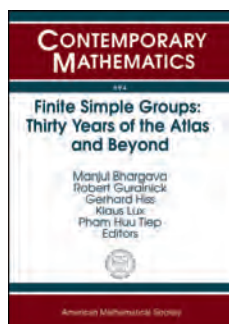


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Algebra and Algebraic Geometry



Finite Simple Groups: Thirty Years of the Atlas and Beyond

Manjul Bhargava, Princeton University, NJ, Robert Guralnick, University of Southern California, Los Angeles, CA, Gerhard Hiss, RWTH Aachen University, Germany, Klaus Lux, University of Arizona, Tucson, AZ, and Pham Huu Tiep, University of Arizona, Tucson, AZ, Editors

This volume contains the proceedings of the international conference Finite Simple Groups: Thirty Years of the Atlas and Beyond Celebrating the Atlases and Honoring John Conway, which was held from November 2-5, 2015, at Princeton University, Princeton, New Jersey.

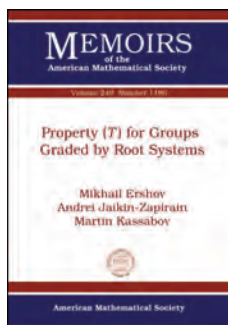
Classification of Finite Simple Groups, one of the most monumental accomplishments of modern mathematics, was announced in 1983 with the proof completed in 2004. Since then, it has opened up a new and powerful strategy to approach and resolve many previously inaccessible problems in group theory, number theory, combinatorics, coding theory, algebraic geometry, and other areas of mathematics. This strategy crucially utilizes various information about finite simple groups, part of which is catalogued in the *Atlas of Finite Groups* (John H. Conway et al.), and in *An Atlas of Brauer Characters* (Christoph Jansen et al.). It is impossible to overestimate the roles of the Atlases and the related computer algebra systems in the everyday life of researchers in many areas of contemporary mathematics.

The main objective of the conference was to discuss numerous applications of the Atlases and to explore recent developments and future directions of research, with focus on the interaction between computation and theory and applications to number theory and algebraic geometry. The papers in this volume are based on talks given at the conference. They present a comprehensive survey on current research in all of these fields.

Contents: Y.-H. He and J. McKay, Moonshine and the meaning of life; S. P. Norton, The monster is fabulous; A. A. Ivanov, Majorana representation of the monster group; J.-P. Serre, Letter to Donna Testerman; T. Breuer, G. Malle, and E. A. O'Brien, Reliability and reproducibility of Atlas information; F. Lübeck, Characters and Brauer trees of the covering group of ${}^2E_6(2)$; R. A. Wilson, Maximal subgroups of sporadic groups; R. T. Curtis, Construction of the Thompson chain of subgroups of the Conway group $\cdot O$ and complete graphs on n letters; N. Gill, N. I. Gillespie, C. E. Praeger, and J. Semeraro, Conway's groupoid and its relatives; M. Aschbacher, The subgroup structure of finite groups; K. Magaard, Some remarks on maximal subgroups of finite classical groups; J. F. Carlson, Toward a classification of endotrivial modules; G. Navarro, Some remarks on global/local conjectures; M. Geck, Minuscule weights and Chevalley groups; G. Nebe, R. Parker, and S. E. Rees, A method for building permutation representations of finitely presented groups; M. W. Liebeck, Character ratios for finite groups of Lie type, and applications; A. Shalev, Conjugacy classes, growth and complexity; R. Waldecker, Permutation groups where non-trivial elements have few fixed points.

Contemporary Mathematics, Volume 694

August 2017, approximately 230 pages, Softcover, ISBN: 978-1-4704-3678-0, 2010 *Mathematics Subject Classification*: 01A70, 05Bxx, 17Bxx, 17D99, 20Bxx, 20Cxx, 20Dxx, 20Exx, 20Gxx, 20Pxx, **AMS members US\$88.80**, List US\$111, Order code CONM/694



Property (T) for Groups Graded by Root Systems

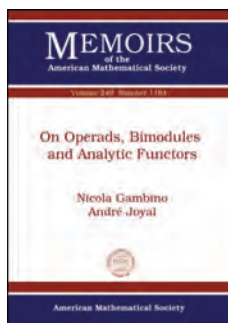
Mikhail Ershov, *University of Virginia, Charlottesville, Virginia*, **Andrei Jaikin-Zapirain**, *Universidad Autónoma de Madrid, Spain*, and **Martin Kassabov**, *Cornell University, Ithaca, New York*, and *University of Southampton, United Kingdom*

Contents: Introduction; Preliminaries; Generalized spectral criterion; Root systems; Property (T) for groups graded by root systems; Reductions of root systems; Steinberg groups over commutative rings; Twisted Steinberg groups; Application: Mother group with property (T); Estimating relative Kazhdan constants; Appendix A. Relative property (T) for $(\mathrm{St}_n(R) \times R^n, R^n)$; Bibliography; Index.

Memoirs of the American Mathematical Society, Volume 249, Number 1186

August 2017, 135 pages, Softcover, ISBN: 978-1-4704-2604-0, 2010 *Mathematics Subject Classification*: 22D10, 17B22; 17B70, 20E42,

Individual member US\$45, List US\$75, Institutional member US\$60, Order code MEMO/249/1186



On Operads, Bimodules and Analytic Functors

Nicola Gambino, *University of Leeds, United Kingdom*, and **André Joyal**, *Université du Québec à Montréal, Québec, Canada*

Contents: Introduction; Background; Monoidal distributors; Symmetric sequences; The bicategory of operad bimodules; Cartesian closure of operad bimodules; Appendix A. A compendium of bicategorical definitions; Appendix B. A technical proof; Bibliography.

Memoirs of the American Mathematical Society, Volume 249, Number 1184

August 2017, 110 pages, Softcover, ISBN: 978-1-4704-2576-0, 2010 *Mathematics Subject Classification*: 18D50; 55P48, 18D05, 18C15,

Individual member US\$45, List US\$75, Institutional member US\$60, Order code MEMO/249/1184



Advanced Modern Algebra

Third Edition, Parts 1 and 2

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

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

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

The second part presents many topics mentioned in the first part in greater depth and in more detail. The five chapters of the book are devoted to group theory, representation theory, homological algebra, categories, and commutative algebra, respectively. The book can be used as a text for a second abstract algebra graduate course, as a source of additional material to a first abstract algebra graduate course, or for self-study.

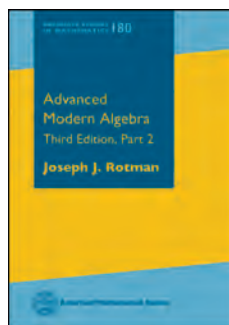
Contents: *Contents for Part 1: Course I:* Classical formulas; Classical number theory; Commutative rings; Groups; Galois theory; Appendix: Set theory; Appendix: Linear algebra; *Course II:* Modules; Zorn's lemma; Advanced linear algebra; Categories of modules; Multilinear algebra; Commutative algebra II; Appendix: Categorical limits; Appendix: Topological spaces; Bibliography; Special notation; Index; *Contents for Part 2:* More groups; Representation theory; Homology; More categories; Commutative rings III; Bibliography; Index.

Graduate Studies in Mathematics, Volume 165, Number 180

Part 1: October 2015, 706 pages, Hardcover, ISBN: 978-1-4704-1554-9, 2010 *Mathematics Subject Classification*: 12-01, 13-01, 14-01, 15-01, 16-01, 18-01, 20-01, Order code GSM/165

Part 2: October 2017, approximately 548 pages, Hardcover, ISBN: 978-1-4704-2311-7, 2010 *Mathematics Subject Classification*: 12-01, 13-01, 14-01, 15-01, 16-01, 18-01, 20-01, Order code GSM/180

Set: October 2017, approximately 1254 pages, Hardcover, ISBN: 978-1-4704-4174-6, 2010 *Mathematics Subject Classification*: 12-01, 13-01, 14-01, 15-01, 16-01, 18-01, 20-01, **AMS members US\$139.20**, List US\$174, Order code GSM/165/180



Advanced Modern Algebra

Third Edition, Part 2

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

This book is the second part of the new edition of *Advanced Modern Algebra* (the first part published as Graduate Studies in Mathematics, Volume 165). Compared

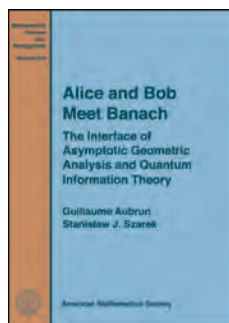
to the previous edition, the material has been significantly reorganized and many sections have been rewritten. The book presents many topics mentioned in the first part in greater depth and in more detail. The five chapters of the book are devoted to group theory, representation theory, homological algebra, categories, and commutative algebra, respectively. The book can be used as a text for a second abstract algebra graduate course, as a source of additional material to a first abstract algebra graduate course, or for self-study.

Contents: More groups; Representation theory; Homology; More categories; Commutative rings III; Bibliography; Index.

Graduate Studies in Mathematics, Volume 180

October 2017, approximately 548 pages, Hardcover, ISBN: 978-1-4704-2311-7, LC 2015019659, 2010 *Mathematics Subject Classification*: 12-01, 13-01, 14-01, 15-01, 16-01, 18-01, 20-01, **AMS members US\$75.20**, List US\$94, Order code GSM/180

Analysis



Alice and Bob Meet Banach

The Interface of Asymptotic Geometric Analysis and Quantum Information Theory

Guillaume Aubrun, *Université Claude Bernard Lyon 1, Villeurbanne, France*, and **Stanisław J. Szarek**, *Case Western Reserve University, Cleveland, OH*

This book builds a bridge between two scientific areas. The first area, Asymptotic Geometric Analysis (AGA), studies the geometry of Banach spaces through their subspaces or subsets of finite but large dimension. Geometric and probabilistic techniques, such as concentration of measure, play a fundamental role. The second area, Quantum Information Theory (QIT), provides the mathematical framework for manipulation of information in the quantum world, and for using quantum phenomena to transmit or store data. Both fields are given a detailed presentation, which includes a discussion of selected important results. One of the main goals of the book is to show how by combining these two

areas, one can get deep recent results about the geometry of entanglement or superadditivity of quantum channel capacities.

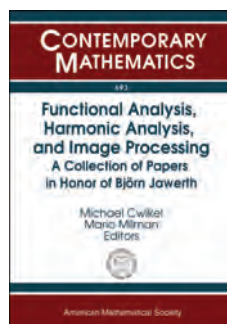
The book is aimed at multiple audiences connected through their interest in the interface of QIT and AGA: at quantum information researchers who want to learn AGA or apply its tools; at mathematicians interested in learning QIT, or at least the part of QIT that is relevant to functional analysis/convex geometry/random matrix theory and related areas; and at beginning researchers in either field. The book aims at making the relevant concepts and facts accessible to everyone from a casual reader to an expert looking for a reference.

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

Contents: *Alice and Bob: Mathematical Aspects of Quantum Information:* Notation and basic concepts; Elementary convex analysis; The mathematics of quantum information theory; Quantum mechanics for mathematicians; *Banach and His spaces:* *Asymptotic Geometric Analysis Miscellany:* More convexity; Metric entropy and concentration of measure in classical spaces; Gaussian processes and random matrices; Some tools from asymptotic geometric analysis; *The Meeting: AGA and QIT:* Entanglement of pure states in high dimensions; Geometry of the set of mixed states; Random quantum states; Bell inequalities and the Grothendieck-Tsirelson inequality; POVMs and the distillability problem; Gaussian measures and Gaussian variables; Classical groups and manifolds; Extreme maps between Lorentz cones and the S -lemma; Polarity and the Santaló point via duality of cones; Hints to exercises; Bibliography; Notation; Index.

Mathematical Surveys and Monographs, Volume 223

October 2017, approximately 413 pages, Hardcover, ISBN: 978-1-4704-3468-7, LC 2017010894, 2010 *Mathematics Subject Classification*: 46Bxx, 52Axx, 81Pxx, 46B07, 46B09, 52C17, 60B20, 81P40, **AMS members US\$92.80**, List US\$116, Order code SURV/223



Functional Analysis, Harmonic Analysis, and Image Processing

A Collection of Papers in Honor of Björn Jawerth

Michael Cwikel, *Technion-Israel Institute of Technology, Haifa, Israel*, and **Mario Milman**, *Instituto Argentino de Matematica, Buenos Aires, Argentina*, Editors

This volume is dedicated to the memory of Björn Jawerth. It contains original research contributions and surveys in several of the areas of mathematics to which Björn made important contributions. Those areas include harmonic analysis, image processing, and functional analysis, which are of course interrelated in many significant and productive ways.

Among the contributors are some of the world's leading experts in these areas. With its combination of research papers and surveys, this book may become an important reference and research tool.

This book should be of interest to advanced graduate students and professional researchers in the areas of functional analysis,

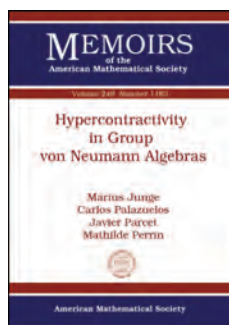
harmonic analysis, image processing, and approximation theory. It combines articles presenting new research with insightful surveys written by foremost experts.

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

Contents: M. Cwikel, M. Frazier, L. M. Jawerth, and M. Milman, Björn David Jawerth (1952–2013); S. V. Astashkin and K. V. Lykov, Jawerth–Milman extrapolation theory: Some recent developments with applications; J. J. Benedetto and M. Dellatorre, Uncertainty principles and weighted norm inequalities; A. Bényi and R. H. Torres, The discrete Calderón reproducing formula of Frazier and Jawerth; H.-O. Bui and T. Candy, A characterisation of the Besov-Lipschitz and Triebel-Lizorkin spaces using Poisson like kernels; C. Cabrelli, C. A. Mosquera, and V. Paternostro, An approximation problem in multiplicatively invariant spaces; G. Cleanthous, A. G. Georgiadis, and M. Nielsen, Discrete decomposition of homogeneous mixed-norm Besov spaces; H. G. Feichtinger and F. Voigtlaender, From Frazier–Jawerth characterizations of Besov spaces to wavelets and decomposition spaces; M. Frazier and S. Roudenko, Traces and extensions of weighted Sobolev and potential spaces; D. D. Haroske and L. Skrzypczak, Compact embeddings of weighted smoothness spaces of Morrey type: An example; L. M. Jawerth and D. A. Weitz, Tracking the structural deformation of a sheared biopolymer network; L. Lempert, Extrapolation, a technique to estimate; A. K. Lerner, On a dual property of the maximal operator on weighted variable L^p spaces; R. Rochberg, Is the Dirichlet space a quotient of DA_n ?; W. Abu-Shammala, J.-L. Shiu, and A. Torchinsky, Characterizations of the Hardy space $H^1(\mathbb{R})$ and $BMO(\mathbb{R})$; C. Tintarev, Four proofs of cocompactness for Sobolev embeddings; H. Triebel, Tempered homogeneous function spaces, II; V. K. Nguyen and W. Sickel, Isotropic and dominating mixed Besov spaces: A comparison; S. Voronin and I. Daubechies, An iteratively reweighted least squares algorithm for sparse regularization.

Contemporary Mathematics, Volume 693

August 2017, 411 pages, Softcover, ISBN: 978-1-4704-2836-5, LC 2016055558, 2010 *Mathematics Subject Classification*: 42B20, 42B25, 42B35, 42C15, 46B70, 42C40, 42B37, 46E30, 46E35, **AMS members US\$88.80**, List US\$111, Order code CONM/693



Hypercontractivity in Group von Neumann Algebras

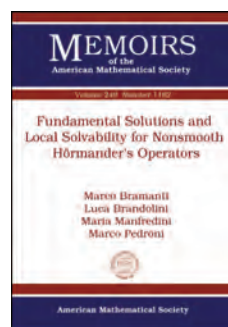
Marius Junge, *University of Illinois at Urbana-Champaign, Illinois*, **Carlos Palazuelos**, *Instituto de Ciencias Matemáticas, Madrid, Spain*, **Javier Parcet**, *Instituto de Ciencias Matemáticas, Madrid, Spain*, and **Mathilde Perrin**, *Instituto de Ciencias Matemáticas, Madrid, Spain*

Contents: The combinatorial method; Optimal time estimates; Poisson-like lengths; Appendix A. Logarithmic Sobolev inequalities; Appendix B. The word length in \mathbb{Z}_n ; Appendix C. Numerical analysis; Appendix D. Technical inequalities; Bibliography.

Memoirs of the American Mathematical Society, Volume 249, Number 1183

August 2017, 83 pages, Softcover, ISBN: 978-1-4704-2565-4, 2010 *Mathematics Subject Classification*: 22D15, 43A22, 47D07, **Individual member US\$45**, List US\$75, Institutional member US\$60, Order code MEMO/249/1183

Differential Equations



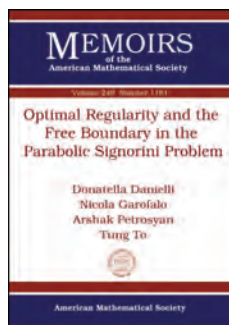
Fundamental Solutions and Local Solvability for Nonsmooth Hörmander's Operators

Marco Bramanti, *Politecnico di Milano, Italy*, **Luca Brandolini**, *Università di Bergamo, Dalmine, Italy*, **Maria Manfredini**, *Università di Bologna, Italy*, and **Marco Pedroni**, *Università di Bergamo, Dalmine, Italy*

Contents: Introduction; Some known results about nonsmooth Hörmander's vector fields; Geometric estimates; The parametrix method; Further regularity of the fundamental solution and local solvability of L ; Appendix. Examples of nonsmooth Hörmander's operators satisfying assumptions A or B; Bibliography.

Memoirs of the American Mathematical Society, Volume 249, Number 1182

August 2017, 79 pages, Softcover, ISBN: 978-1-4704-2559-3, 2010 *Mathematics Subject Classification*: 35A08, 35A17, 35J20, **Individual member US\$45**, List US\$75, Institutional member US\$60, Order code MEMO/249/1182



Optimal Regularity and the Free Boundary in the Parabolic Signorini Problem

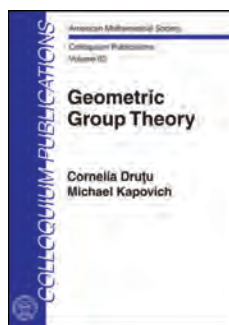
Donatella Danielli, *Purdue University, West Lafayette, Indiana*, **Nicola Garofalo**, *Università di Padova, Italy*, **Arshak Petrosyan**, *Purdue University, West Lafayette, Indiana*, and **Tung To**, *Purdue University, West Lafayette, Indiana*

Contents: Introduction; Notation and preliminaries; Known existence and regularity results; Classes of solutions; Estimates in Gaussian spaces; The generalized frequency function; Existence and homogeneity of blowups; Homogeneous global solutions; Optimal regularity of solutions; Classification of free boundary points; Free boundary: Regular set; Free boundary: Singular set; Weiss and Monneau type monotonicity formulas; Structure of the singular set; Appendix A. Estimates in Gaussian spaces: Proofs; Appendix B. Parabolic Whitney's extension theorem; Bibliography.

Memoirs of the American Mathematical Society, Volume 249, Number 1181

August 2017, 103 pages, Softcover, ISBN: 978-1-4704-2547-0, 2010 *Mathematics Subject Classification*: 35K35, 35K85, **Individual member US\$45**, List US\$75, Institutional member US\$60, Order code MEMO/249/1181

Geometry and Topology



Geometric Group Theory

Cornelia Druțu, *Mathematical Institute, Oxford, United Kingdom*, and **Michael Kapovich**, *University of California, Davis, CA*

With an appendix by Bogdan Nica

The key idea in geometric group theory is to study infinite groups by endowing them with a metric and treating them as geometric spaces. This applies to many groups naturally appearing in topology, geometry, and algebra, such as fundamental groups of manifolds, groups of matrices with integer coefficients, etc. The primary focus of geometric group theory is to cover the foundations of geometric group theory, including coarse topology, ultralimits and asymptotic cones, hyperbolic groups, isoperimetric inequalities, growth of groups, amenability, Kazhdan's Property (T) and the Haagerup property, as well as their characterizations in terms of group actions on median spaces and spaces with walls.

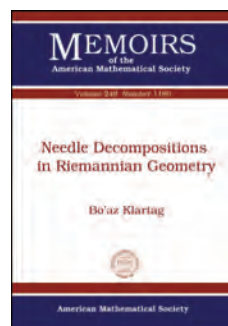
The book contains proofs of several fundamental results of geometric group theory, such as Gromov's theorem on groups of polynomial growth, Tits's alternative, Stallings's theorem on ends of groups, Dunwoody's accessibility theorem, the Mostow Rigidity Theorem, and quasiisometric rigidity theorems of Tukia and Schwartz. This is the first book in which geometric group theory is presented in a form accessible to advanced graduate students and young research mathematicians. It fills a big gap in the literature and will be used by researchers in geometric group theory and its applications.

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

Contents: Geometry and topology; Metric spaces; Differential geometry; Hyperbolic space; Groups and their actions; Median spaces and spaces with measured walls; Finitely generated and finitely presented groups; Coarse geometry; Coarse topology; Ultralimits of metric spaces; Gromov-hyperbolic spaces and groups; Lattices in Lie groups; Solvable groups; Geometric aspects of solvable groups; The Tits alternative; Gromov's theorem; The Banach-Tarski paradox; Amenability and paradoxical decomposition; Ultralimits, fixed point properties, proper actions; Stallings's theorem and accessibility; Proof of Stallings's theorem using harmonic functions; Quasiconformal mappings; Groups quasiisometric to \mathbb{H}^n ; Quasiisometries of nonuniform lattices in \mathbb{H}^n ; A survey of quasiisometric rigidity; Appendix: Three theorems on linear groups; Bibliography; Index.

Colloquium Publications, Volume 63

November 2017, approximately 814 pages, Hardcover, ISBN: 978-1-4704-1104-6, LC 2017002521, 2010 *Mathematics Subject Classification*: 20F65, 20F67, 20F69, 20F05, 20F16, 20F18, 20F34, 20E08, 20E26, 57M07, **AMS members US\$108**, List US\$135, Order code COLL/63



Needle Decompositions in Riemannian Geometry

Bo'az Klartag, *Tel Aviv University, Israel*

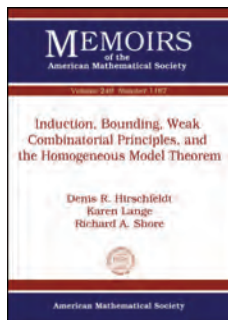
Contents: Introduction; Regularity of geodesic foliations; Conditioning a measure with respect to a geodesic

foliation; The Monge-Kantorovich problem; Some applications; Further research; Appendix: The Feldman-McCann proof of Lemma 2.4.1; Bibliography.

Memoirs of the American Mathematical Society, Volume 249, Number 1180

August 2017, 77 pages, Softcover, ISBN: 978-1-4704-2542-5, **Individual member US\$45**, List US\$75, Institutional member US\$60, Order code MEMO/249/1180

Logic and Foundations



Induction, Bounding, Weak Combinatorial Principles, and the Homogeneous Model Theorem

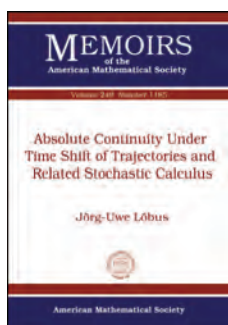
Denis R. Hirschfeldt, *University of Chicago, Illinois*, Karen Lange, *Wellesley College, Massachusetts*, and Richard A. Shore, *Cornell University, Ithaca, New York*

Contents: Introduction; Definitions; The atomic model theorem and related principles; Defining homogeneity; Closure conditions and model existence; Extension functions and model existence; The reverse mathematics of model existence theorems; Open questions; Appendix A. Approximating generics; Appendix B. Atomic trees; Appendix C. Saturated models; Bibliography.

Memoirs of the American Mathematical Society, Volume 249, Number 1187

August 2017, 101 pages, Softcover, ISBN: 978-1-4704-2657-6, 2010 *Mathematics Subject Classification*: 03B30; 03C07, 03C15, 03C50, 03C57, 03D45, 03F30, 03F35, **Individual member US\$45**, List US\$75, Institutional member US\$60, Order code MEMO/249/1187

Probability and Statistics



Absolute Continuity Under Time Shift of Trajectories and Related Stochastic Calculus

Jörg-Uwe Löbus, *Linköpings Universitet, Sweden*

Contents: Introduction, Basic objects, and main result; Flows and logarithmic derivative relative to X under orthogonal projection; The density formula; Partial integration; Relative compactness of particle systems; Appendix A. Basic Malliavin calculus for Brownian motion with random initial data; References; Index.

Memoirs of the American Mathematical Society, Volume 249, Number 1185

August 2017, 135 pages, Softcover, ISBN: 978-1-4704-2603-3, 2010 *Mathematics Subject Classification*: 60H07; 60J65, 60J75, **Individual member US\$45**, List US\$75, Institutional member US\$60, Order code MEMO/249/1185

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