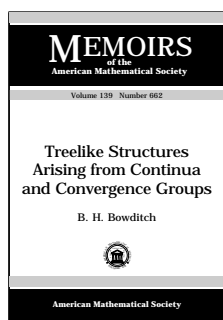


# New Publications Offered by the AMS

## Algebra and Algebraic Geometry



### Treelike Structures Arising from Continua and Convergence Groups

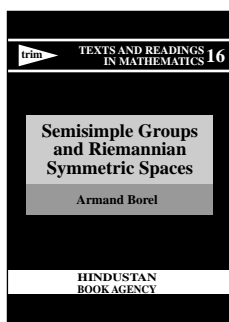
B. H. Bowditch, *University of Southampton, Highfield, UK*

**Contents:** Introduction; Trees; Pretrees; Flows; Quotients; Continua; Groups; Dendrons; References.

*Memoirs of the American Mathematical Society*, Volume 139, Number 662

April 1999, 86 pages, Softcover, ISBN 0-8218-1003-0, LC 99-19220, 1991 *Mathematics Subject Classification*: 20F32, 20F08, **Individual member \$24**, List \$40, Institutional member \$32, Order code MEMO/139/662N

#### Supplementary Reading



### Semisimple Groups and Riemannian Symmetric Spaces

Armand Borel, *Institute for Advanced Study, Princeton, NJ*, Editor

*A publication of Hindustan Book Agency.*

This book presents the previously unpublished notes from a series of

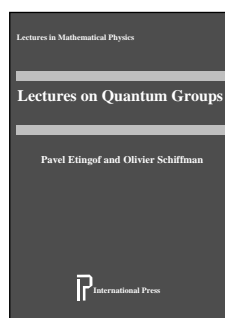
lectures given by the author at the Tata Institute of Fundamental Research in 1961. Basic material on affine connections and on locally or globally Riemannian and Hermitian symmetric spaces is covered. The final chapter proves the basic theorems on maximal compact subgroups of Lie groups. Readers should be familiar with differential manifolds and the elementary theory of Lie groups and Lie algebras.

Distributed worldwide except in India by the American Mathematical Society.

**Contents:** Preliminaries; Orthogonal involutive Lie algebras; Locally symmetric spaces; Riemannian symmetric spaces; Compact groups. Klein forms of symmetric spaces; Hermitian symmetric spaces; Maximal compact subgroups of Lie groups.

**Hindustan Book Agency**

December 1998, 136 pages, Hardcover, ISBN 81-85931-18-6, 1991 *Mathematics Subject Classification*: 22E40; 32M15, **All AMS members \$26**, List \$32, Order code HIN/3N



### Lectures on Quantum Groups

Pavel Etingof, *Harvard University, Cambridge, MA*, and Olivier Schiffmann, *Ecole Normale Supérieure, Paris, France*

*A publication of International Press.*

This book arose from a graduate course on quantum groups given by Professor Etingof at Harvard and expanded upon by Professor Schiffmann. It offers an elementary introduction to the theory of quantum groups from the point of view of quantization.

The topic is presented in the style of lecture notes, rather than in monograph form. The result is a reader-friendly exposition featuring deep and interesting results. Extensive pictorial content aids in writing and checking algebraic relations, and numerous examples, problems, exercises and solutions facilitate reader involvement.

The first seven chapters are devoted to the theory of the quasi-classical objects that are relevant in the theory of quantum groups: Poisson manifolds, Poisson-Lie groups, Lie bialgebras, and the classical Yang-Baxter equation and its solutions. The material is largely standard.

The remaining chapters in the book contain the following: bialgebras and Hopf algebras (definitions and properties); monoidal categories; quasi-bialgebras and quasi-Hopf algebras; Lie associators and the Grothendieck-Teichmüller group; the Tannaka-Krein philosophy for tensor categories; the recently developed method of quantization of Lie bialgebras. Appendices include applications of the material to number theory and to computation of monodromy of the trigonometric Knizhnik-Zamolodchikov equation.

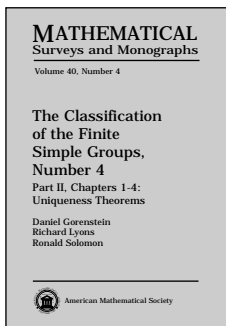
This item will also be of interest to those working in geometry and topology and mathematical physics.

Distributed worldwide, except in Japan, by the American Mathematical Society.

**Contents:** Poisson algebras and quantization; Poisson-Lie groups; Coboundary Lie bialgebras; Drinfeld's double construction; Belavin-Drinfeld classification (I); Infinite dimensional Lie bialgebras; Belavin-Drinfeld classification (II); Hopf algebras; Quantized universal enveloping algebras; Formal groups and  $h$ -formal groups; Infinite dimensional quantum groups; The quantum double; Tensor categories and quasi-Hopf algebras; Braided tensor categories; KZ equations and the Drinfeld category; Quasi-Hopf quantized enveloping algebras; Lie associators; Fiber functors and Tannaka-Krein duality; Quantization of finite dimensional Lie bialgebras; Universal constructions; Universal quantization; Dequantization and the equivalence theorem; KZ associator and multiple zeta functions; Monodromy of trigonometric KZ equations; Solutions to problems and exercises.

**International Press**

August 1998, 239 pages, Hardcover, ISBN 1-57146-063-2, 1991 *Mathematics Subject Classification:* 17B37; 16W30, 81R50, **All AMS members \$34**, List \$42, Order code INPR/33N



**The Classification of the Finite Simple Groups, Number 4**  
**Part II, Chapters 1-4: Uniqueness Theorems**

**Daniel Gorenstein**,<sup>†</sup>  
**Richard Lyons**, *Rutgers University, New Brunswick, NJ,*  
**and Ronald Solomon**, *Ohio State University, Columbus*

*State University, Columbus*

After three introductory volumes on the classification of the finite simple groups, (*Mathematical Surveys and Monographs*, Volumes 40.1, 40.2, and 40.3), the authors now start the proof of the classification theorem: They begin the analysis of a minimal counterexample  $G$  to the theorem.

Two fundamental and powerful theorems in finite group theory are examined: the Bender-Suzuki theorem on strongly embedded subgroups (for which the non-character-theoretic part of the proof is provided) and Aschbacher's Component theorem. Included are new generalizations of Aschbacher's theorem which treat components of centralizers of involutions and  $p$ -components of centralizers of elements of order  $p$  for arbitrary primes  $p$ .

This book, with background from sections of the previous volumes, presents in an approachable manner critical aspects of the classification of finite simple groups.

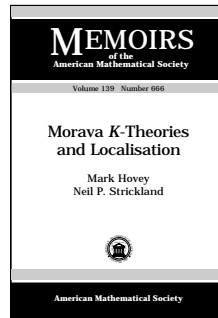
**Features:**

- Treatment of two fundamental and powerful theorems in finite group theory.
- Proofs that are accessible and largely self-contained.
- New results generalizing Aschbacher's Component theorem and related component uniqueness theorems.

**Contents:** General lemmas; Strongly embedded subgroups and related conditions on involutions;  $p$ -component uniqueness theorems; Properties of  $K$ -groups; Background references; Expository references; Errata for number 3, Chapter 1A: Almost simple  $\mathcal{K}$ -groups; Glossary; Index of terminology.

**Mathematical Surveys and Monographs, Volume 40**

April 1999, 341 pages, Hardcover, ISBN 0-8218-1379-X, LC 94-23001, 1991 *Mathematics Subject Classification:* 20D05; 20B20, **Individual member \$45**, List \$75, Institutional member \$60, Order code SURV/40.4N



**Morava  $K$ -Theories and Localisation**

**Mark Hovey**, *Wesleyan University, Middletown, CT,*  
**and Neil P. Strickland**, *University of Sheffield, UK*

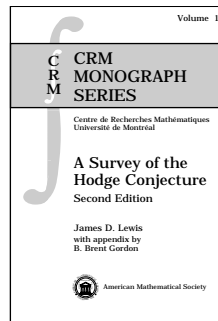
**Contents:** Introduction; Basic definitions;  $E$  theory;  $K$ -injective spectra; Generalised Moore spectra; Bousfield classes; The  $E(n)$ -local category;

General properties of the  $K(n)$ -local category; Smallness and duality; Homology and cohomology functors; Brown-Comenetz duality; The natural topology; Dualisable spectra;  $K$ -nilpotent spectra; Grading over the Picard group; Examples; Questions and conjectures; Completion; Small objects in other categories; References; Index.

**Memoirs of the American Mathematical Society, Volume 139, Number 666**

April 1999, 100 pages, Softcover, ISBN 0-8218-1079-0, LC 99-19210, 1991 *Mathematics Subject Classification:* 55P42, 55P60, 55N22, 55T15, **Individual member \$24**, List \$40, Institutional member \$32, Order code MEMO/139/666N

**Independent Study**



**A Survey of the Hodge Conjecture**  
**Second Edition**

**James D. Lewis**, *University of Alberta, Edmonton, Canada*

This book provides an introduction to a topic of central interest in transcendental algebraic geometry: the Hodge conjecture. Consisting of 15 lectures plus addenda and appendices, the

volume is based on a series of lectures delivered by Professor Lewis at the Centre de Recherches Mathématiques (CRM).

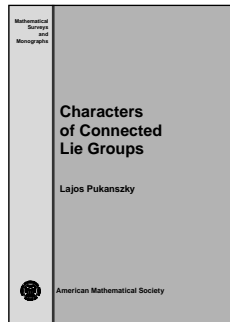
The book is a self-contained presentation, completely devoted to the Hodge conjecture and related topics. It includes many examples, and most results are completely proven or sketched. The motivation behind many of the results and background material is provided. This comprehensive approach to the book gives it a "user-friendly" style. Readers need not search elsewhere for various results. The book is suitable for use as a text for a topics course in algebraic geometry; includes an appendix by B. Brent Gordon.

**Contents:** Complex manifolds; Vector bundles; Kähler manifolds; Line bundles; The Lefschetz (1,1) theorem; The Lefschetz (1,1) theorem revisited; Formulation of the general Hodge conjecture; Chern class theory; Cohomology of complete intersections; The Hodge theorem; Analytic and topological necessities of the Kähler condition; Intermediate Jacobians; Various approaches to the Hodge conjecture for varieties with

well understood geometric structure; The approach to the Hodge conjecture via normal functions; Hodge theory and Chow groups; Results and formulations in the singular case; A survey of the Hodge conjecture for abelian varieties; Index; Index of notation.

CRM Monograph Series, Volume 10

May 1999, 368 pages, Hardcover, ISBN 0-8218-0568-1, LC 99-13391, 1991 *Mathematics Subject Classification*: 14C30, **Individual member \$47**, List \$79, Institutional member \$63, Order code CRMM/10N



## Characters of Connected Lie Groups

Lajos Pukanszky†

This book adds to the great body of research that extends back to A. Weil and E. P. Wigner on the unitary representations of locally compact groups and their characters, i.e. the interplay between classical group theory and modern analysis. The groups studied

here are the connected Lie groups of general type (not necessarily nilpotent or semisimple).

Final results reflect Kirillov's orbit method; in the case of groups that may be non-algebraic or non-type I, the method requires considerable sophistication. Methods used range from deep functional analysis (the theory of  $C^*$ -algebras, factors from F. J. Murray and J. von Neumann, and measure theory) to differential geometry (Lie groups and Hamiltonian actions).

This book presents for the first time a systematic and concise compilation of proofs previously dispersed throughout the literature. The result is an impressive example of the deepness of Pukanszky's work.

**Contents:** Unitary representations of locally algebraic groups; Unitary representations of elementary groups; Existence of characters; Generalized Kirillov theory; Bibliography.

### Mathematical Surveys and Monographs

July 1999, approximately 152 pages, Hardcover, ISBN 0-8218-1088-X, 1991 *Mathematics Subject Classification*: 22E45, **Individual member \$35**, List \$59, Institutional member \$47, Order code SURV-PUKANSZKYN

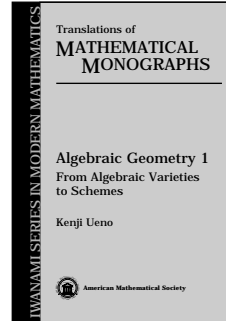
Recommended Text

## Algebraic Geometry 1 From Algebraic Varieties to Schemes

Kenji Ueno, *Kyoto University, Japan*

This is the first of three volumes on algebraic geometry.

Early in the 20th century, algebraic geometry underwent a significant overhaul, as mathematicians, notably Zariski, introduced a much stronger emphasis on algebra and rigor into the subject. This was followed by another fundamental change in the 1960s with Grothendieck's introduction of schemes. Today, most algebraic geometers are well-versed in the language of schemes, but many newcomers are still initially hesitant about them. Ueno's book provides an inviting introduction to the theory, which should overcome any such impediment to learning this rich subject.



The book begins with a description of the standard theory of algebraic varieties. Then, sheaves are introduced and studied, using as few prerequisites as possible. Once sheaf theory has been well understood, the next step is to see that an affine scheme can be defined in terms of a sheaf over the prime spectrum of a ring. By studying algebraic varieties over a field, Ueno demonstrates how the notion of schemes is necessary in algebraic geometry.

This first volume gives a definition of schemes and describes some of their elementary properties. It is then possible, with only a little additional work, to discover their usefulness. Further properties of schemes will be discussed in the second volume.

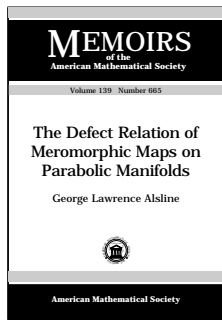
Ueno's book is a self-contained introduction to this important circle of ideas, assuming only a knowledge of basic notions from abstract algebra (such as prime ideals). It is suitable as a text for an introductory course on algebraic geometry.

**Contents:** Algebraic varieties; Schemes; Category and scheme; Solutions to problems; Solutions to exercises; Index.

### Translations of Mathematical Monographs (Iwanami Series in Modern Mathematics)

July 1999, approximately 168 pages, Softcover, ISBN 0-8218-0862-1, LC 99-22304, 1991 *Mathematics Subject Classification*: 14-01, **All AMS members \$20**, List \$25, Order code MMONO-UENO2N

# Analysis



## The Defect Relation of Meromorphic Maps on Parabolic Manifolds

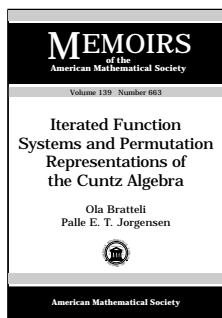
**George Lawrence Ashline**,  
*Saint Michael's College,*  
*Colchester, VT*

**Contents:** Introduction; Parabolic manifolds and the Ricci functions;

Jacobian sections for complex manifolds; Preparations; Lemmata of the logarithmic derivative on parabolic manifolds; Fields and vector spaces of meromorphic maps; Steinmetz map and automorphisms of  $Z(p)$ ; Important lemmata; Main identity; Functions  $\theta_\alpha$  and  $\Lambda$ ; Product to sum estimates; Moving targets and the defect relation; Bibliography.

**Memoirs of the American Mathematical Society**, Volume 139, Number 665

April 1999, 78 pages, Softcover, ISBN 0-8218-1069-3, LC 99-19211, 1991 *Mathematics Subject Classification*: 32-XX,  
**Individual member \$23**, List \$39, Institutional member \$31,  
Order code MEMO/139/665N



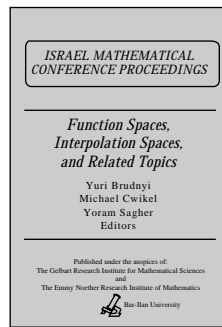
## Iterated Function Systems and Permutation Representations of the Cuntz Algebra

**Ola Bratteli**, *University of Oslo, Norway*, and **Palle E. T. Jorgensen**, *University of Iowa, Iowa City*

**Contents:** Introduction; Permutative representations of  $\mathcal{O}_N$ ; Monomial representations and integers modulo  $N$ ; Cycles of irreducible  $\mathcal{O}_N$  representations and their atoms of  $\text{UHF}_N$  representations; Relations of finite type and sub-Cuntz states; The shift representation; The universal permutative multiplicity-free representation; Some specific examples of the cycle and atom structure: The mod  $N$  case; Some specific examples of the cycle and atom structure: The mod  $N$  case; The general mod  $N$  situation; Concluding remarks; Bibliography; List of symbols.

**Memoirs of the American Mathematical Society**, Volume 139, Number 663

April 1999, 89 pages, Softcover, ISBN 0-8218-0962-8, LC 99-19208, 1991 *Mathematics Subject Classification*: 46L55, 47C15; 42C05, 22E25, 11B85, **Individual member \$24**, List \$40, Institutional member \$32, Order code MEMO/139/663N



## Function Spaces, Interpolation Spaces, and Related Topics

**Yuri Brudnyi** and **Michael Cwikel**, *Technion-Israel Institute of Technology, Haifa*, and **Yoram Sagher**, *University of Illinois at Chicago*, Editors

*A publication of Bar-Ilan University.*

This volume presents the proceedings of the international workshop held at the Technion-Israel Institute of Technology. Included are research and survey articles on interpolation theory and function spaces. Readers will find in this book both current research and a broad overview of the topic.

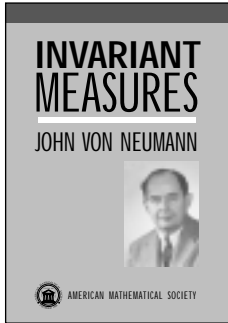
Distributed worldwide by the AMS.

**Contents:** **S. Krein**, **P. Kuchment**, **V. Ovchinnikov**, and **E. Semenov**, Iosif Shneiberg July 26, 1950–July 21, 1992; **J. Bastero**, **M. Milman**, and **F. J. Ruiz**, Reverse Hölder inequalities and interpolation; **M. J. Carro**, **J. Cerdà**, and **J. Soria**, Commutators, interpolation and vector function spaces; **C. Fefferman** and **R. Narasimhan**, Bernstein inequalities for analytic and algebraic functions; **E. Hernández**, **X. Wang**, and **G. Weiss**, Characterization of wavelets, scaling functions and wavelets associated with multiresolution analyses; **S. Janson**, Complex method interpolation defined using a half-plane or full disc; **S. V. Kisliakov**, Interpolation of  $H^p$ -spaces: Some recent developments; **E. Liflyand**, A family of function spaces and multipliers; **R. Nilsen**, Function spaces and  $n$ -dimensional wavelet transforms; **E. Pustylnik**, Generalized potential type operators on rearrangement invariant spaces; **E. M. Semenov**, On the stability of the real interpolation method in the class of rearrangement invariant spaces; **P. Shvartsman**, The  $K$ -functional of the pair  $(l_\infty(w), BMO)$ ; **O. E. Tikhonov**, On the Lozanovskii class of condensing operators and its applications to non-commutative integration; **O. E. Tikhonov** and **L. V. Veselova**, The uniqueness of the solution to the inverse problem of exact interpolation; **P. Wingren**, Lipschitz and Zygmund spaces on subsets, a comparison with respect to the Baire category.

**Israel Mathematical Conference Proceedings**, Volume 13

May 1999, approximately 240 pages, Softcover,  
1991 *Mathematics Subject Classification*: 46B70, 46E15, 46E30,  
**Individual member \$47**, List \$79, Institutional member \$63,  
Order code IMCP/13N

A Classic



## Invariant Measures

John von Neumann

In 1940–1941 von Neumann lectured on invariant measures at the Institute for Advanced Study at Princeton. This book is essentially a written version of those lectures.

The lectures began with general measure theory and went on to Haar measure and some of its generalizations. Shizuo Kakutani was at the

Institute that year, and he and von Neumann had many conversations on the subject. The conversations revealed facts and produced proofs. Quite a bit of the content of the course, especially toward the end, was discovered a few weeks before it appeared on the blackboard. The original version of these notes was prepared by Paul Halmos, von Neumann's assistant that year. Von Neumann read the handwritten version before it went to the typist and sometimes scribbled comments on the margins; he rewrote most of Chapter 6. This book is the first published version of the original notes.

**Contents:** Measure theory; Generalized limits; Haar measure; Uniqueness; Measure and topology; Construction of Haar's invariant measure in groups by approximately equidistributed finite point sets and explicit evaluations of approximations; Index.

September 1999, approximately 144 pages, Softcover, ISBN 0-8218-0912-1, LC 98-15971, 1991 *Mathematics Subject Classification:* 28Axx, 22A10, All AMS members \$31, List \$39, Order code INMEASN

the Second World War; U. Grenander and M. I. Miller, Computational anatomy: An emerging discipline; S. A. Ross, The mathematics of finance: Pricing derivatives; N. Kopell, Networks of neurons as dynamical systems: From geometry to biophysics; J. M. Ball, The calculus of variations and materials science; J. Glimm and D. Sharp, Stochastic methods for the prediction of complex multiscale phenomena; A. J. Chorin, New perspectives in turbulence; J. T. Stuart, Mathematics applied in fluid motion; P. Diaconis, A place for philosophy? The rise of modeling in statistical science; M. Atiyah, Mathematics and the real world; H. J. Greenberg, Ater-dinner speech.

December 1998, 229 pages, Softcover, 1991 *Mathematics Subject Classification:* 01, 34, 35, 39, 49, 62, 73, 76, 82, 90, 92, List \$50, Order code QAMSPN

## Discrete Mathematics and Combinatorics

### Graph Theory and Combinatorial Biology

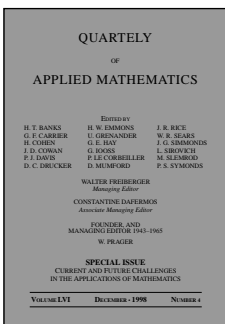
László Lovász, *Yale University, New Haven, CT*,  
 András Gyárfi, *Computer and Automation Institute of the Hungarian Academy of Sciences, Budapest*,  
 Byula O. H. Katona, *Mathematical Institute of the Hungarian Academy of Sciences, Budapest*,  
 András Recski, *Technical University, Budapest, Hungary*, and  
 László Székely, *University of South Carolina, Columbia*, Editors

A publication of *János Bolyai Mathematical Society*.

This volume is based on the discussions from the conference held in Hungary, entitled "International Colloquium on Combinatorics and Graph Theory". Surveys were provided by the participants and are included in this book. The following topics are covered:

- **Graph theory**—A classical area of discrete mathematics, its continuing development depends in part upon its applications and interactions with other areas. Important links are discussed between graph theory and linear algebra and geometric configurations. Discussions include a new parameter relating spectral properties of graphs to topological properties (touching upon circle representations and special vector labellings); a probabilistic approach to graph coloring problems; results on hamiltonicity in claw-free graphs; open problems and contributions.
- **Extremal sets**—A novel approach is represented by three papers. Included are new results and interesting applications on the "edge isoperimetric problem"; a theory generalizing the Kruskal-Katona theorem and closely related problems for a class of posets; theorems and methods applied to a typical problem in database security.
- **Matroid theory**—Considered "old" by the standards of the field, this theory provides extremely important links between graph theory, linear algebra, projective geometry, and other fields. The chapter on combinatorial optimization emphasizes these connections and illustrates important recent developments.
- **Mathematical biology**—Since Darwin, the biologist's dream has been to reconstruct the phylogenetic tree of living things. To date, no known method satisfies the necessary criteria to

## Applications



### Current and Future Challenges in the Applications of Mathematics

Walter Freiberger, *Brown University, Providence, RI*, Editor

A publication of *Brown University*.

This volume is a Special Issue of the journal, *Quarterly of Applied Mathematics*. It features the text of invited talks given at the Division of Applied Mathematics at Brown University during the 50th anniversary celebration. In the spirit of reflection, assessment and planning for the future, the symposium was an opportunity for distinguished scientists to communicate their work and their views on applied mathematics. The book not only presents the authors' scientific contributions, it also gives evidence to the future direction of applied mathematics.

Published by Brown University and distributed worldwide by the American Mathematical Society.

**Contents:** H. Cohen, Opening remarks; P. J. Davis, Introduction; P. D. Lax, The beginnings of Applied Mathematics after

do so. Yet, there is general agreement that biomolecular sequences carry the objective information that is the basis for phylogeny reconstruction. Included are discussions on the accepted models of nucleotide substitution and the criteria for appropriate evaluation; phylogeny reconstruction criteria from the point of view of algorithmic complexity; competition and phylogeny graphs; a combinatorial shape concept: The pharmacophoric polyhedra of biomolecules.

Distributed worldwide, except in Eastern and Western Europe, by the AMS.

**Contents:** *Graph Theory:* R. Faudree, Forbidden subgraphs, closure and Hamiltonian properties—recent results; H. van der Holst, L. Lovász, and A. Schrijver, The Colin de Verdière graph parameter; A. V. Kostochka and M. Stiebitz, Excess in colour-critical graphs; J. Kratochvíl, J. Nešetřil, and M. Rosenfeld, Graph designs, Hadamard matrices and geometric configurations; M. Molloy and B. Reed, Graph colouring via the probabilistic method; *Extremal Sets:* S. L. Bezrukov, Edge isoperimetric problems on graphs; K. Engel and U. Leck, Optimal antichains and ideals in Macaulay posets; J. R. Griggs, Database security and the distribution of subset sums in  $\mathbf{R}^m$ ; *Combinatorial Optimization:* K. Murota, Discrete convex analysis—exposition on conjugacy and duality; J. Oxley, Unavoidable minors in graphs and matroids; *Combinatorics, Molecules, and Biology:* A. von Haeseler, Model based phylogenetic inference; P. G. Mezey, Combinatorial aspects of biomolecular shape analysis; F. S. Roberts, Competition graphs and phylogeny graphs; T. Warnow, Some combinatorial optimization problems in phylogenetics.

**Bolyai Society Mathematical Studies, Volume 7**

February 1999, 443 pages, Hardcover, ISBN 963-8022-90-6, 1991 *Mathematics Subject Classification:* 05–06, **Individual member \$44**, List \$74, Institutional member \$59, Order code BSMS/7N

## Geometry and Topology

### Supplementary Reading

## Geometric Models for Noncommutative Algebras

Ana Cannas da Silva and Alan Weinstein, *University of California, Berkeley*

The volume is based on a course, “Geometric Models for Noncommutative Algebras” taught by Professor Weinstein at Berkeley. Noncommuta-

tive geometry is the study of noncommutative algebras as if they were algebras of functions on spaces, for example, the commutative algebras associated to affine algebraic varieties, differentiable manifolds, topological spaces, and measure spaces. In this work, the authors discuss several types of geometric objects (in the usual sense of sets with structure) that are closely related to noncommutative algebras.

Central to the discussion are symplectic and Poisson manifolds, which arise when noncommutative algebras are obtained by deforming commutative algebras. The authors also give a detailed study of groupoids (whose role in noncommutative geometry has been stressed by Connes) as well as of Lie alge-

broids, the infinitesimal approximations to differentiable groupoids.

Featured are many interesting examples, applications, and exercises. The book starts with basic definitions and builds to (still) open questions. It is suitable for use as a graduate text. An extensive bibliography and index are included.

**Contents:** *Universal enveloping algebras:* Algebraic constructions; The Poincaré-Birkhoff-Witt theorem; *Poisson Geometry:* Poisson structures; Normal forms; Local Poisson geometry; *Poisson Category:* Poisson maps; Hamiltonian actions; *Dual Pairs:* Operator algebras; Dual pairs in Poisson geometry; Examples of symplectic realizations; *Generalized Functions:* Group algebras; Densities; *Groupoids:* Groupoids; Groupoid algebras; Extended groupoid algebras; *Algebroids:* Lie algebroids; Examples of Lie algebroids; Differential geometry for Lie algebroids; *Deformations of Algebras of Functions:* Algebraic deformation theory; Weyl algebras; Deformation quantization; References; Index.

**Berkeley Mathematical Lecture Notes, Volume 10**

April 1999, 184 pages, Softcover, ISBN 0-8218-0952-0, 1991 *Mathematics Subject Classification:* 53F05, 58H05; 16S80, 17B35, 46L89, **All AMS members \$16**, List \$20, Order code BMLN/10N

## Mathematical Physics

## Moscow Seminar in Mathematical Physics

A. Yu. Morozov and M. A. Olshanetsky, *Institute of Theoretical and Experimental Physics, Moscow, Russia*, Editors

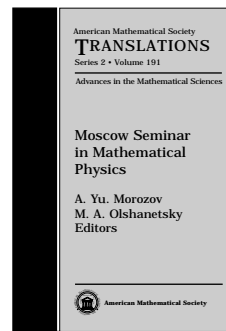
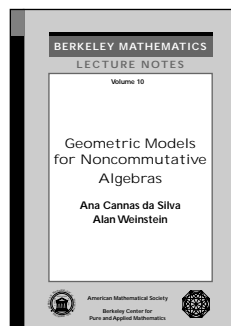
The Theory Department of the Institute of Theoretical and Experimental Physics (ITEP) is internationally recog-

nized for achievements in various branches of theoretical physics. The seminars at ITEP for many years have been among the main centers of scientific life in Moscow.

This volume presents results from the seminar on mathematical physics that has been held at ITEP since 1983. It reflects the style and direction of some of the work done at the Institute.

The majority of the papers in the volume describe the Knizhnik-Zamolodchikov-Bernard connection and its far-reaching generalizations. The remaining papers are related to other aspects of the theory and integrable models. Included are discussions on quantum Lax operators analyzed by methods of algebraic geometry, current algebras associated with complex curves, and the relationship between matrix models and integrable systems.

**Contents:** G. E. Arutyunov, L. O. Chekhov, and S. A. Frolov, Quantum dynamical  $R$ -matrices; B. Enriquez and V. Rubtsov, Some examples of quantum groups in higher genus; V. V. Fock and A. A. Rosly, Poisson structure on moduli of flat connections on Riemann surfaces and the  $r$ -matrix; D. A. Ivanov and A. S. Losev, KZB equations as a flat connection with spectral parameter; S. Kharchev, Kadomtsev-Petviashvili hierarchy and generalized Kontsevich model; S. Khoroshkin, D. Lebedev, and S. Pakuliak, Yangian algebras and classical Riemann problems;

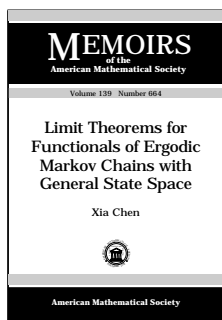


**I. Krichever** and **A. Zabrodin**, Vacuum curves of elliptic  $L$ -operators and representations of the Sklyanin algebra; **A. M. Levin** and **M. A. Olshanetsky**, Hierarchies of isomonodromic deformations and Hitchin systems; **N. Nekrasov**, Infinite-dimensional algebras, many-body systems and gauge theories.

**American Mathematical Society Translations—Series 2**  
(*Advances in the Mathematical Sciences*), Volume 191

May 1999, 299 pages, Hardcover, ISBN 0-8218-1388-9, LC 91-640741, 1991 *Mathematics Subject Classification*: 58Fxx; 81Txx, **Individual member \$66**, List \$110, Institutional member \$88, Order code TRANS2/191N

## Probability



### Limit Theorems for Functionals of Ergodic Markov Chains with General State Space

**Xia Chen**, *Northwestern University, Evanston, IL*

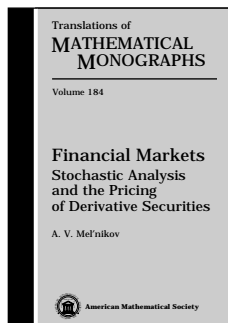
**Contents:** Split chain and regeneration; The central limit theorem; The

law of the iterated logarithm; The moderate deviation principle; Appendix; References.

**Memoirs of the American Mathematical Society**, Volume 139, Number 664

April 1999, 203 pages, Softcover, ISBN 0-8218-1060-X, LC 99-19209, 1991 *Mathematics Subject Classification*: 60B12, 60F05, 60F10, 60F15, 60J10, **Individual member \$30**, List \$50, Institutional member \$40, Order code MEMO/139/664N

**Recommended Text**



### Financial Markets Stochastic Analysis and the Pricing of Derivative Securities

**A. V. Mel'nikov**, *Steklov Institute of Mathematics, Moscow, Russia*

Financial mathematics is going through a period of intensive development, particularly in the area of

stochastic analysis. This timely work presents a comprehensive, self-contained introduction to stochastic financial mathematics. It is based on lectures given at Moscow State University, "Stochastic Analysis in Finance", and comprises the basic methods and key results of the theory of derivative securities pricing in discrete financial markets.

The following elements: martingales, semimartingales, stochastic exponents, Itô's formula, Girsanov's theorem, and more, are used to characterize notions such as arbitrage and completeness of financial markets, fair price and hedging strategies for options, forward and futures pricing, and utility maximization. Limiting transition from a discrete to contin-

uous model with derivation of the famous Black-Scholes formula is shown.

The book contains a wide spectrum of material and can serve as a bridge to continuous models. It is suitable as a text for graduate and advanced graduate students studying economics and/or financial mathematics.

**Contents:** Basic concepts and objects of a financial market; The elements of discrete stochastic analysis; A stochastic model for a financial market. Arbitrage and completeness; Pricing European options in complete markets. The binomial model and the Cox-Ross-Rubinstein formula; Pricing and hedging American options in complete markets; Financial computations on a complete market with the use of nonself-financing strategies; Incomplete markets. Pricing of options and problems of minimizing risk; The structure of prices of other instruments of a financial market. Forwards, futures, bonds; The problem of optimal investment; The concept of continuous models. Limiting transitions from a discrete market to a continuous one. The Black-Scholes formula; Appendix 1; Appendix 2; Appendix 3; Hints for solving the problems; Bibliography; Subject index.

**Translations of Mathematical Monographs**, Volume 184

May 1999, 133 pages, Hardcover, ISBN 0-8218-1082-0, LC 99-17735, 1991 *Mathematics Subject Classification*: 90-02, 90A12, 90A09; 90A60, 60H30, 60G42, 60G40, **Individual member \$29**, List \$49, Institutional member \$39, Order code MMONO/184

## Previously Announced Publications

### Continuous Cohomology, Discrete Subgroups, and Representations of Reductive Groups Second Edition

**A. Borel**, *Institute for Advanced Study, Princeton, NJ*, and **N. Wallach**, *University of California, San Diego, La Jolla*

It has been nearly twenty years since the first edition of this work. In the intervening years, there has been immense progress in the use of homological algebra to construct admissible representations and in the study of arithmetic groups. This second edition is a corrected and expanded version of the original, which was an important catalyst in the expansion of the field. Besides the fundamental material on cohomology and discrete subgroups present in the first edition, this edition also contains expositions of some of the most important developments of the last two decades.

**Contents:** Notation and preliminaries; Relative Lie algebra cohomology; Scalar product, Laplacian and Casimir element; Cohomology with respect to an induced representation; The Langlands classification and uniformly bounded representations; Cohomology with coefficients in  $\Pi_\infty(G)$ ; The computation of certain cohomology groups; Cohomology of discrete subgroups and Lie algebra cohomology; The construction of certain unitary representations and the computation of the corresponding cohomology groups; Continuous cohomology and differentiable cohomology; Continuous and differentiable cohomology for locally compact totally disconnected groups; Cohomology with coefficients in  $\Pi_\infty(G)$ : The  $p$ -adic case; Differentiable cohomology for products of real Lie groups and t.d. groups; Cohomology of discrete cocompact

subgroups; Noncompact  $S$ -arithmetic subgroups; References; Index; Leitfaden to some results.

### Mathematical Surveys and Monographs

June 1999, approximately 265 pages, Hardcover, ISBN 0-8218-0851-6, LC 98-44527, 1991 *Mathematics Subject Classification*: 22E41; 22E40, 22E45, 57T15, **All AMS members \$47**, List \$59, Order code SURV-BORELRT95

## Spline Functions and the Theory of Wavelets

**Serge Dubuc**, *Université de Montréal, PQ, Canada*, and **Gilles Deslauriers**, *Ecole Polytechnic de Montréal, PQ, Canada*, Editors

This work is based on a series of thematic workshops on the theory of wavelets and the theory of splines. Important applications are included. The volume is divided into four parts: Spline Functions, Theory of Wavelets, Wavelets in Physics, and Splines and Wavelets in Statistics.

Part one presents the broad spectrum of current research in the theory and applications of spline functions. Theory ranges from classical univariate spline approximation to an abstract framework for multivariate spline interpolation. Applications include scattered-data interpolation, differential equations and various techniques in CAGD.

Part two considers two developments in subdivision schemes; one for uniform regularity and the other for irregular situations. The latter includes construction of multidimensional wavelet bases and determination of bases with a given time frequency localization.

Part three extends the multifractal formalism to fractal functions involving oscillating singularities. There is a review of a method of quantization of classical systems based on the theory of coherent states. Wavelets are applied in the domains of atomic, molecular and condensed-matter physics.

Part four shows ways in which wavelets can be used to solve important function estimation problems in statistics. Different wavelet estimators are proposed in the following distinct cases: functions with discontinuities, errors that are no longer Gaussian, wavelet estimation with robustness, and error distribution that is no longer stationary.

Some of the contributions in this volume are current research results not previously available in monograph form. The volume features many applications and interesting new theoretical developments. Readers will find powerful methods for studying irregularities in mathematics, physics, and statistics.

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

**Contributors include:** L. P. Bos, D. Holland H. Brunner, F. Dubeau, J. Savoie, J.-P. Dussault, N. Pfister, J. C. Fiorot, P. Jeannin, A. Le Méhauté, A. Bouhamidi, P. Sablonnière, N. Dyn, D. Levin, M. Holschneider, A. Karoui, R. Vaillancourt, J. Kovačević, R. Bernardini, K.-S. Lau, M.-F. Ma, S. Maes, E. Schulz, K. F. Taylor, S. Twareque Ali, J.-P. Antoine, Ph. Antoine, B. Piraux, J. Elezgaray, G. Berkooz, P. Holmes, C. R. Handy, R. Murenzi, A. Arneodo, E. Bacry, S. Jaffard, J. F. Muzy, A. Antoniadis, R. Averkamp, C. Houdré, D. L. Donoho, T. P. Y. Yu, J. O. Ramsay, N. Heckman, R. von Sachs, G. P. Nason, G. Kroisandt.

CRM Proceedings & Lecture Notes, Volume 18

February 1999, 397 pages, Softcover, ISBN 0-8218-0875-3, LC 98-54441, 1991 *Mathematics Subject Classification*: 65D07, 41A30; 41A15, 42C15, 94A12, 65D15, 81V45, 62G07, **Individual member \$66**, List \$110, Institutional member \$88, Order code CRMP/18RT95

## Number Theory

### Fifth Conference of the Canadian Number Theory Association

**Rajiv Gupta**, *University of British Columbia, Vancouver, BC, Canada*, and **Kenneth S. Williams**, *Carleton University, Ottawa, ON, Canada*, Editors

This book contains papers presented at the fifth Canadian Number Theory Association (CNTA) conference held at Carleton University (Ottawa, ON). The invited speakers focused on arithmetic algebraic geometry and elliptic curves, diophantine problems, analytic number theory, and algebraic and computational number theory. The contributed talks represented a wide variety of areas in number theory. David Boyd gave an hour-long talk on "Mahler's Measure and Elliptic Curves". This lecture was open to the public and attracted a large audience from outside the conference.

**Contents:** A. Baragar, B. C. Berndt, H. H. Chan, M.-J. Bertin, F. Beukers, D. A. Buell, K.-K. Choi, J. D. Vaaler, R. J. Cook, W. Duke, R.-M. Elkenbracht-Huizing, P. L. Montgomery, R. D. Silverman, R. K. Wackerbarth, S. S. Wagstaff, Jr., P. Erdős, M. R. Murty, C. Friesen, W. F. Galway, C. Greither, S. Gurak, A. Ivić, C. Pomerance, J. W. Jones, D. P. Roberts, M. Kaneko, P. Kaplan, M. Langevin, X.-J. Li, S. Lindhurst, M.-C. Liu, T. Wang, S. Louboutin, R. A. Mollin, K. Ono, K. Soundararajan, P. L. Pacelli, Y. N. Petridis, A. J. van der Poorten, C. J. Smyth, S. H. Son, H. A. Verrill, L. Ya. Vulakh, M. Waldschmidt, S. Wong, R. K. Guy, P. Ribenboim.

CRM Proceedings & Lecture Notes, Volume 19

February 1999, 392 pages, Softcover, ISBN 0-8218-0964-4, LC 98-49282, 1991 *Mathematics Subject Classification*: 11-06, **Individual member \$66**, List \$110, Institutional member \$88, Order code CRMP/19RT95

## Probability Theory and Applications

**Elton P. Hsu**, *Northwestern University, Evanston, IL*, and **S. R. S. Varadhan**, *Courant Institute, New York University, NY*, Editors

This volume, with contributions by leading experts in the field, is a collection of lecture notes of the six minicourses given at the IAS/Park City Summer Mathematics Institute. It introduces advanced graduates and researchers in probability theory to several of the currently active research areas in the field. Each course is self-contained with references and contains basic materials and recent results. Topics include interacting particle systems, percolation theory, analysis on path and loop spaces, and mathematical finance.

The volume gives a balanced overview of the current status of probability theory. An extensive bibliography for further study and research is included. This unique collection presents several important areas of current research and a valuable survey reflecting the diversity of the field.

Members of the Mathematical Association of America (MAA) and the National Council of Teachers of Mathematics (NCTM) receive a 20% discount from list price.

**Contents:** R. Durrett, *Stochastic Spatial Models*: Introduction; The voter model; Coalescing random walks; Voter model with

mutation; The block construction; Long range limits; Rapid stirring limits; Bibliography; *J. T. Chayes, A. L. Puha, and T. Sweet, Independent and Dependent Percolation*: Preface; The basics of percolation; Rescaling and finite-size scaling in percolation; Critical exponent inequalities; Two fundamental questions; Finite-size scaling and the incipient infinite cluster; The BK(R) inequality; The Potts model and the random cluster model; Bibliography; *L. Jensen and H.-T. Yau, Hydrodynamical Scaling Limits of Simple Exclusion Models*: Introduction; The simple exclusion model; Proof of Theorem 1.4; Local ergodicity; Two-block estimate; Relative entropy; The Green-Kubo formula and asymmetric simple exclusion processes; Some open problems; Bibliography; *D. W. Stroock, An Introduction to Analysis on Path Space*: Introduction; Gaussian measures on a Hilbert space; Rolling on; About  $\mathcal{W}_M$ ; A few facts, and something else; Bibliography; *E. P. Hsu, Analysis on Path and Loop Spaces*: Introduction; Euclidean Brownian motion; Gradient operator; Ornstein-Uhlenbeck operator; Brownian motion on manifolds; Gradient formulas; Integration by parts; Logarithmic Sobolev inequalities; Bibliographical comments; Bibliography; *M. Avellaneda, An Introduction to Option Pricing and the Mathematical Theory of Risk*: Bibliography.

**IAS/Park City Mathematics Series, Volume 6**

March 1999, 374 pages, Hardcover, ISBN 0-8218-0590-8, LC 98-51767, 1991 *Mathematics Subject Classification*: 60-01, 60-02, All AMS members \$45, List \$56, Order code PCMS/6RT95

Recommended Text

Supplementary Reading

## Algebraic Topology: An Intuitive Approach

Hajime Sato, Nagoya University, Japan

The single most difficult thing one faces when one begins to learn a new branch of mathematics is to get a feel for the mathematical sense of the subject. The purpose of this book is to help the aspiring reader acquire this essential common sense about algebraic topology in a short period of time. To this end, Sato leads the reader through simple but meaningful examples in concrete terms. Moreover, results are not discussed in their greatest possible generality, but in terms of the simplest and most essential cases.

In response to suggestions from readers of the original edition of this book, Sato has added an appendix of useful definitions and results on sets, general topology, groups and such. He has also provided references.

Topics covered include fundamental notions such as homeomorphisms, homotopy equivalence, fundamental groups and higher homotopy groups, homology and cohomology, fiber bundles, spectral sequences and characteristic classes. Objects and examples considered in the text include the torus, the Möbius strip, the Klein bottle, closed surfaces, cell complexes and vector bundles.

**Contents:** Objectives; Homeomorphisms and homotopy equivalences; Topological spaces and cell complexes; Fundamental groups and higher homotopy groups; Homology; Homology groups of cell complexes; Cohomology; Homology of product spaces and the universal coefficient theorem; Fiber bundles and vector bundles; Spectral sequences; A view from current mathematics; Appendix; Answers to exercises; Recommended reading; Index.

**Translations of Mathematical Monographs (Iwanami Series in Modern Mathematics), Volume 183**

April 1999, 118 pages, Softcover, ISBN 0-8218-1046-4, LC 98-53247, 1991 *Mathematics Subject Classification*: 55-01; 57-01, All AMS members \$16, List \$20, Order code MMONO/183RT95

## Differential and Symplectic Topology of Knots and Curves

S. Tabachnikov, University of Arkansas, Fayetteville, Editor

This book presents a collection of papers on two related topics: topology of knots and knot-like objects (such as curves on surfaces) and topology of Legendrian knots and links in 3-dimensional contact manifolds.

Featured is the work of international experts in knot theory ("quantum" knot invariants, knot invariants of finite type), in symplectic and contact topology, and in singularity theory. The interplay of diverse methods from these fields makes this volume unique in the study of Legendrian knots and knot-like objects such as wave fronts. A particularly enticing feature of the volume is its international significance. The volume successfully embodies a fine collaborative effort by worldwide experts from Belgium, France, Germany, Israel, Japan, Poland, Russia, Sweden, the U.K., and the U.S.

**Contents:** J. C. Álvarez Paiva, E. Ferrand, V. Goryunov, T. Januszkiewicz, J. Świątkowski, S. K. Lando, A. B. Merkov, M. Polyak, B. Shapiro, S. Tabachnikov, V. Tchernov, M. Umehara, G. Thorbergsson, M. Umehara, V. A. Vassiliev.

**American Mathematical Society Translations—Series 2 (Advances in the Mathematical Sciences), Volume 190**

March 1999, 286 pages, Hardcover, ISBN 0-8218-1354-4, LC 91-640741, 1991 *Mathematics Subject Classification*: 57Gxx; 53Cxx, Individual member \$59, List \$99, Institutional member \$79, Order code TRANS2/190RT95

## The Heritage of Emmy Noether

Mina Teicher, Bar-Ilan University, Ramat-Gan, Israel, Editor

*A publication of Bar-Ilan University.*

Named for the noted mathematician, the Emmy Noether Research Institute for Mathematics held a two-day conference dedicated to her heritage and her influence on mathematics and physics in the 20th and 21st centuries. This volume presents the proceedings of that conference. It includes a comprehensive description of her contributions to commutative and noncommutative algebra, algebraic geometry, topology, and physics given by world experts in these fields. Also included is a profile of her life. The volume is a comprehensive collection of Noether's valuable contributions to mathematics and physics.

Distributed worldwide by the AMS.

**Contents:** M. Teicher, H. Flenner, W. Scharlau, F. Hirzebruch, N. Byers, Y. Ne'eman.

**Israel Mathematical Conference Proceedings, Volume 12**

December 1998, 101 pages, Softcover, 1991 *Mathematics Subject Classification*: 13, 14, 16, 17; 54, Individual member \$23, List \$39, Institutional member \$31, Order code IMCP/12RT95