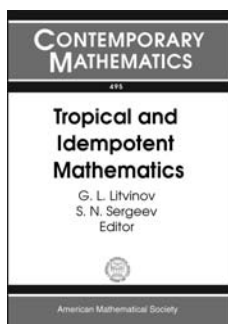


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Algebra and Algebraic Geometry



Tropical and Idempotent Mathematics

G. L. Litvinov, *Independent University of Moscow, Russia*,
and **S. N. Sergeev**, *University of Birmingham, United Kingdom*,
Editors

This volume is a collection of papers from the International Conference on Tropical and Idempotent Mathematics, held in Moscow, Russia in August 2007. This is a relatively new branch of mathematical sciences that has been rapidly developing and gaining popularity over the last decade.

Tropical mathematics can be viewed as a result of the Maslov dequantization applied to “traditional” mathematics over fields. Importantly, applications in econophysics and statistical mechanics lead to an explanation of the nature of financial crises. Another original application provides an analysis of instabilities in electrical power networks.

Idempotent analysis, tropical algebra, and tropical geometry are the building blocks of the subject. Contributions to idempotent analysis are focused on the Hamilton-Jacobi semigroup, the max-plus finite element method, and on the representations of eigenfunctions of idempotent linear operators. Tropical algebras, consisting of plurisubharmonic functions and their germs, are examined. The volume also contains important surveys and research papers on tropical linear algebra and tropical convex geometry.

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

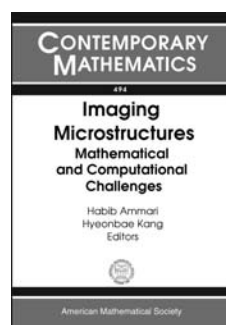
Contents: **M. Akian**, **S. Gaubert**, and **A. Guterman**, Linear independence over tropical semirings and beyond; **M. Akian**, **S. Gaubert**, and **V. Kolokoltsov**, The optimal assignment problem for a countable state space; **D. Alessandrini**, Dequantization of real convex projective manifolds; **M. Ansola** and **M. J. de la Puente**, Tropical conics for the layman; **A. Avantsaggiati** and **P. Loreti**, Idempotent aspects of Hopf-Lax type formulas; **P. Butkovič** and **K. P. Tam**, On some properties of the image set of a max-linear mapping; **V. I. Danilov**, **A. V. Karzanov**, and **G. A. Koshevoy**,

Tropical Plücker functions and their bases; **N. Farhi**, A class of periodic minplus homogeneous dynamical systems; **Z. Izhakian**, Basics of linear algebra over the extended tropical semiring; **M. Joswig**, Tropical convex hull computations; **B. K. Kirshtein**, Complex roots of systems of tropical equations and stability of electrical power networks; **V. Maslov**, Dequantization, statistical mechanics and econophysics; **D. McCaffrey**, Graph selectors and the max-plus finite element method; **W. M. McEaney**, Complexity reduction, cornices and pruning; **A. Rashkovskii**, Tropical analysis of plurisubharmonic singularities; **S. Sergeev**, Multiorder, Kleene stars and cyclic projectors in the geometry of max cones; **G. B. Shpiz** and **G. L. Litvinov**, A tropical version of the Schauder fixed point theorem; **E. Wagneur**, **L. Truffet**, **F. Faye**, and **M. Thiam**, Tropical cones defined by max-linear inequalities; **C. Walsh**, Minimal representing measures in idempotent analysis.

Contemporary Mathematics, Volume 495

October 2009, 382 pages, Softcover, ISBN: 978-0-8218-4782-4, LC 2009011257, 2000 *Mathematics Subject Classification*: 06-06, 06F07, 14A99, 15-06, 16Y60, 46N99, 46T99, 49L99, 81P05, 91B70, **AMS members US\$84**, List US\$105, Order code CONM/495

Applications



Imaging Microstructures

Mathematical and
Computational Challenges

Habib Ammari, *Ecole Polytechnique, Palaiseau, France*,
and **Hyeonbae Kang**, *Inha University, Incheon, Korea*,
Editors

This book contains the proceedings of the research conference, “Imaging Microstructures: Mathematical and Computational Challenges”, held at the Institut Henri Poincaré, on June 18–20, 2008.

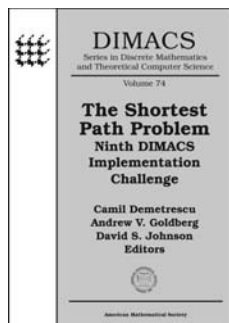
The problems that appear in imaging microstructures pose significant challenges to our community. The methods involved come from a wide range of areas of pure and applied mathematics.

The main purpose of this volume is to review the state-of-the-art developments from analytic, numerical, and physics perspectives.

Contents: **D. Holcman**, Diffusion in cellular microdomains: application to synapses; **G. Bao** and **Y. Sun**, Modeling and computation of the scattering by a nano optical medium; **Y. Otani** and **N. Nishimura**, Behaviour of periodic fast multipole boundary integral equation method for Maxwell's equations near Wood's anomalies; **R. Griesmaier** and **M. Hanke**, An asymptotic factorization method for inverse electromagnetic scattering in layered media II: a numerical study; **D. Volkov**, Faults in elastic half space: direct and inverse problem; **E. Bonnetier** and **F. Triki**, Asymptotics in the presence of inclusions of small volume for a conduction equation: a case with a non-smooth reference potential; **K. Kilgore**, **S. Moskow**, and **J. C. Schotland**, Inverse Born series for diffuse waves; **V. Isakov**, On identification of doping profile in semiconductors; **W. Lionheart** and **V. Sharafutdinov**, Reconstruction algorithm for the linearized polarization tomography problem with incomplete data; **R. G. Novikov**, An effectivization of the global reconstruction in the Gel'fand-Calderón inverse problem in three dimensions; **G. Dassios** and **J. C.-E. Sten**, The image system and Green's function for the ellipsoid.

Contemporary Mathematics, Volume 494

October 2009, 195 pages, Softcover, ISBN: 978-0-8218-4745-9, LC 2009009824, 2000 *Mathematics Subject Classification*: 34A55, 35R30, 35A20, 35B40, 44A12, 78M05, 78M25, 78A45, **AMS members US\$55**, List US\$69, Order code CONM/494



The Shortest Path Problem

Ninth DIMACS Implementation Challenge

Camil Demetrescu, *Sapienza Università di Roma, Rome, Italy*, **Andrew V. Goldberg**, *Microsoft Research - Silicon*

Valley, Mountain View, CA, and **David S. Johnson**, *AT&T Labs - Research, Florham Park, NJ*, Editors

Shortest path problems are among the most fundamental combinatorial optimization problems with many applications, both direct and as subroutines. They arise naturally in a remarkable number of real-world settings. A limited list includes transportation planning, network optimization, packet routing, image segmentation, speech recognition, document formatting, robotics, compilers, traffic information systems, and dataflow analysis. Shortest path algorithms have been studied since the 1950's and still remain an active area of research.

This volume reports on the research carried out by participants during the Ninth DIMACS Implementation Challenge, which led to several improvements of the state of the art in shortest path algorithms. The infrastructure developed during the Challenge facilitated further research in the area, leading to substantial follow-up work as well as to better and more uniform experimental standards. The results of the Challenge included new cutting-edge techniques for emerging applications such as GPS navigation systems, providing experimental evidence of the most effective algorithms in several real-world settings.

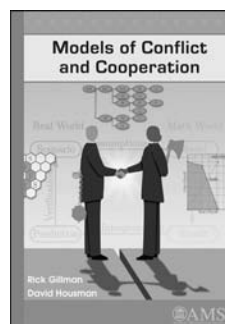
This item will also be of interest to those working in discrete mathematics and combinatorics.

Co-published with the Center for Discrete Mathematics and Theoretical Computer Science beginning with Volume 8. Volumes 1-7 were co-published with the Association for Computer Machinery (ACM).

Contents: **J. L. Santos**, Real-world applications of shortest path algorithms; **U. Lauther**, An experimental evaluation of point-to-point shortest path calculation on road networks with precalculated edge-flags; **M. Hilger**, **E. Köhler**, **R. H. Möhring**, and **H. Schilling**, Fast point-to-point shortest path computations with arc-flags; **D. Delling**, **M. Holzer**, **K. Müller**, **F. Schulz**, and **D. Wagner**, High-performance multi-level routing; **A. V. Goldberg**, **H. Kaplan**, and **R. F. Werneck**, Reach for A*: shortest path algorithms with preprocessing; **D. Delling**, **P. Sanders**, **D. Schultes**, and **D. Wagner**, Highway hierarchies star; **H. Bast**, **S. Funke**, and **D. Matijevic**, Ultrafast shortest-path queries via transit nodes; **P. Sanders** and **D. Schultes**, Robust, almost constant time shortest-path queries in road networks; **N. Edmonds**, **A. Breuer**, **D. Gregor**, and **A. Lumsdaine**, Single-source shortest paths with the parallel boost graph library; **K. Madduri**, **D. A. Bader**, **J. W. Berry**, and **J. R. Crobak**, Parallel shortest path algorithms for solving large-scale instances; **D. Ajwani**, **U. Meyer**, and **V. Osipov**, Breadth first search on massive graphs; **C. L. Barrett**, **K. Bisset**, **M. Holzer**, **G. Konjevod**, **M. V. Marathe**, and **D. Wagner**, Engineering label-constrained shortest-path algorithms; **C. Demetrescu**, **A. V. Goldberg**, and **D. S. Johnson**, Bibliography.

DIMACS: Series in Discrete Mathematics and Theoretical Computer Science, Volume 74

August 2009, 319 pages, Hardcover, ISBN: 978-0-8218-4383-3, LC 2009012805, 2000 *Mathematics Subject Classification*: 05C90, 05C12, 05C38, 05C85, 68-06, 68W05, 68W40, 90B20, 90B18, **AMS members US\$83**, List US\$104, Order code DIMACS/74



Models of Conflict and Cooperation

Rick Gillman, *Valparaiso University, IN*, and **David Housman**, *Goshen College, IN*

Models of Conflict and Cooperation is a comprehensive, introductory, game theory text for general undergraduate students. As a textbook, it provides a new and distinctive experience for students

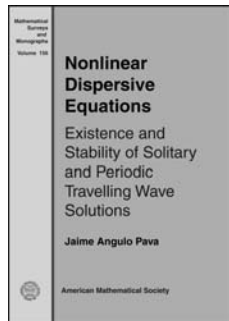
working to become quantitatively literate. Each chapter begins with a "dialogue" that models quantitative discourse while previewing the topics presented in the rest of the chapter. Subsequent sections develop the key ideas starting with basic models and ending with deep concepts and results. Throughout all of the sections, attention is given to promoting student engagement with the material through relevant models, recommended activities, and exercises. The general game models that are discussed include deterministic, strategic, sequential, bargaining, coalition, and fair division games. A separate, essential chapter discusses player preferences. All of the chapters are designed to strengthen the fundamental mathematical skills of quantitative literacy: logical reasoning, basic algebra and probability skills, geometric reasoning, and problem solving. A distinctive feature of this book is its emphasis on the process of mathematical modeling.

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

Contents: Deterministic games; Player preferences; Strategic games; Probabilistic strategies; Strategic game cooperation; Negotiation and arbitration; Coalition games; Fair division; Epilogue; Answers to selected exercises; Bibliography; Index.

October 2009, approximately 419 pages, Hardcover, ISBN: 978-0-8218-4872-2, LC 2009014906, 2000 *Mathematics Subject Classification*: 00A06, 91-01, 91A10, 91A12, 91A40, 91B08, **AMS members US\$55**, List US\$69, Order code MBK/65

Differential Equations



Nonlinear Dispersive Equations

Existence and Stability of Solitary and Periodic Travelling Wave Solutions

Jaime Angulo Pava, *IME-USP, São Paulo, Brazil*

This book provides a self-contained presentation of classical and new methods

for studying wave phenomena that are related to the existence and stability of solitary and periodic travelling wave solutions for nonlinear dispersive evolution equations. Simplicity, concrete examples, and applications are emphasized throughout in order to make the material easily accessible. The list of classical nonlinear dispersive equations studied include Korteweg-de Vries, Benjamin-Ono, and Schrödinger equations. Many special Jacobian elliptic functions play a role in these examples.

The author brings the reader to the forefront of knowledge about some aspects of the theory and motivates future developments in this fascinating and rapidly growing field. The book can be used as an instructive study guide as well as a reference by students and mature scientists interested in nonlinear wave phenomena.

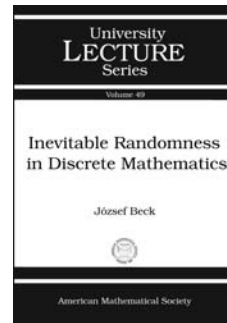
This item will also be of interest to those working in mathematical physics.

Contents: *History, basic models, and travelling waves:* Introduction and a brief review of the history; Basic models; Solitary and periodic travelling wave solutions; *Well-posedness and stability definition:* Initial value problem; Definition of stability; *Stability theory:* Orbital stability—the classical method; Grillakis-Shatah-Strauss's stability approach; *The Concentration-Compactness Principle in stability theory:* Existence and stability of solitary waves for the GBO equations; More about the Concentration-Compactness Principle; Instability of solitary wave solutions; *Stability of periodic travelling waves:* Stability of cnoidal waves; *Appendices:* Sobolev spaces and elliptic functions; Operator theory; Bibliography; Index.

Mathematical Surveys and Monographs, Volume 156

October 2009, approximately 258 pages, Hardcover, ISBN: 978-0-8218-4897-5, 2000 *Mathematics Subject Classification*: 76B25, 35Q53, 35Q55, 37K45, 76B15, 45M15; 76B55, 35B10, 34D20, 35A15, 47A10, 47A75, **AMS members US\$63**, List US\$79, Order code SURV/156

Discrete Mathematics and Combinatorics



Inevitable Randomness in Discrete Mathematics

József Beck, *Rutgers, The State University of New Jersey, Piscataway, NJ*

Mathematics has been called the science of order. The subject is remarkably good for generalizing specific cases to create

abstract theories. However, mathematics has little to say when faced with highly complex systems, where disorder reigns. This disorder can be found in pure mathematical arenas, such as the distribution of primes, the $3n + 1$ conjecture, and class field theory.

The purpose of this book is to provide examples—and rigorous proofs—of the complexity law:

- (1) discrete systems are either simple or they exhibit advanced pseudorandomness;
- (2) a priori probabilities often exist even when there is no intrinsic symmetry.

Part of the difficulty in achieving this purpose is in trying to clarify these vague statements. The examples turn out to be fascinating instances of deep or mysterious results in number theory and combinatorics.

This book considers randomness and complexity. The traditional approach to complexity—computational complexity theory—is to study very general complexity classes, such as P, NP and PSPACE. What Beck does is very different: he studies interesting concrete systems, which can give new insights into the mystery of complexity.

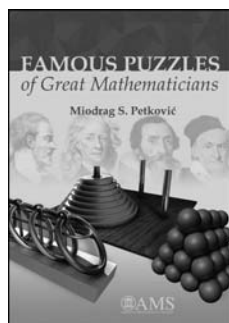
The book is divided into three parts. Part A is mostly an essay on the big picture. Part B is partly new results and partly a survey of real game theory. Part C contains new results about graph games, supporting the main conjecture. To make it accessible to a wide audience, the book is mostly self-contained.

Contents: *Reading the shadows on the wall and formulating a vague conjecture:* Complex systems; Collecting data: Apparent randomness of digit sequences; Collecting data: More randomness in number theory; Laplace and the principle of insufficient reason; Collecting proofs for the SLG conjecture; *More evidence for the SLG conjecture:* *Exact solutions in real game theory:* Ramsey theory and games; Practice session (I): More on Ramsey games and strategies; Practice session (II): Connectivity games and more strategies; What kind of games?; Exact solutions of games: Understanding via the equiprobability postulate; Equiprobability postulate with constraints (endgame policy); Constraints and threshold clustering; Threshold clustering and a few bold conjectures; *New evidence:* *Games and graphs, the surplus, and the square root law:* Yet another simplification: Sparse hypergraphs and the surplus; Is surplus the right concept? (I); Is surplus the right concept? (II); Working with a game-theoretic partition function; An attempt to save the variance; Proof of theorem 1: Combining the variance with an exponential sum; Proof of theorem 2: The upper bound; Conclusion (I): More on theorem 1; Conclusion (II): Beyond the SLG conjecture; Dictionary of phrases and concepts; References.

University Lecture Series, Volume 49

September 2009, approximately 257 pages, Softcover, ISBN: 978-0-8218-4756-5, LC 200901127, 2000 *Mathematics Subject Classification*: 60-02, 05-02, 91A46; 05D40, 11K38, **AMS members US\$47**, List US\$59, Order code ULECT/49

General and Interdisciplinary



Famous Puzzles of Great Mathematicians

Miodrag S. Petković, *University of Nis, Serbia*

This entertaining book presents a collection of 180 famous mathematical puzzles and intriguing elementary problems that great mathematicians have posed, discussed, and/or solved. The selected problems do not require

advanced mathematics, making this book accessible to a variety of readers.

Mathematical recreations offer a rich playground for both amateur and professional mathematicians. Believing that creative stimuli and aesthetic considerations are closely related, great mathematicians from ancient times to the present have always taken an interest in puzzles and diversions. The goal of this book is to show that famous mathematicians have all communicated brilliant ideas, methodological approaches, and absolute genius in mathematical thoughts by using recreational mathematics as a framework. Concise biographies of many mathematicians mentioned in the text are also included.

The majority of the mathematical problems presented in this book originated in number theory, graph theory, optimization, and probability. Others are based on combinatorial and chess problems, while still others are geometrical and arithmetical puzzles.

This book is intended to be both entertaining as well as an introduction to various intriguing mathematical topics and ideas. Certainly, many stories and famous puzzles can be very useful to prepare classroom lectures, to inspire and amuse students, and to instill affection for mathematics.

Contents: Recreational mathematics; Arithmetics; Number theory; Geometry; Tiling and packing; Physics; Combinatorics; Probability; Graphs; Chess; Miscellany; Appendices A-D; Biographies; Bibliography; Name index.

September 2009, 324 pages, Softcover, ISBN: 978-0-8218-4814-2, 2000 *Mathematics Subject Classification*: 00A08, 97A20, 01A05, 01A70, 05A05, 05C45, 05C90, 11D04, 11D09, 51E10, 51M16, 52C15, 52C22, 97D40, **AMS members US\$29**, List US\$36, Order code MBK/63



Poincaré's Legacies, Part I

pages from year two of a mathematical blog

Terence Tao, *University of California, Los Angeles, CA*

There are many bits and pieces of folklore in mathematics that are passed down from advisor to student, or from collaborator

to collaborator, but which are too fuzzy and non-rigorous to be discussed in the formal literature. Traditionally, it was a matter of luck and location as to who learned such folklore mathematics. But today, such bits and pieces can be communicated effectively and efficiently via the semiformal medium of research blogging. This book grew from such a blog.

In 2007, Terry Tao began a mathematical blog to cover a variety of topics, ranging from his own research and other recent developments in mathematics, to lecture notes for his classes, to non-technical puzzles and expository articles. The articles from the first year of that blog have already been published by the AMS. The posts from 2008 are being published in two volumes.

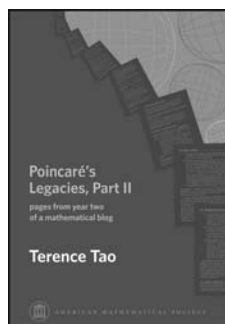
This book is Part I of the second-year posts, focusing on ergodic theory, combinatorics, and number theory. Chapter 2 consists of lecture notes from Tao's course on topological dynamics and ergodic theory. By means of various correspondence principles, recurrence theorems about dynamical systems are used to prove some deep theorems in combinatorics and other areas of mathematics. The lectures are as self-contained as possible, focusing more on the "big picture" than on technical details.

In addition to these lectures, a variety of other topics are discussed, ranging from recent developments in additive prime number theory to expository articles on individual mathematical topics such as the law of large numbers and the Lucas-Lehmer test for Mersenne primes. Some selected comments and feedback from blog readers have also been incorporated into the articles.

The book is suitable for graduate students and research mathematicians interested in broad exposure to mathematical topics.

Contents: Expository articles; Ergodic theory; Lectures in additive prime number theory; Bibliography; Index.

August 2009, 293 pages, Softcover, ISBN: 978-0-8218-4883-8, LC 2009009832, 2000 *Mathematics Subject Classification*: 00A99, **AMS members US\$31**, List US\$39, Order code MBK/66



Poincaré's Legacies, Part II

pages from year two of a mathematical blog

Terence Tao, *University of California, Los Angeles, CA*

There are many bits and pieces of folklore in mathematics that are passed down from advisor to student, or from collaborator to collaborator, but which are too fuzzy and non-rigorous to be discussed in the formal literature. Traditionally, it was a matter of

luck and location as to who learned such folklore mathematics. But today, such bits and pieces can be communicated effectively and efficiently via the semiformal medium of research blogging. This book grew from such a blog.

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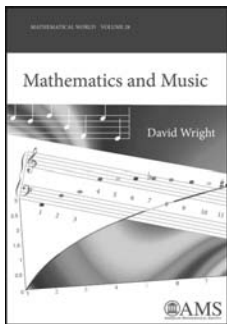
This book is Part II of the second-year posts, focusing on geometry, topology, and partial differential equations. The major part of the book consists of lecture notes from Tao's course on the Poincaré conjecture and its recent spectacular solution by Perelman. The course incorporates a review of many of the basic concepts and results needed from Riemannian geometry and, to a lesser extent, from parabolic PDE. The aim is to cover in detail the high-level features of the argument, along with selected specific components of that argument, while sketching the remaining elements, with ample references to more complete treatments. The lectures are as self-contained as possible, focusing more on the "big picture" than on technical details.

In addition to these lectures, a variety of other topics are discussed, including expository articles on topics such as gauge theory, the Kakeya needle problem, and the Black-Scholes equation. Some selected comments and feedback from blog readers have also been incorporated into the articles.

The book is suitable for graduate students and research mathematicians interested in broad exposure to mathematical topics.

Contents: Expository articles; The Poincaré conjecture; Bibliography; Index.

September 2009, 292 pages, Softcover, ISBN: 978-0-8218-4885-2, LC 2009009832, 2000 *Mathematics Subject Classification:* 00A99, **AMS members US\$31**, List US\$39, Order code MBK/67



Mathematics and Music

David Wright, *Washington University, St. Louis, MO*

Many people intuitively sense that there is a connection between mathematics and music. If nothing else, both involve counting. There is, of course, much more to the association. David Wright's book is an investigation of the interrelationships

between mathematics and music, reviewing the needed background concepts in each subject as they are encountered. Along the way, readers will augment their understanding of both mathematics and music.

The text explores the common foundations of the two subjects, which are developed side by side. Musical and mathematical notions are brought together, such as scales and modular arithmetic, intervals and logarithms, tone and trigonometry, and timbre and harmonic analysis. When possible, discussions of musical and mathematical notions are directly interwoven. Occasionally the discourse dwells for a while on one subject and not the other, but eventually the connection is established, making this an integrative treatment of the two subjects.

The book is a text for a freshman level college course suitable for musically inclined or mathematically inclined students, with the intent of breaking down any apprehension that either group might have for the other subject. Exercises are given at the end of each chapter. The mathematical prerequisites are a high-school level familiarity with algebra, trigonometry, functions, and graphs. Musically, the student should have had some exposure to musical staffs, standard clefs, and key signatures, though all of these are explained in the text.

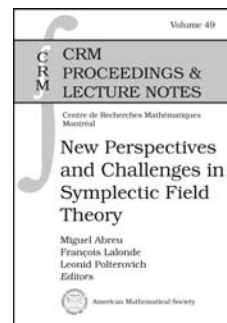
This item will also be of interest to those working in applications.

Contents: Basic mathematical and musical concepts; Horizontal structure; Harmony and related numerology; Ratios and musical intervals; Logarithms and musical intervals; Chromatic scales; Octave identification and modular arithmetic; Algebraic properties of the integers; The integers as intervals; Timbre and periodic functions; The rational numbers as musical intervals; Tuning the scale to obtain rational intervals; Bibliography; Index.

Mathematical World, Volume 28

September 2009, 161 pages, Softcover, ISBN: 978-0-8218-4873-9, LC 2009014813, 2000 *Mathematics Subject Classification:* 00-01, 00A06, **AMS members US\$28**, List US\$35, Order code MAWRLD/28

Geometry and Topology



New Perspectives and Challenges in Symplectic Field Theory

Miguel Abreu, *Instituto Superior Técnico, Lisbon, Portugal*,
François Lalonde, *Université de Montréal, QC, Canada*, and
Leonid Polterovich, *Tel Aviv University, Israel*, Editors

This volume, in honor of Yakov Eliashberg, gives a panorama of some of the most fascinating recent developments in symplectic, contact and gauge theories. It contains research papers aimed at experts, as well as a series of skillfully written surveys accessible for a broad geometrically oriented readership from the graduate level onwards. This collection will serve as an enduring source of information and ideas for those who want to enter this exciting area as well as for experts.

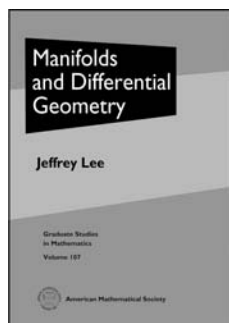
Titles in this series are co-published with the Centre de Recherches Mathématiques.

Contents: P. Biran and O. Cornea, A Lagrangian quantum homology; F. Bourgeois, A survey of contact homology; Y. Chekanov, O. van Koert, and F. Schlenk, Minimal atlases of closed contact manifolds; K. Cieliebak and J. Latschev, The role of string topology in symplectic field theory; R. L. Cohen and M. Schwarz, A Morse theoretic description of string topology; T. Ekholm, A version of rational SFT for exact Lagrangian cobordisms in 1-jet spaces; K. Fukaya, Y.-G. Oh, H. Ohta, and K. Ono, Canonical models of filtered A_∞ -algebras and Morse complexes; R. E. Gompf, Constructing Stein manifolds after

Eliashberg; **S. Hohloch**, **G. Noetzel**, and **D. A. Salamon**, Floer homology groups in hyperkähler geometry; **M. Hutchings**, The embedded contact homology index revisited; **F. Laudenchbach**, Positive Legendrian regular homotopies; **T.-J. Li** and **Y. Ruan**, Symplectic birational geometry; **R. Lipshitz**, Heegaard Floer homology, double points and nice diagrams.

CRM Proceedings & Lecture Notes, Volume 49

September 2009, approximately 345 pages, Softcover, ISBN: 978-0-8218-4356-7, LC 2009022007, 2000 *Mathematics Subject Classification*: 53D40, 53D45, 53D05, 53D10, 53D12, 53D35; 37J05, 58J05, 58J20, 34C25, **AMS members US\$92**, List US\$115, Order code CRMP/49



Manifolds and Differential Geometry

Jeffrey Lee, *Texas Tech University, Lubbock, TX*

Differential geometry began as the study of curves and surfaces using the methods of calculus. In time, the notions of curve and surface were generalized along with associated notions such as length, volume, and curvature. At the same time the topic

has become closely allied with developments in topology. The basic object is a smooth manifold, to which some extra structure has been attached, such as a Riemannian metric, a symplectic form, a distinguished group of symmetries, or a connection on the tangent bundle.

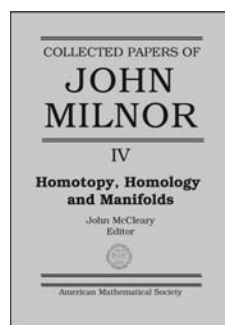
This book is a graduate-level introduction to the tools and structures of modern differential geometry. Included are the topics usually found in a course on differentiable manifolds, such as vector bundles, tensors, differential forms, de Rham cohomology, the Frobenius theorem and basic Lie group theory. The book also contains material on the general theory of connections on vector bundles and an in-depth chapter on semi-Riemannian geometry that covers basic material about Riemannian manifolds and Lorentz manifolds. An unusual feature of the book is the inclusion of an early chapter on the differential geometry of hypersurfaces in Euclidean space. There is also a section that derives the exterior calculus version of Maxwell's equations.

The first chapters of the book are suitable for a one-semester course on manifolds. There is more than enough material for a year-long course on manifolds and geometry.

Contents: Differentiable manifolds; The tangent structure; Immersion and submersion; Curves and hypersurfaces in Euclidean space; Lie groups; Fiber bundles; Tensors; Differential forms; Integration and Stokes' theorem; De Rham cohomology; Distributions and Frobenius' theorem; Connections and covariant derivatives; Riemannian and semi-Riemannian geometry; The language of category theory; Topology; Some calculus theorems; Modules and multilinearity; Bibliography; Index.

Graduate Studies in Mathematics, Volume 107

November 2009, approximately 675 pages, Hardcover, ISBN: 978-0-8218-4815-9, LC 2009012421, 2000 *Mathematics Subject Classification*: 58A05, 58A10, 53C05, 22E15, 53C20, 53B30, 55R10, 53Z05, **AMS members US\$71**, List US\$89, Order code GSM/107



Collected Papers of John Milnor

IV. Homotopy, Homology and Manifolds

John McCleary, *Vassar College, Poughkeepsie, NY*, Editor

The development of algebraic topology in the 1950's and 1960's was deeply influenced by the work of Milnor. In this

collection of papers the reader finds those original papers and some previously unpublished works. The book is divided into four parts: Homotopy Theory, Homology and Cohomology, Manifolds, and Expository Papers. Introductions to each part provide some historical context and subsequent development. Of particular interest are the articles on classifying spaces, the Steenrod algebra, the introductory notes on foliations and the surveys of work on the Poincaré conjecture.

Together with the previously published volumes I-III of the Collected Works by John Milnor, volume IV provides a rich portion of the most important developments in geometry and topology from those decades.

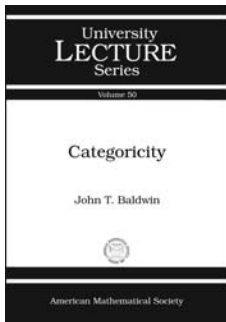
This volume is highly recommended to a broad mathematical audience, and, in particular, to young mathematicians who will certainly benefit from their acquaintance with Milnor's mode of thinking and writing.

Contents: *Part 1: Homotopy theory:* Introduction to Part 1: homotopy theory; Construction of universal bundles, I; Construction of universal bundles, II; The geometric realization of a semi-simplicial complex; On spaces having the homotopy type of a CW-complex; On the construction of FK ; *Part 2: Cohomology and homology:* Introduction to Part 2: cohomology and homology; The Steenrod algebra and its dual; On the Steenrod homology theory; On axiomatic homology theory; (with **M. G. Barratt**), An example of anomalous singular homology; (with **G. Lusztig** and **F. P. Peterson**), Semi-characteristics and cobordism; On the homology of Lie groups made discrete; *Part 3: Manifolds:* Introduction to Part 3: Manifolds; On the immersion of n -manifolds in $(n+1)$ -space; On simply connected 4-manifolds; (with **M. Kervaire**), On 2-spheres in 4-manifolds; (with **E. Spanier**), Two remarks on fiber homotopy type; Microbundles and differentiable structures; Topological manifolds and smooth manifolds; Microbundles. I; On characteristic classes for spherical fibre spaces; *Part 4: Expository papers:* Introduction to Part 4: Expository papers; The work of J. H. C. Whitehead; Foliation and foliated vector bundles; The work of M. H. Freedman; Towards the Poincaré conjecture and the classification of 3-manifolds; The Poincaré conjecture one hundred years later; Fifty years ago: topology of manifolds in the 50's and 60's; Bibliography; Index.

Collected Works, Volume 19

October 2009, approximately 357 pages, Hardcover, ISBN: 978-0-8218-4475-5, 2000 *Mathematics Subject Classification*: 55-XX, 57-XX, **AMS members US\$63**, List US\$79, Order code CWORKS/19.4

Logic and Foundations



Categoricity

John T. Baldwin, University of Illinois at Chicago, IL

Modern model theory began with Morley's categoricity theorem: A countable first-order theory that has a unique (up to isomorphism) model in one uncountable cardinal (i.e., is categorical in cardinality) if and only if the same holds in all uncountable cardinals. Over the last 35 years Shelah made great strides in

extending this result to infinitary logic, where the basic tool of compactness fails. He invented the notion of an Abstract Elementary Class to give a unifying semantic account of theories in first-order, infinitary logic and with some generalized quantifiers. Zilber developed similar techniques of infinitary model theory to study complex exponentiation.

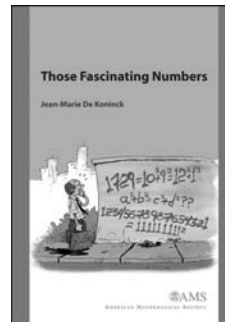
This book provides the first unified and systematic exposition of this work. The many examples stretch from pure model theory to module theory and covers of Abelian varieties. Assuming only a first course in model theory, the book expounds eventual categoricity results (for classes with amalgamation) and categoricity in excellent classes. Such crucial tools as Ehrenfeucht-Mostowski models, Galois types, tameness, omitting-types theorems, multi-dimensional amalgamation, atomic types, good sets, weak diamonds, and excellent classes are developed completely and methodically. The (occasional) reliance on extensions of basic set theory is clearly laid out. The book concludes with a set of open problems.

Contents: *Part 1. Quasiminimal excellence and complex exponentiation:* Combinatorial geometries and infinitary logics; Abstract quasiminimality; Covers of the multiplicative group of \mathbb{C} ; *Part 2. Abstract elementary classes:* Abstract elementary classes; Two basic results about $L_{\omega_1, \omega}(Q)$; Categoricity implies completeness; A model in \aleph_2 ; *Part 3. Abstract elementary classes with arbitrarily large models:* Galois types, saturation, and stability; Brimful models; Special, limit and saturated models; Locality and tameness; Splitting and minimality; Upward categoricity transfer; Omitting types and downward categoricity; Unions of saturated models; Life without amalgamation; Amalgamation and few models; *Part 4. Categoricity in $L_{\omega_1, \omega}$:* Atomic AEC; Independence in ω -stable classes; Good systems; Excellence goes up; Very few models implies excellence; Very few models implies amalgamation over pairs; Excellence and $*$ -excellence; Quasiminimal sets and categoricity transfer; Demystifying non-excellence; Appendix A. Morley's omitting types theorem; Appendix B. Omitting types in uncountable models; Appendix C. Weak diamonds; Appendix D. Problems; Bibliography; Index.

University Lecture Series, Volume 50

August 2009, 235 pages, Softcover, ISBN: 978-0-8218-4893-7, LC 2009018740, 2000 *Mathematics Subject Classification:* 03C30, 03C45, 03C52, 03C60, 03C75, 03C95, 03C98, **AMS members US\$44**, List US\$55, Order code ULECT/50

Number Theory



Those Fascinating Numbers

Jean-Marie De Koninck, Université Laval, Quebec, QC, Canada

Translated by Jean-Marie De Koninck

Who would have thought that listing the positive integers along with their most remarkable properties could end up being

such an engaging and stimulating adventure? The author uses this approach to explore elementary and advanced topics in classical number theory. A large variety of numbers are contemplated: Fermat numbers, Mersenne primes, powerful numbers, sublime numbers, Wieferich primes, insolite numbers, Sastry numbers, voracious numbers, to name only a few. The author also presents short proofs of miscellaneous results and constantly challenges the reader with a variety of old and new number theory conjectures.

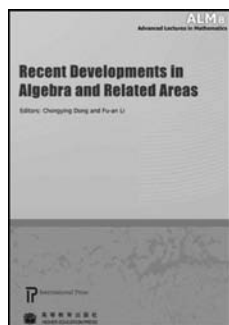
This book becomes a platform for exploring new concepts such as the index of composition and the index of isolation of an integer. In addition, the book displays several tables of particular families of numbers, including the list of all 88 narcissistic numbers and the list of the eight known numbers which are not prime powers but which can be written as the sum of the cubes of their prime factors, and in each case with the algorithm used to create them.

Contents: Those fascinating numbers; Appendix: The prime numbers < 10000 ; Bibliography; Index.

August 2009, 426 pages, Softcover, ISBN: 978-0-8218-4807-4, LC 2009012806, 2000 *Mathematics Subject Classification:* 11-00, 11A05, 11A25, 11A41, 11A51, 11K65, 11N05, 11N25, 11N37, 11N56, **AMS members US\$39**, List US\$49, Order code MBK/64

New AMS-Distributed Publications

Algebra and Algebraic Geometry



Recent Developments in Algebra and Related Areas

Chongying Dong, *University of California, Santa Cruz, CA*, and **Fu-an Li**, *Chinese Academy of Sciences, Beijing, China*, Editors

This volume contains fifteen articles presented at the International Conference on Algebra and Related Areas held at

Tsinghua University, Beijing, in August 2007. Some are surveys and others are research papers on topics including algebraic geometry, combinatorics, coding theory, Lie algebras, representation theory of finite groups and algebraic groups, and vertex operator algebras, with their applications. This volume is intended for researchers and graduate students in algebra and related areas.

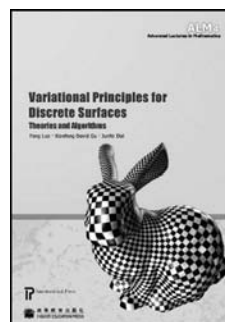
A publication of International Press. Distributed worldwide by the American Mathematical Society.

Contents: Eiichi and Etsuko Bannai, Spherical designs and Euclidean designs; Y. Chen, Minimal representation degree of affine Kac-Moody groups; H. Chu, S.-J. Hu, and M.-C. Kang, A rationality problem of certain A_4 action; Z. Dai, K. Wang, and D. Ye, Characterization of multi-continued fractions for multi-formal Laurent series; Y. Fang and Z. Lin, Eulerian trails and Hamiltonian paths in digraphs with anti-involutions; R. Feng and H. Wu, Efficient pairing computation on curves; W. Guo, Some ideas and results in group theory; T. Huang, L. Huang, and M.-I. Lin, On a class of strongly regular designs and quasi-semisymmetric designs; H. Li, Γ -leading homogeneous algebras and Gröbner bases; J. Liu and K. Zhao, Automorphism groups of Lie algebras from quantum tori; Y. Su, Quasifinite representations of some Lie algebras related to the Virasoro algebra; G. Szeto and L. Xue, On Galois extensions with an inner Galois group; N. Xi, Representations of algebraic groups: Some basics and progresses; J. Zhang and Z. Zhang, Broué's conjecture for finite groups with abelian Sylow p -subgroups; S. Zhou and D. Lin, An interesting member ID-based group signature; Curriculum vitae and publications of Zhexian Wan.

International Press

February 2009, 317 pages, Softcover, ISBN: 978-1-57146-135-3, 2000 *Mathematics Subject Classification*: 03-XX, **AMS members US\$46**, List US\$58, Order code INPR/79

Analysis



Variational Principles for Discrete Surfaces

Junfel Dai, *Zhejiang University, China*, **Xianfeng David Gu**, *SUNY at Stony Brook, NY*, and **Feng Luo**, *Rutgers University, New Brunswick, NJ*, Editors

This volume introduces readers to some of the current topics of research in the geometry of polyhedral surfaces, with applications to computer graphics. The main feature of the volume is a systematic introduction to the geometry of polyhedral surfaces based on the variational principle. The authors focus on using analytic methods in the study of some of the fundamental results and problems of polyhedral geometry: for instance, the Cauchy rigidity theorem, Thurston's circle packing theorem, rigidity of circle packing theorems, and Colin de Verdière's variational principle. This book is the first complete treatment of the vast, and expansively developed, field of polyhedral geometry.

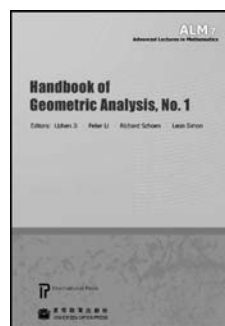
This item will also be of interest to those working in geometry and topology.

A publication of International Press. Distributed worldwide by the American Mathematical Society.

Contents: Introduction; Spherical geometry and Cauchy rigidity theorem; A brief introduction to hyperbolic geometry; The cosine law and polyhedral surfaces; Spherical polyhedral surfaces and Legendre transformation; Rigidity of Euclidean polyhedral surfaces; Polyhedral surfaces of circle packing type; Non-negative curvature metrics and Delaunay polytopes; A brief introduction to Teichmüller space; Parameterizations of Teichmüller spaces; Surface Ricci flow; Geometric structure; Shape acquisition and representation; Discrete Ricci flow; Hyperbolic Ricci flow; Reference; Index.

International Press

August 2008, 146 pages, Hardcover, ISBN: 978-1-57146-172-8, 2000 *Mathematics Subject Classification*: 52C99, **AMS members US\$34**, List US\$42, Order code INPR/77



Handbook of Geometric Analysis Number 1

Lizhen Ji, *University of Michigan, Ann Arbor, MI*, **Peter Li**, *University of California, Irvine, CA*, and **Richard Schoen** and **Leon Simon**, *Stanford University, CA*, Editors

This handbook of geometric analysis—the first of two to be published in the Advanced Lectures in Mathematics series—presents introductions and survey papers treating important topics in geometric analysis, with their applications to

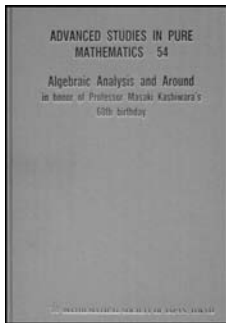
related fields. It can be used as a reference by graduate students and by researchers in related areas.

A publication of International Press. Distributed worldwide by the American Mathematical Society.

Contents: R. S. Bunch and S. K. Donaldson, Numerical approximations to extremal metrics on toric surfaces; S. K. Donaldson, Kähler geometry on toric manifolds, and some other manifolds with large symmetry; M. Haskins and N. Kapouleas, Gluing constructions of special Lagrangian cones; J. Jost, Harmonic mappings; P. Li, Harmonic functions on complete Riemannian manifolds; F. H. Lin, Complexity of solutions of partial differential equations; F. Luo, Variational principles on triangulated surfaces; T. Mabuchi, Asymptotic structures in the geometry of stability and extremal metrics; W. H. Meeks III, J. Pérez, and A. Ros, Stable constant mean curvature surfaces; L. Simon, A general asymptotic decay lemma for elliptic problems; L.-F. Tam, Uniformization of open nonnegatively curved Kähler manifolds in higher dimensions; T. Toro, Geometry of measures: Harmonic analysis meets geometric measure theory; M.-T. Wang, Lectures on mean curvature flows in higher codimensions; S. Zelditch, Local and global analysis of eigenfunctions on Riemannian manifolds; K. Zuo, Yau's form of Schwarz lemma and Arakelov inequality on moduli spaces of projective manifolds.

International Press

August 2008, 676 pages, Hardcover, ISBN: 978-1-57146-130-8, 2000 *Mathematics Subject Classification*: 01-02, **AMS members US\$78**, List US\$97, Order code INPR/78



Algebraic Analysis and Around

In Honor of Professor Masaki Kashiwara's 60th Birthday

Tetsuji Miwa, *Kyoto University, Japan*, Atsushi Matsuo, *University of Tokyo, Japan*, Toshiki Nakashima, *Sophia*

University, Tokyo, Japan, and Yoshihisa Saito, *University of Tokyo, Japan*, Editors

This volume is the proceedings of the conference "Algebraic Analysis and Around", in honor of Professor Masaki Kashiwara's 60th birthday. The conference was held in Kyoto in June 2007.

Most of the papers are based on talks given at the conference, and the subjects discussed include D -modules, micro-local analysis, representation theory, integrable systems, to which Kashiwara's contribution and influence are really profound. The readers may find groundbreaking materials for the future in mathematics.

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

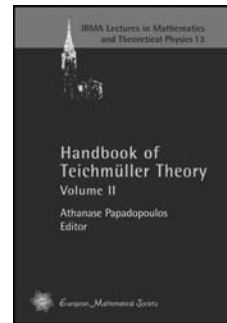
Published for the Mathematical Society of Japan by Kinokuniya, Tokyo, and distributed worldwide, except in Japan, by the AMS.

Contents: P. Schapira, Masaki Kashiwara and algebraic analysis; T. Tanisaki, Masaki Kashiwara and representation theory; T. Aoki, T. Kawai, and Y. Takei, The Bender-Wu analysis and the Voros theory. II; A. Boysal and S. Kumar, A conjectural presentation of fusion algebras; B. Feigin, E. Feigin, M. Jimbo,

T. Miwa, and E. Mukhin, Principal $\widehat{\mathfrak{sl}}_3$ subspaces and quantum Toda Hamiltonian; E. Frenkel and D. Gaietsgory, Local geometric Langlands correspondence: The spherical case; K. Kato, C. Nakayama, and S. Usui, Classifying spaces of degenerating mixed Hodge structures, I: Borel-Serre spaces; T. Mochizuki, Good formal structure for meromorphic flat connections on smooth projective surfaces; P.-E. Paradan and M. Vergne, Quillen's relative Chern character; C. Sabbah, Wild twister D -modules; M. Saito, On b -function, spectrum and multiplier ideals.

Advanced Studies in Pure Mathematics, Volume 54

February 2009, 379 pages, Hardcover, ISBN: 978-4-931469-51-8, 2000 *Mathematics Subject Classification*: 32C38; 17B67, 17B80, 32S35, **AMS members US\$49**, List US\$61, Order code ASPM/54



Handbook of Teichmüller Theory

Volume II

Athanase Papadopoulos, *Université de Strasbourg, France*, Editor

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.

The volume has 19 chapters and is divided into four parts:

- The metric and the analytic theory (uniformization, Weil-Petersson geometry, holomorphic families of Riemann surfaces, infinite-dimensional Teichmüller spaces, cohomology of moduli space, and the intersection theory of moduli space).
- The group theory (quasi-homomorphisms of mapping class groups, measurable rigidity of mapping class groups, applications to Lefschetz fibrations, affine groups of flat surfaces, braid groups, and Artin groups).
- Representation spaces and geometric structures (trace coordinates, invariant theory, complex projective structures, circle packings, and moduli spaces of Lorentz manifolds homeomorphic to the product of a surface with the real line).
- The Grothendieck-Teichmüller theory (dessins d'enfants, Grothendieck's reconstruction principle, and the Teichmüller theory of the solenoid).

This handbook is an essential reference for graduate students and researchers interested in Teichmüller theory and its ramifications, in particular for mathematicians working in topology, geometry, algebraic geometry, dynamical systems and complex analysis.

The authors are leading experts in the field.

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

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

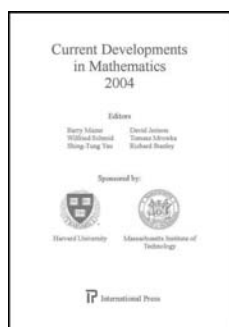
Contents: A. Papadopoulos, Introduction to Teichmüller theory, old and new; Part A. *The metric and the analytic theory*, 2:

S. A. Wolpert, The Weil–Petersson metric geometry; A. Fletcher and V. Markovic, Infinite dimensional Teichmüller spaces; Y. Imayoshi, A construction of holomorphic families of Riemann surfaces over the punctured disk with given monodromy; R. Silhol, The uniformization problem; G. Mondello, Riemann surfaces, ribbon graphs and combinatorial classes; N. Kawazumi, Canonical 2-forms on the moduli space of Riemann surfaces; *Part B. The group theory, 2*: K. Fujiwara, Quasi-homomorphisms on mapping class groups; M. Korkmaz and A. Stipsicz, Lefschetz fibrations on 4-manifolds; Y. Kida, Introduction to measurable rigidity of mapping class groups; M. Möller, Affine groups of flat surfaces; L. Paris, Braid groups and Artin groups; *Part C. Representation spaces and geometric structures, 1*: D. Dumas, Complex projective structures; S. Kojima, Circle packing and Teichmüller space; R. Benedetti and F. Bonsante, $(2 + 1)$ Einstein spacetimes of finite type; W. M. Goldman, Trace coordinates on Fricke spaces of some simple hyperbolic surfaces; S. Lawton and E. Peterson, Spin networks and $SL(2, \mathbb{C})$ -character varieties; *Part D. The Grothendieck–Teichmüller theory*: F. Luo, Grothendieck’s reconstruction principle and 2-dimensional topology and geometry; F. Herrlich and G. Schmühsen, Dessins d’enfants and origami curves; D. Šarić, The Teichmüller theory of the solenoid; List of contributors; Index.

IRMA Lectures in Mathematics and Theoretical Physics, Volume 13

March 2009, 883 pages, Hardcover, ISBN: 978-3-03719-055-5, 2000 *Mathematics Subject Classification*: 30-00, 32-00, 32G15, 30F60, **AMS members US\$102**, List US\$128, Order code EMSILMTP/13

General and Interdisciplinary



Current Developments in Mathematics, 2004

Barry Mazur, Wilfried Schmid, and Shing-Tung Yau, *Harvard University, Cambridge, MA*, and David Jerison, Tomasz Mrowka, and Richard P. Stanley, *Massachusetts Institute of*

Technology, Cambridge, MA, Editors

The Current Developments in Mathematics (CDM) conference is an annual seminar, jointly hosted by Harvard University and the Massachusetts Institute of Technology, and devoted to surveying the most recent developments in mathematics. In choosing speakers, the hosts take a broad look at the field of geometry and select geometers who transcend classical perceptions within their field. All speakers are prominent specialists in the fields of algebraic geometry, mathematical physics, and other areas. International Press is pleased to present the full contents of these proceedings in the CDM book series.

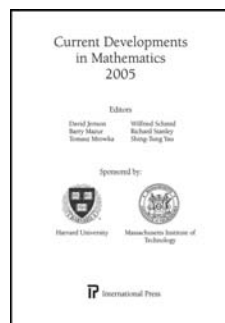
A publication of International Press. Distributed worldwide by the American Mathematical Society.

Contents: H. Hofer, A general Fredholm theory and applications; L. Caffarelli, A homogenization method for nonvariational problems; W. Meeks III, Applications of minimal surfaces to the

topology of three-manifolds; E. Lindenstrauss, Adelic dynamics and arithmetic quantum unique ergodicity; C. Skinner, Main conjectures and modular forms.

International Press

June 2006, 161 pages, Hardcover, ISBN: 978-1-57146-105-6, 2000 *Mathematics Subject Classification*: 00Bxx, **AMS members US\$55**, List US\$69, Order code INPR/80



Current Developments in Mathematics, 2005

Barry Mazur, Wilfried Schmid, and Shing-Tung Yau, *Harvard University, Cambridge, MA*, and David Jerison, Tomasz Mrowka, and Richard P. Stanley, *Massachusetts Institute of*

Technology, Cambridge, MA, Editors

The Current Developments in Mathematics (CDM) conference is an annual seminar, jointly hosted by Harvard University and the Massachusetts Institute of Technology, and devoted to surveying the most recent developments in mathematics. In choosing speakers, the hosts take a broad look at the field of geometry and select geometers who transcend classical perceptions within their field. All speakers are prominent specialists in the fields of algebraic geometry, mathematical physics, and other areas. International Press is pleased to present the full contents of these proceedings in the CDM book series.

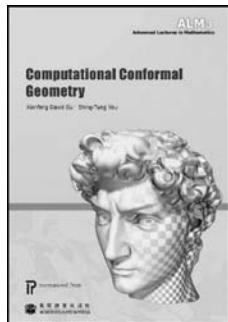
A publication of International Press. Distributed worldwide by the American Mathematical Society.

Contents: E. D. Hoker and D. H. Phong, Complex geometry and supergeometry; D. Sullivan, String topology: Background and present state; E. H. Lieb, The stability of matter and quantum electrodynamics; J.-Y. Cai, Holographic algorithm; S. DeBacker, The fundamental lemma: What is it and what do we know?; P. W. Shor, The additivity conjecture in quantum information theory; M. Kisin, Modularity of 2-dimensional Galois representations.

International Press

January 2008, 230 pages, Hardcover, ISBN: 978-1-57146-166-7, 2000 *Mathematics Subject Classification*: 00Bxx, **AMS members US\$55**, List US\$69, Order code INPR/81

Geometry and Topology



Computational Conformal Geometry

Xianfeng David Gu, *SUNY at Stony Brook, NY*, and **Shing-Tung Yau**, *Harvard University, Cambridge, MA*, Editors

Computational conformal geometry is an emerging inter-disciplinary field, with applications to algebraic topology, differential geometry and Riemann

surface theories applied to geometric modeling, computer graphics, computer vision, medical imaging, visualization, scientific computation, and many other engineering fields.

This volume presents thorough introductions to the theoretical foundations—as well as to the practical algorithms—of computational conformal geometry. These have direct applications to engineering and digital geometric processing, including surface parameterization, surface matching, brain mapping, 3-D face recognition and identification, facial expression and animation, dynamic face tracking, mesh-spline conversion, and more.

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

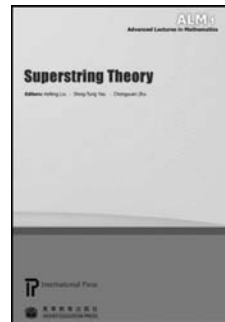
A publication of International Press. Distributed worldwide by the American Mathematical Society.

Contents: *Introduction:* Overview of theories; Algorithms for computing conformal mappings; Applications; Further readings; *Part I. Theories:* Homotopy group; Homology and cohomology; Exterior differential calculus; Differential geometry of surfaces; Riemann surface; Harmonic maps and surface Ricci flow; Geometric structure; *Part II. Algorithms:* Topological algorithms; Algorithms for harmonic maps; Harmonic forms and holomorphic forms; Discrete Ricci flow; Appendix A: Major algorithms; Appendix B: Acknowledgement; Reference; Index.

International Press

July 2008, 295 pages, Hardcover, ISBN: 978-1-57146-171-1, 2000 *Mathematics Subject Classification:* 68U05, **AMS members US\$71**, List US\$89, Order code INPR/76

Mathematical Physics



Superstring Theory

Kefeng Liu, *University of California, Los Angeles, CA*, **Shing-Tung Yau**, *Harvard University, Cambridge, MA*, and **Chongyuan Zhu**, *Chinese Academy of Sciences, Beijing, China*, Editors

Interest in string theory is driven largely by the hope that it will evolve to be the

ultimate “Theory of Everything”. Work on string theory has led to advances in many branches of mathematics. This rapidly developing subject is one of the mainstream topics of mathematics in the 21st century.

This volume presents lectures from the important String Theory International Conference held in 2002 in Hangzhou, China. These include talks given by several mathematicians of particular prominence in the field, among them Stephen Hawking and Edward Witten.

A publication of International Press. Distributed worldwide by the American Mathematical Society.

Contents: **S. Hawking**, Brane new world; **E. Witten**, Gauge theory and gravity; **E. Witten**, Easing into QFT; **A. Strominger**, Open string creation by S-brane; **S. Ferrara**, Duality, gauging and superHiggs effect in string and M-theory; **T. Eguchi** and **K. Sakai**, Seiberg–Witten curve for the E-string theory; **L. Dolan** and **C. R. Nappi**, Strings and noncommutativity; **E. D’Hoker** and **D. H. Phong**, Lectures on two-loop superstrings; **E. D’Hoker**, **I. Krichever**, and **D. H. Phong**, Seiberg–Witten theory, symplectic forms, and Hamiltonian theory of solitons; **Z.-Z. Xing**, Quark mass hierarchy and flavor mixing in orbifold models; **S. Gukov**, M-theory on manifolds with exceptional holonomy; **R. P. Thomas**, Stability conditions and the braid group; **R.-G. Cai**, Some remarks on constant curvature spaces; **S. Hosono**, Fourier–Mukai partners and mirror symmetry of K3 surfaces; **S. Hosono**, Counting BPS states via holomorphic anomaly equations; **Y.-H. Gao**, Symmetries, matrices, and de sitter gravity; **M. Li**, Correspondence principle in a PP-wave background; **B. Wang**, Support of dS/CFT correspondence from spacetime perturbations; **C.-J. Gao** and **Y.-G. Shen**, Quintessence cosmology in the Brans–Dicke theory; **X.-H. Ge** and **Y.-G. Shen**, Entropy in the NUT–Kerr–Newman black holes due to an arbitrary spin field.

International Press

August 2008, 348 pages, Hardcover, ISBN: 978-1-57146-131-5, 2000 *Mathematics Subject Classification:* 83E30, **AMS members US\$36**, List US\$45, Order code INPR/75