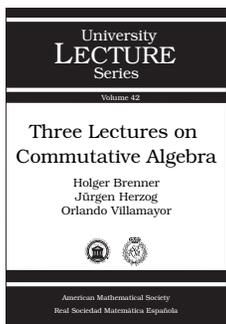


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Algebra and Algebraic Geometry



Three Lectures on Commutative Algebra

Holger Brenner, *University of Sheffield, United Kingdom*, **Jürgen Herzog**, *Universität Duisburg-Essen, Germany*, **Orlando Villamayor**, *Universidad Autónoma de Madrid, Spain*, and edited by **Juan Elias**, **Teresa Cortadellas Benítez**, **Gemma**

Colomé-Nin, and **Santiago Zarzuela**, *Universitat de Barcelona, Spain*

This book provides careful and detailed introductions to some of the latest advances in three significant areas of rapid development in commutative algebra and its applications. The book is based on courses at the Winter School on Commutative Algebra and Applications held in Barcelona: Tight closure and vector bundles, by H. Brenner; Combinatorics and commutative algebra, by J. Herzog; and Constructive desingularization, by O. Villamayor.

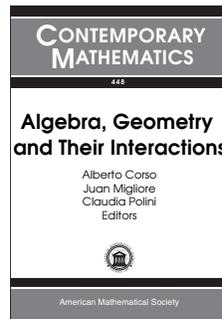
The exposition is aimed at graduate students who have some experience with basic commutative algebra or algebraic geometry but may also serve as an introduction to these modern approaches for mathematicians already familiar with commutative algebra.

This book is copublished by the Real Sociedad Matemática Española and the American Mathematical Society.

Contents: **H. Brenner**, Tight closure and vector bundles; **J. Herzog**, Combinatorics and commutative algebra; **O. Villamayor**, Notes on constructive desingularization.

University Lecture Series, Volume 42

April 2008, approximately 176 pages, Softcover, ISBN: 978-0-8218-4434-2, LC 2007060568, 2000 *Mathematics Subject Classification*: 13-02, 14-02, 05Cxx, 13Dxx, 13Fxx, 13Hxx, 14Bxx, 14Exx, 14Jxx, **AMS members US\$31**, List US\$39, Order code ULECT/42



Algebra, Geometry and Their Interactions

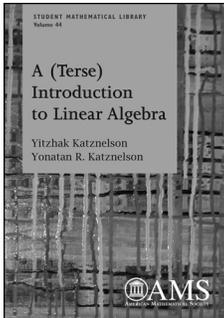
Alberto Corso, *University of Kentucky, Lexington, KY*, and **Juan Migliore** and **Claudia Polini**, *University of Notre Dame, IN*, Editors

This volume's papers present work at the cutting edge of current research in algebraic geometry, commutative algebra, numerical analysis, and other related fields, with an emphasis on the breadth of these areas and the beneficial results obtained by the interactions between these fields. This collection of two survey articles and sixteen refereed research papers, written by experts in these fields, gives the reader a greater sense of some of the directions in which this research is moving, as well as a better idea of how these fields interact with each other and with other applied areas. The topics include blowup algebras, linkage theory, Hilbert functions, divisors, vector bundles, determinantal varieties, (square-free) monomial ideals, multiplicities and cohomological degrees, and computer vision.

Contents: **M. Bertolini**, **G. M. Besana**, and **C. Turrini**, Instability of projective reconstruction from 1-view near critical configurations in higher dimensions; **K. A. Chandler**, Examples and counterexamples on the conjectured Hilbert function of multiple points; **C. Ciuperca**, **W. Heinzer**, **J. Ratliff**, and **D. Rush**, Projectively full ideals in Noetherian rings, a survey; **K. Dalili** and **W. V. Vasconcelos**, Cohomological degrees and the HomAB conjecture; **J. A. Eagon**, A minimal generating set for the first syzygies of a monomial ideal; **E. Gorla**, Lifting the determinantal property; **H. T. Há** and **A. Van Tuyl**, Resolutions of square-free monomial ideals via facet ideals: A survey; **M. Hochster**, Some finiteness properties of Lyubeznik's \mathcal{F} -modules; **C. Huneke**, **J. Migliore**, **U. Nagel**, and **B. Ulrich**, Minimal homogeneous liaison and Licci ideals; **J. O. Kleppe** and **R. M. Miró-Roig**, Unobstructedness and dimension of families of codimension 3 ACM algebras; **A. Lanteri** and **H. Maeda**, Ample vector bundles with sections vanishing on submanifolds of sectional genus three; **Y. Lu**, **D. J. Bates**, **A. J. Sommese**, and **C. W. Wampler**, Finding all real points of a complex curve; **R. M. Miró-Roig**, On the multiplicity conjecture; **J. M. Rojas**, Efficiently detecting torsion points and subtori; **A. K. Singh** and **S. Spiroff**, Divisor class groups of graded hypersurfaces; **K. E. Smith** and **H. M. Thompson**, Irrelevant exceptional divisors for curves on a smooth surface; **M. A. van Opstall** and **R. Veliche**, Variation of hyperplane sections; **C. Yuen**, Jet schemes of determinantal varieties.

Contemporary Mathematics, Volume 448

December 2007, 270 pages, Softcover, ISBN: 978-0-8218-4094-8, LC 2007060846, 2000 *Mathematics Subject Classification*: 05C90, 13C40, 13D02, 13D07, 13D40, 14C05, 14J60, 14M12, 14N05, 65H10, 65H20, **AMS members US\$63**, List US\$79, Order code CONM/448



A (Terse) Introduction to Linear Algebra

Yitzhak Katznelson, *Stanford University, CA*, and **Yonatan R. Katznelson**, *University of California, Santa Cruz, CA*

Linear algebra is the study of vector spaces and the linear maps between them. It underlies much of modern mathematics and is widely used in applications.

A (Terse) Introduction to Linear Algebra is a concise presentation of the core material of the subject—those elements of linear algebra that every mathematician, and everyone who uses mathematics, should know. It goes from the notion of a finite-dimensional vector space to the canonical forms of linear operators and their matrices, and covers along the way such key topics as: systems of linear equations, linear operators and matrices, determinants, duality, and the spectral theory of operators on inner-product spaces.

The last chapter offers a selection of additional topics indicating directions in which the core material can be applied.

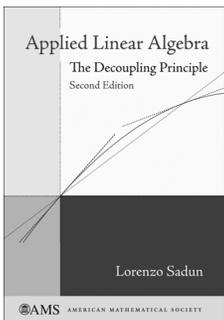
The Appendix provides all the relevant background material.

Written for students with some mathematical maturity and an interest in abstraction and formal reasoning, the book is self-contained and is appropriate for an advanced undergraduate course in linear algebra.

Contents: Vector spaces; Linear operators and matrices; Duality of vector spaces; Determinants; Invariant subspaces; Operators on inner-product spaces; Structure theorems; Additional topics; Appendix; Index; Symbols.

Student Mathematical Library, Volume 44

January 2008, 215 pages, Softcover, ISBN: 978-0-8218-4419-9, LC 2007060571, 2000 *Mathematics Subject Classification*: 15-01, **AMS members US\$28**, List US\$35, Order code STML/44



Applied Linear Algebra
The Decoupling Principle, Second Edition

Lorenzo Sadun, *University of Texas, Austin, TX*

Linear algebra permeates mathematics, as well as physics and engineering. In this text for junior and senior undergraduates,

Sadun treats diagonalization as a central tool in solving complicated problems in these subjects by reducing coupled linear evolution

problems to a sequence of simpler decoupled problems. This is the Decoupling Principle.

Traditionally, difference equations, Markov chains, coupled oscillators, Fourier series, the wave equation, the Schrödinger equation, and Fourier transforms are treated separately, often in different courses. Here, they are treated as particular instances of the decoupling principle, and their solutions are remarkably similar. By understanding this general principle and the many applications given in the book, students will be able to recognize it and to apply it in many other settings.

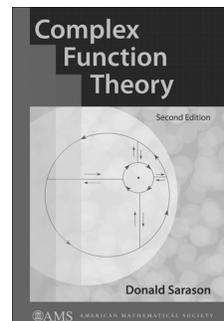
Sadun includes some topics relating to infinite-dimensional spaces. He does not present a general theory, but enough so as to apply the decoupling principle to the wave equation, leading to Fourier series and the Fourier transform.

The second edition contains a series of *Explorations*. Most are numerical labs in which the reader is asked to use standard computer software to look deeper into the subject. Some explorations are theoretical, for instance, relating linear algebra to quantum mechanics. There is also an appendix reviewing basic matrix operations and another with solutions to a third of the exercises.

Contents: The decoupling principle; Vector spaces and bases; Linear transformations and operators; An introduction to eigenvalues; Some crucial applications; Inner products; Adjoints, Hermitian operators, and unitary operators; The wave equation; Continuous spectra and the Dirac delta function; Fourier transforms; Green's functions; Matrix operations; Solutions to selected exercises; Index.

January 2008, 371 pages, Hardcover, ISBN: 978-0-8218-4441-0, LC 2007060567, 2000 *Mathematics Subject Classification*: 15-01; 34-01, 35-01, 39-01, 42-01, **AMS members US\$47**, List US\$59, Order code MBK/50

Analysis



Complex Function Theory
Second Edition

Donald Sarason, *University of California, Berkeley, CA*

From a review of the previous edition ... The exposition is clear, rigorous, and friendly.

— Zentralblatt MATH

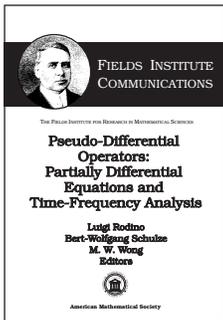
Complex Function Theory is a concise and rigorous introduction to the theory of functions of a complex variable. Written in a classical style, it is in the spirit of the books by Ahlfors and by Saks and Zygmund. Being designed for a one-semester course, it is much shorter than many of the standard texts. Sarason covers the basic material through Cauchy's theorem and applications, plus the Riemann mapping theorem. It is suitable for either an introductory graduate course or an undergraduate course for students with adequate preparation.

The first edition was published with the title *Notes on Complex Function Theory*.

Contents: Complex numbers; Complex differentiation; Linear-fractional transformations; Elementary functions; Power series; Complex integration; Core versions of Cauchy's theorem, and consequences; Laurent series and isolated singularities; Cauchy's theorem; Further development of basic complex function theory; Appendix 1: Sufficient condition for differentiability; Appendix 2: Two instances of the chain rule; Appendix 3: Groups, and linear-fractional transformations; Appendix 4: Differentiation under the integral sign; References; Index.

January 2008, 163 pages, Hardcover, ISBN: 978-0-8218-4428-1, LC 2007060552, 2000 *Mathematics Subject Classification:* 30-01, AMS members US\$31, List US\$39, Order code MBK/49

Differential Equations



Pseudo-Differential Operators: Partially Differential Equations and Time-Frequency Analysis

Luigi Rodino, *Università di Torino, Italy*, Bert-Wolfgang Schulze, *Universität Potsdam, Germany*, and M. W. Wong, *York University, Toronto, ON, Canada*, Editors

University, Toronto, ON, Canada, Editors

This volume is based on lectures given at the workshop on pseudo-differential operators held at the Fields Institute from December 11, 2006 to December 15, 2006. The two main themes of the workshop and hence this volume are partial differential equations and time-frequency analysis. The contents of this volume consist of five mini-courses for graduate students and post-docs, and fifteen papers on related topics. Of particular interest in this volume are the mathematical underpinnings, applications and ramifications of the relatively new Stockwell transform, which is a hybrid of the Gabor transform and the wavelet transform. The twenty papers in this volume reflect modern trends in the development of pseudo-differential operators.

Titles in this series are co-published with the Fields Institute for Research in Mathematical Sciences (Toronto, Ontario, Canada).

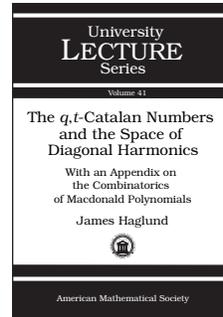
Contents: P. Greiner, On Hörmander operators and non-holonomic geometry; A. Dasgupta and M. W. Wong, Weyl transforms and the inverse of the sub-Laplacian on the Heisenberg group; B.-W. Schulze, Pseudo-differential calculus on manifolds with geometric singularities; C.-I. Martin, Corner operators and applications to elliptic complexes; N. Dines, Ellipticity of a class of corner operators; C. L. Epstein, Pseudodifferential methods for boundary value problems; V. Rabinovich, Invertibility of parabolic Pseudodifferential operators; M. Cappiello, T. Gramchev, and L. Rodino, Semilinear pseudo-differential equations and travelling waves; E. Buzano and J. Toft, Continuity and compactness properties of pseudo-differential operators; F. Concetti and J. Toft, Trace ideals for Fourier integral operators with non-smooth symbols; V. Catană, Schatten-von Neumann norm inequalities for two-wavelet localization operators; R. G. Stockwell, Why use the S-transform?; T. A. Bjarnason, S. Drabycz, D. H. Adler, J. G. Cairncross, and J. R. Mitchell, Applying the S-transform

to magnetic resonance imaging texture analysis; Y. Liu and M. W. Wong, Inversion formulas for two-dimensional Stockwell transforms; C. R. Pinnegar, Localization of signal and image features with the TT-transform; K. Gröchenig, Weight functions in time-frequency analysis; R. R. Radha and S. Sivanathan, Shannon type sampling theorems on the Heisenberg group; A. Mohammed and M. W. Wong, Rihaczek transforms and pseudo-differential operators; P. Boggiatto, G. De Donno, and A. Oliaro, A unified point of view on time-frequency representations and pseudo-differential operators; R. Ashino, T. Mandai, A. Morimoto, and F. Sasaki, Blind source separation using time-frequency analysis.

Fields Institute Communications, Volume 52

November 2007, 414 pages, Hardcover, ISBN: 978-0-8218-4276-8, LC 2007060553, 2000 *Mathematics Subject Classification:* 35-06, 35S05, 42-06, 47G10, 47G30, 58-06, 58J40, 65T60, 94A12, AMS members US\$95, List US\$119, Order code FIC/52

Discrete Mathematics and Combinatorics



The q, t -Catalan Numbers and the Space of Diagonal Harmonics

With an Appendix on the Combinatorics of Macdonald Polynomials

James Haglund, *University of Pennsylvania, Philadelphia, PA*

This book contains detailed descriptions of the many exciting recent developments in the combinatorics of the space of diagonal harmonics, a topic at the forefront of current research in algebraic combinatorics. These developments led in turn to some surprising discoveries in the combinatorics of Macdonald polynomials, which are described in Appendix A. The book is appropriate as a text for a topics course in algebraic combinatorics, a volume for self-study, or a reference text for researchers in any area which involves symmetric functions or lattice path combinatorics.

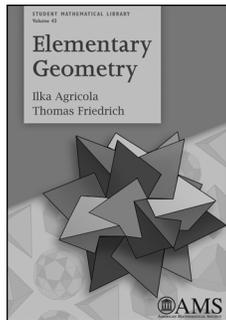
The book contains expository discussions of some topics in the theory of symmetric functions, such as the practical uses of plethystic substitutions, which are not treated in depth in other texts. Exercises are interspersed throughout the text in strategic locations, with full solutions given in Appendix C.

Contents: Introduction to q -analogues and symmetric functions; Macdonald polynomials and the space of diagonal harmonics; The q, t -Catalan numbers; The q, t -Schröder polynomial; Parking functions and the Hilbert series; The shuffle conjecture; The proof of the q, t -Schröder theorem; The combinatorics of Macdonald polynomials; The Loehr-Warrington conjecture; Solutions to exercises; Bibliography.

University Lecture Series, Volume 41

January 2008, 167 pages, Softcover, ISBN: 978-0-8218-4411-3, LC 2007060570, 2000 *Mathematics Subject Classification*: 05E05, 05A30; 05A05, **AMS members US\$31**, List US\$39, Order code ULECT/41

Geometry and Topology



Elementary Geometry

Ilka Agricola and Thomas Friedrich, *Humboldt-Universität zu Berlin, Germany*

Translated by Philip G. Spain

Elementary geometry provides the foundation of modern geometry. For the most part, the standard introductions end at the formal Euclidean geometry of high school. Agricola and Friedrich revisit

geometry, but from the higher viewpoint of university mathematics. Plane geometry is developed from its basic objects and their properties and then moves to conics and basic solids, including the Platonic solids and a proof of Euler's polytope formula. Particular care is taken to explain symmetry groups, including the description of ornaments and the classification of isometries by their number of fixed points. Complex numbers are introduced to provide an alternative, very elegant approach to plane geometry. The authors then treat spherical and hyperbolic geometries, with special emphasis on their basic geometric properties.

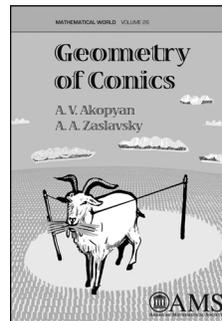
This largely self-contained book provides a much deeper understanding of familiar topics, as well as an introduction to new topics that complete the picture of two-dimensional geometries. For undergraduate mathematics students the book will be an excellent introduction to an advanced point of view on geometry. For mathematics teachers it will be a valuable reference and a source book for topics for projects.

The book contains over 100 figures and scores of exercises. It is suitable for a one-semester course in geometry for undergraduates, particularly for mathematics majors and future secondary school teachers.

Contents: Introduction: Euclidean space; Elementary geometrical figures and their properties; Symmetries of the plane and of space; Hyperbolic geometry; Spherical geometry; Bibliography; List of symbols; Index.

Student Mathematical Library, Volume 43

January 2008, approximately 246 pages, Softcover, ISBN: 978-0-8218-4347-5, LC 2007060844, 2000 *Mathematics Subject Classification*: 51M04, 51M09, 51M15, **AMS members US\$31**, List US\$39, Order code STML/43



Geometry of Conics

A. V. Akopyan, and A. A. Zaslavsky, *CEMI RAN, Moscow, Russia*

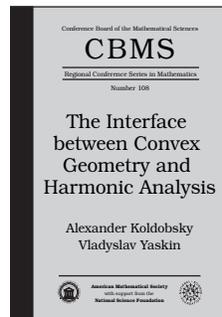
The book is devoted to the properties of conics (plane curves of second degree) that can be formulated and proved using only elementary geometry. Starting with the well-known optical properties of conics, the authors move to less trivial results, both classical and contemporary. In particular, the chapter on projective properties of conics contains a detailed analysis of the polar correspondence, pencils of conics, and the Poncelet theorem. In the chapter on metric properties of conics the authors discuss, in particular, inscribed conics, normals to conics, and the Poncelet theorem for confocal ellipses.

The book demonstrates the advantage of purely geometric methods of studying conics. It contains over 50 exercises and problems aimed at advancing geometric intuition of the reader. The book also contains more than 100 carefully prepared figures, which will help the reader to better understand the material presented.

Contents: Elementary properties of curves of second degree; Some results from classical geometry; Projective properties of conics; Euclidean properties of curves of second degree; Solutions to the problems; Bibliography; Index.

Mathematical World, Volume 26

November 2007, 134 pages, Softcover, ISBN: 978-0-8218-4323-9, LC 2007060841, 2000 *Mathematics Subject Classification*: 51-02, 51M04, **AMS members US\$21**, List US\$26, Order code MAWRDL/26



The Interface between Convex Geometry and Harmonic Analysis

Alexander Koldobsky, *University of Missouri, Columbia, MO*, and **Vladyslav Yaskin**, *University of Oklahoma, Norman, OK*

The study of convex bodies is a central part of geometry, and is particularly useful in applications to other areas of mathematics and the sciences. Recently, methods from Fourier analysis have been developed that greatly improve our understanding of the geometry of sections and projections of convex bodies. The idea of this approach is to express certain properties of bodies in terms of the Fourier transform and then to use methods of Fourier analysis to solve geometric problems. The results covered in the book include an analytic solution to the Busemann-Petty problem, which asks whether bodies with smaller areas of central hyperplane sections necessarily have smaller volume, characterizations of intersection bodies, extremal sections of certain classes of bodies, and a Fourier analytic solution to Shephard's problem on projections of convex bodies.

The book is written in the form of lectures accessible to graduate students. This approach allows the reader to clearly see the main ideas behind the method, rather than to dwell on technical difficulties. The book also contains discussions of the most recent

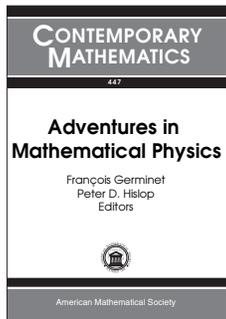
advances in the subject. The first section of each lecture is a snapshot of that lecture. By reading each of these sections first, novices can gain an overview of the subject, then return to the full text for more details.

Contents: Hyperplane sections of ℓ_p -balls; Volume and the Fourier transform; Intersection bodies; The Busemann-Petty problem; Projections and the Fourier transform; Intersection bodies and L_p -spaces; On the road between polar projection bodies and intersection bodies; Open problems; Bibliography; Index.

CBMS Regional Conference Series in Mathematics, Number 108

January 2008, 107 pages, Softcover, ISBN: 978-0-8218-4456-4, LC 2007060572, 2000 *Mathematics Subject Classification*: 52A20, 42A38, 44A05, **All Individuals US\$23**, List US\$29, Order code CBMS/108

Mathematical Physics



Adventures in Mathematical Physics

François Germinet, *Université de Cergy-Pontoise, France*, and **Peter D. Hislop**, *University of Kentucky, Lexington, KY*, Editors

This volume consists of refereed research articles written by some of the speakers at this international conference in honor of the sixty-fifth birthday of Jean-Michel

Combes. The topics span modern mathematical physics with contributions on state-of-the-art results in the theory of random operators, including localization for random Schrödinger operators with general probability measures, random magnetic Schrödinger operators, and interacting multiparticle operators with random potentials; transport properties of Schrödinger operators and classical Hamiltonian systems; equilibrium and nonequilibrium properties of open quantum systems; semiclassical methods for multiparticle systems and long-time evolution of wave packets; modeling of nanostructures; properties of eigenfunctions for first-order systems and solutions to the Ginzburg-Landau system; effective Hamiltonians for quantum resonances; quantum graphs, including scattering theory and trace formulas; random matrix theory; and quantum information theory. Graduate students and researchers will benefit from the accessibility of these articles and their current bibliographies.

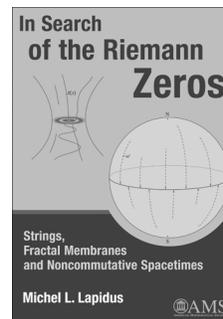
Contents: **W. H. Aschbacher**, On the emptiness formation probability in quasi-free states; **V. Chulaevsky**, Wegner-Stollmann type estimates for some quantum lattice systems; **M. Combes**, The mutually unbiased bases revisited; **H. D. Cornean**, **T. G. Pedersen**, and **B. Ricard**, Perturbative vs. variational methods in the study of carbon nanotubes; **S. De Bièvre**, **P. Lafitte**, and **P. E. Parris**, Normal transport at positive temperatures in classical Hamiltonian open systems; **P. Exner** and **J. Lipovský**, Equivalence of resolvent and scattering resonances on quantum graphs; **S. Fournais** and **B. Helffer**, Optimal uniform elliptic estimates for the Ginzburg-Landau system; **F. Germinet** and **A. Klein**, Localization for a continuum Cantor-Anderson Hamiltonian; **F. Germinet** and **S. Tcheremchantsev**, Generalized fractal dimensions on the negative axis for non compactly supported

measures; **F. Ghribi**, **P. D. Hislop**, and **F. Klopp**, Localization for Schrödinger operators with random vector potentials; **G. A. Hagedorn** and **A. Joye**, Vibrational levels associated with hydrogen bonds and semiclassical Hamiltonian normal forms; **V. Jakšić** and **C.-A. Pillet**, On the strict positivity of entropy production; **A. Jensen** and **G. Nenciu**, Uniqueness results for transient dynamics of quantum systems; **V. Kostrykin**, **J. Potthoff**, and **R. Schrader**, Heat kernels on metric graphs and a trace formula; **J. L. Lebowitz**, **A. Lytova**, and **L. Pastur**, On a random matrix model of quantum relaxation; **D. Robert**, Revivals of wave packets and Bohr-Sommerfeld quantization rules; **L. E. Thomas** and **Y. Wang**, On a linear stochastic wave equation modeling heat flow; **D. R. Yafaev**, Exponential decay of eigenfunctions of first order systems.

Contemporary Mathematics, Volume 447

December 2007, 256 pages, Softcover, ISBN: 978-0-8218-4241-6, LC 2007060847, 2000 *Mathematics Subject Classification*: 35Pxx, 35Qxx, 35Sxx, 47Axx, 81-XX, **AMS members US\$63**, List US\$79, Order code CONM/447

Number Theory



In Search of the Riemann Zeros

Strings, Fractal Membranes and Noncommutative Spacetimes

Michel L. Lapidus, *University of California, Riverside, CA*

Formulated in 1859, the Riemann Hypothesis is the most celebrated and multifaceted open problem in mathematics. In essence, it states that the primes are distributed as harmoniously as possible—or, equivalently, that the Riemann zeros are located on a single vertical line, called the critical line.

In this book, the author proposes a new approach to understand and possibly solve the Riemann Hypothesis. His reformulation builds upon earlier (joint) work on complex fractal dimensions and the vibrations of fractal strings, combined with string theory and noncommutative geometry. Accordingly, it relies on the new notion of a fractal membrane or quantized fractal string, along with the modular flow on the associated moduli space of fractal membranes. Conjecturally, under the action of the modular flow, the spacetime geometries become increasingly symmetric and crystal-like, hence, arithmetic. Correspondingly, the zeros of the associated zeta functions eventually condense onto the critical line, towards which they are attracted, thereby explaining why the Riemann Hypothesis must be true.

Written with a diverse audience in mind, this unique book is suitable for graduate students, experts and nonexperts alike, with an interest in number theory, analysis, dynamical systems, arithmetic, fractal or noncommutative geometry, and mathematical or theoretical physics.

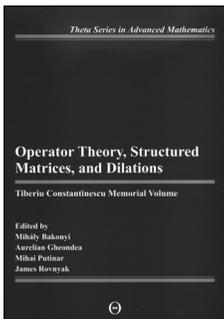
This item will also be of interest to those working in mathematical physics.

Contents: Introduction; String theory on a circle and T-duality: Analogy with the Riemann zeta function; Fractal strings and fractal membranes; Noncommutative models of fractal strings: Fractal membranes and beyond; Towards an 'arithmetic site': Moduli spaces of fractal strings and membranes; Vertex algebras; The Weil conjectures and the Riemann hypothesis; The Poisson summation formula, with applications; Generalized primes and Beurling zeta functions; The Selberg class of zeta functions; The noncommutative space of Penrose tilings and quasicrystals; Bibliography; Conventions; Index of symbols; Subject index; Author index.

February 2008, 558 pages, Hardcover, ISBN: 978-0-8218-4222-5, LC 2007060845, 2000 *Mathematics Subject Classification:* 11A41, 11G20, 11M06, 11M26, 11M41, 28A80, 37N20, 46L55, 58B34, 81T30, **AMS members US\$63**, List US\$79, Order code MBK/51

New AMS-Distributed Publications

Analysis



Operator Theory, Structured Matrices, and Dilations

Tiberiu Constantinescu
Memorial Volume

Mihaly Bakonyi, *Georgia State University, Atlanta, GA*, **Aurelian Gheondea**, *Romanian Academy, Institute of Mathematics,*

Bucharest, Romania, **Mihai Putinar**, *University of California, Santa Barbara, CA*, and **James Rovnyak**, *University of Virginia, Charlottesville, VA*, Editors

The volume is a careful selection of peer-reviewed papers in operator theory, structured matrices, and dilations, dedicated to Tiberiu Constantinescu, a prominent mathematician in the field.

The extensive survey of J. W. Helton and M. Putinar on positive polynomials, spectral theorem, and optimization is a pioneering essay that, under the unifying concept of positivity, brings together ideas from algebra, algebraic geometry, complex analysis, control theory, mathematical logic, and operator theory.

The other research papers deal with recent advances in the following areas:

- multivariable operator theory
- interpolation and moment problems
- perturbation theory
- composition operators
- matrix completion problems
- systems theory

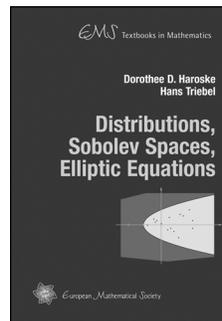
A publication of the Theta Foundation. Distributed worldwide, except in Romania, by the AMS.

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International Book Series of Mathematical Texts

October 2007, 356 pages, Hardcover, ISBN: 978-973-87899-0-6, 2000 *Mathematics Subject Classification:* 00B15; 47-06, **AMS members US\$46**, List US\$58, Order code THETA/10

Differential Equations



Distributions, Sobolev Spaces, Elliptic Equations

Dorothee D. Haroske and **Hans Triebel**, *Friedrich-Schiller University, Jena, Germany*

It is the main aim of this book to develop at an accessible, moderate level an L_2 theory for elliptic differential operators of

second order on bounded smooth domains in Euclidean n -space, including a priori estimates for boundary-value problems in terms of (fractional) Sobolev spaces on domains and on their boundaries, together with a related spectral theory.

The presentation is preceded by an introduction to the classical theory for the Laplace-Poisson equation, and some chapters provide required ingredients such as the theory of distributions, Sobolev spaces and the spectral theory in Hilbert spaces.

The book grew out of two-semester courses the authors have given several times over a period of ten years at the Friedrich Schiller University of Jena. It is addressed to graduate students and mathematicians who have a working knowledge of calculus, measure theory and the basic elements of functional analysis (as

usually covered by undergraduate courses) and who are seeking an accessible introduction to some aspects of the theory of function spaces and its applications to elliptic equations.

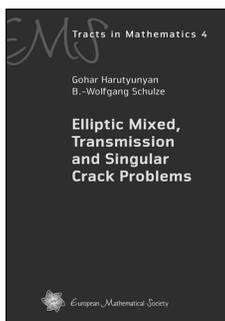
This item will also be of interest to those working in analysis.

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

Contents: The Laplace-Poisson equation; Distributions; Sobolev space on \mathbb{R}^n and \mathbb{R}_+^n ; Sobolev spaces on domains; Elliptic operators in L_2 ; Spectral theory in Hilbert spaces and Banach spaces; Compact embeddings, spectral theory of elliptic operators; A. Domains, basic spaces, and integral formulae; B. Orthonormal bases of trigonometric functions; C. Operator theory; D. Some integral inequalities; E. Function spaces; Selected solutions; Bibliography; Author index; List of figures; Notation index; Subject index.

EMS Textbooks in Mathematics

November 2007, 303 pages, Hardcover, ISBN: 978-3-03719-042-5, 2000 *Mathematics Subject Classification*: 35-01, 46-01, 35J25, 35P15, 42B35, 46E35, 46F05, 47B06, 47F05, AMS members US\$54, List US\$68, Order code EMSTEXT/4



Elliptic Mixed, Transmission and Singular Crack Problems

Gohar Harutyunyan, *University of Oldenburg, Germany,* and Bert-Wolfgang Schulze, *University of Potsdam, Germany*

Mixed, transmission, or crack problems belong to the analysis of boundary value problems on manifolds with singularities. The Zaremba problem with a jump between Dirichlet and Neumann conditions along an interface on the boundary is a classical example. The central theme of this book is to study mixed problems in standard Sobolev spaces as well as in weighted edge spaces where the interfaces are interpreted as edges. Parametrices and regularity of solutions are obtained within a systematic calculus of boundary value problems on manifolds with conical or edge singularities. This calculus allows singularities on the interface and homotopies between mixed and crack problems. Additional edge conditions are computed in terms of relative index results. In a detailed final chapter, the intuitive ideas of the approach are illustrated, and there is a discussion of future challenges. A special feature of the text is the inclusion of many worked-out examples which help the reader to appreciate the scope of the theory and to treat new cases of practical interest.

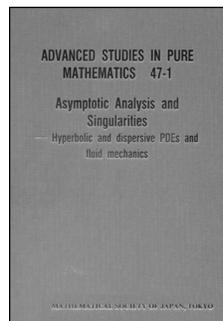
This book is addressed to mathematicians and physicists interested in models with singularities, associated boundary value problems, and their solvability strategies based on pseudo-differential operators. The material is also useful for students in higher semesters and young researchers, as well as for experienced specialists working in analysis on manifolds with geometric singularities, the applications of index theory and spectral theory, operator algebras with symbolic structures, quantisation, and asymptotic analysis.

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

Contents: Introduction; Boundary value problems with mixed and interface data; Symbolic structures and associated operators; Boundary value problems with the transmission property; Mixed problems in standard Sobolev spaces; Mixed problems in weighted edge spaces; Operators on manifolds with conical singularities and boundary; Operators on manifolds with edges and boundary; Corner operators and problems with singular interfaces; Operators in infinite cylinders and the relative index; Intuitive ideas of the calculus on singular manifolds; Bibliography; List of symbols; Index.

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Asymptotic Analysis and Singularities

Hyperbolic and Dispersive PDEs and Fluid Mechanics

Hideo Kozono and Takayoshi Ogawa, *Tohoku University, Sendai, Japan,* Kazunaga Tanaka, *Waseda University, Tokyo, Japan,* Yoshio Tsutsumi, *Kyoto University, Japan,* and Eiji Yanagida, *Tohoku University, Sendai, Japan,* Editors

This volume is the proceedings of the 14th MSJ International Research Institute "Asymptotic Analysis and Singularity", which was held at Sendai, Japan in July 2005. The proceedings contain survey papers and original research papers on nonlinear partial differential equations, dynamical systems, calculus of variations and mathematical physics.

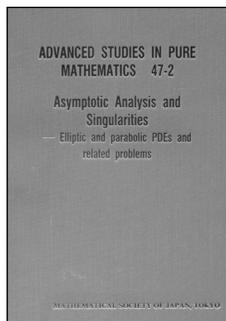
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Advanced Studies in Pure Mathematics, Volume 47

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Asymptotic Analysis and Singularities

Elliptic and Parabolic PDEs and Related Problems

Hideo Kozono and **Takayoshi Ogawa**, *Tohoku University, Sendai, Japan*, **Kazunaga Tanaka**, *Waseda University, Tokyo, Japan*, **Yoshio Tsutsumi**, *Kyoto University, Japan*, and **Eiji Yanagida**, *Tohoku University, Sendai, Japan*, Editors

Kyoto University, Japan, and *Eiji Yanagida, Tohoku University, Sendai, Japan*, Editors

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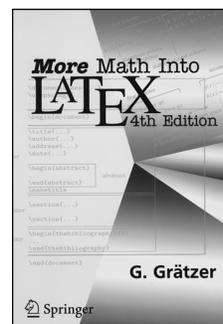
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