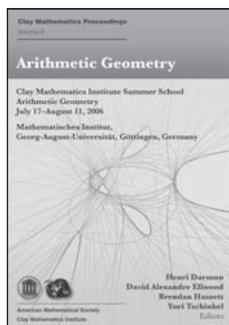


# New Publications Offered by the AMS

To subscribe to email notification of new AMS publications,  
please go to <http://www.ams.org/bookstore-email>.

## Algebra and Algebraic Geometry



### Arithmetic Geometry

**Henri Darmon**, *McGill University, Montreal, Quebec, Canada*,  
**David Alexandre Ellwood**,  
*Clay Mathematics Institute, Cambridge, MA*, **Brendan Hassett**, *Rice University, Houston, TX*, and **Yuri Tschinkel**, *Courant Institute of Mathematical Sciences, New York University, NY*, Editors

This book is based on survey lectures given at the 2006 Clay Summer School on Arithmetic Geometry at the Mathematics Institute of the University of Göttingen. Intended for graduate students and recent Ph.D.'s, this volume will introduce readers to modern techniques and outstanding conjectures at the interface of number theory and algebraic geometry.

The main focus is rational points on algebraic varieties over non-algebraically closed fields. Do they exist? If not, can this be proven efficiently and algorithmically? When rational points do exist, are they finite in number and can they be found effectively? When there are infinitely many rational points, how are they distributed?

For curves, a cohesive theory addressing these questions has emerged in the last few decades. Highlights include Faltings' finiteness theorem and Wiles's proof of Fermat's Last Theorem. Key techniques are drawn from the theory of elliptic curves, including modular curves and parametrizations, Heegner points, and heights.

The arithmetic of higher-dimensional varieties is equally rich, offering a complex interplay of techniques including Shimura varieties, the minimal model program, moduli spaces of curves and maps, deformation theory, Galois cohomology, harmonic analysis, and automorphic functions. However, many foundational questions about the structure of rational points remain open, and research tends to focus on properties of specific classes of varieties.

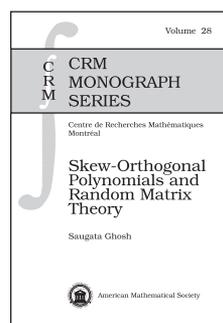
*This item will also be of interest to those working in number theory.*

Titles in this series are co-published with the Clay Mathematics Institute (Cambridge, MA).

**Contents:** **N. Elkies**, About the cover: Rational curves on a K3 surface; *Curves:* **H. Darmon**, Rational points on curves; **H. Chabdelaine**, Non-abelian descent and the generalized Fermat equation; **M. Rebolledo**, Merel's theorem on the boundedness of the torsion of elliptic curves; **P. Charollois**, Generalized Fermat equations (d'après Halberstadt-Kraus); **S. Dasgupta** and **J. Voight**, Heegner points and Sylvester's conjecture; **J. Voight**, Shimura curve computations; **M. Greenberg**, Computing Heegner points arising from Shimura curve parametrizations; **M. Greenberg**, The arithmetic of elliptic curves over imaginary quadratic fields and Stark-Heegner points; **Y. I. Manin**, Lectures on modular symbols; *Surfaces:* **B. Hassett**, Rational surfaces over nonclosed fields; **D. Harari**, Non-abelian descent; **B. G. Vioreanu**, Mordell-Weil problem for cubic surfaces, numerical evidence; *Higher-dimensional varieties:* **Y. Tschinkel**, Algebraic varieties with many rational points; **D. Abramovich**, Birational geometry for number theorists; **J. M. Starr**, Arithmetic over function fields; **N. Ratazzi** and **E. Ullmo**, Galois + Equidistribution = Manin-Mumford; **E. Ullmo** and **A. Yafaev**, The André-Oort conjecture for products of modular curves; **C.-L. Chai** and **F. Oort**, Moduli of abelian varieties and  $p$ -divisible groups; **D. Kaledin**, Cartier isomorphism and Hodge theory in the non-commutative case.

**Clay Mathematics Proceedings, Volume 8**

November 2009, 562 pages, Softcover, ISBN: 978-0-8218-4476-2, LC 2009027374, 2000 *Mathematics Subject Classification:* 14E30, 14G05, 14D10, **AMS members US\$95**, List US\$119, Order code CMP/8



### Skew-Orthogonal Polynomials and Random Matrix Theory

**Saugata Ghosh**, *Gurgaon, India*

Orthogonal polynomials satisfy a three-term recursion relation irrespective of the weight function with respect to which they are defined. This gives a simple formula

for the kernel function, known in the literature as the Christoffel-Darboux sum. The availability of asymptotic results of orthogonal polynomials and the simple structure of the Christoffel-Darboux sum make the study of unitary ensembles of random matrices relatively straightforward.

In this book, the author develops the theory of skew-orthogonal polynomials and obtains recursion relations which, unlike orthogonal polynomials, depend on weight functions. After deriving reduced expressions, called the generalized Christoffel–Darboux formulas (GCD), he obtains universal correlation functions and non-universal level densities for a wide class of random matrix ensembles using the GCD.

The author also shows that once questions about higher order effects are considered (questions that are relevant in different branches of physics and mathematics) the use of the GCD promises to be efficient.

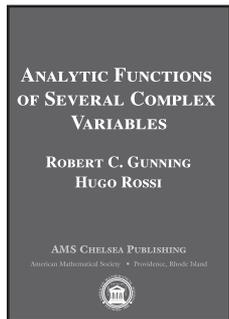
Titles in this series are co-published with the Centre de Recherches Mathématiques.

**Contents:** Introduction; Level density and correlation functions; The  $S_{\mathbb{N}}^{(\beta)}(x, y)$  kernel and Christoffel–Darboux formulas; Mapping; Unitary ensembles; Orthogonal ensembles (even dimension); Orthogonal ensembles (odd dimension); Symplectic ensembles; Skew-orthogonal polynomials and differential systems; Matrix integral representations and zeros of polynomials; Duality; Conclusion; Appendix A. Proofs of (5.7), (5.12), and (5.19); Appendix B. Associated Laguerre and Gaussian results as limiting cases of Jacobi skew-orthogonal polynomials; Appendix C. Proofs of (10.2)–(10.9); Bibliography.

CRM Monograph Series, Volume 28

October 2009, 127 pages, Hardcover, ISBN: 978-0-8218-4878-4, LC 2009029006, 2000 *Mathematics Subject Classification*: 33-XX, 11Cxx, 26Cxx, 15-XX, **AMS members US\$41**, List US\$51, Order code CRMM/28

## Analysis



### Analytic Functions of Several Complex Variables

**Robert C. Gunning**, Princeton University, NJ, and **Hugo Rossi**, University of Utah, Salt Lake City, UT

The theory of analytic functions of several complex variables enjoyed a period of remarkable development in the middle part of the twentieth century. After initial successes by Poincaré and others in the late 19th and early 20th centuries, the theory encountered obstacles that prevented it from growing quickly into an analogue of the theory for functions of one complex variable. Beginning in the 1930s, initially through the work of Oka, then H. Cartan, and continuing with the work of Grauert, Remmert, and others, new tools were introduced into the theory of several complex variables that resolved many of the open problems and fundamentally changed the landscape of the subject. These tools included a central role for sheaf theory and increased uses of topology and algebra. The book by Gunning and Rossi was the first of the modern era of the theory of several complex variables, which is distinguished by the use of these methods.

The intention of Gunning and Rossi’s book is to provide an extensive introduction to the Oka–Cartan theory and some of its applications,

and to the general theory of analytic spaces. Fundamental concepts and techniques are discussed as early as possible. The first chapter covers material suitable for a one-semester graduate course, presenting many of the central problems and techniques, often in special cases. The later chapters give more detailed expositions of sheaf theory for analytic functions and the theory of complex analytic spaces.

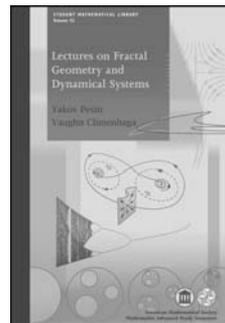
Since its original publication, this book has become a classic resource for the modern approach to functions of several complex variables and the theory of analytic spaces.

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

**Contents:** Holomorphic functions; Local rings of holomorphic functions; Varieties; Analytic sheaves; Analytic spaces; Cohomology theory; Stein spaces, geometric theory; Stein spaces, sheaf theory; Pseudoconvexity; Partitions of unity; The theorem of Schwartz on Frechet spaces; References; Bibliography; Index.

AMS Chelsea Publishing, Volume 368

December 2009, 317 pages, Hardcover, ISBN: 978-0-8218-2165-7, LC 2009025418, 2000 *Mathematics Subject Classification*: 32C15, 32C22, 32C35, 32Exx, 32Q28, **AMS members US\$45**, List US\$50, Order code CHEL/368.H



### Lectures on Fractal Geometry and Dynamical Systems

**Yakov Pesin** and **Vaughn Climenhaga**, Pennsylvania State University, University Park, PA

Both fractal geometry and dynamical systems have a long history of development and have provided fertile ground for many great mathematicians and much deep and important mathematics. These two areas interact with each other and with the theory of chaos in a fundamental way; many dynamical systems (even some very simple ones) produce fractal sets, which are in turn a source of irregular “chaotic” motions in the system. This book is an introduction to these two fields, with an emphasis on the relationship between them.

The first half of the book introduces some of the key ideas in fractal geometry and dimension theory—Cantor sets, Hausdorff dimension, box dimension—using dynamical notions whenever possible, particularly one-dimensional Markov maps and symbolic dynamics. Various techniques for computing Hausdorff dimension are shown, leading to a discussion of Bernoulli and Markov measures and of the relationship between dimension, entropy, and Lyapunov exponents.

In the second half of the book some examples of dynamical systems are considered and various phenomena of chaotic behaviour are discussed, including bifurcations, hyperbolicity, attractors, horseshoes, and intermittent and persistent chaos. These phenomena are naturally revealed in the course of our study of two real models from science—the FitzHugh–Nagumo model and the Lorenz system of differential equations.

This book is accessible to undergraduate students and requires only standard knowledge in calculus, linear algebra, and differential equations. Elements of point set topology and measure theory are introduced as needed.

This book is a result of the MASS course in analysis at Penn State University in the fall semester of 2008.

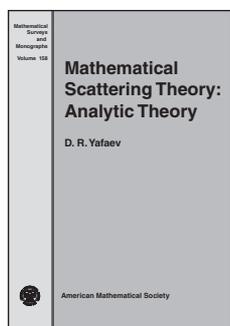
*This item will also be of interest to those working in differential equations.*

This volume is published in cooperation with the Mathematics Advanced Study Semesters.

**Contents:** Basic concepts and examples; Fundamentals of dimension theory; Measures: definitions and examples; Measures and dimensions; Discrete-time systems: the FitzHugh-Nagumo model; The bifurcation diagram for the logistic map; Chaotic attractors and persistent chaos; Horseshoes and intermittent chaos; Continuous-time systems: the Lorenz model; Appendix; Hints to selected exercises; Suggested reading; Bibliography; Index.

**Student Mathematical Library**, Volume 52

December 2009, approximately 324 pages, Softcover, ISBN: 978-0-8218-4889-0, LC 2009028324, 2000 *Mathematics Subject Classification*: 37-01, 37C45; 37B10, 37D20, 37E05, **AMS members US\$41**, List US\$51, Order code STML/52



## Mathematical Scattering Theory

Analytic Theory

**D. R. Yafaev**, *Université Rennes 1, France*

The main subject of this book is applications of methods of scattering theory to differential operators, primarily the Schrödinger operator.

There are two different trends in scattering theory for differential operators. The first one relies on the abstract scattering theory. The second one is almost independent of it. In this approach the abstract theory is replaced by a concrete investigation of the corresponding differential equation. In this book both of these trends are presented. The first half of this book begins with the summary of the main results of the general scattering theory of the previous book by the author, *Mathematical Scattering Theory: General Theory*, American Mathematical Society, 1992. The next three chapters illustrate basic theorems of abstract scattering theory, presenting, in particular, their applications to scattering theory of perturbations of differential operators with constant coefficients and to the analysis of the trace class method.

In the second half of the book direct methods of scattering theory for differential operators are presented. After considering the one-dimensional case, the author returns to the multi-dimensional problem and discusses various analytical methods and tools appropriate for the analysis of differential operators, including, among others, high- and low-energy asymptotics of the Green function, the scattering matrix, ray and eikonal expansions.

The book is based on graduate courses taught by the author at Saint-Petersburg (Russia) and Rennes (France) Universities and is oriented towards a reader interested in studying deep aspects of scattering theory (for example, a graduate student in mathematical physics).

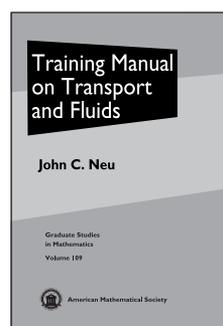
**Contents:** Basic notation; Introduction; Basic concepts; Smooth theory. The Schrödinger operator; Smooth theory. General differential operators; Scattering for perturbations of trace class type; Scattering on the half-line; One-dimensional scattering; The

limiting absorption principle (LAP), the radiation conditions and the expansion theorem; High- and lower-energy asymptotics; The scattering matrix (SM) and the scattering cross section; The spectral shift function and trace formulas; The Schrödinger operator with a long-range potential; The LAP and radiation estimates revisited; Review of the literature; Bibliography; Index.

**Mathematical Surveys and Monographs**, Volume 158

December 2009, approximately 445 pages, Hardcover, ISBN: 978-0-8218-0331-8, LC 2009027382, 2000 *Mathematics Subject Classification*: 34L25, 35-02, 35P10, 35P25, 47A40, 81U05, **AMS members US\$88**, List US\$110, Order code SURV/158

## Applications



## Training Manual on Transport and Fluids

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

*I have learned a lot from John Neu over the past years, and his book reflects very well his sense of style and purpose.*

—**Walter Craig**, *McMaster University, Hamilton, Ontario, Canada and Fields Institute for Research in Mathematical Sciences, Toronto, Ontario, Canada*

This book presents elementary models of transport in continuous media and a corresponding body of mathematical technique. Physical topics include convection and diffusion as the simplest models of transport; local conservation laws with sources as the general framework of continuum mechanics; ideal fluid as the simplest model of a medium with mass; momentum and energy transport; and finally, free surface waves, in particular, shallow water theory.

There is a strong emphasis on dimensional analysis and scaling. Some topics, such as physical similarity and similarity solutions, are traditional. In addition, there are reductions based on scaling, such as incompressible flow as a limit of compressible flow, and shallow water theory derived asymptotically from the full equations of free surface waves. More and deeper examples are presented as problems, including a series of problems that model a tsunami approaching the shore.

The problems form an embedded subtext to the book. Each problem is followed by a detailed solution emphasizing process and craftsmanship. The problems express the practice of applied mathematics as the examination and re-examination of simple but essential ideas in many interrelated examples.

*This item will also be of interest to those working in differential equations.*

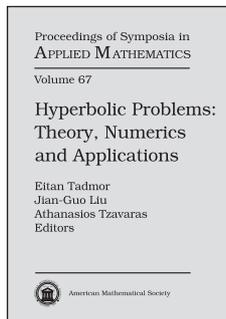
**Contents:** *Transport processes: The basic prototypes:* Convection; Diffusion; Local conservation laws; *Superposition:* Superposition of point source solutions;  $\delta$ -functions; *Scaling-based reductions in*

*basic fluid mechanics*: Ideal fluid mechanics; Free surface waves; Solution of the shallow water equations; Bibliography; Index.

**Graduate Studies in Mathematics**, Volume 109

January 2010, approximately 269 pages, Hardcover, ISBN: 978-0-8218-4083-2, 2000 *Mathematics Subject Classification*: 35-XX, 44-XX, 76-XX, **AMS members US\$47**, List US\$59, Order code GSM/109

## Differential Equations



### Hyperbolic Problems: Theory, Numerics and Applications

**Eitan Tadmor**, *University of Maryland, College Park, MD*,  
**Jian-Guo Liu**, *Duke University, Durham, NC*, and *University of Maryland, College Park, MD*,  
and **Athanasios E. Tzavaras**,

*University of Maryland, College Park, MD*, and *University of Crete, Heraklion, Greece*, Editors

The International Conference on Hyperbolic Problems: Theory, Numerics and Applications, "HYP2008", was held at the University of Maryland from June 9–14, 2008. This was the twelfth meeting in the bi-annual international series of HYP conferences which originated in 1986 at Saint-Etienne, France, and over the last twenty years has become one of the highest quality and most successful conference series in Applied Mathematics.

The articles in this two-part volume are written by leading researchers as well as promising young scientists and cover a diverse range of multi-disciplinary topics addressing theoretical, modeling and computational issues arising under the umbrella of "hyperbolic PDEs".

This volume will bring readers to the forefront of research in this most active and important area in applied mathematics.

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

**Contents: Part I: List of plenary talks: S. Benzoni-Gavage and J.-F. Coulombel**, Multidimensional shock waves and surface waves; **G.-Q. Chen and M. Feldman**, Shock reflection-diffraction phenomena and multidimensional conservation laws; **S. Chen**, Study on Mach reflection and Mach configuration; **F. Golse**, Nonlinear regularizing effect for conservation laws; **S. Jin**, Numerical methods for hyperbolic systems with singular coefficients: Well-balanced scheme, Hamiltonian preservation, and beyond; **A. Kiselev**, Some recent results on the critical surface quasi-geostrophic equation: A review; **B. Perthame**, Why hyperbolic and kinetic models for cell populations self-organization?; **B. Piccoli**, Flows on networks and complicated domains; *Invited talks: D. Amadori and A. Corli*, Global solutions for a hyperbolic model of multiphase flow; **F. Ancona and A. Marson**, On the convergence rate for the Glimm scheme; **W. Bao and F. Y. Lim**, Analysis and computation for the semiclassical limits of the ground and excited states of the Gross-Pitaevskii equation; **G.-Q. Chen, M. Slemrod, and D. Wang**, Conservation laws: Transonic flow and differential geometry; **C. Christoforou**, A survey on the  $L^1$  comparison of entropy

weak solutions to Euler equations in the large with respect to physical parameters; **P. D'Ancona, D. Foschi, and S. Selberg**, Low regularity solutions of the Maxwell-Dirac system; **A. Dedner and R. Klöforn**, Stabilization for discontinuous Galerkin methods applied to systems of conservation laws; **C. De Lellis**, Ill-posedness for bounded admissible solutions of the 2-dimensional  $p$ -system; **D. Donatelli and P. Marcati**, Applications of dispersive estimates to the acoustic pressure waves for incompressible fluid problems; **P. G. LeFloch**, Stability in the  $L^1$  norm via a linearization method for nonlinear hyperbolic systems; **S. Nishibata and M. Suzuki**, A review of semiconductor models: Global solvability and hierarchy; Index; **Part II: Contributed talks: G. Alberti, S. Bianchini, and G. Crippa**, Two-dimensional transport equation with Hamiltonian vector fields; **A. C. Alvarez, G. Hime, and D. Marchesin**, Analytic regularization of an inverse problem for a system of conservation laws; **P. Antonelli and P. Marcati**, On the finite weak solutions to a system in quantum fluid dynamics; **K. C. Assi and M. Laforest**, Accuracy of modeling error estimates for discrete velocity models; **A. V. Azevedo, A. P. de Souza, F. Furtado, and D. Marchesin**, The Riemann solution for three-phase flow in a porous medium; **J. Balbás and X. Qian**, Non-oscillatory central schemes for 3D hyperbolic conservation laws; **J. Benz, A. Meister, and P. A. Zardo**, A conservative, positivity preserving scheme for advection-diffusion-reaction equations in biochemical applications; **S. Berres and T. Voitovich**, On the spectrum of a rank two modification of a diagonal matrix for linearized fluxes modelling polydisperse sedimentation; **S. Bianchini and L. V. Spinolo**, Invariant manifolds for viscous profiles of a class of mixed hyperbolic-parabolic systems; **P. Birken and A. Jameson**, Nonlinear iterative solvers for unsteady Navier-Stokes equations; **F. Bouchut, C. Klingenberg, and K. Waagan**, An approximate Riemann solver for ideal MHD based on relaxation; **R. Bürger, A. Coronel, and M. Sepúlveda**, Numerical solution of an inverse problem for a scalar conservation law modelling sedimentation; **R. Bürger, K. H. Karlsen, and J. D. Towers**, A conservation law with discontinuous flux modelling traffic flow with abruptly changing road surface conditions; **M. J. Castro-Diaz, P. G. LeFloch, M. L. Muñoz-Ruiz, and C. Parés**, Numerical investigation of finite difference schemes for nonconservative hyperbolic systems; **F. Cavalli, G. Naldi, G. Puppo, and M. Semplice**, Relaxed schemes for nonlinear evolutionary PDEs; **G. Chapiro, G. Hime, A. Mailybaev, D. Marchesin, and A. P. de Souza**, Global asymptotic effects of the structure of combustion waves in porous media; **B. Cheng**, Multiscale dynamics of 2D rotational compressible Euler equations—An analytic approach; **I. Christov, I. D. Mishev, and B. Popov**, Finite volume methods on unstructured Voronoi meshes for hyperbolic conservation laws; **R. M. Colombo, G. Facchi, G. Maternini, and M. D. Rosini**, On the continuum modeling of crowds; **R. M. Colombo and G. Guerra**, Balance laws as quasidifferential equations in metric spaces; **O. Delestre, S. Cordier, F. James, and F. Darboux**, Simulation of rain-water overland-flow; **C. Donadello**, On the vanishing viscosity approximation in the vectorial case; **V. Elling**, Counterexamples to the sonic and detachment criteria; **J. T. Frings and S. Noelle**, Well-balanced high order scheme for 2-layer shallow water flows; **F. G. Fuchs, A. D. McMurry, and S. Mishra**, High-order finite volume schemes for wave propagation in stratified atmospheres; **J. M. Gallardo, M. J. Castro, and C. Parés**, High-order finite volume schemes for shallow water equations with topography and dry areas; **M. Garavello and B. Piccoli**, Riemann solvers for conservation laws at a node; **H. Haasdonk and M. Ohlberger**, Reduced basis method for explicit finite volume approximations of nonlinear conservation laws; **J. Haink**, Error estimate for the local discontinuous Galerkin scheme of a diffusive-dispersive equation with convolution; **B. Haspot**, Cauchy problem for capillarity Van der Waals model; **H. Hattori**, Viscous conservation

laws with discontinuous initial data; **G. Hime** and **V. Matos**, Parallel computation of large amplitude shocks for a system of conservation laws with small data; **H. Holden**, **N. H. Risebro**, and **H. Sande**, Convergence of front tracking and the Glimm scheme for a model of the flow of immiscible gases; **X. Hu** and **D. Wang**, Global existence and incompressible limit of weak solutions to the multi-dimensional compressible magnetohydrodynamics; **H. K. Jenssen** and **I. A. Kogan**, Construction of conservative systems; **E. A. Johnson** and **J. A. Rossmann**, Collisionless magnetic reconnection in a five-moment two-fluid electron-positron plasma; **M. Jradeh**, Finite difference scheme for a nonlinear damped wave equation derived from brain modulation; **K. H. Karlsen** and **T. K. Karper**, Convergent finite element methods for compressible barotropic Stokes systems; **S. Karni** and **G. Hernández-Dueñas**, A hybrid scheme for flows in porous media; **F. Kemm**, Discrete involutions, resonance, and the divergence problem in MHD; **J. Kim** and **R. J. LeVeque**, Two-layer shallow water system and its applications; **W. J. Lambert** and **D. Marchesin**, Asymptotic rarefaction waves for balance laws with stiff sources; **R. Liska**, **R. Loubère**, **P.-H. Maire**, **J. Briel**, **S. Galera**, and **P. Váchal**, Comparison of staggered and cell-centered Lagrangian and ALE hydrodynamical methods; **M. Lukáčová-Medvidová** and **E. Tadmor**, On the entropy stability of Roe-type finite volume methods; **A. Madrane** and **E. Tadmor**, Entropy stability of Roe-type upwind finite volume methods on unstructured grids; **F. Marche** and **C. Berthon**, A robust high order VFRoe scheme for shallow water equations; **S. Mishra** and **E. Tadmor**, Vorticity preserving schemes using potential-based fluxes for the system wave equation; **T. Nakamura** and **S. Nishibata**, Half space problem for the compressible Navier-Stokes equation; **M. Nolte** and **D. Kröner**, Computing the effective Hamiltonian for a time-dependent Hamiltonian; **R. Pan** and **K. Zhao**, Initial boundary value problems for compressible Euler equations with damping; **M. Pelanti** and **F. Bouchut**, A relaxation method for modeling two-phase shallow granular flows; **Y.-J. Peng** and **J. Ruiz**, Riemann problem for Born-Infeld systems; **E. Peterson**, **M. Shearer**, **T. P. Witelski**, and **R. Levy**, Stability of traveling waves in thin liquid films driven by gravity and surfactant; **M. V. Popov** and **S. D. Ustyugov**, Piecewise parabolic method on a local stencil for hyperbolic conservation laws; **X. Qian**, **J. Balbás**, **A. Bhattacharjee**, and **H. Yang**, A numerical study of magnetic reconnection: A central scheme for Hall MHD; **M. Ricciuto** and **A. Bollermann**, Accuracy of stabilized residual distribution for shallow water flows including dry beds; **O. Rouch** and **P. Arminjon**, Using the entropy production rate to enhance artificial compression; **O. Rozanova**, Blow up of smooth solutions to the barotropic compressible magnetohydrodynamic equations with finite mass and energy; **G. Russo** and **A. Khe**, High order well balanced schemes for systems of balance laws; **V. M. Shelkovich**, Transport of mass, momentum and energy in zero-pressure gas dynamics; **W. Shen**, On a model of granular flow; **K.-M. Shyue**, A simple unified coordinates method for compressible homogeneous two-phase flows; **D. L. Tkachev** and **A. M. Blokhin**, Courant-Friedrich's hypothesis and stability of the weak shock; **R. Touma**, Unstaggered central schemes for MHD and SMHD; **Y. Ueda**, **T. Nakamura**, and **S. Kawashima**, Stability of planar stationary wave for damped wave equation with nonlinear convection in half space; **D. Wright**, **M. Frank**, and **A. Klar**, The minimum entropy approximation to the radiative transfer equation; Index.

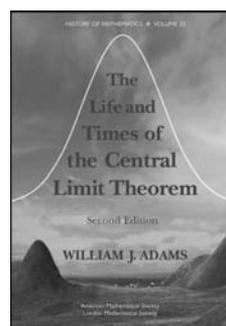
**Proceedings of Symposia in Applied Mathematics, Volume 67**

**Part 1:** December 2009, approximately 351 pages, Hardcover, ISBN: 978-0-8218-4729-9, LC 2009023286, 2000 *Mathematics Subject Classification*: 35Lxx, 35M10, 35Q30, 35Q60, 35R35, 65Mxx, 65Nxx, 65Txx, 65Yxx, 65Z05, 74B20, 74Jxx, 76Rxx, 76Txx, 80A32, 80Mxx, 83F05, **AMS members US\$71**, List US\$89, Order code PSAPM/67.1

**Part 2:** December 2009, approximately 671 pages, Hardcover, ISBN: 978-0-8218-4730-5, LC 2009023286, 2000 *Mathematics Subject Classification*: 35Lxx, 35M10, 35Q30, 35Q60, 35R35, 65Mxx, 65Nxx, 65Txx, 65Yxx, 65Z05, 74B20, 74Jxx, 76Rxx, 76Txx, 80A32, 80Mxx, 83F05, **AMS members US\$127**, List US\$159, Order code PSAPM/67.2

**Set:** December 2009, approximately 1022 pages, Hardcover, ISBN: 978-0-8218-4728-2, LC 2009023286, 2000 *Mathematics Subject Classification*: 35Lxx, 35M10, 35Q30, 35Q60, 35R35, 65Mxx, 65Nxx, 65Txx, 65Yxx, 65Z05, 74B20, 74Jxx, 76Rxx, 76Txx, 80A32, 80Mxx, 83F05, **AMS members US\$178**, List US\$223, Order code PSAPM/67

## General and Interdisciplinary



### The Life and Times of the Central Limit Theorem

Second Edition

William J. Adams, *Pace University, New York, NY*

**About the First Edition:**

*The study of any topic becomes more meaningful if one also studies the historical development that resulted in the final theorem. ... This is an excellent book on mathematics in the making.*

—Philip Peak, *The Mathematics Teacher*, May, 1975

*I find the book very interesting. It contains valuable information and useful references. It can be recommended not only to historians of science and mathematics but also to students of probability and statistics.*

—Wei-Ching Chang, *Historica Mathematica*, August, 1976

*In the months since I wrote... I have read it from cover to cover at least once and perused it here and there a number of times. I still find it a very interesting and worthwhile contribution to the history of probability and statistics.*

—Churchill Eisenhart, past president of the American Statistical Association, in a letter to the author, February 3, 1975

The name *Central Limit Theorem* covers a wide variety of results involving the determination of necessary and sufficient conditions under which sums of independent random variables, suitably standardized, have cumulative distribution functions close to the Gaussian distribution. As the name Central Limit Theorem suggests, it is a centerpiece of probability theory which also carries over to statistics.

Part One of *The Life and Times of the Central Limit Theorem, Second Edition* traces its fascinating history from seeds sown by Jacob Bernoulli to use of integrals of  $\exp(x^2)$  as an approximation tool, the development of the theory of errors of observation, problems in mathematical astronomy, the emergence of the hypothesis of elementary errors, the fundamental work of Laplace, and the emergence of an abstract Central Limit Theorem through the work of Chebyshev, Markov and Lyapunov. This closes the classical period of the life of the Central Limit Theorem, 1713–1901.

The second part of the book includes papers by Feller and Le Cam, as well as comments by Doob, Trotter, and Pollard, describing the modern history of the Central Limit Theorem (1920–1937), in particular through contributions of Lindeberg, Cramér, Lévy, and Feller.

The Appendix to the book contains four fundamental papers by Lyapunov on the Central Limit Theorem, made available in English for the first time.

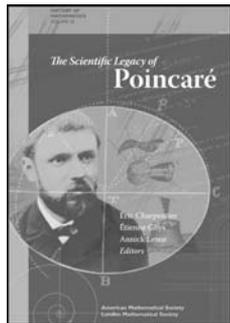
*This item will also be of interest to those working in probability.*

Co-published with the London Mathematical Society beginning with Volume 4. Members of the LMS may order directly from the AMS at the AMS member price. The LMS is registered with the Charity Commissioners.

**Contents:** *Early life and middle years:* A seed is sown; Approximation by integrals of  $e^{-x^2}$ ; Impetus provided by the theory of errors of observation; Impetus provided by mathematical astronomy; The flowering of the central limit theorem begins; The development of the hypothesis of elementary errors; The emergence of an abstract central limit theorem; Chebyshev's pupils: A. A. Markov and A. M. Lyapunov; Bibliography; *The modern era:* W. Feller, The fundamental limit theorems in probability; L. Le Cam, The central limit theorem around 1935; H. F. Trotter, J. L. Doob, David Pollard, and L. Le Cam, Comments and rejoinder; *Appendix:* A. M. Lyapunov, On a theorem in probability theory; A. M. Lyapunov, On a theorem in probability theory; A. M. Lyapunov, A general proposition in probability theory; A. M. Lyapunov, A new form of a theorem on the limit of a probability; Index.

**History of Mathematics, Volume 35**

November 2009, approximately 195 pages, Hardcover, ISBN: 978-0-8218-4899-9, LC 2009022932, 2000 *Mathematics Subject Classification:* 60-03; 01A50, 01A55, 01A60, 60F05, **AMS members US\$42**, List US\$53, Order code HMATH/35



**The Scientific Legacy of Poincaré**

Éric Charpentier, *Université Bordeaux 1, Talence, France*, Étienne Ghys, *École Normale Supérieure de Lyon, France*, and Annick Lesne, *Université Pierre et Marie Curie, Paris, France*, Editors

Translated by Joshua Bowman

Henri Poincaré (1854–1912) was one of the greatest scientists of his time, perhaps the last one to have mastered and expanded almost all areas in mathematics and theoretical physics. He created new mathematical branches, such as algebraic topology, dynamical systems, and automorphic functions, and he opened the way to complex analysis with several variables and to the modern approach to asymptotic expansions. He revolutionized celestial mechanics, discovering deterministic chaos. In physics, he is one of the fathers of special relativity, and his work in the philosophy of sciences is illuminating.

For this book, about twenty world experts were asked to present one part of Poincaré's extraordinary work. Each chapter treats one theme, presenting Poincaré's approach, and achievements, along with examples of recent applications and some current

prospects. Their contributions emphasize the power and modernity of the work of Poincaré, an inexhaustible source of inspiration for researchers, as illustrated by the Fields Medal awarded in 2006 to Grigori Perelman for his proof of the Poincaré conjecture stated a century before.

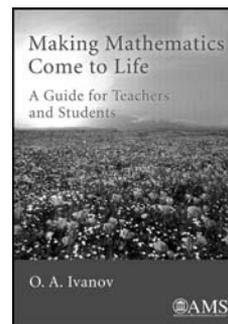
This book can be read by anyone with a master's (even a bachelor's) degree in mathematics, or physics, or more generally by anyone who likes mathematical and physical ideas. Rather than presenting detailed proofs, the main ideas are explained, and a bibliography is provided for those who wish to understand the technical details.

Co-published with the London Mathematical Society beginning with Volume 4. Members of the LMS may order directly from the AMS at the AMS member price. The LMS is registered with the Charity Commissioners.

**Contents:** E. Ghys, Poincaré and his disk; N. Bergeron, Differential equations with algebraic coefficients over arithmetic manifolds; E. Kowalski, Poincaré and analytic number theory; J.-P. Francoise, The theory of limit cycles; D. Cerveau, Singular points of differential equations: On a theorem of Poincaré; M. Nauenberg, Periodic orbits of the three body problem: Early history, contributions of Hill and Poincaré, and some recent developments; N. Anantharaman, On the existence of closed geodesics; F. Béguin, Poincaré's memoir for the Prize of King Oscar II: Celestial harmony entangled in homoclinic intersections; E. Ghys, Variations on Poincaré's recurrence theorem; G. Boffetta, G. Lacorata, and A. Vulpiani, Low-dimensional chaos and asymptotic time behavior in the mechanics of fluids; A. Yger, The concept of "residue" after Poincaré: Cutting across all of mathematics; L. Bessières, G. Besson, and M. Boileau, The proof of the Poincaré conjecture, according to Perelman; J. Mawhin, Henri Poincaré and the partial differential equations of mathematical physics; P. Cartier, Poincaré's *calculus of probabilities*; M. M. France, Poincaré and geometric probability; P.-P. Grivel, Poincaré and Lie's third theorem; M. Le Bellac, The Poincaré group; Y. Pomeau, Henri Poincaré as an applied mathematician; G. Heinzmann, Henri Poincaré and his thoughts on the philosophy of science.

**History of Mathematics, Volume 36**

January 2010, approximately 396 pages, Hardcover, ISBN: 978-0-8218-4718-3, LC 2009027575, 2000 *Mathematics Subject Classification:* 30F35, 34C07, 37N05, 53C22, 32A27, 57M40, 16S30, 83A05, 00A30, 35J05, 01A60, **AMS members US\$71**, List US\$89, Order code HMATH/36



**Making Mathematics Come to Life**

A Guide for Teachers and Students

O. A. Ivanov, *Steklov Institute of Mathematics, St. Petersburg, Russia*

"It is difficult to define the genre of the book. It is not a problem book, nor a textbook, nor a 'book for reading about mathematics'. It is most of all reminiscent of a good lecture course, from which a thoughtful student comes away with more than was actually spoken about in the lectures."

—from the Preface by A. S. Merkurjev

If you are acquainted with mathematics at least to the extent of a standard high school curriculum and like it enough to want to learn more, and if, in addition, you are prepared to do some serious work, then you should start studying this book.

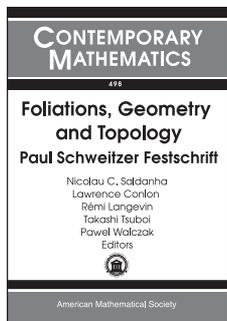
An understanding of the material of the book requires neither a developed ability to reason abstractly nor skill in using the refined techniques of mathematical analysis. In each chapter elementary problems are considered, accompanied by theoretical material directly related to them. There are over 300 problems in the book, most of which are intended to be solved by the reader. In those places in the book where it is natural to introduce concepts outside the high school syllabus, the corresponding definitions are given with examples. And in order to bring out the meaning of such concepts clearly, appropriate (but not too many) theorems are proved concerning them.

Unfortunately, what is sometimes studied at school under the name “mathematics” resembles real mathematics not any closer than a plucked flower gathering dust in a herbarium or pressed between the pages of a book resembles that same flower in the meadow besprinkled with dewdrops sparkling in the light of the rising sun.

**Contents:** Introduction; Induction; Combinatorics; The whole numbers; Geometric transformations; Inequalities; Graphs; The pigeonhole principle; Complex numbers and polynomials; Rational approximations; Mathematics and the computer; Instead of a conclusion: teaching how to look for solutions of problems, or fantasy in the manner of Pólya; Solutions of the supplementary problems.

December 2009, approximately 326 pages, Hardcover, ISBN: 978-0-8218-4808-1, LC 2009025419, 2000 *Mathematics Subject Classification:* 00A05; 00A35, **AMS members US\$55**, List US\$69, Order code MBK/61

## Geometry and Topology



### Foliations, Geometry, and Topology

Paul Schweitzer Festschrift

**Nicolau C. Saldanha**, *Pontificia Universidade Catolica, Rio de Janeiro, Brazil*, **Lawrence Conlon**, *Washington University, St. Louis, MO*, **Rémi Langevin**, *Université de Bourgogne, Dijon, France*,

**Takashi Tsuboi**, *University of Tokyo, Japan*, and **Paweł Walczak**, *University of Lodz, Poland*, Editors

This volume represents the proceedings of the conference on Foliations, Geometry, and Topology, held August 6–10, 2007, in Rio de Janeiro, Brazil, in honor of the 70th birthday of Paul Schweitzer. The papers concentrate on the theory of foliations and related areas such as dynamical systems, group actions on low dimensional manifolds, and geometry of hypersurfaces.

There are survey papers on classification of foliations and their dynamical properties, including codimension one foliations with Bott–Morse singularities. Other papers involve the relationship

of foliations with characteristic classes, contact structures, and Eliashberg–Mishachev wrinkled mappings.

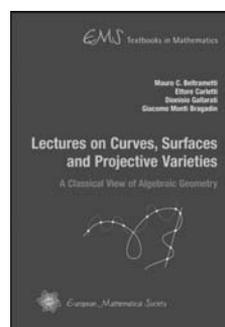
**Contents:** **S. Hurder**, Classifying foliations; **T. Tsuboi**, Classifying spaces for groupoid structures; **B. Scárdua** and **J. Seade**, Compact foliations with Bott–Morse singularities; **G. Hector** and **M. A. Chaouch**, Dynamiques Source-Puits et Flots transversalement affines; **J. L. Arraut** and **C. Maquera**, Structurally stable singular actions of  $\mathbb{R}^2$  having a first integral; **S. Matsumoto**, The parameter rigid flows on orientable 3-manifolds; **D. Calegari**, The Euler class of planar groups; **Y. Matsuda**, Global fixed points for groups of homeomorphisms of the circle; **P. G. Walczak**, Orthogonal total foliations: Godbillon–Vey forms via local conformal invariants; **F. J. Andrade**, **J. L. M. Barbosa**, and **J. H. S. de Lira**, Prescribed mean curvature hypersurfaces in warped products; **H. Kodama**, **Y. Mitsumatsu**, **S. Miyoshi**, and **A. Mori**, On Thurston’s inequality for spinnable foliations; **S. Miyoshi** and **A. Mori**, Reeb components and Thurston’s inequality; **Y. M. Eliashberg** and **N. M. Mishachev**, Wrinkled embeddings.

**Contemporary Mathematics**, Volume 498

November 2009, 232 pages, Softcover, ISBN: 978-0-8218-4628-5, LC 2009018764, 2000 *Mathematics Subject Classification:* 57R30, 53C12, **AMS members US\$63**, List US\$79, Order code CONM/498

## New AMS-Distributed Publications

### Algebra and Algebraic Geometry



### Lectures on Curves, Surfaces and Projective Varieties

A Classical View of Algebraic Geometry

**Mauro C. Beltrametti**, **Ettore Carletti**, **Dionisio Gallarati**, and **Giacomo Monti Bragadin**, *University of Genova, Italy*

Translated from the Italian by Francis Sullivan

This book offers a wide-ranging introduction to algebraic geometry along classical lines. It consists of lectures on topics in classical algebraic geometry, including the basic properties of projective algebraic varieties, linear systems of hypersurfaces, algebraic curves (with special emphasis on rational curves), linear series on algebraic curves, Cremona transformations, rational surfaces, and notable examples of special varieties like the Segre, Grassmann, and Veronese varieties. An integral part and special feature of the

presentation is the inclusion of many exercises, not easy to find in the literature and almost all with complete solutions.

The text is aimed at students in the last two years of an undergraduate program in mathematics. It contains some rather advanced topics suitable for specialized courses at the advanced undergraduate or beginning graduate level, as well as interesting topics for a senior thesis. The prerequisites have been deliberately limited to basic elements of projective geometry and abstract algebra. Thus, for example, some knowledge of the geometry of subspaces and properties of fields is assumed.

The book will be welcomed by teachers and students of algebraic geometry who are seeking a clear and panoramic path leading from the basic facts about linear subspaces, conics and quadrics to a systematic discussion of classical algebraic varieties and the tools needed to study them. The text provides a solid foundation for approaching more advanced and abstract literature.

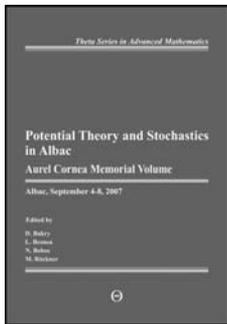
A publication of the European Mathematical Society (EMS). Distributed within the Americas by the American Mathematical Society.

**Contents:** Prerequisites; Algebraic sets, morphisms, and rational maps; Geometric properties of algebraic varieties; Rudiments of elimination theory; Hypersurfaces in projective space; Linear systems; Algebraic curves; Linear series on algebraic curves; Cremona transformations; Rational surfaces; Segre varieties; Grassmann varieties; Supplementary exercises; Bibliography; Index.

**EMS Textbooks in Mathematics, Volume 9**

August 2009, 506 pages, Hardcover, ISBN: 978-3-03719-064-7, 2000 *Mathematics Subject Classification:* 14-01, 14E05, 14E07, 14H50, 14J26, 14J70, 14M99, 14N05, **AMS members US\$62**, List US\$78, Order code EMSTEXT/9

## Analysis



### Potential Theory and Stochastics in Albac

Aurel Cornea Memorial Volume

**Dominique Bakry**, *Université Paul Sabatier, Toulouse, France*, **Lucian Beznea**, *Romanian Academy, Institute of Mathematics, Bucharest,*

*Romania*, **Nicu Boboc**, *University of Bucharest, Romania*, and **Michael Röckner**, *Bielefeld University, Germany*, Editors

This volume contains the proceedings of the Potential Theory and Stochastics Conference, which was held in Albac, Romania, from September 4 to 8, 2007. It is also intended as a memorial volume for Aurel Cornea. Besides a presentation of the life and work of Aurel Cornea, it includes twenty refereed papers of the participants, covering the main topics of the conference: geometric aspects in potential theory, Dirichlet structures and stochastic analysis, potential theoretical methods for the analysis of infinite

dimensional processes, stochastic partial differential equations, non-linear partial differential equations and potential theory.

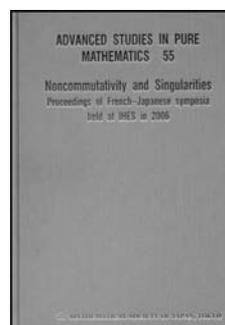
*This item will also be of interest to those working in probability.*

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

**Contents:** **D. Bakry**, **F. Baudoin**, **M. Bonnefont**, and **B. Qian**, Subelliptic Li-Yau estimates on three dimensional spaces; **V. Barbu**, **P. Blanchard**, **G. Da Prato**, and **M. Röckner**, Self-organized criticality via stochastic partial differential equations; **K. Ben Ali** and **M. Bezzarga**, On a nonhomogenous quasilinear problem in Sobolev spaces with variable exponent; **M. Biroli**,  $\Gamma$ -convergence for strongly local Dirichlet forms in open sets with holes; **H.-P. Blatt**, Divergence of rational approximants to non-analytic functions; **N. Boboc** and **G. Bucur**, Non-symmetric resistance forms; **S.-L. Eriksson** and **H. Leutwiler**, Hyperbolic harmonic functions and their function theory; **M. Fukushima**, On extended Dirichlet spaces and the space of BL functions; **S. J. Gardiner** and **T. Sjödin**, Partial balayage and the exterior inverse problem of potential theory; **M. Ghergu** and **V. Rădulescu**, The influence of the distance function in some singular elliptic problems; **K. GowriSankaran**, A Fatou type theorem for multiply superharmonic functions; **Z.-C. Hu**, **Z.-M. Ma**, and **W. Sun**, Some remarks on representations of non-symmetric local Dirichlet forms; **N. Jacob**, **A. Potrykus**, and **M. Schicks**, Operators associated with multi-parameter families of probability measures; **K. Kuwae**, Jensen's inequality over  $CAT(\kappa)$ -space with small diameter; **P. A. Loeb**, Rich measure spaces; **Y. Mizuta**, **T. Ohno**, and **T. Shimomura**, Integrability of maximal functions for generalized Lebesgue spaces  $L^{p(\cdot)}(\log L)^{q(\cdot)}$ ; **M. N. Pascu**, Probabilistic approaches to monotonicity and maximum principles; **E. Popa**, Polyinvariant elements in a semi-dynamical system; **W. Stannat**, Lipschitz continuity of the pseudo resolvent of the stochastic Burgers equation; **C. Udrea**, Excessive functions with respect to Monge-Ampère resolvents and concave functions.

**International Book Series of Mathematical Texts**

June 2009, 246 pages, Hardcover, ISBN: 978-973-87899-5-1, 2000 *Mathematics Subject Classification:* 00B25, 31-06, 60-06, **AMS members US\$46**, List US\$57, Order code THETA/14



### Noncommutativity and Singularities

Proceedings of French-Japanese Symposia Held at IHÉS in 2006

**Jean-Pierre Bourguignon**, *Institut des Hautes Études Scientifiques, Bures-sur-Yvette, France*, **Motoko Kotani**, *Tohoku University, Sendai, Japan*, **Yoshiaki Maeda**, *Keio University, Kohoku, Japan*, and **Nobuyuki Tose**, *Keio University, Japan*, Editors

The two symposia, the Hayashibara Forum and the MSJ/IHÉS Joint Workshop, were held at the Institute des Hautes Études Scientifiques (IHÉS) in November 2006. The Hayashibara Forum focused on singularity theory, which has been one of the research areas that has over the years been well represented at IHÉS. The MSJ/IHÉS Joint Workshop focused on the broad area of

noncommutativity, with an emphasis on noncommutative geometry as one of the fundamental themes of 21st century mathematics.

This volume contains papers presented at the symposia in the form of invited lectures and contributed talks by young researchers. The scope of this volume reflects a new development for singularity theory and a new direction in mathematics through noncommutativity. This volume aims to inspire not only the specialists in these fields but also a wider audience of mathematicians.

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

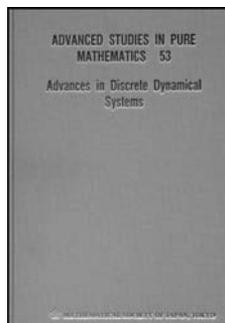
Published for the Mathematical Society of Japan by Kinokuniya, Tokyo, and distributed worldwide, except in Japan, by the AMS.

**Contents:** *Plenary Lectures:* **P. Biane**, From Pitman's theorem to crystals; **T. Harada**, Singularities and self-similarity in gravitational collapse; **S. Izumiya**, Horospherical geometry in the hyperbolic space; **H. Kanno**, Instanton counting and the chiral ring relations in supersymmetric gauge theories; **Y. Kawahigashi**, Superconformal field theory and operator algebras; **P. Popescu-Pampu**, Iterating the Hessian: A dynamical system on the moduli space of elliptic curves and dessins d'enfants; **S. V. Ngoc**, Quantum Birkhoff normal forms and semiclassical analysis; **K.-i. Sugiyama**, On geometric analogues of Iwasawa main conjecture for a hyperbolic threefold; **Y. Sugiyama**, Partial regularity and its application to the blow-up asymptotics of parabolic systems modelling chemotaxis with porous medium diffusion; **T. Yamaguchi**, Upper curvature bounds and singularities; **Y. Yomdin** and **G. Zahavi**, High-order processing of singular data; *Research Articles:* **S. Echterhoff**, **R. Nest**, and **H. Oyono-Oyono**, An analogue of Serre fibrations for  $C^*$ -algebra bundles; **K. Fujiwara**, **H. Itayama**, and **M. Sakaguchi**, Spontaneous partial breaking of  $\mathcal{N} = 2$  supersymmetry and the  $U(N)$  gauge model; **K. Gomi**, An analogue of the space of conformal blocks in  $(4k + 2)$ -dimensions; **M. Kasatani** and **Y. Takeyama**, The quantum Knizhnik-Zamolodchikov equation and non-symmetric Macdonald polynomials; **Y. Konishi**, Local Gromov-Witten invariants of cubic surfaces; **S. Minabe**, Flop invariance of the topological vertex; **H. Moriuchi**, A table of  $\theta$ -curves and handcuff graphs with up to seven crossings; **H. Nagoya**, A quantization of the sixth Painlevé equation; **Y. Nohara**, Lagrangian fibrations and theta functions; **Y. Ogawa**, Generalized Q-functions and UC hierarchy of B-type; **M. Pichot**, The space of triangle buildings; **M. Watanabe**, Ends of metric measure spaces with nonnegative Ricci curvature; **S. Yamagata**, On ideal boundaries of some Coxeter groups; **T. Yoshida**, On manifolds which are locally modeled on the standard representation of a torus.

**Advanced Studies in Pure Mathematics**, Volume 55

July 2009, 363 pages, Hardcover, ISBN: 978-4-931469-54-9, 2000 *Mathematics Subject Classification:* 58-06; 58B34, **AMS members US\$65**, List US\$81, Order code ASPM/55

## Differential Equations



### Advances in Discrete Dynamical Systems

**Saber Elaydi**, *Trinity University, San Antonio, TX*, **Kazuo Nishimura** and **Mitsuhiro Shishikura**, *Kyoto University, Japan*, and **Nobuyuki Tose**, *Keio University, Japan*, Editors

This volume contains the proceedings of talks presented at the 11th International Conference on Difference Equations and Applications (ICDEA 2006). ICDEA 2006 was held on July 2006 in Kyoto at the 15th MSJ International Research Institute.

These proceedings comprise new results at the leading edge of many areas in difference equations and discrete dynamical systems and their various applications to the sciences, engineering, physics, and economics.

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

**Contents:** **J. Ferreira Alves**, On periodic points of 2-periodic dynamical systems; **J. A. D. Appleby** and **C. Swords**, Asymptotic behaviour of a nonlinear stochastic difference equation modelling an inefficient financial market; **J. Diblík** and **I. Hlavičková**, Asymptotic properties of solutions of the discrete analogue of the Emden-Fowler equation; **M. Cecchi**, **Z. Došlá**, and **M. Marino**, Intermediate solutions for nonlinear difference equations with  $p$ -Laplacian; **O. Došlý**, Oscillation theory of symplectic difference systems; **T. Furumochi** and **M. Muraoka**, Periodic solutions of periodic difference equations; **Y. Hamaya**, On the existence of almost periodic solutions to a nonlinear Volterra difference equation; **K. Hori**, Indeterminacy in a monetary economy with heterogeneous agents; **S. Iwamoto** and **M. Yasuda**, Golden optimal path in discrete-time dynamic optimization processes; **S. R. Jang**, Cannibalism in a discrete predator-prey model with an age structure in the prey; **T. Kohda**, 3-dimensional i.i.d. binary random vectors governed by Jacobian elliptic space curve dynamics; **A. Kondo**, Inefficacy of temporary policy in Neumeyer-Yano's monetary model; **C. Correia Ramos**, **N. Martins**, **J. Sousa Ramos**, and **R. Severino**, Discrete potential theory for iterated maps of the interval; **M. Inoue** and **H. Matsunaga**, Global behavior of a two-dimensional monotone difference system; **F. Kawahigashi** and **H. Matsunaga**, Asymptotic stability conditions for a delay difference system; **M. Matsuo** and **T. Sakagami**, Characterization of equilibrium paths in the two-sector model with sector specific externality; **D. Mendes**, **V. M. Mendes**, **J. Sousa Ramos**, and **O. Gomes**, Computing topological entropy in asymmetric Cournot duopoly games with homogeneous expectations; **A. Mizushima**, Equilibrium dynamics in an overlapping generations economy with endogenous labor supply; **S. Murakami**, Stabilities with respect to a weight function in Volterra difference equations; **P. Niamsup**, A note on asymptotic stability condition for delay difference equations; **N. Nishimura**, **H. Takahashi**, and **A. Venditti**, Global externalities, endogenous growth and sunspot fluctuations; **L. Erbe** and **A. Peterson**, Some oscillation results for second order linear delay dynamic equations; **N. Pop**, Analysis of an evolutionary variational inequality arising in elasticity quasi-static contact problems; **C. Pötzsche**, Dissipative delay endomorphisms and

asymptotic equivalence; **P. Řehák**, A Willett type criterion with the best possible constant for linear dynamic equations; **J. A. D. Appleby**, **M. Riedle**, and **A. Rodkina**, On asymptotic stability of linear stochastic Volterra difference equations with respect to a fading perturbation; **W. Hernandez-Padilla** and **L.-I. Roeger**, Local stability of a discrete competition model derived from a nonstandard numerical method; **S. Saito**, Eventual stability criterion for periodic points of Michio Morishima's example; **T. Sauer**, Detection of periodic driving in nonautonomous difference equations; **H. Sedaghat**, Periodic and chaotic behavior in a class of second order difference equations; **J. F. Selgrade** and **J. H. Roberds**, Uniqueness of polymorphism for a discrete, selection-migration model with genetic dominance; **W. Sizer**, Periodicity in the May's host parasitoid equation; **P. Stehlik**, On variational methods for second order discrete periodic problems; **Y. Takahashi**, Time evolution with and without remote past; **Y. Aoki** and **Y. Tomoda**, The Friedman rule under habit formation; **A. Vanderbauwhede**, Subharmonic bifurcation from relative equilibria in reversible systems with rotation symmetry; **C. L. Wesley**, **L. J. S. Allen**, **C. B. Jonsson**, **Y.-K. Chu**, and **R. D. Owen**, A discrete-time rodent-hantavirus model structured by infection and developmental stages.

**Advanced Studies in Pure Mathematics**, Volume 53

June 2009, 398 pages, Hardcover, ISBN: 978-4-931469-49-5, 2000 *Mathematics Subject Classification*: 39A05; 37N25, 37N40, 39A11, **AMS members US\$52**, List US\$65, Order code ASPM/53

## Geometry and Topology



### Geometry, Analysis, and Algebraic Geometry (Surveys in Differential Geometry, Volume XIII)

Forty Years of the Journal of Differential Geometry

**Huai-Dong Cao**, *Lehigh University, Bethlehem, PA*, and

**Shing-Tung Yau**, *Harvard University, Cambridge, MA*, Editors

The editors of the highly esteemed *Journal of Differential Geometry* (published by International Press) each year present a new volume of Surveys in Differential Geometry, a collection of original contributions on a specially chosen topic pertaining to differential geometry and related topics. The series presents an overview of recent trends while making predictions and suggestions for future research.

Each invited contributor is a prominent specialist in the field of algebraic geometry, mathematical physics, or related areas. Contributors to Surveys tend to transcend classical frameworks within their field.

Once every three years, Lehigh University and Harvard University, in conjunction with the editors of the JDG, sponsor a conference whose purpose is to survey the general field of differential

geometry and related subjects. Speakers at the conference are likewise selected for their prominence in a given field and for their innovative contributions to it. Hence every third volume of Surveys is a publication of those presented talks.

The Surveys in Differential Geometry series is a beneficial collection for experts and non-experts alike, and, in particular, for those independent of the mainstream of activity in the field of geometry.

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

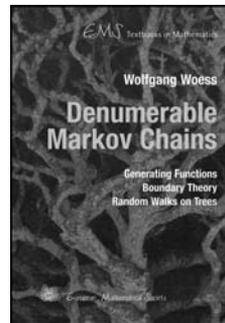
A publication of International Press. Distributed worldwide by the American Mathematical Society.

**Contents:** **D. Auroux**, Special Lagrangian fibrations, wall-crossing, and mirror symmetry; **S. Brendle** and **R. Schoen**, Sphere theorems in geometry; **R. Donagi** and **T. Pantev**, Geometric Langlands and non-Abelian Hodge theory; **K. Grove**, Developments around positive sectional curvature; **C. LeBrun**, Einstein metrics, four-manifolds, and conformally Kähler geometry; **F. Hang**, **F. Lin**, and **Y. Yang**, Existence of Faddeev knots; **F. Bogomolov** and **Y. Tschinkel**, Milnor  $K_2$  and field homomorphisms; **E. Viehweg**, Arakelov inequalities; **S.-T. Yau**, A survey of Calabi-Yau manifolds.

**International Press**

August 2009, 318 pages, Hardcover, ISBN: 978-1-57146-138-4, 2000 *Mathematics Subject Classification*: 53C44, **AMS members US\$68**, List US\$85, Order code INPR/83

## Probability



### Denumerable Markov Chains

Generating Functions, Boundary Theory, Random Walks on Trees

**Wolfgang Woess**, *Graz University of Technology, Austria*

Markov chains are among the basic and most important examples of random processes. This book is about time-homogeneous Markov chains that evolve with discrete time steps on a countable state space.

A specific feature is the systematic use, on a relatively elementary level, of generating functions associated with transition probabilities for analyzing Markov chains. Basic definitions and facts include the construction of the trajectory space and are followed by ample material concerning recurrence and transience, the convergence and ergodic theorems for positive recurrent chains. There is a side-trip to the Perron-Frobenius theorem. Special attention is given to reversible Markov chains and to basic mathematical models of population evolution such as birth-and-death chains, Galton-Watson process and branching Markov chains.

A good part of the second half is devoted to the introduction of the basic language and elements of the potential theory of transient Markov chains. Here the construction and properties of the Martin boundary for describing positive harmonic functions are crucial. In the long final chapter on nearest neighbor random walks on (typically infinite) trees the reader can harvest from the seed of

# THE FEATURE COLUMN

monthly essays on mathematical topics



[www.ams.org/featurecolumn](http://www.ams.org/featurecolumn)

Each month, the Feature Column provides an online in-depth look at a mathematical topic. Complete with graphics, links, and references, the columns cover a wide spectrum of mathematics and its applications, often including historical figures and their contributions. The authors—David Austin, Bill Casselman, Joe Malkevitch, and Tony Phillips—share their excitement about developments in mathematics.

## Recent essays include:

How Google Finds Your Needle in the Web's Haystack

Rationality and Game Theory

Lorenz and Modular Flows: A Visual Introduction

The Princess of Polytopia: Alicia Boole Stott and the 120-cell

Finite Geometries?

Voronoi Diagrams and a Day at the Beach

Simple Chaos – The Hénon Map

The Octosphericon and the Cretan Maze

Trees: A Mathematical Tool for All Seasons

Variations on Graph Minor

Penrose Tilings Tied up in Ribbons

Topology of Venn Diagrams



**AMS members:** Sign up for the AMS members-only *Headlines & Deadlines* service at [www.ams.org/eneews](http://www.ams.org/eneews) to receive email notifications when each new column is posted.

## New AMS-Distributed Publications

methods laid out so far, in order to obtain a rather detailed understanding of a specific, broad class of Markov chains.

The level varies from basic to more advanced, addressing an audience from master's degree students to researchers in mathematics, and persons who want to teach the subject on a medium or advanced level. Measure theory is not avoided; careful and complete proofs are provided. A specific characteristic of the book is the rich source of classroom-tested exercises with solutions.

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

**Contents:** Preliminaries and basic facts; Irreducible classes; Recurrence and transience, convergence, and the ergodic theorem; Reversible Markov chains; Models of population evolution; Elements of the potential theory of transient Markov chains; The Martin boundary of transient Markov chains; Minimal harmonic functions on Euclidean lattices; Nearest neighbour random walks on trees; Solutions of all exercises; Bibliography; List of symbols and notation; Index.

**EMS Textbooks in Mathematics, Volume 10**

August 2009, 386 pages, Hardcover, ISBN: 978-3-03719-071-5, 2000 *Mathematics Subject Classification:* 60-01, 60J10, 60J50, 60J80, 60G50, 05C05, 94C05, 15A48, **AMS members US\$54**, List US\$68, Order code EMSTEXT/10