The main goal of this book is to give a self-contained presentation of the recent developments of pluripotential theory on compact Kähler manifolds and its application to Kähler–Einstein metrics on mildly singular varieties. After reviewing basic properties of plurisubharmonic functions, Bedford–Taylor’s local theory of complex Monge–Ampère measures is developed. In order to solve degenerate complex Monge–Ampère equations on compact Kähler manifolds, fine properties of quasi-plurisubharmonic functions are explored, classes of finite energies defined and various maximum principles established. After proving Yau’s celebrated theorem as well as its recent generalizations, the results are then used to solve the (singular) Calabi conjecture and to construct (singular) Kähler–Einstein metrics on some varieties with mild singularities.

The book is accessible to advanced students and researchers of complex analysis and differential geometry.





Vol. 25

Yves de Cornulier (Université Paris-Sud, France) and
Pierre de la Harpe (Université de Genève, Switzerland)

Metric Geometry of Locally Compact Groups

ISBN 978-3-03719-166-8

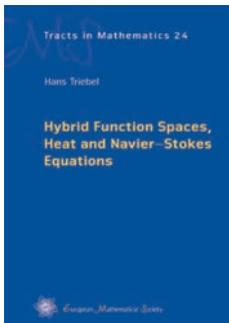
2016. 243 pages. Hardcover. 17 x 24 cm

62.00 €

The main aim of this book is the study of locally compact groups from a geometric perspective, with an emphasis on appropriate metrics that can be defined on them. The approach has been successful for finitely generated groups, and can favourably be extended to locally compact groups. Parts of the book address the coarse geometry of metric spaces, where 'coarse' refers to that part of geometry concerning properties that can be formulated in terms of large distances only. This point of view is instrumental in studying locally compact groups.

Basic results in the subject are exposed with complete proofs, others are stated with appropriate references. Most importantly, the development of the theory is illustrated by numerous examples, including matrix groups with entries in the field of real or complex numbers, or other locally compact fields such as p -adic fields, isometry groups of various metric spaces, and, last but not least, discrete group themselves.

The book is aimed at graduate students and advanced undergraduate students, as well as mathematicians who wish some introduction to coarse geometry and locally compact groups.



Vol. 24

Hans Triebel (University of Jena, Germany)

Hybrid Function Spaces, Heat and Navier-Stokes Equations

ISBN 978-3-03719-150-7

2015. 196 pages. Hardcover. 17 x 24 cm

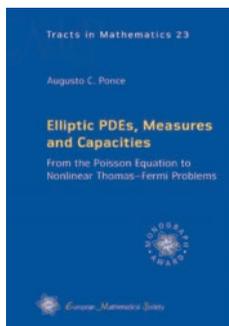
48.00 €

This book is the continuation of *Local Function Spaces, Heat and Navier–Stokes Equations* (Tracts in Mathematics 20, 2013) by the author. A new approach is presented to exhibit relations between Sobolev spaces, Besov spaces, and Hölder–Zygmund spaces on the one hand and Morrey–Campanato spaces on the other. Morrey–Campanato spaces extend the notion of functions of bounded mean oscillation. These spaces play a crucial role in

the theory of linear and nonlinear PDEs.

Chapter 1 (Introduction) describes the main motivations and intentions of this book. Chapter 2 is a self-contained introduction into Morrey spaces. Chapter 3 deals with hybrid smoothness spaces (which are between local and global spaces) in Euclidean n -space based on the Morrey–Campanato refinement of the Lebesgue spaces. The presented approach relies on wavelet decompositions. This is applied in Chapter 4 to linear and nonlinear heat equations in global and hybrid spaces. The obtained assertions about function spaces and nonlinear heat equations are used in the Chapters 5 and 6 to study Navier–Stokes equations in hybrid and global spaces.

This book is addressed to graduate students and mathematicians having a working knowledge of basic elements of (global) function spaces, and who are interested in applications to nonlinear PDEs with heat and Navier–Stokes equations as prototypes.



Vol. 23
Augusto C. Ponce (Université catholique de Louvain, Belgium)

Elliptic PDEs, Measures and Capacities From the Poisson Equation to Nonlinear Thomas–Fermi Problems

ISBN 978-3-03719-140-8
2017. Approx. 350 pages. Hardcover. 17 x 24 cm
58.00 €

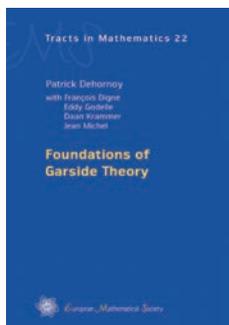


Partial differential equations (PDEs) and geometric measure theory (GMT) are branches of analysis whose connections are usually not emphasized in introductory graduate courses. Yet, one cannot dissociate the notions of mass or electric charge, naturally described in terms of measures, from the physical potential they generate. Having such a principle in mind, this book illustrates the beautiful interplay between tools from PDEs and GMT in a simple and elegant way by investigating properties like existence and regularity of solutions of linear and nonlinear elliptic PDEs.

Inspired by a variety of sources, from the pioneer balayage scheme of Poincaré to more recent results related to the Thomas–Fermi and the Chern–Simons models, the problems covered in this book follow an original presentation, intended to emphasize the main ideas in the proofs. Classical techniques like regularity theory, maximum principles and the method of sub and supersolutions are adapted to the setting where merely integrability or density assumptions on the data are available. The distinguished role played by capacities and precise representatives is also explained.

This book invites the reader to a trip through modern techniques at the frontier of elliptic PDEs and GMT, and is addressed to graduate students and researchers having some deep interest in analysis. Most of the chapters can be read independently, and only basic knowledge of measure theory, functional analysis and Sobolev spaces is required.

Review: The book is a valuable resource for graduate students, researchers and scientists interested in the general field of analysis, particularly in the study of semilinear elliptic equations with nonsmooth data. The whole book stands out by the elegance of the presented results and the clarity of exposition. (zbMATH)



Vol. 22
Patrick Dehornoy (Université de Caen, France)
with François Digne (Université de Picardie Jules-Verne, Amiens, France), Eddy Godelle (Université de Caen, France), Daan Krammer (University of Warwick, Coventry, UK) and Jean Michel (Université Denis Diderot Paris 7, France)

Foundations of Garside Theory

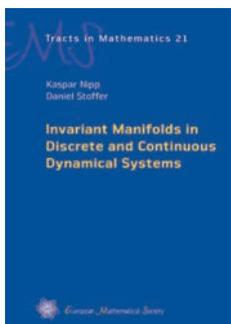
ISBN 978-3-03719-139-2
2015. 710 pages. Hardcover. 17 x 24 cm
108.00 €



This text is a monograph in algebra, with connections toward geometry and low-dimensional topology. It mainly involves groups, monoids, and categories, and aims at providing a unified treatment for those situations in which one can find distinguished decompositions by iteratively extracting a maximal fragment lying in a prescribed family. Initiated in 1969 by F. A. Garside in the case of Artin's braid groups, this approach turned out to lead to interesting results in a number of cases, the central notion being what the authors call a Garside family. At the moment, the study is far from complete, and the purpose of this book is both to present the current state of the theory and to be an invitation for further research.

There are two parts: the bases of a general theory, including many easy examples, are developed in Part A, whereas various more sophisticated examples are specifically addressed in Part B.

In order to make the content accessible to a wide audience of nonspecialists, exposition is essentially self-contained and very few prerequisites are needed. In particular, it should be easy to use the current text as a textbook both for Garside theory and for the more specialized topics investigated in Part B: Artin–Tits groups, Deligne–Lusztig varieties, groups of algebraic laws, ordered groups, structure groups of set-theoretic solutions of the Yang–Baxter equation. The first part of the book can be used as the basis for a graduate or advanced undergraduate course.



Vol. 21

Kaspar Nipp (ETH Zürich, Switzerland)

Daniel Stoffer (ETH Zürich, Switzerland)

Invariant Manifolds in Discrete and Continuous Dynamical Systems

ISBN 978-3-03719-124-8

2013. 225 pages. Hardcover. 17 x 24 cm

58.00 €

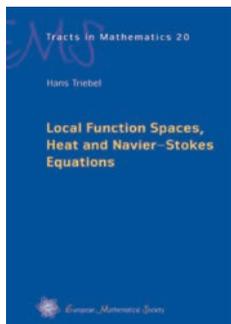
In this book dynamical systems are investigated from a geometric viewpoint. Admitting an invariant manifold is a strong geometric property of a dynamical system. This text presents rigorous results on invariant manifolds and gives examples of possible applications.

In the first part discrete dynamical systems in Banach spaces are considered. Results on the existence and smoothness of attractive and repulsive invariant manifolds are derived. In addition, perturbations and approximations of the manifolds and the foliation of the adjacent space are treated. In the second part analogous results for continuous dynamical systems in finite dimensions are established. In the third part the theory developed is applied to problems in numerical analysis and to singularly perturbed systems of ordinary differential equations.

The mathematical approach is based on the so-called graph transform, already used by Hadamard in 1901. The aim is to establish invariant manifold results in a simple setting providing quantitative estimates.

The book is targeted at researchers in the field of dynamical systems interested in precise theorems easy to apply. The application part might also serve as an underlying text for a student seminar in mathematics.

Review: The present research monograph is not only an original and well-written account to invariant manifolds illustrating how useful and modern Hadamard's graph transform still is, but it also underlines applicability and provides a widely accessible reference for related existence and perturbation results. ... The authors' intention is to provide easily applicable and yet largely quantitative results – they succeed in both respects. The book will be a helpful tool for researchers in the field. (zbMATH)



Vol. 20
Hans Triebel (University of Jena, Germany)

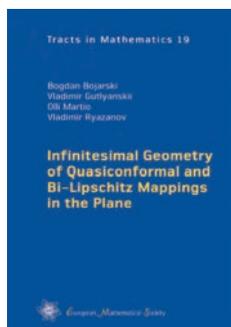
Local Function Spaces, Heat and Navier–Stokes Equations

ISBN 978-3-03719-123-1
2013. 241 pages. Hardcover. 17 x 24 cm
64.00 €

In this book a new approach is presented to exhibit relations between Sobolev spaces, Besov spaces, and Hölder–Zygmund spaces on the one hand and Morrey–Campanato spaces on the other. Morrey–Campanato spaces extend the notion of functions of bounded mean oscillation. These spaces play an important role in the theory of linear and nonlinear PDEs.

Chapters 1–3 deal with local smoothness spaces in Euclidean n -space based on the Morrey–Campanato refinement of the Lebesgue spaces. The presented approach relies on wavelet decompositions. This is applied in Chapter 4 to Gagliardo–Nirenberg inequalities. Chapter 5 deals with linear and nonlinear heat equations in global and local function spaces. The obtained assertions about function spaces and nonlinear heat equations are used in Chapter 6 to study Navier–Stokes equations.

The book is addressed to graduate students and mathematicians having a working knowledge of basic elements of (global) function spaces, and who are interested in applications to nonlinear PDEs with heat and Navier–Stokes equations as prototypes.



Vol. 19
Bogdan Bojarski (IM PAN, Warsaw, Poland)
Vladimir Gutlyanskii (National Academy of Science of Ukraine, Donetsk, Ukraine)
Olli Martio (Finnish Academy of Science and Letters, Helsinki, Finland)
Vladimir Ryazanov (National Academy of Science of Ukraine, Donetsk, Ukraine)

Infinitesimal Geometry of Quasiconformal and Bi-Lipschitz Mappings in the Plane

ISBN 978-3-03719-122-4
2013. 214 pages. Hardcover. 17 x 24 cm
58.00 €

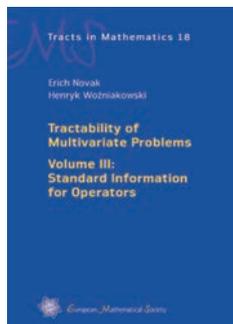
This book is intended for researchers interested in new aspects of local behavior of plane mappings and their applications. The presentation is self-contained, but the reader is assumed to know basic complex and real analysis.

The study of the local and boundary behavior of quasiconformal and bi-Lipschitz mappings in the plane forms the core of the book. The concept of the infinitesimal space is used to investigate the behavior of a mapping at points without differentiability. This concept, based on compactness properties, is applied to regularity problems of quasiconformal mappings and quasiconformal curves, boundary behavior, weak and asymptotic conformality, local winding properties, variation of quasiconformal mappings, and criteria of univalence. Quasiconformal and bi-Lipschitz mappings are instrumental for understanding elasticity, control theory and tomography and the book also offers a new look at the classical areas such as the boundary regularity of a conformal map. Complicated local behavior is illustrated by many examples.

The text offers a detailed development of the background for graduate students and researchers. Starting with the classical methods to study quasiconformal mappings, this treatment advances to the concept of the infinitesimal space

and then relates it to other regularity properties of mappings in Part II. The new unexpected connections between quasiconformal and bi-Lipschitz mappings are treated in Part III. There is an extensive bibliography.

Review: ...the first self-contained and detailed exposition focusing on infinitesimal behavior of quasiconformal mappings and applications. It is written in lucid language and contains all necessary preliminaries. Therefore, one can recommend this book also for beginning researchers and graduate students... (Math Reviews)



Vol. 18
Erich Novak (University of Jena, Germany)
Henryk Woźniakowski (Columbia University, New York, USA, and University of Warsaw, Poland)

Tractability of Multivariate Problems Volume III: Standard Information for Operators

ISBN 978-3-03719-116-3
2012. 604 pages. Hardcover. 17 x 24 cm
98.00 €

This three-volume set is a comprehensive study of the tractability of multivariate problems.

Volume I covers algorithms using linear information consisting of arbitrary continuous linear functionals. Volumes II and III are devoted to algorithms using standard information consisting of function values. Approximation of linear and selected nonlinear functionals is dealt with in volume II, and linear and selected nonlinear operators are studied in volume III. To a large extent, volume III can be read independently of volumes I and II.

The most important example studied in volume III is the approximation of multivariate functions. It turns out that many other linear and some nonlinear problems are closely related to the approximation of multivariate functions. While the lower bounds obtained in volume I for the class of linear information also yield lower bounds for the standard class of function values, new techniques for upper bounds are presented in volume III.

The book is of interest to researchers working in computational mathematics, especially in approximation of high-dimensional problems. It may be well suited for graduate courses and seminars. The text contains 58 open problems for future research in tractability.

Vol. 12 **Tractability of Multivariate Problems**
Volume II: Standard Information for Functionals

ISBN 978-3-03719-084-5. 2010. 675 pages. Hardcover. 17 x 24 cm. 98. 00 €

Vol. 6 **Tractability of Multivariate Problems**
Volume I: Linear Information

ISBN 978-3-03719-026-5. 2008. 395 pages. Hardcover. 17 x 24 cm. 68. 00 €

Review: This series of books is highly suitable for people who are interested in high-dimensional computational mathematics. It should appeal to researchers in this area. Moreover, it contains ample material for several graduate-level courses and seminars. ... Hundreds of papers have dealt with tractability, meaning that acquainting oneself with the current literature would be a formidable barrier to anyone trying to break into the field. The authors of this series have done an excellent job in digesting this vast panoply of material, thereby lowering the bar immensely for those wishing to follow. (Math Reviews)

Previous titles published in this series

Vol. 17 Anders Björn and Jana Björn, *Nonlinear Potential Theory on Metric Spaces*

ISBN 978-3-03719-099-9. 2011. 415 pages. Hardcover. 17 x 24 cm. 64.00 €

Review: ... The book, while not exhaustive in its coverage of nonlinear potential theory in the metric setting, does contain the essential tools necessary for one who wishes to venture into this area of research. It is eminently readable, and for the most part complete details are provided. (Math Reviews)

Vol. 16 Marek Jarnicki and Peter Pflug, *Separately Analytic Functions*

ISBN 978-3-03719-098-2. 2011. 306 pages. Hardcover. 17 x 24 cm. 58.00 €

Review: As the authors admit themselves, the book is not easy reading. It is however attractive for researchers and serious students since the writing is very clear and complemented by open problems. Needless to say, many results appear for the first time in a monograph. (zbMATH)

Vol. 15 Ronald Brown, Philip J. Higgins and Rafael Sivera, *Nonabelian Algebraic Topology. Filtered spaces, crossed complexes, cubical homotopy groupoids*

ISBN 978-3-03719-083-8. 2011. 703 pages. Hardcover. 17 x 24 cm. 88.00 €

Review: ... The book is very clearly written, heavily annotated and foot-noted, and sports examples as well as exercises woven through the text. All in all, it's a very impressive piece of scholarship promising to have a beneficial pedagogical effect in topological circles. (MAA Reviews)

Vol. 14 Steffen Börm, *Efficient Numerical Methods for Non-local Operators. \mathcal{H}^2 -Matrix Compression, Algorithms and Analysis*

ISBN 978-3-03719-091-3. 2010. 441 pages. Hardcover. 17 x 24 cm. 58.00 €

Review: The monograph under review is without any doubt a very carefully prepared one, and researchers interested in hierarchical matrices (especially \mathcal{H}^2 -matrices) have to get in touch with this book. (Math Reviews)

Vol. 13 Laurent Bessières, Gérard Besson, Michel Boileau, Sylvain Maillot and Joan Porti, *Geometrisation of 3-manifolds*

ISBN 978-3-03719-082-1. 2010. 247 pages. Hardcover. 17 x 24 cm. 48.00 €

Vol. 11 Hans Triebel, *Bases in Function Spaces, Sampling, Discrepancy, Numerical Integration*

ISBN 978-3-03719-085-2. 2010. 305 pages. Hardcover. 17 x 24 cm. 58.00 €

Review: ... The author makes a systematic effort to render the text intelligible for the occasional reader by recalling at crucial points where relevant definitions have been given and important comments have been made. As a result, the book can be used as a reference text. ... The intelligibility of the text is also a consequence of the care put into providing some historical perspective for the subjects under study, as well as plans for what follows at convenient places. (Math Reviews)

Vol. 10 Vladimir Turaev, *Homotopy Quantum Field Theory*

ISBN 978-3-03719-086-9. 2010. 290 pages. Hardcover. 17 x 24 cm. 58.00 €

Review: The theory is powerful, interesting, challenging, etc., but, like many new areas of mathematics, it leaves so much unsaid and unknown, and there are situations that were crying out for further development. It is a very enjoyable area to study. ... (The book) would make an excellent monograph on which to base a joint study seminar at the graduate or postdoc level. Such a study would be likely to raise new questions and result in new insights and clarifications of the ramifications of homotopy quantum field theories. (Bull. Amer. Math. Soc.)

Vol. 9 Gebhard Böckle and Richard Pink, *Cohomological Theory of Crystals over Function Fields*

ISBN 978-3-03719-074-6. 2009. 195 pages. Hardcover. 17 x 24 cm. 48.00 €

Review: *The book can be warmly recommended to anyone interested or working in the modern arithmetic of function fields. It is written with great didactical care. All ten chapters and many of the sections and subsections begin with a helpful motivating text. Examples are included. The reviewer did not spot a single misprint. The layout is very attractive, it is a pleasure to have this book in hands.* (zbMATH)

Vol. 8 Sergio Albeverio, Yuri Kondratiev, Yuri Kozitsky and Michael Röckner, *The Statistical Mechanics of Quantum Lattice Systems. A Path Integral Approach*

ISBN 978-3-03719-070-8. 2009. 392 pages. Hardcover. 17 x 24 cm. 62.00 €

Review: *The text is highly recommended to all mathematicians who are interested in this subject, especially expert researchers in related fields and graduate students who are aiming for this area.* (zbMATH)

Vol. 6 Hans Triebel, *Function Spaces and Wavelets on Domains*

ISBN 978-3-03719-019-7. 2008. 265 pages. Hardcover. 17 x 24 cm. 58.00 €

Review: *This book is addressed to two types of readers: researchers in the theory of function spaces who are interested in wavelets as new effective building blocks for functions, and scientists who wish to use wavelet bases in classical function spaces for various applications. Adapted to the second type of readers, the preface contains a guide to where one finds basic definitions and key assertions. In short, as the author's other monographs, this book is well written and its content is rich and well organized. It should be an extremely useful reference of this field.* (zbMATH)

Vol. 5 Gennadiy Feldman, *Functional Equations and Characterization Problems on Locally Compact Abelian Groups*

ISBN 978-3-03719-045-6. 2008. 268 pages. Hardcover. 17 x 24 cm. 58.00 €

Vol. 4 Gohar Harutyunyan and B.-Wolfgang Schulze, *Elliptic Mixed, Transmission and Singular Crack Problems*

ISBN 978-3-03719-040-1. 2007. 777 pages. Hardcover. 17 x 24 cm. 112.00 €

Review: *Summing up, the book is excellent reading for specialists interested in mixed, transmission and crack problems, as well as a useful textbook for students and researchers wanting to study the general theory of operators on singular manifolds.* (Mathematical Reviews)

Vol. 3 Ralf Meyer, *Local and Analytic Cyclic Homology*

ISBN 978-3-03719-039-5. 2007. 368 pages. Hardcover. 17 x 24 cm. 58.00 €

Review: *The present monograph is based on the author's thesis but rewritten almost entirely. The main change is the inclusion of bivariant local cyclic homology, which is quite close to the analytic theory, but has much better formal properties, with the main difference being that complete bornological vector spaces are replaced by inductive systems of Banach spaces.* (zbMATH)

Vol. 2 Karl H. Hofmann and Sidney A. Morris, *The Lie Theory of Connected Pro-Lie Groups. A Structure Theory for Pro-Lie Algebras, Pro-Lie Groups, and Connected Locally Compact Groups*

ISBN 978-3-03719-032-6. 2007. 693 pages. Hardcover. 17 cm x 24 cm. 88.00 €

Review: *The present book contains valuable tools for researchers in topological groups, Lie theory, harmonic analysis and representation theory. ... A special feature is the large collection of examples that fills a whole chapter. This collection is well organized and contains many useful comments. Several of these examples actually belong to the realm of Lie groups of finite dimension and show that many of the problems encountered in the theory of pro-Lie groups arise inside the theory of (nonlinear) Lie groups of finite dimension.* (Math Reviews)

Vol. 1 Panagiota Daskalopoulos and Carlos E. Kenig, *Degenerate Diffusions. Initial Value Problems and Local Regularity Theory*

ISBN 978-3-03719-033-3. 2007. 207 pages. Hardcover. 17.0 x 24.0 cm. 48.00 €

Review: *This book is addressed to graduate students and does an excellent job. Actually, it is a good compromise between the necessity to show the critical points of the theory and the need (in order to be readable for a student) to avoid the deep technicalities that naturally arise when one faces these questions...* (zbMATH)

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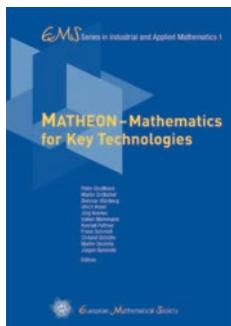
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This series publishes high quality advanced texts and monographs in all areas of industrial and applied mathematics. Books include those of a general nature as well as those dealing with the mathematics of specific applications areas and real-world situations. While it is intended to disseminate scholarship of the highest standard, authors are encouraged to make their work as accessible as possible.



Vol. 1

MATHEON – Mathematics for Key Technologies

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Editors

ISBN 978-3-03719-137-8

2014. 466 pages. Hardcover. 17 x 24 cm

48. 00 €

Mathematics: intellectual endeavor, production factor, key technology, key to key technologies?

Mathematics is all of these! The last three of its facets have been the focus of the research and development in the Berlin-based DFG Research Center MATHEON in the last twelve years. Through these activities MATHEON has become an international trademark for carrying out creative, application-driven research in mathematics and for cooperating with industrial partners in the solution of complex problems in key technologies.

Modern key technologies have become highly sophisticated, integrating aspects of engineering, computer, business and other sciences. Flexible mathematical models, as well as fast and accurate methods for numerical simulation and optimization open new possibilities to handle the indicated complexities, to react quickly, and to explore new options. Researchers in mathematical fields such as Optimization, Discrete Mathematics, Numerical Analysis, Scientific Computing, Applied Analysis and Stochastic Analysis have to work hand in hand with scientists and engineers to fully exploit this potential and to strengthen the transversal role of mathematics in the solution of the challenging problems in key technologies.

This book presents in seven chapters the highlights of the research work carried out in the MATHEON application areas: Life Sciences, Networks, Production, Electronic and Photonic Devices, Finance, Visualization, and Education. The chapters summarize many of the contributions, put them in the context of current mathematical research activities and outline their impact in various key technologies. To make some of the results more easily accessible to the general public, a large number of "showcases" are presented that illustrate a few success stories.

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.

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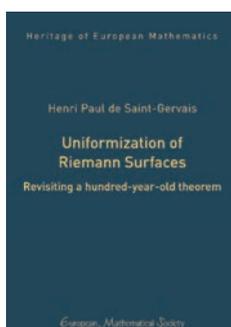
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Henri Paul de Saint-Gervais

Translated from the French by Robert G. Burns

Uniformization of Riemann Surfaces

Revisiting a hundred-year-old theorem

ISBN 978-3-03719-145-3

2015. Approx. 520 pages. Hardcover. 17 cm x 24 cm

78.00 €

In 1907 Paul Koebe and Henri Poincaré almost simultaneously proved the uniformization theorem: *Every simply connected Riemann surface is isomorphic to the plane, the open unit disc, or the sphere.*

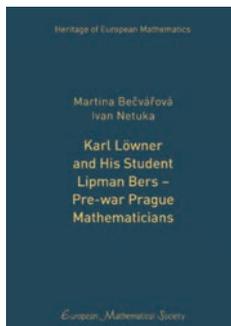
It took a whole century to get to the point of stating this theorem and providing a convincing proof of it, relying as it did on prior work of Gauss, Riemann, Schwarz, Klein, Poincaré, and Koebe, among others. The present book offers an overview of the maturation process of this theorem.

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. The uniformization theorem may thus be considered one of the guiding principles of 19th century mathematics. Rather than describe the history of a single theorem, our aim is to return to the original proofs, to look at these through the eyes of modern mathematicians, to enquire as to their correctness, and to attempt to make them rigorous while respecting insofar as possible the state of mathematical knowledge at the time, or, if this should prove impossible, then using modern mathematical tools not available to their authors.

This book will be useful to today's mathematicians wishing to cast a glance back at the history of their discipline. It should also provide graduate students with a non-standard approach to concepts of great importance for modern research.

Reviews: *The book under review is an excellent reference on this wonderful topic, and it should be a valuable reference for students and for researchers in Riemann surface theory, geometry and topology. ... One would hope for more books like this one.* (Math Reviews)

This book will be useful to today's mathematicians wishing to cast a glance back at the history of their discipline. It should also provide graduate students with a non-standard approach to concepts of great importance for modern research. (zbMATH)



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

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

ISBN 978-3-03719-144-6
2015. 310 pages. Hardcover. 17 cm x 24 cm
78.00 €

This monograph is devoted to two distinguished mathematicians, Karel Löwner (1893–1968) and Lipman Bers (1914–1993), whose lives are dramatically interlinked with key historical events of the 20th century. K. Löwner, Professor of Mathematics at the German University in Prague (Czechoslovakia), was dismissed from his position because he was a Jew, and emigrated to the USA in 1939 (where he changed his name to Charles Loewner). Earlier, he had published several outstanding papers in complex analysis and a masterpiece on matrix functions. In particular, his ground-breaking parametric method in geometric function theory from 1923, which led to Löwner's celebrated differential equation, brought him world-wide fame and turned out to be a cornerstone in de Branges' proof of the Bieberbach conjecture. Unexpectedly, Löwner's differential equation has gained recent prominence with the introduction of a conformally invariant stochastic process called stochastic Loewner evolution (SLE) by O. Schramm in 2000. SLE features in two Fields Medal citations from 2006 and 2010. L. Bers was the final Prague Ph.D. student of K. Löwner. His dissertation on potential theory (1938), completed shortly before his emigration and long thought to be irretrievably lost, was found in 2006. It is here made accessible for the first time, with an extensive commentary, to the mathematical community.

This monograph presents an in-depth account of the lives of both mathematicians, with special emphasis on the pre-war period. Löwner's teaching activities and professional achievements are presented in the context of the prevailing complex political situation and against the background of the wider development of mathematics in Europe. Each of his publications is accompanied by an extensive commentary, tracing the origin and motivation of the problem studied, and describing the state-of-art at the time of the corresponding mathematical field. Special attention is paid to the impact of the results obtained and to the later development of the underlying ideas, thus connecting Löwner's achievements to current research activity. The text is based on an extensive archival search, and most of the archival findings appear here for the first time.

Anyone with an interest in mathematics and the history of mathematics will enjoy reading this book about two famous mathematicians of the 20th century.

Review: Well documented, the book is a valuable contribution to the history of European mathematics. (zbMATH)



Della Dumbaugh (University of Richmond, USA)
Joachim Schwermer (University of Vienna, Vienna, Austria)
with contributions by James Cogdell and Robert Langlands

Emil Artin and Beyond – Class Field Theory and L-functions

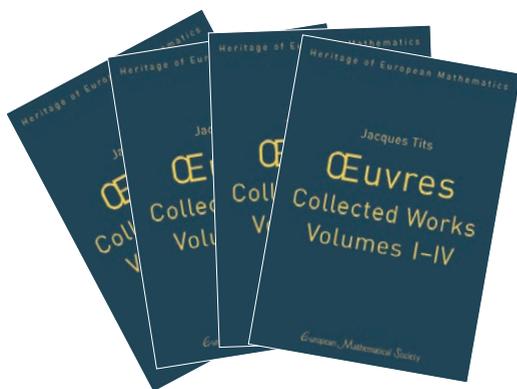
ISBN 978-3-03719-146-0
2015. 245 pages. Hardcover. 17 cm x 24 cm
68.00 €

This book explores the development of number theory, and class field theory in particular, as it passed through the hands of Emil Artin, Claude Chevalley and Robert Langlands in the middle of the twentieth century. Claude Chevalley's presence in Artin's 1931 Hamburg lectures on class field theory serves as the starting point for this volume. From there, it is

traced how class field theory advanced in the 1930s and how Artin's contributions influenced other mathematicians at the time and in subsequent years. Given the difficult political climate and his forced emigration as it were, the question of how Artin created a life in America within the existing institutional framework, and especially of how he continued his education of and close connection with graduate students, is considered. In particular, Artin's collaboration in algebraic number theory with George Whaples and his student Margaret Matchett's thesis work "On the zeta-function for ideles" in the 1940s are investigated. A (first) study of the influence of Artin on present day work on a non-abelian class field theory finishes the book.

The volume consists of individual essays by the authors and two contributors, James Cogdell and Robert Langlands, and contains relevant archival material. Among these, the letter from Chevalley to Helmut Hasse in 1935 is included, where he introduces the notion of ideles and explores their significance, along with the previously unpublished thesis by Matchett and the seminal letter of Langlands to André Weil of 1967 where he lays out his ideas regarding a non-abelian class field theory. Taken together, these chapters offer a view of both the life of Artin in the 1930s and 1940s and the development of class field theory at that time. They also provide insight into the transmission of mathematical ideas, the careful steps required to preserve a life in mathematics at a difficult moment in history, and the interplay between mathematics and politics (in more ways than one). Some of the technical points in this volume require a sophisticated understanding of algebra and number theory. The broader topics, however, will appeal to a wider audience that extends beyond mathematicians and historians of mathematics to include historically minded individuals, particularly those with an interest in the time period.

Review: This very readable book makes valuable historical contributions to the development of class field theory, and includes good mathematical summaries of its development. (Math Reviews)



Jacques Tits – Œuvres. Collected Works. Volumes I–IV

Francis Buekenhout (Université libre de Bruxelles, Belgium)
Bernhard Matthias Mühlherr (Justus-Liebig-Universität Gießen, Germany)
Jean-Pierre Tignol (Université catholique de Louvain, Belgium)
Hendrik Van Maldeghem (Ghent University, Belgium),
Editors

ISBN 978-3-03719-126-2

2013. 4 volumes, 3963 pages. Hardcover. 17 x 24 cm
598.00 €

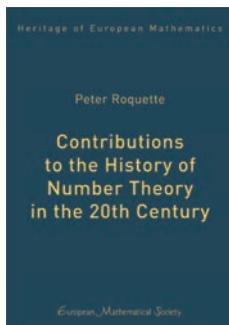
Jacques Tits was awarded the Wolf Prize in 1993 and the Abel Prize (jointly with John Thompson) in 2008. The impact of his contributions in algebra, group theory and geometry made over a span of more than five decades is incalculable. Many fundamental developments in several fields of mathematics have their origin in ideas of Tits. A number of Tits' papers mark the starting point of completely new directions of research. Outstanding examples are papers on quadratic forms, on Kac–Moody groups and on what subsequently became known as the Tits-alternative.

These volumes contain an almost complete collection of Tits' mathematical writings. They include, in particular, a number of published and unpublished manuscripts which have not been easily accessible until now. This collection of Tits' contributions in one place makes the evolution of his mathematical thinking visible. The development of his theory of buildings and BN -pairs and its bearing on the theory of algebraic groups, for example, reveal a fascinating story. Along with Tits' mathematical writings, these volumes contain biographical data, survey articles on aspects of Tits' work and comments by the editors on the content of some of his papers.

Heritage of European Mathematics

With the publication of these volumes, a major piece of 20th century mathematics is being made available to a wider audience.

Review: The editors have done a great job collecting and reproducing Tits' works. This was apparently not always an easy task, as there are several papers that were difficult to obtain (and to reproduce). Also, they included some manuscripts which were previously unpublished. ... Each volume closes with an interesting list of comments and notes by the editors, pointing towards further developments, corrections and complements. Everyone interested in group theory should have access to these four volumes. (zbMATH)



Peter Roquette (University of Heidelberg, Germany)

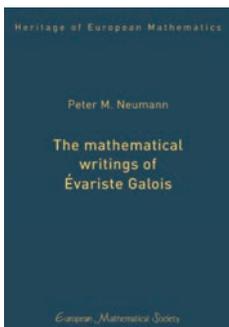
Contributions to the History of Number Theory

ISBN 978-3-03719-113-2
2013. 289 pages. Hardcover. 17 cm x 24 cm
78.00 €

The 20th century was a time of great upheaval and great progress, mathematics not excluded. In order to get the overall picture of trends, developments and results it is illuminating to look at their manifestations locally, in the personal life and work of people living at the time. The university archives of Göttingen harbor a wealth of papers, letters and manuscripts from several generations of mathematicians – documents which tell us the story of the historic developments from a local point of view.

The present book offers a number of essays based on documents from Göttingen and elsewhere – essays which are not yet contained in the author's Collected Works. These little pieces, independent from each other, are meant as contributions to the imposing mosaic of history of number theory. They are written for mathematicians but with no special background requirements. Involved are the names of Abraham Adrian Albert, Cahit Arf, Emil Artin, Richard Brauer, Otto Grün, Helmut Hasse, Klaus Hoeschsmann, Robert Langlands, Heinrich-Wolfgang Leopoldt, Emmy Noether, Abraham Robinson, Ernst Steinitz, Hermann Weyl and others.

Review: ... this book is indispensable to anyone interested in the history of algebra and number theory in the first half of the 20th century. (MAA Reviews)



Peter M. Neumann (University of Oxford, UK)

The mathematical writings of Évariste Galois

ISBN 978-3-03719-104-0
2011. 421 pages. Hardcover. 17 cm x 24 cm
78.00 €

Although Évariste Galois was only 20 years old when he died, shot in a mysterious early-morning duel in 1832, his ideas, when they were published 14 years later, changed the course of algebra. He invented what is now called Galois Theory, the modern form of what was classically the Theory of Equations. For that purpose, and in particular to formulate a precise condition for solubility of equations by radicals, he also invented groups and began investigating their theory. His main writings were published in French in 1846 and there have been a number

of French editions culminating in the great work published by Bourgne & Azra in 1962 containing transcriptions of every page and fragment of the manuscripts that survive. Very few items have been available in English up to now.

The present work contains English translations of almost all the Galois material. They are presented alongside a new transcription of the original French, and are enhanced by three levels of commentary. An introduction explains the context of Galois' work, the various publications in which it appears, and the vagaries of his manuscripts. Then there is a chapter in which the five mathematical articles published in his lifetime are reprinted. After that come the Testamentary Letter and the First Memoir (in which Galois expounded the ideas now called Galois Theory), which are the most famous of the manuscripts. There follow the less well known manuscripts, namely the Second Memoir and the many fragments. A short epilogue devoted to myths and mysteries concludes the text.

The book is written as a contribution to the history of mathematics but with mathematicians as well as historians in mind. It makes available to a wide mathematical and historical readership some of the most exciting mathematics of the first half of the 19th century, presented in its original form. The primary aim is to establish a text of what Galois wrote. Exegesis would fill another book or books, and little of that is to be found here.

This work will be a resource for research in the history of mathematics, especially algebra, as well as a source book for those many mathematicians who enliven their student lectures with reliable historical background.

Reviews: *The book is simply a masterpiece. The publisher has equipped the book with a robust binding, beautiful opaque paper and many facsimiles so that reading the book is a delight.* (zbMATH)

This monograph is an outstanding contribution to the history of mathematics. It surely will become a standard reference for anyone wishing to return to the source of Galois' writings. At many places in the work Neumann indicates that he hopes to discuss a particular point in a future article. The reviewer will surely echo the wishes of the whole mathematical community in encouraging Peter Neumann to find the time to write such articles. (Bull. London Math. Soc.)

It remains to say that this edition of the mathematical writings of Évariste Galois is handsomely produced, and should become the standard reference for anyone interested in what Galois wrote. (MAA Reviews)



Jacqueline Stedall (University of Oxford, UK)

From Cardano's Great Art to Lagrange's Reflections: Filling a Gap in the History of Algebra

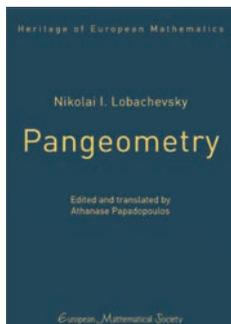
ISBN 978-3-03719-092-0

2011. 236 pages. Hardcover. 17 cm x 24 cm

68.00 €

This book is an exploration of a claim made by Lagrange in the autumn of 1771 as he embarked upon his lengthy *Réflexions sur la résolution algébrique des équations*: that there had been few advances in the algebraic solution of equations since the time of Cardano in the mid sixteenth century. That opinion has been shared by many later historians. The present study attempts to redress that view and to examine the intertwined developments in the theory of equations from Cardano to Lagrange. A similar historical exploration led Lagrange himself to insights that were to transform the entire nature and scope of algebra.

Review: ... *This is a well-written fascinating book and one which the reviewer greatly enjoyed reading. At times one has to take a pen and paper and work through the details of arguments which are only sketched. This actually makes the book more valuable than if Stedall had included these details in the text. It would make an interesting text on which to base a course on the history of mathematics since it captures well the spirit of how mathematical progress occurs. It also provides a full bibliography and clear references to the original articles that would allow, and indeed encourage, the reader to investigate further.* (Bulletin of the London Mathematical Society)



Nikolai I. Lobachevsky, *Pangeometry*

Edited and translated by Athanase Papadopoulos

Athanase Papadopoulos (Université de Strasbourg, France), Editor

ISBN 978-3-03719-087-6

2010. 322 pages. Hardcover. 17 cm x 24 cm

78.00 €

Lobachevsky wrote his *Pangeometry* in 1855, the year before his death. This memoir is a résumé of his work on non-Euclidean geometry and its applications, and it can be considered as his clearest account on the subject. It is also the conclusion of his lifework, and the last attempt he made to acquire recognition. The treatise contains basic ideas of hyperbolic geometry, including

the trigonometric formulae, the techniques of computation of arc length, of area and of volume, with concrete examples. It also deals with the applications of hyperbolic geometry to the computation of new definite integrals. The techniques are different from those found in most modern books on hyperbolic geometry since they do not use models.

Besides its historical importance, Lobachevsky's *Pangeometry* is a beautiful work, written in a simple and condensed style. The material that it contains is still very alive, and reading this book will be most useful for researchers and for students in geometry and in the history of science. It can be used as a textbook, as a source book and as a repository of inspiration.

The present edition provides the first complete English translation of the *Pangeometry* that appears in print. It contains facsimiles of both the Russian and the French original versions. The translation is accompanied by notes, followed by a biography of Lobachevsky and an extensive commentary.

Review: This is the first integral English translation of Lobachevsky's Pangeometry of 1855. The translation of this classic, which is printed together with its Russian and French original and translated from the latter, is not only for the use of historians of mathematics, but for offering present-day students of hyperbolic geometry a "fresh point of view on the subject, namely, a model-free point of view which is not to be found in most of the more modern textbooks on hyperbolic geometry". The translation is made significantly more readable than its French original first and foremost by adding figures (the original had none), as well as by shortening long sentences and adding an index.

Previous titles published in this series

Thomas Harriot's Doctrine of Triangular Numbers: the 'Magisteria Magna', edited by Janet Beery and Jacqueline Stedall

978-3-03719-059-3. 2008. 144 pages. Hardcover. 17 x 24 cm. 64.00 €

Review: ...There are far too few books that, like this one, reproduce, translate, and make accessible important mathematical works. ... (MAA Reviews)

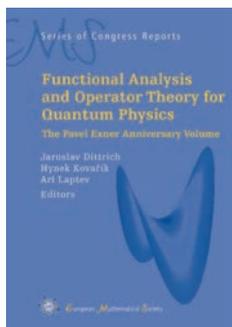
Hans Freudenthal – Selecta, edited by Tonny A. Springer and Dirk van Dalen

ISBN 978-3-03719-058-6. 2009. 661 pages. Hardcover. 17 cm x 24 cm. 128.00 €

Andrzej Schinzel, Selecta Volume I: Diophantine Problems and Polynomials; Volume II: Elementary, Analytic and Geometric Number Theory, edited by Henryk Iwaniec, Władysław Narkiewicz and Jerzy Urbanowicz

ISBN 978-3-03719-038-8. 2007. 1417 pages. Hardcover. 17 cm x 24 cm. 168.00 €

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.

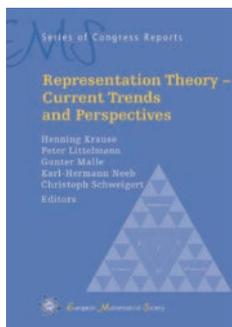


Functional Analysis and Operator Theory for Quantum Physics The Pavel Exner Anniversary Volume

Jaroslav Dittrich (Czech Academy of Sciences, Rez-Prague, Czech Republic)
Hynek Kovařík (Università degli Studi di Brescia, Italy)
Ari Laptev (Imperial College London, UK), Editors

ISBN 978-3-03719-175-0
2017. 597 pages. Hardcover. 17.0 x 24.0 cm
98.00 €

This volume is dedicated to Pavel Exner on the occasion of his 70th anniversary. It collects contributions by numerous scientists with expertise in mathematical physics and in particular in problems arising from quantum mechanics. The questions addressed in the contributions cover a large range of topics. A lot of attention was paid to differential operators with zero range interactions, which are often used as models in quantum mechanics. Several authors considered problems related to systems with mixed-dimensions such as quantum waveguides, quantum layers and quantum graphs. Eigenvalues and eigenfunctions of Laplace and Schrödinger operators are discussed too, as well as systems with adiabatic time evolution. Although most of the problems treated in the book have a quantum mechanical background, some contributions deal with issues which go well beyond this framework. As for the mathematical tools involved, the book provides a wide variety of techniques from functional analysis and operator theory. Altogether the volume presents a collection of research papers which will be of interest to any active scientist working in one of the above mentioned fields.



Representation Theory – Current Trends and Perspectives

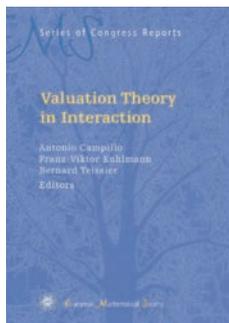
Henning Krause (Universität Bielefeld, Germany)
Peter Littelmann (University of Köln, Germany)
Gunter Malle (University of Kaiserslautern, Germany)
Karl-Hermann Neeb (University of Erlangen-Nürnberg, Germany)
Christoph Schweigert (University of Hamburg, Germany), Editors

ISBN 978-3-03719-171-2
2017. 773 pages. Hardcover. 17.0 x 24.0 cm
98.00 €

From April 2009 until March 2016, the German Science Foundation supported generously the Priority Program SPP 1388 in Representation Theory. The core principles of the projects realized in the framework of the priority program have been categorification and geometrization, this is also reflected by the contributions to this volume.

Apart from the articles by former postdocs supported by the priority program, the volume contains a number of invited research and survey articles, many of them are extended versions of talks given at the last joint meeting of the priority program in Bad Honnef in March 2015. This volume is covering current research topics from the representation theory of finite groups, of algebraic groups, of Lie superalgebras, of finite dimensional algebras and of infinite dimensional Lie groups.

Graduate students and researchers in mathematics interested in representation theory will find this volume inspiring. It contains many stimulating contributions to the development of this broad and extremely diverse subject.



Valuation Theory in Interaction

Antonio Campillo (Universidad de Valladolid, Spain)
Franz-Viktor Kuhlmann (University of Saskatchewan, Saskatoon, Canada)
Bernard Teissier (Institut de Mathématiques de Jussieu, Paris, France), Editors

ISBN 978-3-03719-149-1
2014. 670 pages. Hardcover. 16.5 x 23.5 cm
98.00 €

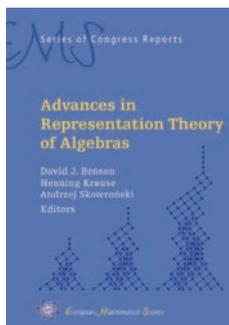
Having its classical roots in algebraic number theory, algebraic geometry and the theory of ordered fields and groups, valuation theory has seen an amazing expansion into many other areas in recent decades. Moreover, it has now been reintroduced as a tool to attack the open problem of resolution of singularities in positive characteristic and to analyse

the structure of singularities. Driven by this topic, and by its many new applications in other areas, also the research in valuation theory itself has been intensified, with a particular emphasis on the deep open problems in positive characteristic.

As important examples for the expansion of valuation theory, it has become extremely useful in the theory of complex dynamical systems, and in the study of non-oscillating trajectories of real analytic vector fields in three dimensions. Analogues of the Riemann–Zariski valuation spaces have been found to be the proper framework for questions of intersection theory in algebraic geometry and in the analysis of singularities of complex plurisubharmonic functions. In a different direction, the relation between Berkovich geometry, tropical geometry and valuation spaces, on the one hand, and the geometry of arc spaces and valuation spaces, on the other, have begun to deepen and clarify.

Ever since its beginnings, valuation theory and Galois theory have grown closely together and influenced each other. Arguably, studying and understanding the extensions of valuations in algebraic field extensions is one of the most important questions in valuation theory, whereas using valuation theory is one of the most important tools in studying Galois extensions of fields, as well as constructing field extensions with given properties. The well established topic of the model theory of valued fields is also being transformed, in particular through the study of valued fields with functions and operators, and through the study of types over valued fields.

The multifaceted development of valuation theory has been monitored by two International Conferences and Workshops: the first in 1999 in Saskatoon, Canada, and the second in 2011 in Segovia and El Escorial in Spain. This book grew out of the second conference and presents high quality papers on recent research together with survey papers that illustrate the state of the art in several areas and applications of valuation theory. The book is addressed to researchers and graduate students who work in valuation theory or the areas where it is applied, as well as a general mathematical audience interested in the expansion and usefulness of the valuation theoretical approach. For young mathematicians who want to enter these areas of research, it provides a valuable source of up-to-date information.

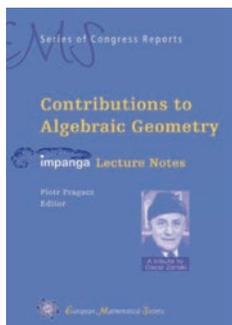


Advances in Representation Theory of Algebras

David J. Benson (University of Aberdeen, UK)
Henning Krause (University of Bielefeld, Germany)
Andrzej Skowroński (Nicolaus Copernicus University, Toruń, Poland), Editors

ISBN 978-3-03719-125-5
2014. 378 pages. Hardcover. 17.0 x 24.0 cm
78.00 €

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 which took place 2012 in Bielefeld. Many of the expository surveys are included here. Researchers of representation theory will find in this volume interesting and stimulating contributions to the development of the subject.



Contributions to Algebraic Geometry Impanga Lecture Notes

Piotr Pragacz (Polish Academy of Sciences, Warsaw, Poland), Editor

ISBN 978-3-03719-114-9

2012. 516 pages. Hardcover. 17 x 24 cm

98.00 €

The articles in this volume are the outcome of the Impanga Conference on Algebraic Geometry in 2010 at the Banach Center in Będlewo. The following spectrum of topics is covered: K3 surfaces and Enriques surfaces; Prym varieties and their moduli; invariants of singularities in birational geometry; differential forms on singular spaces; Minimal Model Program; linear systems; toric varieties; Seshadri and packing constants; equivariant

cohomology; Thom polynomials; arithmetic questions.

The main purpose of the volume is to give comprehensive introductions to the above topics through texts starting from an elementary level and ending with the discussion of current research. The first four topics are represented by the notes from the minicourses held during the conference. In the articles the reader will find classical results and methods, as well as modern ones. The book is addressed to researchers and graduate students in algebraic geometry, singularity theory and algebraic topology. Most of the material exposed in the volume has not yet appeared in book form.

Previous title published in this series

Geometry and Arithmetic, Carel Faber, Gavril Farkas and Robin de Jong (Eds.)

ISBN 978-3-03719-119-4. 2012. 383 pages. Hardcover. 17.0 x 24.0 cm. 78.00 €

Derived Categories in Algebraic Geometry – Tokyo 2011, Yujiro Kawamata (Ed.)

ISBN 978-3-03719-115-6. 2012. 354 pages. Hardcover. 17.0 x 24.0 cm. 78.00 €

Representations of Algebras and Related Topics, Andrzej Skowroński and Kunio Yamagata (Eds.)

ISBN 978-3-03719-101-9. 2011. 740 pages. Hardcover. 17.0 x 24.0 cm. 98.00 €

Surveys in Stochastic Processes, Jochen Blath, Peter Imkeller and Sylvie Roelly (Eds.)

ISBN 978-3-03719-072-2. 2011. 263 pages. Hardcover. 17 x 24 cm. 78.00 €

Classification of Algebraic Varieties, Carel Faber, Gerard van der Geer and Eduard Looijenga (Eds.)

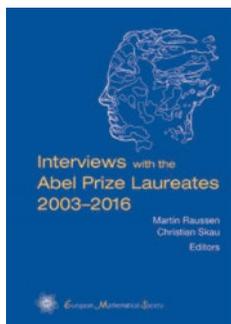
ISBN 978-3-03719-007-4. 2010. 346 pages. Hardcover. 17.0 x 24.0 cm. 78.00 €

K-Theory and Noncommutative Geometry, Guillermo Cortiñas, Joachim Cuntz, Max Karoubi, Ryszard Nest and Charles A. Weibel (Eds.)

ISBN 978-3-03719-060-9. 2008. 454 pages. Hardcover. 17.0 x 24.0 cm. 88.00 €

Trends in Representation Theory of Algebras and Related Topics, Andrzej Skowroński (Ed.)

ISBN 978-3-03719-062-3. 2008. 722 pages. Hardcover. 17.0 x 24.0 cm. 98.00 €



Interviews with the Abel Prize Laureates 2003–2016

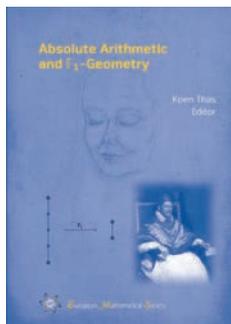
Martin Raussen (Aalborg University, Denmark)
Christian Skau (Norwegian University of Science and Technology, Trondheim, Norway)
Editors

ISBN 978-3-03719-177-4
2017. 302 pages. Softcover. 17 cm x 24 cm
24.00 €

The Abel Prize was established in 2002 by the Norwegian Ministry of Education and Research. It has been awarded annually to mathematicians in recognition of pioneering scientific achievements.

Since the first occasion in 2003, Martin Raussen and Christian Skau have had the opportunity to conduct extensive interviews with the laureates. The interviews were broadcast by Norwegian television; moreover, they have appeared in the membership journals of several mathematical societies.

The interviews from the period 2003–2016 have now been collected in this edition. They highlight the mathematical achievements of the laureates in a historical perspective and they try to unravel the way in which the world's most famous mathematicians conceive and judge their results, how they collaborate with peers and students, and how they perceive the importance of mathematics for society.



Absolute Arithmetic and \mathbb{F}_1 -Geometry

Koen Thas (University of Gent, Belgium), Editor

ISBN 978-3-03719-157-6
2016. 404 pages. Hardcover. 17 cm x 24 cm
68.00 €

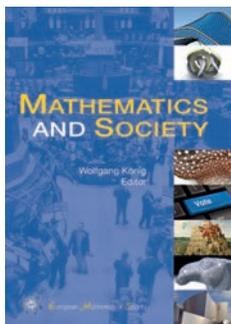
It has been known for some time that geometries over finite fields, their automorphism groups and certain counting formulae involving these geometries have interesting guises when one lets the size of the field go to 1. On the other hand, the nonexistent field with one element, \mathbb{F}_1 , presents itself as a ghost candidate for an absolute basis in Algebraic Geometry to perform the Deninger–Manin program, which aims at solving the classical Riemann Hypothesis.

This book, which is the first of its kind in the \mathbb{F}_1 -world, covers several areas in \mathbb{F}_1 -theory, and is divided into four main parts – Combinatorial Theory, Homological Algebra, Algebraic Geometry and Absolute Arithmetic.

Topics treated include the combinatorial theory and geometry behind \mathbb{F}_1 , categorical foundations, the blend of different scheme theories over \mathbb{F}_1 which are presently available, motives and zeta functions, the Habiro topology, Witt vectors and total positivity, moduli operads, and at the end, even some arithmetic.

Each chapter is carefully written by experts, and besides elaborating on known results, brand new results, open problems and conjectures are also met along the way.

The diversity of the contents, together with the mystery surrounding the field with one element, should attract any mathematician, regardless of speciality.



Mathematics and Society

Wolfgang König (WIAS Berlin and Technical University Berlin, Germany), Editor

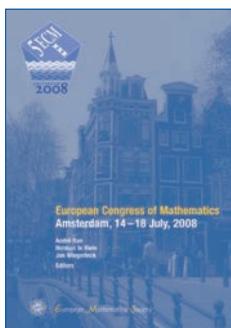
ISBN 978-3-03719-164-4

2016. 314 pages. Hardcover. 17 cm x 24 cm

42.00 €

The ubiquity and importance of mathematics in our complex society is generally not in doubt. However, even a scientifically interested layman would be hard pressed to point out aspects of our society where contemporary mathematical research is essential. Most popular examples are finance, engineering, weather and industry, but the way mathematics comes into play is widely unknown in the public. And who thinks of application fields like biology, encryption, architecture, or voting systems?

This volume comprises a number of success stories of mathematics in our society – important areas being shaped by cutting edge mathematical research. The authors are eminent mathematicians with a high sense for public presentation, addressing scientifically interested laymen as well as professionals in mathematics and its application disciplines.



European Congress of Mathematics Kraków, 2–7 July, 2012

Rafał Łatała (University of Warsaw, Poland), Andrzej Ruciński (A. Mickiewicz University, Poznań, Poland), Paweł Strzelecki (University of Warsaw, Poland), Jacek Świątkowski (University of Wrocław, Poland), Dariusz Wrzosek (University of Warsaw, Poland)
Piotr Zakrzewski (University of Warsaw, Poland), Editors

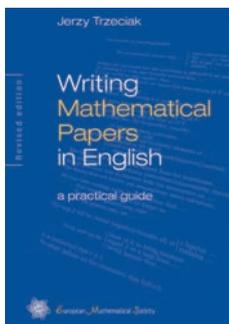
ISBN 978-3-03719-120-0

2014. 824 pages. Hardcover. 16.5 x 23.5 cm

108.00 €

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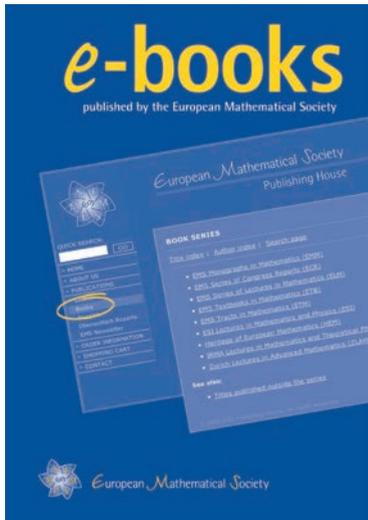
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