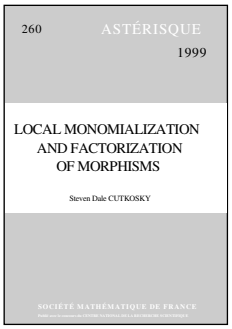
New Publications Offered by the AMS

Algebra and Algebraic Geometry



Local Monomialization and Factorization of Morphisms

Steven Dale Cutkosky

A publication of Société Mathématique de France.

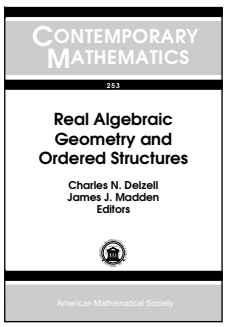
In this volume, the author studies morphisms of algebraic varieties. More specifically, suppose that $R \subset S$ are regular local rings of a common dimension, which are essentially of finite type over a field k of characteristic zero, such that the quotient field K of S is finite over the quotient field of R. If V is a valuation ring of K which dominates S, it is shown that there are sequences of monoidal transforms (blowups of regular primes) $R \to R_1$ and $S \to S_1$ along V such that $R_1 \to S_1$ is a monomial mapping. It follows that a generically finite morphism of nonsingular varieties can be made to be a monomial mapping along a valuation, after blowups of nonsingular subvarieties. Applications are given to factorization of birational morphisms and simultaneous resolution of singularities.

Distributed by the AMS in the United States, Canada, and Mexico. Orders from other countries should be sent to the SMF, Maison de la SMF, B.P. 67, 13274 Marseille cedex 09, France, or to Institut Henri Poincaré, 11 rue Pierre et Marie Curie, 75231 Paris cedex 05, France. Members of the SMF receive a 30% discount from list.

Contents: Introduction; Preliminaries; Uniformizing transforms; Monomialization; Factorization 1; Factorization 2; The Zariski manifold; Bibliography.

Astérisque, Number 260

December 1999, 143 pages, Softcover, 2000 *Mathematics Subject Classification*: 14Exx, 13Bxx, **Individual member $30**, List $33, Order code AST/260N



Real Algebraic Geometry and Ordered Structures

Charles N. Delzell and **James J. Madden**, *Louisiana State University, Baton Rouge*, Editors

This volume contains 16 carefully refereed articles by participants in the Special Semester and the AMS Special Session on Real Algebraic Geometry and Ordered Structures held at Louisiana State University and Southern University (Baton Rouge). The 23 contributors to this volume were among the 75 mathematicians from 15 countries who participated in the special semester.

Topics include the topology of real algebraic curves (Hilbert's 16th problem), moduli of real algebraic curves, effective sums of squares of real forms (Hilbert's 17th problem), efficient real quantifier elimination, subanalytic sets and stratifications, semialgebraic singularity theory, radial vector fields, exponential functions and valuations on nonarchimedean ordered fields, valued field extensions, partially ordered and lattice-ordered rings, rings of continuous functions, spectra of rings, and abstract spaces of (higher-level) orderings and real places.

This volume provides a good overview of the state of the art in this area in the 1990s. It includes both expository and original research papers by top workers in this thriving field. The authors and editors strived to make the volume useful to a wide audience (including students and researchers) interested in real algebraic geometry and ordered structures—two subjects that are obviously related, but seldom brought together.

Contents: M. E. Alonso and **M. P. Vélez**, On real involutions and ramification of real valuations; **E. Becker**, **V. Powers**, and **T. Wörmann**, Deciding positivity of real polynomials; **J.-P. Brasselet**, Radial vector fields and the Poincaré-Hopf theorem; **S. Finashin**, A generalization of the Arnold-Viro inequalities for real singular algebraic curves; **P. M. Gilmer**, Floppy curves, with applications to real algebraic curves; **D. Gondard** and **M. Marshall**, Towards an abstract description of the space of real places; **L. Gonzalez-Vega**, A special quantifier elimination algorithm for Pham systems; **M. Henriksen** and **F. A. Smith**, A look at biseparating maps from an algebraic point of view; **J. Huisman**, Real Teichmüller spaces and moduli of real algebraic curves; **J. Huisman**, Correction to "A real algebraic vector

bundle is strongly algebraic whenever its total space is affine"; **F.-V. Kuhlmann** and **S. Kuhlmann**, The exponential rank of nonarchimedean exponential fields; **L. Noirel** and **D. Trotman**, Subanalytic and semialgebraic realisations of abstract stratified sets; **J. Ohm**, On the vector space defect for valued field extensions; **G. M. Polotovskii**, On the classification of decomposable 7-th degree curves; **M. J. de la Puente**, The complex spectrum of a ring; **B. Reznick**, Some concrete aspects of Hilbert's 17th problem; **M. Shiota**, Semialgebraic singularity theory.

Contemporary Mathematics, Volume 253

April 2000, 287 pages, Softcover, ISBN 0-8218-0804-4, 2000 *Mathematics Subject Classification*: 00B25, 14Pxx; 01A60, 06Fxx, 11Exx, 12–XX, 13–XX, 32B20, 54C45, 57R25, 58A07, **Individual member $45**, List $75, Institutional member $60, Order code CONM/253N

Analysis

Géométrie Complexe et Systèmes Dynamiques Colloque en L'Honneur D'Adrien Douady

Marguerite Flexor, **Pierrette Sentenac**, and **Jean-Christophe Yoccoz**, Editors

A publication of Société Mathématique de France.

This volume presents written accounts of the lectures given at the University of Paris-Sud (Orsay) during the conference in honor of Adrien Douady's sixtieth birthday. The multi-faceted activity within the field of dynamical systems is reflected in the papers in this volume. Topics covered in the book include iteration of polynomials (specifically quadratic), rational fractions, holomorphic foliations, and non-uniformly hyperbolic dynamics.

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

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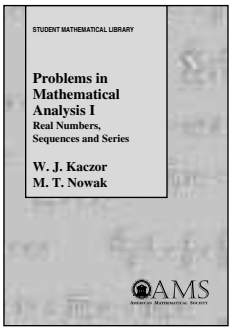
Contents: K. Astala, **Z. Balogh**, and **H. M. Reimann**, Lempert mappings and holomorphic motions in $\mathbf{C}^n$; **M. Benedicks** and **L.-S. Young**, Markov extensions and decay of correlations for certain Hénon maps; **C. Camacho** and **B. A. Scárdua**, Complex foliations with algebraic limit sets; **A. Fathi**, Une caractérisation des stades à virages circulaires; **M. Jakobson** and **S. Newhouse**, Asymptotic measures for hyperbolic piecewise smooth mappings of a rectangle; **G. Levin** and **S. van Strien**, Total disconnectedness of Julia sets and absence of invariant linefields for real polynomials; **M. Lyubich**, Dynamics of quadratic polynomials, III parapuzzle and SBR measures; **S. Luzzatto** and **M. Viana**, Positive Lyapunov exponents for Lorenz-like families with criticalities; **M. Martens** and **T. Nowicki**, Invariant measures for typical quadratic maps; **J.-F. Mattei**, Quasi-homogénéité et équiréductibilité de feuilletages holomorphes en dimension deux; **J. Milnor**, Periodic orbits, externals rays and the Mandelbrot set: An expository account; **J. Palis**, A global view of dynamics and a conjecture on the denseness of finitude of attractors; **K. Pilgrim** and **T. Lei**, Rational maps with disconnected Julia set; **F. Przytycki**, Hölder implies Collet-Eckmann; **D. Schleicher**, Rational parameter rays of the Mandelbrot set.

Astérisque, Number 261

December 1999, 443 pages, Softcover, ISBN 2-85629-081-7, 2000 *Mathematics Subject Classification*: 30Cxx, 30Dxx, 30Fxx, 32Axx, 32Bxx, 32Gxx, 32Sxx, 32Lxx, 37Axx, 37Cxx, 37Dxx, 37Exx, 37–XX, 52Axx, 53Cxx, **Individual member $89**, List $99, Order code AST/261N

Supplementary Reading



Problems in Mathematical Analysis I

Real Numbers, Sequences and Series

W. J. Kaczor and **M. T. Nowak**, *Marie Curie-Skłodowska University, Lublin, Poland*

We learn by doing. We learn mathematics by doing problems. This book is the first volume of a series of books of problems in mathematical analysis. It is mainly intended for students studying the basic principles of analysis. However, given its organization, level, and selection of problems, it would also be an ideal choice for tutorial or problem-solving seminars, particularly those geared toward the Putnam exam. The volume is also suitable for self-study.

Each section of the book begins with relatively simple exercises, yet may also contain quite challenging problems. Very often several consecutive exercises are concerned with different aspects of one mathematical problem or theorem. This presentation of material is designed to help student comprehension and to encourage them to ask their own questions and to start research. The collection of problems in the book is also intended to help teachers who wish to incorporate the problems into lectures. Solutions for all the problems are provided.

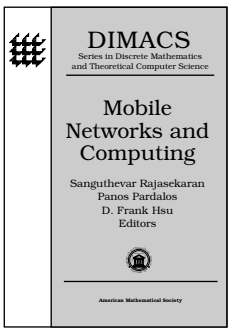
The book covers three topics: real numbers, sequences, and series, and is divided into two parts: exercises and/or problems, and solutions. Specific topics covered in this volume include the following: basic properties of real numbers, continued fractions, monotonic sequences, limits of sequences, Stolz's theorem, summation of series, tests for convergence, double series, arrangement of series, Cauchy product, and infinite products.

Contents: *Problems:* Real numbers; Sequence of real numbers; Series of real numbers; *Solutions:* Real numbers; Sequences of real numbers; Series of real numbers; Bibliography.

Student Mathematical Library

April 2000, approximately 400 pages, Softcover, ISBN 0-8218-2050-8, LC 99-087039, 2000 *Mathematics Subject Classification*: 00A07; 40–01, **All AMS members $31**, List $39, Order code STML-NOWAKN

Applications



Mobile Networks and Computing

Sanguthevar Rajasekaran and **Panos Pardalos**, *University of Florida, Gainesville*, and **D. Frank Hsu**, *Fordham University, Bronx, NY*, Editors

Advances in the technologies of networking, wireless communications, and miniaturization of computers have lead to rapid development in mobile communication infrastructure and have engendered a new paradigm of computing. Users carrying portable devices can now move freely about while remaining connected to the network. This "portability" allows for access to information from anywhere and at any time. The flexibility has resulted in new levels of complexity not encountered previously in software and protocol design for wired networking.

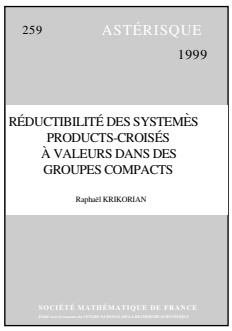
New challenges in designing software systems for mobile networks include location and mobility management, channel allocation, power conservation, and more. In this book, renowned researchers in the field address these aspects of mobile networking.

Contents: **A.-H. A. Abou-Zeid**, **M. Azizoglu**, and **S. Roy**, Stochastic modeling of a single TCP/IP session over a random loss channel; **A. F. Almutairi**, **S. L. Miller**, and **H. A. Latchman**, Tracking of multi-level modulation formats for DS/CDMA systems in a slowly fading channel; **E. Bertino**, **E. Pagani**, and **G. P. Rossi**, An adaptive concurrency control protocol for mobile transactions; **J. Gomez** and **A. T. Campbell**, Supporting adaptive-QOS over multiple time scales in wireless networks; **S. K. S. Gupta** and **P. K. Srimani**, Using self-stabilization to design adaptive multicast protocols for mobile ad hoc networks; **Z. J. Haas** and **A. Warkhedi**, The design and performance of mobile TCP for wireless networks; **A. (Sumi) Helal**, **J. Jing**, and **A. Elmagarmid**, Supporting transaction service handoff in mobile environments; **B. Jaumard**, **C. Meyer**, and **T. Vovor**, How to combine a column and row generation method with a column or row elimination procedure–Application to a channel assignment problem; **A. Joshi**, On mobility and agents; **I. Korpeoglu**, **P. Bhagwat**, **C. Bisdikian**, and **M. Naghshineh**, Multiplexed serial wireless connectivity for palmtop computers; **J.-P. Lin**, **S.-Y. Kuo**, and **Y. Huang**, A cluster-based checkpointing scheme for mobile computing on wide area network; **X. Liu**, **P. M. Pardalos**, **S. Rajasekaran**, and **M. G. C. Resende**, A GRASP for frequency assignment in mobile radio networks; **R. A. Murphey**, **P. M. Pardalos**, and **E. Pasiliao**, Multicriteria optimization for frequency assignment; **T. Hayashi**, **K. Nakano**, and **S. Olariu**, Randomized initialization protocols for packet radio networks; **K. Naik** and **D. S. L. Wei**, Energy-conserving software design for mobile computers; **K. Naik** and **D. S. L. Wei**, Software implementation strategies for power-conscious systems; **R. Prakash** and **M. Singhal**, Impact of unidirectional links in wireless ad-hoc networks; **S. Rajasekaran**, **K. Naik**, and **D. Wei**, On frequency assignment in cellular networks; **X. Yi**, **S. Kitazawa**, **H. Sakazaki**, **E. Okamoto**, and **D. F. Hsu**, An agent-based architecture for securing mobile IP.

DIMACS: Series in Discrete Mathematics and Theoretical Computer Science

April 2000, approximately 313 pages, Hardcover, ISBN 0-8218-1547-4, 2000 *Mathematics Subject Classification*: 68M10, 68M12, 90B18, **Individual member $59**, List $99, Institutional member $79, Order code DIMACS-PARDALOS8N

Differential Equations



Réductibilité des Systèmes Produits-Croisés à Valeurs dans des Groupes Compacts

Raphaël Krikorian, *Centre de Mathématiques de l'École Polytechnique, Palaiseau, France*

A publication of Société Mathématique de France.

This book studies the problem of reducibility (conjugacy to constants) of quasi-periodic skew-product systems with values in compact semisimple groups, as well as the existence of Floquet-type solutions for linear differential quasi-periodic systems with values in compact semisimple algebras.

The main result (Chapter 6) is that for real one-parameter families of quasi-periodic systems with values in the group of rotations of the 3-space, reducibility holds for almost all values of the parameter (provided the family is close enough to some family of constant systems). For the proof of this result (which relies on a resonance removing procedure due to L. H. Eliasson), the author introduces a notion of transversality à la Pyartli, which allows for controlling the dependence of the eigenvalues on the parameter. Also used is a positive measure reducibility theorem, which in case the group is compact semisimple, is proven in Chapter 3. In Chapter 5, again in the compact semisimple group case, the author proves that modulo some finite covering which depends only on the group, the set of reducible systems is dense near the constants. Chapter 4 is devoted to a normal form type theorem which enables recovery of the result of Chapter 3. Finally in Chapter 2, a necessary and sufficient condition (modulo a finite covering) is given for reducibility of skew-product systems and the centralizer of constant systems is studied.

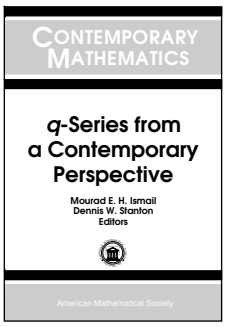
Distributed by the AMS in the United States, Canada, and Mexico. Orders from other countries should be sent to the SMF, Maison de la SMF, B.P. 67, 13274 Marseille cedex 09, France, or to Institut Henri Poincaré, 11 rue Pierre et Marie Curie, 75231 Paris cedex 05, France. Members of the SMF receive a 30% discount from list.

Contents: Introduction; Rappels et notations difféomorphismes produits-croisés, systèmes quasi-périodiques; Réductibilité des systèmes produits-croisés; Méthode K.A.M. classique, résultats en mesure positive; Théorèmes de formes normales et applications; Densité et quasi-densité des systèmes réductibles au voisinage des constantes; Réductibilité presque partout dans le cas $SO(3,\mathbf{R})$; Annexe: Quelques estimées; Bibliographie.

Astérisque, Number 259

November 1999, 216 pages, Softcover, 2000 *Mathematics Subject Classification*: 34–XX, 58–XX, **Individual member $50**, List $55, Order code AST/259N

Discrete Mathematics and Combinatorics



q-Series from a Contemporary Perspective

Mourad E. H. Ismail, *University of South Florida, Tampa*, and **Dennis W. Stanton**, *University of Minnesota, Minneapolis*, Editors

This volume presents the proceedings of the Summer Research Conference on q-series and related topics held at Mount Holyoke College (Hadley, MA). All of the papers were contributed by participants and offer original research. Articles in the book reflect the diversity of areas that overlap with q-series, as well as the usefulness of q-series across the mathematical sciences. The conference was held in honor of Richard Askey on the occasion of his 65th birthday.

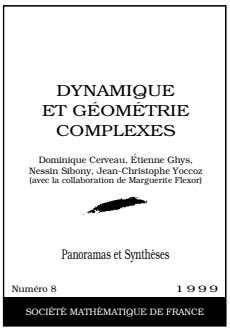
This item will also be of interest to those working in analysis.

Contents: G. E. Andrews, Schur's theorem, partitions with odd parts and the Al-Salam-Carlitz polynomials; **K. Aomoto** and **K. Iguchi**, Singularity and monodromy of quasi-hypergeometric functions; **B. C. Berndt**, **H. H. Chan**, and **S.-S. Huang**, Incomplete elliptic integrals in Ramanujan's lost notebook; **W. C. Connett** and **A. L. Schwartz**, Measure algebras associated with orthogonal polynomials; **D. Foata** and **G. Han**, Word straightening and q-Eulerian calculus; **O. Foda**, **K. S. M. Lee**, **Y. Pugai**, and **T. A. Welsh**, Path generating transforms; **G. Gasper**, q-extensions of Erdélyi's fractional integral representations for hypergeometric functions and some summation formulas for double q-Kampé de Fériet series; **R. Wm. Gosper, Jr.** and **S. K. Suslov**, Numerical investigation of basic Fourier series; **M. D. Hirschhorn**, An identity of Ramanujan, and applications; **M. E. H. Ismail** and **D. W. Stanton**, Addition theorems for the q-exponential function; **K. W. J. Kadell**, The Schur functions for partitions with complex parts; **J. Kaneko**, On Forrester's generalization of Morris constant term identity; **A. N. Kirillov**, New combinatorial formula for modified Hall-Littlewood polynomials; **C. Krattenthaler**, Schur function identities and the number of perfect matchings of Holey Aztec rectangles; **S. C. Milne**, A new $U(n)$ generalization of the Jacobi triple product identity; **H. Rosengren**, A new quantum algebraic interpretation of the Askey-Wilson polynomials; **S. Sahi**, Some properties of Koornwinder polynomials; **M. Schlosser**, A new multidimensional matrix inversion in A_r.

Contemporary Mathematics

April 2000, approximately 440 pages, Softcover, ISBN 0-8218-1150-9, 2000 *Mathematics Subject Classification*: 05-XX, 11-XX, 20-XX, 22-XX, 30-XX, 33-XX, 41-XX, 42-XX, 43-XX, 82-XX, **Individual member $56**, List $93, Institutional member $74, Order code CONM-ISMAIL2N

Geometry and Topology



Dynamique et Géométrie Complexes

Dominique Cerveau, *Université de Rennes I, France*, **Étienne Ghys**, *École Normale Supérieure de Lyon, France*, and **Nessim Sibony** and **Jean-Christophe Yoccoz**, *Université de Paris-Sud, Orsay, France*

A publication of Société Mathématique de France.

In the last twenty years, the theory of holomorphic dynamical systems had a resurgence of activity, particularly concerning the fine analysis of Julia sets associated to polynomials and rational maps in one complex variable. At the same time, closely related theories had a similar rapid development, for example the qualitative theory of differential equations in the complex domain.

The meeting, "État de la recherche" held at the ENS Lyon presented the current state of the art in this area, emphasizing the unity linking the various sub-domains. This volume contains four survey articles corresponding to the talks presented at this meeting.

D. Cerveau describes the structure of polynomial differential equations in the complex plane, focusing on the local analysis in neighborhoods of singular points. É. Ghys surveys the theory of laminations by Riemann surfaces which occur in many dynamical or geometrical situations. N. Sibony describes the present state of the generalization of the Fatou-Julia theory for polynomial or rational maps in two or more complex dimensions. Lastly, the talk of J.-C. Yoccoz, written by M. Flexor, considers polynomials of degree 2 in one complex variable and, in particular, with the hyperbolic properties of these polynomials centered around the Jakobson theorem.

A general introduction gives a basic history of holomorphic dynamical systems, which demonstrates the numerous and fruitful interactions among the topics. In the spirit of the "État de la recherche de la SMF" meetings, articles are written for a broad mathematical audience, especially students or mathematicians working in different fields.

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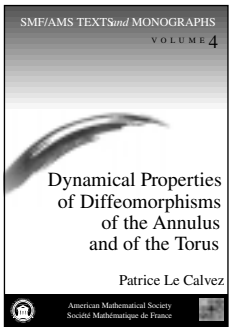
Contents: E. Ghys, Les systèmes dynamiques holomorphes; **D. Cerveau**, Feuilletages holomorphes de codimension 1. Réduction des singularités en petite dimensions et applications; **E. Ghys**, Laminations par surfaces de Riemann; **N. Sibony**, Dynamique des applications rationnelles de $\mathbb{P}^k$; **J.-C. Yoccoz**, Dynamique des polynômes quadratiques.

Panoramas et Synthèses, Number 8

December 1999, 222 pages, Softcover, ISBN 2-85629-078-7, 2000 *Mathematics Subject Classification*: 32S65, 37F75, 34Mxx, 37B10, **Individual member $40**, List $44, Order code PASY/8



Dynamical Properties of Diffeomorphisms of the Annulus and of the Torus

Patrice Le Calvez, *University of Paris, Villetaneuse, France*

The first chapter of this monograph presents a survey of the theory of monotone twist maps of the annulus. First, the author covers the conservative case by presenting a short survey of Aubry-Mather theory and Birkhoff theory, followed by some criteria for existence of periodic orbits without the area-preservation property. These are applied in the area-decreasing case, and the properties of Birkhoff attractors are discussed. A diffeomorphism of the closed annulus which is isotopic to the identity can be written as the composition of monotone twist maps.

The second chapter generalizes some aspects of Aubry-Mather theory to such maps and presents a version of the Poincaré-Birkhoff theorem in which the periodic orbits have the same braid type as in the linear case. A diffeomorphism of the torus isotopic to the identity is also a composition of twist maps, and it is possible to obtain a proof of the Conley-Zehnder theorem with the same kind of conclusions about the braid type, in the case of periodic orbits. This result leads to an equivariant version of the Brouwer translation theorem which permits new proofs of some results about the rotation set of diffeomorphisms of the torus.

This is the English translation of a volume previous published as volume 204 in the Astérisque series.

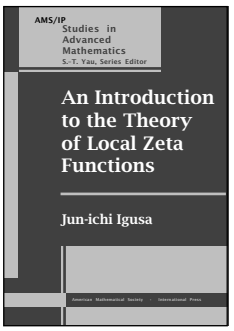
Contents: Presentation and comparison of the different approaches to the theory of monotone twist diffeomorphisms of the annulus; Generating phases of the diffeomorphisms of the torus and the annulus; Bibliography; Index.

SMF/AMS Texts and Monographs, Volume 4

April 2000, 105 pages, Softcover, ISBN 0-8218-1943-7, LC 99-087060, 2000 *Mathematics Subject Classification*: 58–XX, **All AMS members $17**, List $21, Order code SMFAMS/4N

Number Theory

Independent Study



An Introduction to the Theory of Local Zeta Functions

Jun-ichi Igusa, *Johns Hopkins University, Baltimore, MD*

This book is an introductory presentation to the theory of local zeta functions. As distributions, and mostly in the archimedian case, local zeta functions are called complex powers.

The volume contains major results on complex powers by Atiyah, Bernstein, I. M. Gelfand, and S. I. Gelfand. Also included are related results by Sato. The section on p-adic local zeta functions presents Serre's structure theorem, a rationality theorem and many examples by the author. It concludes with theorems by Denef and Meuser.

Prerequisites for understanding the text include basic courses in algebra, calculus, complex analysis, and general topology. The book follows the usual pattern of progress in mathematics: examples are given, conjectures follow, conjectures are developed into theorems.

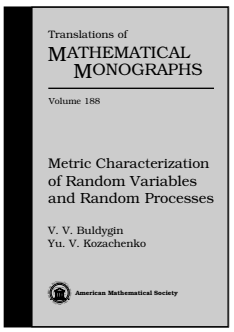
This book is accessible and self-contained. Results illustrate the unity of mathematics by gathering important theorems from algebraic geometry and singularity theory, number theory, algebra, topology, and analysis. The ideas are then employed in essential ways to prove the theorems.

Contents: Preliminaries; Implicit function theorems and K-analytic manifolds; Hironaka's desingularization theorem; Bernstein's theory; Archimedean local zeta functions; Prehomogeneous vector spaces; Totally disconnected spaces and p-adic manifolds; Local zeta functions (p-adic case); Some homogeneous polynomials; Computation of $Z(s)$; Theorems of Denef and Meuser; Bibliography; Index.

AMS/IP Studies in Advanced Mathematics, Volume 14

April 2000, 232 pages, Hardcover, ISBN 0-8218-2015-X, LC 99-087031, 2000 *Mathematics Subject Classification*: 11Sxx, 11S40, 11Mxx, 11Gxx, 14Gxx, **All AMS members $36**, List $45, Order code AMSIP/14N

Probability



Metric Characterization of Random Variables and Random Processes

V. V. Buldygin, *Kyïv Politechnic Institute, Ukraine*, and **Yu. V. Kozachenko**, *Kyïv Taras Shevchenko National University, Ukraine*

The topic covered in this book is the study of metric and other close characteristics of different spaces and classes of random variables and the application of the entropy method to the investigation of properties of stochastic processes whose values, or increments, belong to given spaces. The following processes appear in detail: pre-Gaussian processes, shot noise processes representable as integrals over processes with independent increments, quadratically Gaussian processes, and, in particular, correlogram-type estimates of the correlation function of a stationary Gaussian process, jointly strictly sub-Gaussian processes, etc.

The book consists of eight chapters divided into four parts: The first part deals with classes of random variables and their metric characteristics. The second part presents properties of stochastic processes "imbedded" into a space of random variables discussed in the first part. The third part considers

applications of the general theory. The fourth part outlines the necessary auxiliary material.

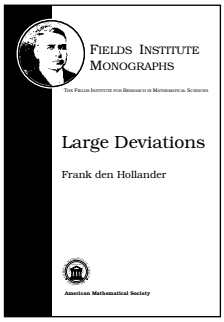
Problems and solutions presented show the intrinsic relation existing between probability methods, analytic methods, and functional methods in the theory of stochastic processes. The concluding sections, "Comments" and "References", gives references to the literature used by the authors in writing the book.

Contents: Sub-Gaussian and pre-Gaussian random variables; Orlicz spaces of random variables; Regularity of sample paths of a stochastic process; Pre-Gaussian processes; Shot noise processes and their properties; Correlograms of stationary Gaussian processes; Jointly sub-Gaussian, super-Gaussian, and pseudo-Gaussian stochastic processes; Appendices; Comments; References; Basic notation; Index.

Translations of Mathematical Monographs, Volume 188

April 2000, approximately 264 pages, Hardcover, ISBN 0-8218-0533-9, LC 99-087766, 2000 *Mathematics Subject Classification*: 60Gxx; 60Exx, **Individual member $57**, List $95, Institutional member $76, Order code MMONO/188N

Recommended Text



Large Deviations

Frank den Hollander, *Nijmegen University, Netherlands*

This volume offers an introduction to large deviations. It is divided into two parts: theory and applications. Basic large deviation theorems are presented for i.i.d. sequences, Markov sequences, and sequences with moderate dependence. The rate function is computed explicitly. The theory is explained without too much emphasis on technicalities. Also included is an outline of general definitions and theorems. The goal is to expose the unified theme that gives large deviation theory its overall structure, which can be made to work in many concrete cases. The section on applications focuses on recent work in statistical physics and random media.

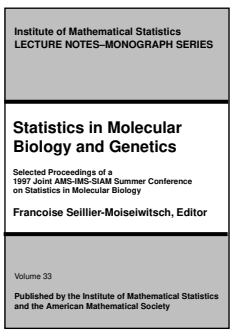
This book contains 60 exercises (with solutions) that should elucidate the content and engage the reader. Prerequisites for the book are a strong background in probability and analysis and some knowledge of statistical physics. It would make an excellent textbook for a special topics course in large deviations.

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

Contents: *Theory:* Large deviations for i.i.d. sequences: Part 1; Large deviations for i.i.d. sequences: Part 2; General theory; Large deviations for Markov sequences; Large deviations for dependent sequences; *Applications:* Statistical hypothesis testing; Random walk in random environment; Heat conduction with random sources and sinks; Polymer chains; Interacting diffusions; Solutions to the exercises; Bibliography; Index; Glossary of symbols.

Fields Institute Monographs, Volume 14

March 2000, 143 pages, Hardcover, ISBN 0-8218-1989-5, LC 99-058913, 2000 *Mathematics Subject Classification*: 60–01, 60F10, 60K35; 82B31, 82B44, **All AMS members $39**, List $49, Order code FIM/14N



Statistics in Molecular Biology and Genetics

Francoise Seillier-Moiseiwitsch, Editor

This volume contains papers from the Summer Research Conference in the Mathematical Sciences jointly sponsored by the Institute of Mathematical Statistics, the American Mathematical Society, and the Society for Industrial and Applied Mathematics. The theme of the conference was Statistics in Molecular Biology and Genetics.

Articles fall into the following broad categories: population genetics, evolutionary genetics, protein structure, genetic mechanisms, quantitative genetics, human genetics, and sequence motifs. Talks by Professors D. Botstein, M.-C. King, and M. Olson outlined the great need for statistical expertise in cutting-edge biological technology. Their stimulating presentations offered very clear overviews of directions in important areas of genetic research, such as physical mapping, genetic mapping, and functional genetics. Manuscripts went through vigorous review, making this a fine comprehensive volume on the topic.

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

Co-published by the American Mathematical Society and the Institute of Mathematical Statistics.

Contents: *Genetic Mechanisms:* **H. Zhao** and **T. Speed**, On a Markov model for chromatid interference; *Population Genetics:* **S. Datta**, Some statistical aspects of cytonuclear disequilibria; **R. Fan** and **K. Lange**, Diffusion process calculations for mutant genes in nonstationary populations; **M. Nordborg**, The coalescent with partial selfing and balancing selection: An applications of structured coalescent processes; *Human Genetics:* **W. Ewens**, Statistical aspects of the transmission/disequilibrium test (TDT); **E. Thompson** and **S. Heath**, Estimation of conditional multilocus gene identity among relatives; *Quantitative Genetics:* **K. Broman** and **T. Speed**, A review of methods for identifying QTL's in experimental crosses; *Evolutionary Genetics:* **M. Newton**, **B. Mau**, and **B. Larget**, Markov chain Monte Carlo for the Bayesian analysis of evolutionary trees from aligned molecular sequences; **J. Felsenstein**, **M. Kuhner**, **J. Yamato**, and **P. Beerli**, Likelihoods on coalescents: A Monte Carlo sampling approach to inferring parameters from population samples of molecular data; **K. Crandall**, Uses of statistical parsimony in HIV analyses; **P. Joyce**, **L. Fox**, **N. Casavant**, and **H. Wichman**, Linear estimators for the evolution of transposable elements; **M. Karnoub**, **F. Seillier-Moiseiwitsch**, and **P. K. Sen**, A conditional approach to the detection of correlated mutations; **A. Lapedes**, **B. Girard**, **L. Liu**, and **G. Stormo**, Correlated mutations in protein sequences: Phylogenetic and structural effects; *Sequence Motifs:* **G. Reinert** and **S. Schbath**, Compound Poisson approximations for occurences of multiple words; *Protein Structure:* **M. Trosset** and **G. Phillips**, Deriving interatomic distance bounds from chemical structure; **L. Edler** and **J. Grassmann**, Protein fold class prediction is a new field for statistical classification and regression.

October 1999, 313 pages, Softcover, ISBN 0-940600-47-1, 2000 *Mathematics Subject Classification*: 60–XX, 62–XX, 92–XX, **Individual member $36**, **All Individuals $36**, List $45, Institutional member $36, Order code SMBGN

Previously Announced Publications

Extension Theory

Hermann Grassmann

The *Ausdehnungslehre* of 1862 is Grassmann's most mature presentation of his "extension theory". The work was unique in capturing the full sweep of his mathematical achievements.

Compared to Grassmann's first book, *Lineale Ausdehnungslehre*, this book contains an enormous amount of new material, including a detailed development of the inner product and its relation to the concept of angle, the "theory of functions" from the point of view of extension theory, and Grassmann's contribution to the Pfaff problem. In many ways, this book is the version of Grassmann's system most accessible to contemporary readers.

This translation is based on the material in Grassmann's "Gesammelte Werke", published by B. G. Teubner (Stuttgart and Leipzig, Germany). It includes nearly all the Editorial Notes from that edition, but the "improved" proofs are relocated, and Grassmann's original proofs are restored to their proper places. The original Editorial Notes are augmented by Supplementary Notes, elucidating Grassmann's achievement in modern terms.

This is the third in an informal sequence of works to be included within the History of Mathematics series, co-published by the AMS and the London Mathematical Society. Volumes in this subset are classical mathematical works that served as cornerstones for modern mathematical thought.

This item will also be of interest to those working in general and interdisciplinary areas.

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

History of Mathematics, Volume 19

April 2000, approximately 403 pages, Softcover, ISBN 0-8218-2031-1, 2000 *Mathematics Subject Classification*: 01A55, 15A75, **Individual member $45**, List $75, Institutional member $60, Order code HMATH/19RT003

Introduction to Mathematical Finance

David C. Heath, *Cornell University, Ithaca, NY*, and **Glen Swindle**, *Avista Energy, Houston, TX*, Editors

The foundation for the subject of mathematical finance was laid nearly 100 years ago by Bachelier in his fundamental work, *Théorie de la spéculation*. In this work, he provided the first treatment of Brownian motion. Since then, the research of Markowitz, and then of Black, Merton, Scholes, and Samuelson brought remarkable and important strides in the field. A few years later, Harrison and Kreps demonstrated the fundamental role of martingales and stochastic analysis in constructing and understanding models for financial markets. The connection opened the door for a flood of mathematical developments and growth.

Concurrently with these mathematical advances, markets have grown, and developments in both academia and industry continue to expand. This lively activity inspired an AMS Short Course at the Joint Mathematics Meetings in San Diego (CA).

The present volume includes the written results of that course. Articles are featured by an impressive list of recognized researchers and practitioners. Their contributions present deep results, pose challenging questions, and suggest directions for future research. This collection offers compelling introductory articles on this new, exciting, and rapidly growing field.

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

Contributors include: S. E. Shreve, M. Avellaneda, F. Delbaen, W. Schachermayer, D. Heath, Y. Aït-Sahalia, and T. Zariphopoulou.

Proceedings of Symposia in Applied Mathematics, Volume 57

March 2000, 167 pages, Hardcover, ISBN 0-8218-0751-X, 2000 *Mathematics Subject Classification*: 91B28; 60H30, 91B24, 93E20, **All AMS members $24**, List $30, Order code PSAPM/57RT003

Recommended Text

Dynamics in One Complex Variable

John Milnor, *State University of New York at Stony Brook, NY*

A publication of Vieweg Verlag.

The text studies the dynamics of iterated holomorphic mappings from a Riemann surface to itself, concentrating on the classical case of rational maps of the Riemann sphere. It is based on introductory lectures given by the author at SUNY, Stony Brook (NY), over the past 10 years.

The subject is large and rapidly growing. These lecture notes are intended to introduce readers to some key ideas in the field and to form a basis for further study. Readers are assumed to be familiar with the basics of complex variable theory and of two-dimensional differential geometry, as well as some basic topics from topology. The exposition is clear and enriched by many beautiful illustrations.

The AMS is exclusive distributor in North America, and non-exclusive distributor worldwide except in Germany, Switzerland, Austria, and Japan.

Vieweg Monographs

August 1999, 257 pages, Softcover, ISBN 3-528-03130-1, 2000 *Mathematics Subject Classification*: 37Fxx, **All AMS members $26**, List $29, Order code VW/9RT003

p-adic L-Functions and p-adic Representations

Bernadette Perrin-Riou, *Université Paris-Sud, France*

Since the original publication of this book in French (see Astérisque 229, 1995), the field has undergone significant progress. These advances are noted in this English edition. Also, some minor improvements have been made to the text.

SMF members are entitled to AMS member discounts.

SMF/AMS Texts and Monographs, Volume 3

February 2000, 150 pages, Softcover, ISBN 0-8218-1946-1, LC 99-055660, 2000 *Mathematics Subject Classification*: 11E95, 11G40, 11R32, 11R42, **All AMS members $39**, List $49, Order code SMFAMS/3RT003

Mathematical Sciences Professional Directory, 2000

March 2000, approximately 232 pages, Softcover, ISBN 0-8218-2043-5, 2000 *Mathematics Subject Classification*: 00–XX, List $50, Institutional member $40, Order code PRODIR/2000RT003