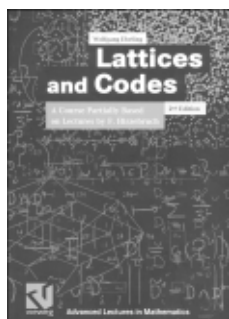

New Publications Offered by the AMS

Algebra and Algebraic Geometry



Lattices and Codes A Course Partially Based on Lectures by F. Hirzebruch, Second Edition

Wolfgang Ebeling, *Universität
Hannover, Germany*

The purpose of coding theory is the design of efficient systems for the transmission of information. The mathematical treatment leads to certain finite structures: the error-correcting codes. Surprisingly, problems that are interesting for the design of codes turn out to be closely related to problems studied earlier and independently in pure mathematics. In this book, examples of such connections are presented. The relation between lattices studied in number theory and geometry and error-correcting codes is discussed. At the same time, the book provides an introduction to the theory of integral lattices and modular forms and to coding theory.

In this second edition, additional basic material has been included to make the text even more self-contained. There is a new section on automorphism groups related to the Leech lattice. Some hints to new results have been incorporated. Finally, several new exercises have been added.

It is suitable for graduate students and researchers in mathematics and computer science.

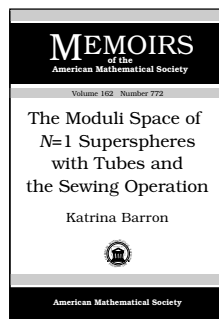
This item will also be of interest to those working in discrete mathematics and combinatorics.

A publication of Vieweg Verlag. The AMS is exclusive distributor in North America. Vieweg Verlag Publications are available worldwide from the AMS outside of Germany, Switzerland, Austria, and Japan.

Contents: Lattices and codes; Theta functions and weight enumerators; Even unimodular lattices; The Leech lattice; Lattices over integers of number fields and self-dual codes; Bibliography; Index.

Vieweg Advanced Lectures in Mathematics

July 2002, 188 pages, Softcover, ISBN 3-528-16497-2, 2000 *Mathematics Subject Classification:* 11H06, 11H31, 11H55, 11F11, 11F41, 11R04, 11R18, 94B05, 94B15, 94B75, 51F15, 51E10, **All AMS members \$32**, List \$35, Order code VWALM/9N



The Moduli Space of $N = 1$ Superspheres with Tubes and the Sewing Operation

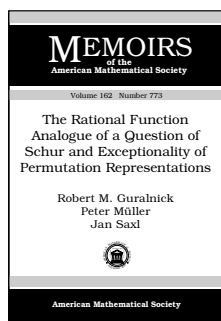
Katrina Barron, *University of
Notre Dame, IN*

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

Contents: Introduction; An introduction to the moduli space of $N = 1$ superspheres with tubes and the sewing operation; A formal algebraic study of the sewing operation; An analytic study of the sewing operation; Bibliography.

Memoirs of the American Mathematical Society, Volume 162, Number 772

March 2003, 135 pages, Softcover, ISBN 0-8218-3260-3, LC 2002038386, 2000 *Mathematics Subject Classification:* 17B65, 17B68, 17B81, 32A05, 32C11, 58A50, 81R10, 81T40, 81T60; 17B69, 30F10, 32G15, **All AMS members \$44**, List \$55, Order code MEMO/162/772N



The Rational Function Analogue of a Question of Schur and Exceptionality of Permutation Representations

Robert M. Guralnick,

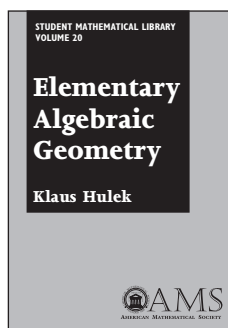
University of Southern California, Los Angeles,
Peter Müller, University of Heidelberg, Germany,
and Jan Saxl

Contents: Introduction; Arithmetic-Geometric preparation; Group theoretic exceptionality; Genus 0 condition; Dickson polynomials and Rédei functions; Rational functions with Euclidean signature; Sporadic cases of arithmetic exceptionality; Bibliography.

Memoirs of the American Mathematical Society, Volume 162, Number 773

March 2003, 79 pages, Softcover, ISBN 0-8218-3288-3, LC 2002038385, 2000 *Mathematics Subject Classification*: 12E30, 20B15; 11G05, 14H25, 14H30, **All AMS members \$39**, List \$49, Order code MEMO/162/773N

Recommended Text



Elementary Algebraic Geometry

Klaus Hulek, *Universität Hannover, Germany*

This is a true introduction to algebraic geometry. The author makes no assumption that readers know more than can be expected of a good undergraduate. He introduces fundamental concepts in a way that enables

students to move on to a more advanced book or course that relies more heavily on commutative algebra.

The language is purposefully kept on an elementary level, avoiding sheaf theory and cohomology theory. The introduction of new algebraic concepts is always motivated by a discussion of the corresponding geometric ideas. The main point of the book is to illustrate the interplay between abstract theory and specific examples. The book contains numerous problems that illustrate the general theory.

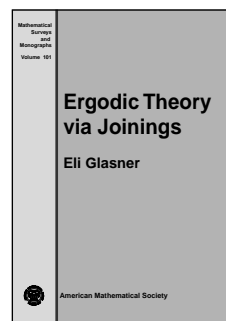
The text is suitable for advanced undergraduates and beginning graduate students. It contains sufficient material for a one-semester course. The reader should be familiar with the basic concepts of modern algebra. A course in one complex variable would be helpful, but is not necessary. It is also an excellent text for those working in neighboring fields (algebraic topology, algebra, Lie groups, etc.) who need to know the basics of algebraic geometry.

Contents: Introduction; Affine varieties; Projective varieties; Smooth points and dimension; Plane cubic curves; Cubic surfaces; Introduction to the theory of curves; Bibliography; Index.

Student Mathematical Library, Volume 20

March 2003, 213 pages, Softcover, ISBN 0-8218-2952-1, LC 2002038457, 2000 *Mathematics Subject Classification*: 14-01, **All AMS members \$28**, List \$35, Order code STML/20N

Analysis



Supplementary Reading

Independent Study

Recommended Text

Ergodic Theory via Joinings

Eli Glasner, *Tel Aviv University, Israel*

This book introduces modern ergodic theory. It emphasizes a new approach that relies on the technique of joining two (or more) dynamical systems. This approach has proved to be fruitful in many recent works, and this is the first time that the entire theory is presented from a joining perspective.

Another new feature of the book is the presentation of basic definitions of ergodic theory in terms of the Koopman unitary representation associated with a dynamical system and the invariant mean on matrix coefficients, which exists for any acting groups, amenable or not. Accordingly, the first part of the book treats the ergodic theory for an action of an arbitrary countable group.

The second part, which deals with entropy theory, is confined (for the sake of simplicity) to the classical case of a single measure-preserving transformation on a Lebesgue probability space.

Topics treated in the book include:

- The interface between topological dynamics and ergodic theory;
- The theory of distal systems due to H. Furstenberg and R. Zimmer—presented for the first time in monograph form;
- B. Host's solution of Rohlin's question on the mixing of all orders for systems with singular spectral type;
- The theory of simple systems;
- A dynamical characterization of Kazhdan groups;
- Weiss's relative version of the Jewett-Krieger theorem;
- Ornstein's isomorphism theorem;
- A local variational principle and its applications to the theory of entropy pairs.

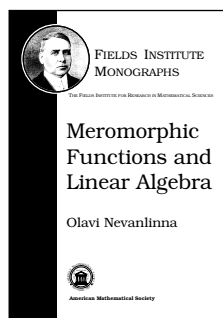
The book is intended for graduate students who have a good command of basic measure theory and functional analysis and who would like to master the subject. It contains many detailed examples and many exercises, usually with indications of solutions. It can serve equally well as a textbook for graduate courses, for independent study, supplementary reading, or as a streamlined introduction for non-specialists who wish to learn about modern aspects of ergodic theory.

Contents: Introduction; *General group actions*: Topological dynamics; Dynamical systems on Lebesgue spaces; Ergodicity and mixing properties; Invariant measures on topological systems; Spectral theory; Joinings; Some applications of joinings; Quasifactors; Isometric and weakly mixing extensions; The Furstenberg-Zimmer structure theorem; Host's theorem;

Simple systems and their self-joinings; Kazhdan's property and the geometry of $M_T(X)$; *Entropy theory for \mathbb{Z} -systems*: Entropy; Symbolic representations; Constructions; The relation between measure and topological entropy; The Pinsker algebra, CPE and zero entropy systems; Entropy pairs; Krieger's and Ornstein's theorems; Prerequisite background and theorems; Bibliography; Index of symbols; Index of terms.

Mathematical Surveys and Monographs, Volume 101

March 2003, 384 pages, Hardcover, ISBN 0-8218-3372-3, LC 2002043617, 2000 *Mathematics Subject Classification*: 37Axx, 28Dxx, 37Bxx, 54H20, 20Cxx, **All AMS members \$71**, List \$89, Order code SURV/101N



Independent Study

Meromorphic Functions and Linear Algebra

Olavi Nevanlinna, Helsinki University of Technology, Finland

This volume describes for the first time in monograph form important applications in numerical methods of linear algebra. The author presents

new material and extended results from recent papers in a very readable style.

The main goal of the book is to study the behavior of the resolvent of a matrix under the perturbation by low rank matrices. Whereas the eigenvalues (the poles of the resolvent) and the pseudospectra (the sets where the resolvent takes large values) can move dramatically under such perturbations, the growth of the resolvent as a matrix-valued meromorphic function remains essentially unchanged. This has practical implications to the analysis of iterative solvers for large systems of linear algebraic equations.

First, the book introduces the basics of value distribution theory of meromorphic scalar functions. It then introduces a new nonlinear tool for linear algebra, the total logarithmic size of a matrix, which allows for a nontrivial generalization of Rolf Nevanlinna's characteristic function from the scalar theory to matrix- and operator-valued functions. In particular, the theory of perturbations by low rank matrices becomes possible. As an example, if the spectrum of a normal matrix collapses under a low rank perturbation, there is always a compensation in terms of the loss of orthogonality of the eigenvectors. This qualitative phenomenon is made quantitative by using the new tool. Applications are given to rational approximation, to the Kreiss matrix theorem, and to convergence of Krylov solvers.

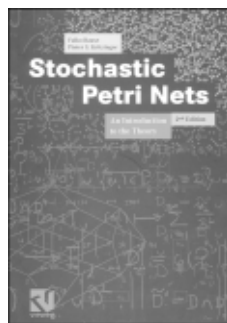
The book is intended for researchers in mathematics in general and especially for those working in numerical linear algebra. Much of the book is understandable if the reader has a good background in linear algebra and a first course in complex analysis.

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

Fields Institute Monographs, Volume 18

April 2003, 136 pages, Hardcover, ISBN 0-8218-3247-6, LC 2002041519, 2000 *Mathematics Subject Classification*: 30G30, 47A10, 47B10, 65F10, **All AMS members \$39**, List \$49, Order code FIM/18N

Applications



Stochastic Petri Nets An Introduction to the Theory, Second Edition

Falko Bause and Pieter S. Kritzinger, University of Cape Town, South Africa

Stochastic Petri nets are a modeling paradigm for the functional and performance analysis of systems. This book provides all the information

necessary for understanding stochastic Petri nets, including a short refresher on probability theory, Markov processes, and single queues. The authors explain generalized stochastic Petri nets in detail and also show how to incorporate queueing aspects into the theory. The book analyzes stochastic Petri nets stressing a combined functional and quantitative examination of systems.

It is suitable for advanced undergraduates, graduate students, researchers, software developers, and systems engineers interested in mathematics, computer science, and the functional and performance evaluation of systems.

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

A publication of Vieweg Verlag. The AMS is exclusive distributor in North America. Vieweg Verlag Publications are available worldwide from the AMS outside of Germany, Switzerland, Austria, and Japan.

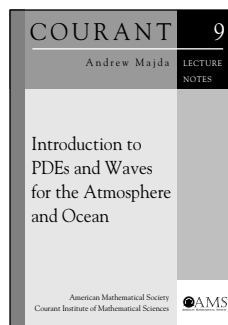
Contents: Preface; *Part I. Stochastic Theory*: Random variables; Markov processes; General queueing systems; Further reading; *Part II. Petri Nets*: Place-transition nets; Coloured Petri nets; Further reading; *Part III. Time-augmented Petri nets*: Stochastic Petri nets; Generalized stochastic Petri nets; Queueing Petri nets; Further reading; Application examples; Solutions to selected exercises; Bibliography; Index.

Vieweg Monographs

August 2002, 218 pages, Softcover, ISBN 3-528-15535-3, 2000 *Mathematics Subject Classification*: 60-XX, 68-XX, **All AMS members \$32**, List \$35, Order code VW/12N

Supplementary Reading

Independent Study



Introduction to PDEs and Waves for the Atmosphere and Ocean

Andrew Majda, *New York University-Courant Institute of Mathematical Sciences, New York*

Written by a leading specialist in the area of atmosphere/ocean science (AOS), the book presents an excellent introduction to this important topic. The goals of these lecture notes, based on courses presented by the author at the Courant Institute of Mathematical Sciences, are to introduce mathematicians to the fascinating and important area of atmosphere/ocean science (AOS) and, conversely, to develop a mathematical viewpoint on basic topics in AOS of interest to the disciplinary AOS community, ranging from graduate students to researchers. The lecture notes emphasize the serendipitous connections between applied mathematics and geophysical flows in the style of modern applied mathematics, where rigorous mathematical analysis as well as asymptotic, qualitative, and numerical modeling all interact to ease the understanding of physical phenomena. Reading these lecture notes does not require a previous course in fluid dynamics, although a serious reader should supplement these notes with material such as additional information on geophysical flows, as suggested in the preface.

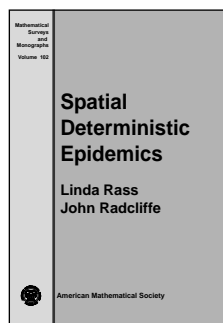
The book is intended for graduate students and researchers working in interdisciplinary areas between mathematics and AOS. It is excellent for supplementary course reading or independent study.

Titles in this series are copublished with the Courant Institute of Mathematical Sciences at New York University.

Contents: Introduction; Some remarkable features of stratified flow; Linear and nonlinear instability of stratified flows with strong stratification; Rotating shallow water theory; Linear and weakly nonlinear theory of dispersive waves with geophysical examples; Simplified equations for the dynamics of strongly stratified flow; The stratified quasi-geostrophic equations as a singular limit of the rotating Boussinesq equations; Introduction to averaging over fast waves for geophysical flows; Waves and PDEs for the equatorial atmosphere and ocean; Bibliography.

Courant Lecture Notes, Volume 9

February 2003, 234 pages, Softcover, ISBN 0-8218-2954-8, LC 2002042674, 2000 *Mathematics Subject Classification*: 34-XX, 35-XX, 65-XX, 76-XX, 86-XX, **All AMS members \$26**, List \$32, Order code CLN/9N



Spatial Deterministic Epidemics

Linda Rass and John Radcliffe, *Queen Mary, University of London*

The study of epidemic models is one of the central topics of mathematical biology. This volume is the first to present in monograph form the rigorous mathematical theory developed to analyze the asymptotic

behavior of certain types of epidemic models.

The main model discussed is the so-called spatial deterministic epidemic in which infected individuals are not allowed to again become susceptible, and infection is spread by means of contact distributions. Results concern the existence of traveling wave solutions, the asymptotic speed of propagation, and the spatial final size. A central result for radially symmetric contact distributions is that the speed of propagation is the minimum wave speed. Further results are obtained using a saddle point method, suggesting that this result also holds for more general situations.

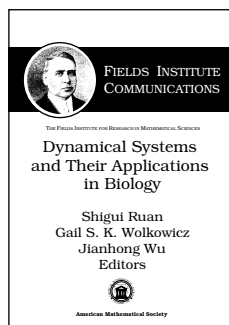
Methodology, used to extend the analysis from one-type to multi-type models, is likely to prove useful when analyzing other multi-type systems in mathematical biology. This methodology is applied to two other areas in the monograph, namely epidemics with return to the susceptible state and contact branching processes.

This book presents an elegant theory that has been developed over the past quarter century. It will be useful to researchers and graduate students working in mathematical biology.

Contents: Introduction; The non-spatial epidemic; Bounds on the spatial final size; Wave solutions; The asymptotic speed of propagation; An epidemic on sites; The saddle point method; Epidemics with return to the susceptible state; Contact branching processes; Appendices; Bibliography; Index.

Mathematical Surveys and Monographs, Volume 102

March 2003, 261 pages, Hardcover, ISBN 0-8218-0499-5, LC 2002038456, 2000 *Mathematics Subject Classification*: 92D30; 92D25, **All AMS members \$55**, List \$69, Order code SURV/102N



Dynamical Systems and Their Applications in Biology

Shigui Ruan, *Dalhousie University, Halifax, NS, Canada*, **Gail S. K. Wolkowicz**, *McMaster University, Hamilton, ON, Canada*, and **Jianhong Wu**, *York University, North York, ON, Canada*, Editors

This volume is based on the proceedings of the International Workshop on Dynamical Systems and their Applications in Biology held at the Canadian Coast Guard College on Cape Breton Island (Nova Scotia, Canada). It presents a broad picture of the current research surrounding applications of dynamical systems in biology, particularly in population biology.

The book contains 19 papers and includes articles on the qualitative and/or numerical analysis of models involving ordinary, partial, functional, and stochastic differential equations. Applications include epidemiology, population dynamics, and physiology.

The material is suitable for graduate students and research mathematicians interested in ordinary differential equations and their applications in biology. Also available by Ruan, Wolkowicz, and Wu is *Differential Equations with Applications to Biology*, Volume 21 in the AMS series Fields Institute Communications.

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

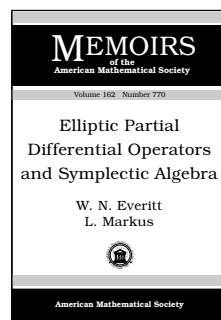
Contents: **J. Atamanyk** and **W. F. Langford**, A compartmental model of Cheyne-Stokes respiration; **M. Bachar** and **O. Arino**, Integrated semigroup and linear ordinary differential equation with impulses; **C. Bauch** and **D. J. D. Earn**, Interepidemic intervals in forced and unforced SEIR models; **E. Beretta**, **H. Sakakibara**, and **Y. Takeuchi**, Stability analysis of time delayed chemostat models for bacteria and virulent phage; **J. Best**, **C. Castillo-Chavez**, and **A.-A. Yakubu**, Hierarchical competition in discrete time models with dispersal; **F. Brauer**, Stability and instability theorems for a characteristic equation arising in epidemic modeling; **F. Brauer** and **P. van den Driessche**, Some directions for mathematical epidemiology; **Y. Chen**, Global attractivity of a population model with state-dependent delay; **Z. Feng**, **Y. Yi**, and **H. Zhu**, Metapopulation dynamics with migration and local competition; **S. A. Gourley**, Oscillations and convergence in a harvesting model with sawtooth delay; **W. Li** and **M. Zhang**, Rigidity for differentiable classification of one-dimensional dynamical systems; **X. Liu**, Management of biological populations via impulsive control; **C. C. McCluskey**, Stability for a class of three-dimensional homogeneous systems; **I. Ncube**, **S. A. Campbell**, and **J. Wu**, Change in criticality of synchronous Hopf bifurcation in a multiple-delayed neural system; **Y. Saito** and **Y. Takeuchi**, Sharp conditions for global stability of Lotka-Volterra systems with delayed intraspecific competitions; **H. L. Smith** and **B. Li**, Competition for essential resources: A brief review; **X. H. Tang**, **L. Wang**, and **X. Zou**, $3/2$ type criteria for global attractivity of Lotka-Volterra discrete system with delays;

P. van den Driessche and **J. Watmough**, Epidemic solutions and endemic catastrophies; **X.-Q. Zhao**, Persistence in almost periodic predator-prey reaction-diffusion systems.

Fields Institute Communications, Volume 36

March 2003, 268 pages, Hardcover, ISBN 0-8218-3163-1, LC 2002038530, 2000 *Mathematics Subject Classification*: 34-XX; 92-XX, 35-XX, 58-XX, **All AMS members \$63**, List \$79, Order code FIC/36N

Differential Equations



Elliptic Partial Differential Operators and Symplectic Algebra

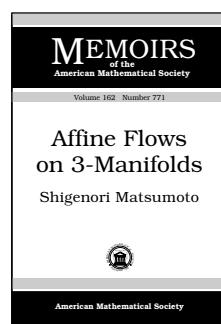
W. N. Everitt, *University of Birmingham, England*, and **L. Markus**, *University of Minnesota, Minneapolis*

Contents: Introduction: Organization of results; Review of Hilbert and symplectic space theory; GKN-theory for elliptic differential operators; Examples of the general theory; Global boundary conditions: Modified Laplace operators; Appendix A. List of symbols and notations; Bibliography; Index.

Memoirs of the American Mathematical Society, Volume 162, Number 770

March 2003, 111 pages, Softcover, ISBN 0-8218-3235-2, LC 2002038388, 2000 *Mathematics Subject Classification*: 35J40, 35P05, 51A50; 47B25, 35J67, **All AMS members \$42**, List \$52, Order code MEMO/162/770N

Geometry and Topology



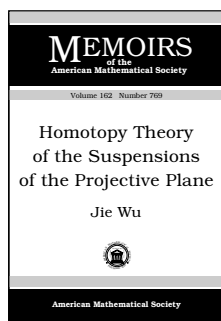
Affine Flows on 3-Manifolds

Shigenori Matsumoto, *Nihon University, Tokyo*

Contents: Introduction; Complete affine flows; Luxuriant foliations; SL-flows; SA-flows; Bibliography.

Memoirs of the American Mathematical Society, Volume 162, Number 771

March 2003, 94 pages, Softcover, ISBN 0-8218-3257-3, LC 2002038387, 2000 *Mathematics Subject Classification*: 57R25, 53C12, 37C10, **All AMS members \$41**, List \$51, Order code MEMO/162/771N



Homotopy Theory of the Suspensions of the Projective Plane

Jie Wu, *National University of Singapore*

Contents: Preliminary and the classical homotopy theory; Decompositions of self smash products; Decompositions of the loop spaces; The homotopy groups

$\pi_{n+r}(\Sigma^r \mathbb{R}P^2)$ for $n \geq 2$ and $r \leq 8$; The homotopy theory of $\Sigma \mathbb{R}P^2$; Bibliography.

Memoirs of the American Mathematical Society, Volume 162, Number 769

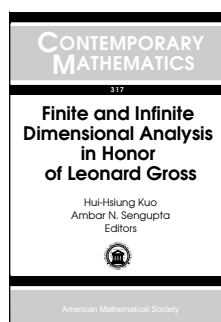
March 2003, 130 pages, Softcover, ISBN 0-8218-3239-5, LC 2002038389, 2000 *Mathematics Subject Classification*: 55Q52; 55P35, 55P40, 55Q20, 55R05, 20F38, 20C20, 57T05, 57T20, **All AMS members \$42**, List \$53, Order code MEMO/162/769N

Poisson white noises with related characterization theorems; **B. K. Driver**, Analysis of Wiener measure on path and loop groups; **M. Gordina**, Stochastic differential equations on noncommutative L^2 ; **B. C. Hall**, The Segal-Bargmann transform and the Gross ergodicity theorem; **B. C. Hall** and **M. B. Stenzel**, Sharp bounds for the heat kernel on certain symmetric spaces of non-compact type; **T. Hida**, Laplacians in white noise analysis; **M. Hino**, On Dirichlet spaces over convex sets in infinite dimensions; **C. King**, Information capacity of quantum channels; **Y.-J. Lee** and **C.-Y. Shih**, The Riesz representation theorem on infinite dimensional spaces; **J. J. Mitchell**, Asymptotic behavior in heat kernel analysis on manifolds; **M. Redfern**, Complex stochastic calculus; **S. B. Sontz**, Recent results and open problems in Segal-Bargmann analysis; **A. Stan**, A new Heisenberg inequality for white noise analysis.

Contemporary Mathematics, Volume 317

February 2003, 224 pages, Softcover, ISBN 0-8218-3202-6, LC 2002038529, 2000 *Mathematics Subject Classification*: 60H40, 28C20, 60G20, 46N50, 46L52, 58J35, 31C25, 62P05, 81P68, 81S30, **All AMS members \$39**, List \$49, Order code CONM/317N

Probability



Finite and Infinite Dimensional Analysis in Honor of Leonard Gross

Hui-Hsiung Kuo and Ambar N. Sengupta, *Louisiana State University, Baton Rouge*, Editors

This book contains the proceedings of the special session in honor of Leonard Gross held at the annual Joint Mathematics Meetings in New Orleans (LA). The speakers were specialists in a variety of fields, and many were Professor Gross's former Ph.D. students and their descendants.

Papers in this volume present results from several areas of mathematics. They illustrate applications of powerful ideas that originated in Gross's work and permeate diverse fields. Topics include stochastic partial differential equations, white noise analysis, Brownian motion, Segal-Bargmann analysis, heat kernels, and some applications.

The volume should be useful to graduate students and researchers. It provides perspective on current activity and on central ideas and techniques in the topics covered.

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

Contents: **L. Accardi**, Meixner classes and the square of white noise; **S. Albeverio**, **Y. Kondratiev**, and **M. Röckner**, Strong Feller properties for distorted Brownian motion and applications to finite particle systems with singular interactions; **H. Allouba** and **V. Goodman**, Market price of risk and random field driven models of term structure: A space-time change of measure look; **N. Asai**, **I. Kubo**, and **H.-H. Kuo**, Gaussian and