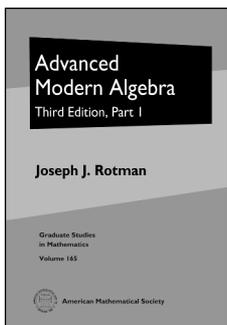


New Publications Offered by the AMS

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Algebra and Algebraic Geometry



Advanced Modern Algebra

Third Edition, Part 1

Joseph J. Rotman, *University of Illinois at Urbana-Champaign, IL*

This new edition, now in two parts, has been significantly reorganized and many sections have been rewritten. This first part, designed for a first year of graduate algebra,

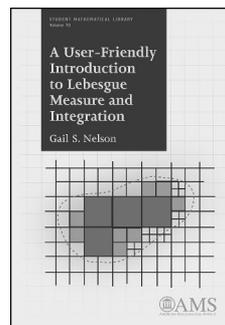
consists of two courses: Galois theory and Module theory. Topics covered in the first course are classical formulas for solutions of cubic and quartic equations, classical number theory, commutative algebra, groups, and Galois theory. Topics in the second course are Zorn's lemma, canonical forms, inner product spaces, categories and limits, tensor products, projective, injective, and flat modules, multilinear algebra, affine varieties, and Gröbner bases.

Contents: *Course I:* Classical formulas; Classical number theory; Commutative rings; Groups; Galois theory; Appendix: Set theory; Appendix: Linear Algebra; *Course II:* Modules; Zorn's lemma; Advanced linear algebra; Categories of modules; Multilinear algebra; Commutative algebra II; Appendix: Categorical limits; Appendix: Topological spaces; Bibliography; Special notation; Index.

Graduate Studies in Mathematics, Volume 165

November 2015, approximately 709 pages, Hardcover, ISBN: 978-1-4704-1554-9, LC 2015019659, 2010 *Mathematics Subject Classification:* 12-01, 13-01, 14-01, 15-01, 16-01, 18-01, 20-01, **AMS members US\$71.20**, List US\$89, Order code GSM/165

Analysis



A User-Friendly Introduction to Lebesgue Measure and Integration

Gail S. Nelson, *Carleton College, Northfield, MN*

A User-Friendly Introduction to Lebesgue Measure and Integration provides a bridge between an undergraduate course in Real

Analysis and a first graduate-level course in Measure Theory and Integration. The main goal of this book is to prepare students for what they may encounter in graduate school, but will be useful for many beginning graduate students as well. The book starts with the fundamentals of measure theory that are gently approached through the very concrete example of Lebesgue measure. With this approach, Lebesgue integration becomes a natural extension of Riemann integration.

Next, L^p -spaces are defined. Then the book turns to a discussion of limits, the basic idea covered in a first analysis course. The book also discusses in detail such questions as: When does a sequence of Lebesgue integrable functions converge to a Lebesgue integrable function? What does that say about the sequence of integrals? Another core idea from a first analysis course is completeness. Are these L^p -spaces complete? What exactly does that mean in this setting?

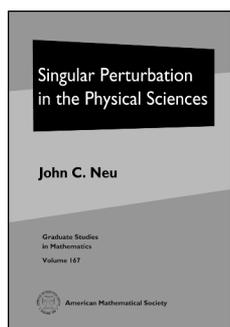
This book concludes with a brief overview of General Measures. An appendix contains suggested projects suitable for end-of-course papers or presentations.

The book is written in a very reader-friendly manner, which makes it appropriate for students of varying degrees of preparation, and the only prerequisite is an undergraduate course in Real Analysis.

Contents: Review of Riemann integration; Lebesgue measure; Lebesgue integration; L^p spaces; General measure theory; Ideas for projects; References; Index.

Student Mathematical Library, Volume 78

December 2015, approximately 229 pages, Softcover, ISBN: 978-1-4704-2199-1, LC 2015022834, 2010 *Mathematics Subject Classification:* 26-XX, 28-XX, **AMS members US\$39.20**, **All Individuals US\$39.20**, List US\$49, Order code STML/78



Singular Perturbation in the Physical Sciences

John C. Neu, *University of California, Berkeley, CA*

This book is the testimony of a physical scientist whose language is singular perturbation analysis. Classical mathematical notions, such as matched asymptotic expansions, projections of large dynamical systems onto small center manifolds, and modulation theory of oscillations based either on multiple scales or on averaging/transformation theory, are included. The narratives of these topics are carried by physical examples: Let's say that the moment when we "see" how a mathematical pattern fits a physical problem is like "hitting the ball." Yes, we want to hit the ball. But a powerful stroke includes the follow-through. One intention of this book is to discern in the structure and/or solutions of the equations their geometric and physical content. Through analysis, we come to sense directly the shape and feel of phenomena.

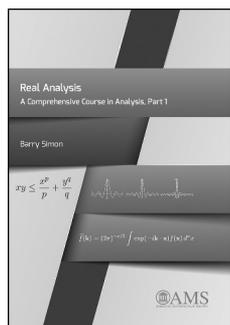
The book is structured into a main text of fundamental ideas and a subtext of problems with detailed solutions. Roughly speaking, the former is the initial contact between mathematics and phenomena, and the latter emphasizes geometric and physical insight. It will be useful for mathematicians and physicists learning singular perturbation analysis of ODE and PDE boundary value problems as well as the full range of related examples and problems. Prerequisites are basic skills in analysis and a good junior/senior level undergraduate course of mathematical physics.

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

Contents: What is a singular perturbation?; Asymptotic expansions; Matched asymptotic expansions; Matched asymptotic expansions in PDE; Prandtl boundary layer theory; Modulated oscillations; Modulation theory by transforming variables; Nonlinear resonance; Bibliography; Index.

Graduate Studies in Mathematics, Volume 167

January 2016, approximately 335 pages, Hardcover, ISBN: 978-1-4704-2555-5, 2010 *Mathematics Subject Classification:* 34-XX, 35-XX, 37-XX, 41-XX, 76-XX, 97-XX, **AMS members US\$63.20**, List US\$79, Order code GSM/167



Real Analysis: A Comprehensive Course in Analysis, Part 1

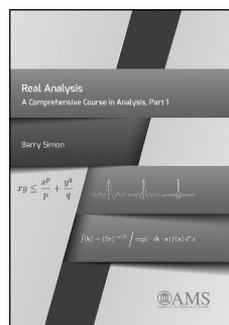
Barry Simon, *California Institute of Technology, Pasadena, CA*

A Comprehensive Course in Analysis by Poincaré Prize winner Barry Simon is a five-volume set that can serve as a graduate-level analysis textbook with a lot of additional *bonus* information, including hundreds of problems and numerous notes

that extend the text and provide important historical background. Depth and breadth of exposition make this set a valuable reference source for almost all areas of classical analysis.

Each volume in this set is sold separately. For a description of each volume, see the New Publication entries that follow.

Set: December 2015, 3259 pages, Hardcover, ISBN: 978-1-4704-1098-8, **AMS members US\$280**, List US\$350, Order code SIMON-SET



Basic Complex Analysis

A Comprehensive Course in Analysis, Part 2A

Barry Simon, *California Institute of Technology, Pasadena, CA*

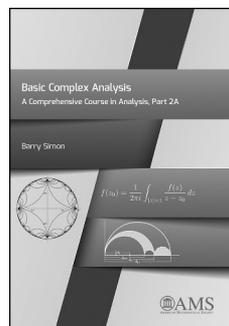
A Comprehensive Course in Analysis by Poincaré Prize winner Barry Simon is a five-volume set that can serve as a graduate-level analysis textbook with a lot of additional *bonus* information, including

hundreds of problems and numerous notes that extend the text and provide important historical background. Depth and breadth of exposition make this set a valuable reference source for almost all areas of classical analysis.

Part 1 is devoted to real analysis. From one point of view, it presents the infinitesimal calculus of the twentieth century with the ultimate integral calculus (measure theory) and the ultimate differential calculus (distribution theory). From another, it shows the triumph of abstract spaces: topological spaces, Banach and Hilbert spaces, measure spaces, Riesz spaces, Polish spaces, locally convex spaces, Fréchet spaces, Schwartz space, and L^p spaces. Finally it is the study of big techniques, including the Fourier series and transform, dual spaces, the Baire category, fixed point theorems, probability ideas, and Hausdorff dimension. Applications include the constructions of nowhere differentiable functions, Brownian motion, space-filling curves, solutions of the moment problem, Haar measure, and equilibrium measures in potential theory.

Contents: Preliminaries; Topological spaces; A first look at Hilbert spaces and Fourier series; Measure theory; Convexity and Banach spaces; Tempered distributions and the Fourier transform; Bonus chapter: Probability basics; Bonus chapter: Hausdorff measure and dimension; Bonus chapter: Inductive limits and ordinary distributions; Bibliography; Symbol index; Subject index; Author index; Index of capsule biographies.

December 2015, 789 pages, Hardcover, ISBN: 978-1-4704-1099-5, LC 2014047381, 2010 *Mathematics Subject Classification:* 26-01, 28-01, 42-01, 46-01; 33-01, 35-01, 41-01, 52-01, 54-01, 60-01, **AMS members US\$74.40**, List US\$93, Order code SIMON/1



Basic Complex Analysis

A Comprehensive Course in Analysis, Part 2A

Barry Simon, *California Institute of Technology, Pasadena, CA*

A Comprehensive Course in Analysis by Poincaré Prize winner Barry Simon is a five-volume set that can serve as a graduate-level analysis textbook with a lot of additional *bonus* information, including

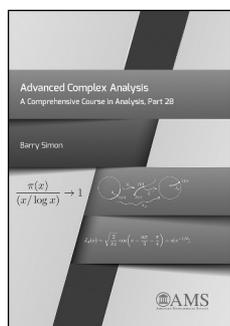
hundreds of problems and numerous notes that extend the text and provide important historical background. Depth and breadth of

exposition make this set a valuable reference source for almost all areas of classical analysis.

Part 2A is devoted to basic complex analysis. It interweaves three analytic threads associated with Cauchy, Riemann, and Weierstrass, respectively. Cauchy's view focuses on the differential and integral calculus of functions of a complex variable, with the key topics being the Cauchy integral formula and contour integration. For Riemann, the geometry of the complex plane is central, with key topics being fractional linear transformations and conformal mapping. For Weierstrass, the power series is king, with key topics being spaces of analytic functions, the product formulas of Weierstrass and Hadamard, and the Weierstrass theory of elliptic functions. Subjects in this volume that are often missing in other texts include the Cauchy integral theorem when the contour is the boundary of a Jordan region, continued fractions, two proofs of the big Picard theorem, the uniformization theorem, Ahlfors's function, the sheaf of analytic germs, and Jacobi, as well as Weierstrass, elliptic functions.

Contents: Preliminaries; The Cauchy integral theorem: Basics; Consequences of the Cauchy integral formula; Chains and the ultimate Cauchy integral theorem; More consequences of the CIT; Spaces of analytic functions; Fractional linear transformations; Conformal maps; Zeros of analytic functions and product formulae; Elliptic functions; Selected additional topics; Bibliography; Symbol index; Subject index; Author index; Index of capsule biographies.

December 2015, 641 pages, Hardcover, ISBN: 978-1-4704-1100-8, LC 2015009337, 2010 *Mathematics Subject Classification*: 30-01, 33-01, 40-01; 34-01, 41-01, 44-01, **AMS members US\$74.40**, List US\$93, Order code SIMON/2.1



Advanced Complex Analysis

A Comprehensive Course in Analysis, Part 2B

Barry Simon, *California Institute of Technology, Pasadena, CA*

A Comprehensive Course in Analysis by Poincaré Prize winner Barry Simon is a five-volume set that can serve as a

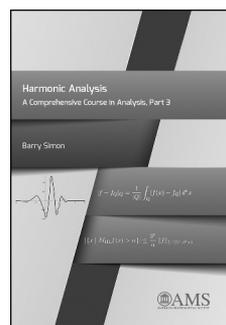
graduate-level analysis textbook with a lot of additional *bonus* information, including hundreds of problems and numerous notes that extend the text and provide important historical background. Depth and breadth of exposition make this set a valuable reference source for almost all areas of classical analysis.

Part 2B provides a comprehensive look at a number of subjects of complex analysis not included in Part 2A. Presented in this volume are the theory of conformal metrics (including the Poincaré metric, the Ahlfors-Robinson proof of Picard's theorem, and Bell's proof of the Painlevé smoothness theorem), topics in analytic number theory (including Jacobi's two- and four-square theorems, the Dirichlet prime progression theorem, the prime number theorem, and the Hardy-Littlewood asymptotics for the number of partitions), the theory of Fuchsian differential equations, asymptotic methods (including Euler's method, stationary phase, the saddle-point method, and the WKB method), univalent functions (including an introduction to SLE), and Nevanlinna theory. The chapters on Fuchsian differential equations and on asymptotic methods can be viewed as a minicourse on the theory of special functions.

Contents: Riemannian metrics and complex analysis; Some topics in analytic number theory; Ordinary differential equations in the

complex domain; Asymptotic methods; Univalent functions and Loewner evolution; Nevanlinna theory; Bibliography; Symbol index; Subject index; Author index; Index of capsule biographies.

December 2015, 321 pages, Hardcover, ISBN: 978-1-4704-1101-5, LC 2015015258, 2010 *Mathematics Subject Classification*: 30-01, 33-01, 34-01, 11-01; 30C55, 30D35, 33C05, 60J67, **AMS members US\$74.40**, List US\$93, Order code SIMON/2.2



Harmonic Analysis

A Comprehensive Course in Analysis, Part 3

Barry Simon, *California Institute of Technology, Pasadena, CA*

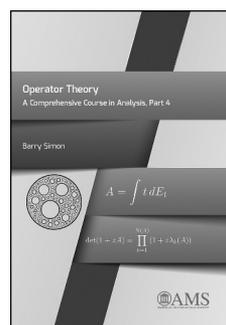
A Comprehensive Course in Analysis by Poincaré Prize winner Barry Simon is a five-volume set that can serve as a graduate-level analysis textbook with a lot of additional *bonus* information, including

hundreds of problems and numerous notes that extend the text and provide important historical background. Depth and breadth of exposition make this set a valuable reference source for almost all areas of classical analysis.

Part 3 returns to the themes of Part 1 by discussing pointwise limits (going beyond the usual focus on the Hardy-Littlewood maximal function by including ergodic theorems and martingale convergence), harmonic functions and potential theory, frames and wavelets, H^p spaces (including bounded mean oscillation (BMO)) and, in the final chapter, lots of inequalities, including Sobolev spaces, Calderon-Zygmund estimates, and hypercontractive semigroups.

Contents: Preliminaries; Pointwise convergence almost everywhere; Harmonic and subharmonic functions; Bonus chapter: Phase space analysis; H^p spaces and boundary values of analytic functions on the unit disk; Bonus chapter: More inequalities; Bibliography; Symbol index; Subject index; Author index; Index of capsule biographies.

December 2015, 759 pages, Hardcover, ISBN: 978-1-4704-1102-2, LC 2015024457, 2010 *Mathematics Subject Classification*: 26-01, 31-01, 46-01; 30H10, 30H35, 42C40, 42B20, 46E35, **AMS members US\$74.40**, List US\$93, Order code SIMON/3



Operator Theory

A Comprehensive Course in Analysis, Part 4

Barry Simon, *California Institute of Technology, Pasadena, CA*

A Comprehensive Course in Analysis by Poincaré Prize winner Barry Simon is a five-volume set that can serve as a graduate-level analysis textbook with a lot of additional *bonus* information, including

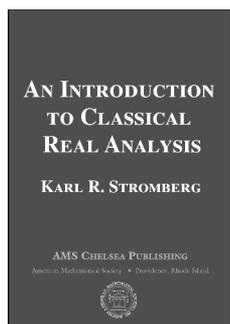
hundreds of problems and numerous notes that extend the text and provide important historical background. Depth and breadth of exposition make this set a valuable reference source for almost all areas of classical analysis.

Part 4 focuses on operator theory, especially on a Hilbert space. Central topics are the spectral theorem, the theory of trace class and

Fredholm determinants, and the study of unbounded self-adjoint operators. There is also an introduction to the theory of orthogonal polynomials and a long chapter on Banach algebras, including the commutative and non-commutative Gel'fand-Naimark theorems and Fourier analysis on general locally compact abelian groups.

Contents: Preliminaries; Operator basics; Compact operators, mainly on a Hilbert space; Orthogonal polynomials; The spectral theorem; Banach algebras; Bonus chapter: Unbounded self-adjoint operators; Bibliography; Symbol index; Subject index; Author index; Index of capsule biographies.

December 2015, 749 pages, Hardcover, ISBN: 978-1-4704-1103-9, LC 2015033104, 2010 *Mathematics Subject Classification*: 47-01, 34-01, 46-01; 81Q10, 34L05, 35P05, 42C05, 46H05, 22B05, **AMS members US\$74.40**, List US\$93, Order code SIMON/4



An Introduction to Classical Real Analysis

Karl R. Stromberg

This classic book is a text for a standard introductory course in real analysis, covering sequences and series, limits and continuity, differentiation, elementary transcendental functions, integration, infinite series and products, and trigonometric series. The author has

scrupulously avoided any presumption at all that the reader has any knowledge of mathematical concepts until they are formally presented in the book.

One significant way in which this book differs from other texts at this level is that the integral which is first mentioned is the Lebesgue integral on the real line. There are at least three good reasons for doing this. First, this approach is no more difficult to understand than is the traditional theory of the Riemann integral. Second, the readers will profit from acquiring a thorough understanding of Lebesgue integration on Euclidean spaces before they enter into a study of abstract measure theory. Third, this is the integral that is most useful to current applied mathematicians and theoretical scientists, and is essential for any serious work with trigonometric series.

The exercise sets are a particularly attractive feature of this book. A great many of the exercises are projects of many parts which, when completed in the order given, lead the student by easy stages to important and interesting results. Many of the exercises are supplied with copious hints. This new printing contains a large number of corrections and a short author biography as well as a list of selected publications of the author.

Stromberg's book gives an excellent treatment of real analysis. Making no assumption that the reader is familiar with "baby real variables," it starts from the beginning and develops the Lebesgue theory of measure and integration, then applies the techniques to a study of Fourier analysis. The book is a classic, suitable as a text for the standard graduate course. It's great to have it available again!

—Peter Duren, University of Michigan

... it is a splendid book well worth reprinting.

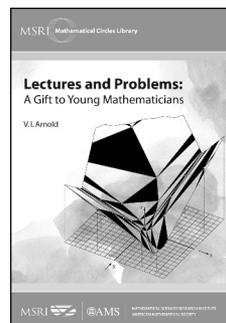
—Tom Körner, University of Cambridge

Contents: Preliminaries; Numbers; Sequences and series; Limits and continuity; Differentiation; The elementary transcendental functions; Integration; Infinite series and infinite products; Trigonometric series; Bibliography; Other works by the author; Index.

AMS Chelsea Publishing, Volume 376

December 2015, 575 pages, Hardcover, ISBN: 978-1-4704-2544-9, LC 2015024928, 2010 *Mathematics Subject Classification*: 26-01, 28-01, **AMS members US\$40**, List US\$50, Order code CHEL/376.H

General Interest



Lectures and Problems: A Gift to Young Mathematicians

V. I. Arnold

Translated by Dmitry Fuchs and Mark Saul

Vladimir Arnold (1937–2010) was one of the great mathematical minds of the late 20th century. He did significant work in many areas of the field. On another level, he was keeping with a strong tradition in Russian mathematics to write for and to directly teach younger students interested in mathematics. This book contains some examples of Arnold's contributions to the genre.

"Continued Fractions" takes a common enrichment topic in high school math and pulls it in directions that only a master of mathematics could envision.

"Euler Groups" treats a similar enrichment topic, but it is rarely treated with the depth and imagination lavished on it in Arnold's text. He sets it in a mathematical context, bringing to bear numerous tools of the trade and expanding the topic way beyond its usual treatment.

In "Complex Numbers" the context is physics, yet Arnold artfully extracts the mathematical aspects of the discussion in a way that students can understand long before they master the field of quantum mechanics.

"Problems for Children 5 to 15 Years Old" must be read as a collection of the author's favorite intellectual morsels. Many are not original, but all are worth thinking about, and each requires the solver to think out of his or her box. Dmitry Fuchs, a long-term friend and collaborator of Arnold, provided solutions to some of the problems. Readers are of course invited to select their own favorites and construct their own favorite solutions.

In reading these essays, one has the sensation of walking along a path that is found to ascend a mountain peak and then being shown a vista whose existence one could never suspect from the ground.

Arnold's style of exposition is unforgiving. The reader—even a professional mathematician—will find paragraphs that require hours of thought to unscramble, and he or she must have patience with the ellipses of thought and the leaps of reason. These are all part of Arnold's intent.

In the interest of fostering a greater awareness and appreciation of mathematics and its connections to other disciplines and everyday life, MSRI and the AMS are publishing books in the Mathematical Circles Library series as a service to young people, their parents and teachers, and the mathematics profession.

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

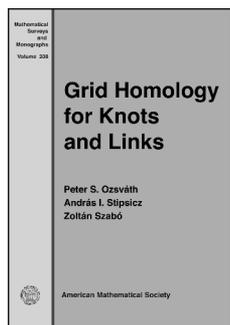
Contents: *Continued fractions*: Continued fractions; *Geometry of complex numbers, quaternions, and spins*: Geometry of complex

numbers, quaternions, and spins; *Euler groups and arithmetics of geometric progressions*: Euler groups and arithmetics of geometric progressions; *Problem for children 5 to 15 years old*: Problems; Solutions to selected problems; Bibliography.

MSRI Mathematical Circles Library, Volume 17

December 2015, 176 pages, Softcover, ISBN: 978-1-4704-2259-2, LC 2015024495, 2010 *Mathematics Subject Classification*: 00A09; 00A07, 11Axx, AMS members US\$23.20, List US\$29, Order code MCL/17

Geometry and Topology



Grid Homology for Knots and Links

Peter S. Ozsváth, Princeton University, NJ, **András I. Stipsicz**, Renyi Institute of Mathematics, Budapest, Hungary, and **Zoltán Szabó**, Princeton University, NJ

Knot theory is a classical area of low-dimensional topology, directly

connected with the theory of three-manifolds and smooth four-manifold topology. In recent years, the subject has undergone transformative changes thanks to its connections with a number of other mathematical disciplines, including gauge theory; representation theory and categorification; contact geometry; and the theory of pseudo-holomorphic curves.

Starting from the combinatorial point of view on knots using their grid diagrams, this book serves as an introduction to knot theory, specifically as it relates to some of the above developments. After a brief overview of the background material in the subject, the book gives a self-contained treatment of knot Floer homology from the point of view of grid diagrams. Applications include computations of the unknotting number and slice genus of torus knots (asked first in the 1960s and settled in the 1990s), and tools to study variants of knot theory in the presence of a contact structure. Additional topics are presented to prepare readers for further study in holomorphic methods in low-dimensional topology, especially Heegaard Floer homology.

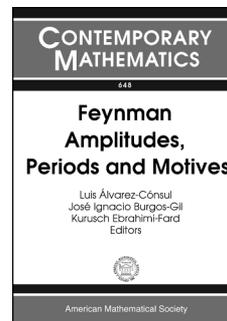
The book could serve as a textbook for an advanced undergraduate or part of a graduate course in knot theory. Standard background material is sketched in the text and the appendices.

Contents: Introduction; Knots and links in S^3 ; Grid diagrams; Grid homology; The invariance of grid homology; The unknotting number and τ ; Basic properties of grid homology; The slice genus and τ ; The oriented skein exact sequence; Grid homologies of alternating knots; Grid homology for links; Invariants of Legendrian and transverse knots; The filtered grid complex; More on the filtered chain complex; Grid homology over the integers; The holomorphic theory; Open problems; Homological algebra; Basic theorems in knot theory; Bibliography; Index.

Mathematical Surveys and Monographs, Volume 208

December 2015, 410 pages, Hardcover, ISBN: 978-1-4704-1737-6, LC 2015025903, 2010 *Mathematics Subject Classification*: 57M25, 57M27, 57R58, 53D10, AMS members US\$88, List US\$110, Order code SURV/208

Mathematical Physics



Feynman Amplitudes, Periods and Motives

Luis Álvarez-Cónsul, **José Ignacio Burgos-Gil**, and **Kuruşch Ebrahimi-Fard**, Instituto de Ciencias Matemáticas, Madrid, Spain, Editors

This volume contains the proceedings of the International Research Workshop on

Periods and Motives—A Modern Perspective on Renormalization, held from July 2–6, 2012, at the Instituto de Ciencias Matemáticas, Madrid, Spain.

Feynman amplitudes are integrals attached to Feynman diagrams by means of Feynman rules. They form a central part of perturbative quantum field theory, where they appear as coefficients of power series expansions of probability amplitudes for physical processes. The efficient computation of Feynman amplitudes is pivotal for theoretical predictions in particle physics.

Periods are numbers computed as integrals of algebraic differential forms over topological cycles on algebraic varieties. The term originated from the period of a periodic elliptic function, which can be computed as an elliptic integral.

Motives emerged from Grothendieck's "universal cohomology theory", where they describe an intermediate step between algebraic varieties and their linear invariants (cohomology). The theory of motives provides a conceptual framework for the study of periods. In recent work, a beautiful relation between Feynman amplitudes, motives and periods has emerged.

The articles provide an exciting panoramic view on recent developments in this fascinating and fruitful interaction between pure mathematics and modern theoretical physics.

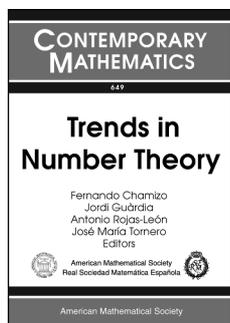
This item will also be of interest to those working in algebra and algebraic geometry.

Contents: S. Bloch, A note on twistor integrals; C. Bogner and M. Lüders, Multiple polylogarithms and linearly reducible Feynman graphs; P. Brosnan and R. Joshua, Comparison of motivic and simplicial operations in mod- l -motivic and étale cohomology; S. Carr, H. Gangl, and L. Schneps, On the Broadhurst-Kreimer generating series for multiple zeta values; C. Delaney and M. Marcolli, Dyson-Schwinger equations in the theory of computation; C. Duhr, Scattering amplitudes, Feynman integrals and multiple polylogarithms; V. Golyshev and M. Vlasenko, Equations D3 and spectral elliptic curves; D. Kreimer, Quantum fields, periods and algebraic geometry; E. Panzer, Renormalization, Hopf algebras and Mellin transforms; I. Soudères, Multiple zeta value cycles in low weight; S. Weinzierl, Periods and Hodge structures in perturbative quantum field theory; K. Yeats, Some combinatorial interpretations in perturbative quantum field theory.

Contemporary Mathematics, Volume 648

October 2015, 289 pages, Softcover, ISBN: 978-1-4704-2247-9, LC 2015010413, 2010 *Mathematics Subject Classification*: 11S40, 11M32, 14C25, 14C15, 14F42, 16T05, 32G20, 81Q30, 81T15, 81T18, AMS members US\$84, List US\$105, Order code CONM/648

Number Theory



Trends in Number Theory

Fernando Chamizo, *Universidad Autónoma de Madrid, Spain*, **Jordi Guàrdia**, *Universitat Politècnica de Catalunya, Vilanova I La Geltrú, Spain*, and **Antonio Rojas-León** and **José María Tornero**, *Universidad de Sevilla, Spain*, Editors

This volume contains the proceedings of the Fifth Spanish Meeting on Number Theory, held from July 8–12, 2013, at the Universidad de Sevilla, Spain.

The articles contained in this book give a panoramic vision of the current research in number theory, both in Spain and abroad. Some of the topics covered in this volume are classical algebraic number theory, arithmetic geometry, and analytic number theory.

Contents: **S. Arias-de-Reyna**, Automorphic Galois representations and the inverse Galois problem; **A. C. Domínguez**, Two Mayer-Vietoris spectral sequences for \mathcal{D} -modules; **T. Crespo**, **A. Rio**, and **M. Vela**, From Galois to Hopf Galois: Theory and practice; **A. Dujella** and **J. C. Peral**, Elliptic curves with torsion group $\mathbb{Z}/8\mathbb{Z}$ or $\mathbb{Z}/2\mathbb{Z} \times \mathbb{Z}/6\mathbb{Z}$; **F. Fité**, Equidistribution, L -functions, and Sato-Tate groups; **E. González-Jiménez**, Covering techniques and rational points on some genus 5 curves; **B. Le Stum** and **A. Quirós**, On quantum integers and rationals; **G. Mantilla-Soler**, A space of weight 1 modular forms attached to totally real cubic number fields; **G. Márquez-Campos** and **J. M. Tornero**, Characterization of gaps and elements of a numerical semigroup using Groebner bases; **A. Mínguez** and **V. Sécherre**, Classification des représentations modulaires de $GL_n(q)$ caractéristique non naturelle; **E. Nagel**, Fractional p -adic differentiability under the Amice transform; **F. P. Romo**, Reciprocity laws related to finite potent endomorphisms; **D. Raboso**, When the modular world becomes non-holomorphic.

Contemporary Mathematics, Volume 649

October 2015, 244 pages, Softcover, ISBN: 978-0-8218-9858-1, LC 2015011077, 2010 *Mathematics Subject Classification*: 11B65, 11F03, 11F37, 11G05, 11G30, 12F12, 14F10, 16T05, 20C33, 20M14, **AMS members US\$84**, List US\$105, Order code CONM/649

New AMS-Distributed Publications

Geometry and Topology



3-Manifold Groups

Matthias Aschenbrenner, *University of California, Los Angeles, CA*, **Stefan Friedl**, *Universität Regensburg, Germany*, and **Henry Wilton**, *University of Cambridge, United Kingdom*

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 focusing 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.

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Contents: Decomposition theorems; Classification of 3-manifolds by their fundamental groups; 3-manifold groups after geometrization; The work of Agol, Kahn-Markovic, and Wise; Consequences of the virtually compact special theorem; Subgroups of 3-manifold groups; Open questions; Bibliography; Index.

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