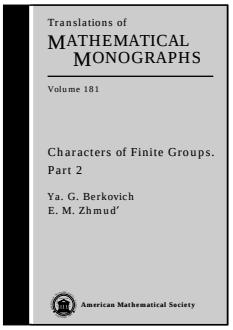
New Publications Offered by the AMS

Algebra and Algebraic Geometry



Characters of Finite Groups. Part 2

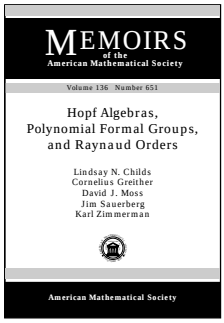
Ya. G. Berkovich, *University of Haifa, Israel*, and **E. M. Zhmud′**, *Kharkov University, Ukraine*

This book places character theory and its applications to finite groups within the reach of people with a comparatively modest mathematical background. The work concentrates mostly on applications of character theory to finite groups. The main themes are degrees and kernels of irreducible characters, the class number and the number of nonlinear irreducible characters, values of irreducible characters, characterizations and generalizations of Frobenius groups, and generalizations of monomial groups. The presentation is detailed, and many proofs of known results are new.

Contents: Degrees and kernels of irreducible characters; Involutions; Connectedness and Zassenhaus groups; The Nagao theorem; Linear groups; Permutation characters; Characters of $SL(2, p^n)$; Zeros of characters; The Schur index; On degrees of irreducible components of induced characters; Groups in which only two nonlinear irreducible characters have equal degrees; Groups with small sums of degrees of some characters; On sums of degrees of irreducible characters; Groups whose nonlinear irreducible characters take three distinct values; Nonsolvable groups with many involutions; On kernels of nonlinear irreducible characters; On monolithic characters; The class number; Problems; Notes on the bibliography; Bibliography; Author index; Subject index; List of corrections to part 1.

Translations of Mathematical Monographs, Volume 181

October 1998, 332 pages, Hardcover, ISBN 0-8218-0532-0, LC 97-39813, 1991 *Mathematics Subject Classification*: 20C15, **Individual member $69**, List $115, Institutional member $92, Order code MMONO/181N



Hopf Algebras, Polynomial Formal Groups, and Raynaud Orders

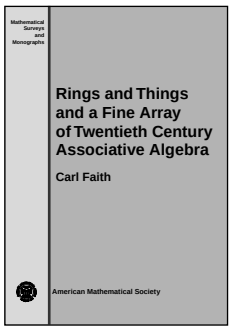
Lindsay N. Childs, *State University of New York at Albany*, **Cornelius Greither**, *Université Laval, Quebec, PQ, Canada*, **David J. Moss**, *MapInfo Corporation, Troy, NY*, **Jim Sauerberg**, *Saint Mary's College, Moraga, CA*, and **Karl Zimmermann**, *Union College, Schenectady, NY*

This book gives two new methods for constructing p-elementary Hopf algebra orders over the valuation ring R of a local field K containing the p-adic rational numbers. One method constructs Hopf orders using isogenies of commutative degree 2 polynomial formal groups of dimension n, and is built on a systematic study of such formal group laws. The other method uses an exponential generalization of a 1992 construction of Greither. Both constructions yield Raynaud orders as iterated extensions of rank p Hopf algebras; the exponential method obtains all Raynaud orders whose invariants satisfy a certain p-adic condition.

Contents: Introduction to polynomial formal groups and Hopf algebras; Dimension one polynomial formal groups; Dimension two polynomial formal groups and Hopf algebras; Degree two formal groups and Hopf algebras; p-Elementary group schemes—Constructions and Raynaud's theory.

Memoirs of the American Mathematical Society, Volume 136, Number 651

November 1998, 118 pages, Softcover, ISBN 0-8218-1077-4, LC 98-34748, 1991 *Mathematics Subject Classification*: 14L15, 14L05, **Individual member $25**, List $41, Institutional member $33, Order code MEMO/136/651N



Rings and Things and a Fine Array of Twentieth Century Associative Algebra

Carl Faith, *Professor Emeritus, Rutgers University, New Brunswick, NJ*

This book surveys more than 125 years of aspects of associative algebras, especially ring and module theory. Included are certain categorical properties from theorems of Frobenius and Stickelberger on the primary decomposition of finite Abelian groups, Hilbert's basis theorem and his Nullstellensatz, Maschke's theorem on the representation theory of finite groups over a field, and the fundamental theorems of Wedderburn on the structure of finite-dimensional algebras and finite skew fields.

Two of the author's prior works (*Algebra: Rings, Modules and Categories, I* and *II*, Springer-Verlag, 1973) are devoted to the development of modern associative algebra and ring and module theory. Those works serve as a foundation for the present survey.

This book is the first to probe so extensively such a wealth of historical development. A special feature is the in-depth study of rings with chain condition on annihilator ideals pioneered by Noether, Artin, Jacobson, and others.

In addition to the mathematical survey, the author gives candid and descriptive impressions of the last half of the twentieth century in "Part II: Snapshots of Some Mathematical Friends and Places". Beginning with his teachers and fellow graduate students at the University of Kentucky and at Purdue, Faith discusses his Fulbright-Nato postdoctoral at Heidelberg and at IAS, his year as a visiting scholar at Berkeley, and the many acquaintances he met there and in subsequent travels in India, Europe, and especially Spain.

Comments on the book:

Researchers in algebra should find it both enjoyable to read and very useful in their work. In all cases, [Faith] cites full references as to the origin and development of the theorem … I know of no other work in print which does this as thoroughly and as broadly.

John O'Neill, University of Detroit at Mercy

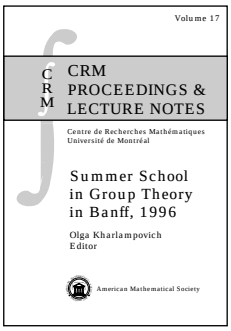
"Part II: Snapshots of Some Mathematical Friends and Places" is wonderful! [It is] a joy to read! Mathematicians of my age and younger will relish reading "Snapshots."

James A. Huckaba, University of Missouri-Columbia

Contents: *Part I: An array of 20th century associative algebra:* Direct product and sums of rings and modules and the structure of fields; Introduction to ring theory: Schur's lemma and semisimple rings, prime and primitive rings, nil, prime and Jacobson radicals; Direct sum decompositions of projective and injective modules; Direct product decompositions of von Neumann regular rings and self-injective rings; Direct sums of cyclic modules; When injectives are flat: Coherent FP-injective rings; Direct decompositions and dual generalizations of Noetherian rings; Completely decomposable modules and the Krull-Schmidt-Azumaya theorem; Polynomial rings over Vamosian and Kerr rings, valuation rings and Prüfer rings; Isomorphic polynomial rings; Group rings and Maschke's theorem revisited; Maximal quotient rings; Morita duality and dual rings; Krull and global dimensions; Polynomial identities and PI-rings; Unions of primes, prime avoidance, associated prime ideals, ACC on irreducible ideals and annihilator ideals in commutative rings; Dedekind's theorem on the independence of automorphisms revisited; *Part II:* Snapshots of some mathematical friends and places; Envoi to my century; Bibliography; Register of names; Index of terms and authors of theorems.

Mathematical Surveys and Monographs

November 1998, 420 pages, Hardcover, ISBN 0-8218-0993-8, LC 98-38824, 1991 *Mathematics Subject Classification*: 00–XX, 01–XX, 12–XX, 13–XX, 16–XX; 03–XX, 04–XX, 06–XX, 08–XX, 14–XX, 15–XX, 18–XX, **Individual member $59**, List $99, Institutional member $79, Order code SURV-FAITHN



Summer School in Group Theory in Banff, 1996

Olga Kharlampovich, *McGill University, Montreal, PQ, Canada*, Editor

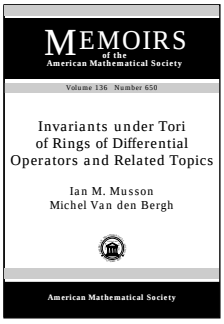
The third annual CRM Summer School took place in Banff (Alberta, Canada) and was aimed toward advanced students and recent PhDs. This volume presents surveys from the group theory part of the theme year and examines different approaches to the topic: a geometric approach, an approach using methods from logic, and an approach with roots in the Bass-Serre theory of groups acting on trees.

The work offers a concise introduction to current directions of research in combinatorial group theory. Surveys in the text are by leading researchers in the field who are experienced expositors. The text is suitable for use in a graduate course in geometric and combinatorial group theory.

Contents: G. Baumslag, Some open problems; **I. M. Chiswell**, Length functions and Λ-trees; **S. M. Gersten**, Introduction to hyperbolic and automatic groups; **O. Kharlampovich** and **A. Myasnikov**, Description of fully residually free groups and irreducible affine varieties over a free group; **Y. Kuz'min**, Homological methods in group theory; **M. du Sautoy**, Pro-p groups; **S. M. Vovsi**, Identities of representations of finite groups.

CRM Proceedings & Lecture Notes, Volume 17

November 1998, 165 pages, Softcover, ISBN 0-8218-0948-2, LC 98-38712, 1991 *Mathematics Subject Classification*: 20E05, 20E06, 20F05, 20F06, 20F10, 20F32, **Individual member $27**, List $45, Institutional member $36, Order code CRMP/17N



Invariants under Tori of Rings of Differential Operators and Related Topics

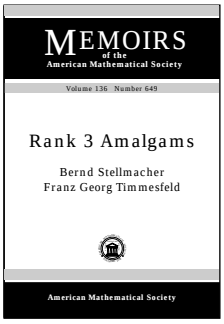
Ian M. Musson, *University of Wisconsin, Milwaukee*, and **Michel Van den Bergh**, *Free University of Brussels, Belgium*

If G is a reductive algebraic group acting rationally on a smooth affine variety X, then it is generally believed that $D(X)^G$ has properties very similar to those of enveloping algebras of semisimple Lie algebras. In this book, the authors show that this is indeed the case when G is a torus and $X = k^r \times (k^*)^s$. They give a precise description of the primitive ideals in $D(X)^G$ and study in detail the ring theoretical and homological properties of the minimal primitive quotients of $D(X)^G$. The latter are of the form $B^\chi = D(X)^G/(\mathfrak{g} - \chi(\mathfrak{g}))$ where $\mathfrak{g} = \mathrm{Lie}(G)$, $\chi \in \mathfrak{g}^*$ and $\mathfrak{g} - \chi(\mathfrak{g})$ is the set of all $\nu - \chi(\nu)$ with $\nu \in \mathfrak{g}$. They occur as rings of twisted differential operators on toric varieties. It is also proven that if G is a torus acting rationally on a smooth affine variety, then $D(X//G)$ is a simple ring.

Contents: Introduction; Notations and conventions; A certain class of rings; Some constructions; The algebras introduced by S. P. Smith; The Weyl algebras; Rings of differential operators for torus invariants; Dimension theory for B^χ; Finite global dimension; Finite dimensional representations; An example; References.

Memoirs of the American Mathematical Society, Volume 136, Number 650

November 1998, 85 pages, Softcover, ISBN 0-8218-0885-0, LC 98-35281, 1991 *Mathematics Subject Classification*: 16S32, 32C38; 16E10, 16D25, **Individual member $23**, List $38, Institutional member $30, Order code MEMO/136/650N



Rank 3 Amalgams

Bernd Stellmacher, *University of Bielefeld, Germany*, and **Franz Georg Timmesfeld**, *University of Giessen, Germany*

Let G be a group, p a fixed prime, $I = 1, \ldots, n$ and let B and $P_i, i \in I$ be a collection of finite subgroups of G. Then G satisfies P_n (with respect to p, B and $P_i, i \in I$) if:

(1) $G = \langle P_i | i \in I \rangle$,

(2) B is the normalizer of a $p - Sylow$-subgroup in P_i,

(3) No nontrivial normal subgroup of B is normal in G,

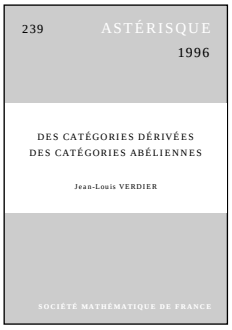
(4) $O^{p'}(P_i/O_p(P_i))$ is a rank 1 Lie-type group in char p (also including solvable cases).

If $n = 2$, then the structure of P_1, P_2 was determined by Delgado and Stellmacher. In this book the authors treat the case $n = 3$. This has applications for locally finite, chamber transitive Tits-geometries and the classification of quasithin groups.

Contents: Introduction; Weak $(B, N,)$-pairs of Rank 2; Modules; The Graph Γ; The structure of $\overline{L}_\delta$ and $\overline{Z}_\delta$; The case $b \geq 2$; The case $b = 0$; The case $b = 1$ and the proof of Theorems 1 and 4; The proof of Theorems 2 and 3.

Memoirs of the American Mathematical Society, Volume 136, Number 649

November 1998, 123 pages, Softcover, ISBN 0-8218-0870-2, LC 98-35280, 1991 *Mathematics Subject Classification*: 20Gxx, **Individual member $25**, List $41, Institutional member $33, Order code MEMO/136/649N



Des Catégories Dérivées des Catégories Abéliennes

Jean-Louis Verdier, *University of Paris VII, France*

A publication of the Société Mathématique de France.

This volume contains Jean-Louis Verdier's thesis, never published nor circulated until now. The aim of this thesis was to create the appropriate homological framework to state and prove the generalizations of the duality theorems of Grothendieck. This framework is the theory of derived categories, whose foundations are put forth in this text. This notion of triangulated category is introduced for the first time. This notion, inspired by topological and cohomological examples, has proved to be extremely fruitful. The text is written in French.

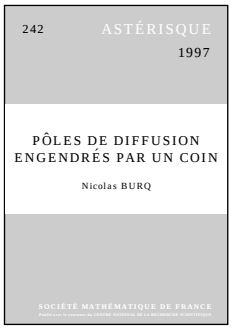
Titles in this series are distributed by the AMS in the United States, Canada, and Mexico. Orders from other countries should be sent to the SMF, Maison de la SMF, B.P. 67, 13274 Marseille cedex 09, France, or to Institut Henri Poincaré, 11 rue Pierre et Marie Curie, 75231 Paris cedex 05, France. Members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

Contents: Les catégories de complexes des catégories additives; Catégories triangulées; Les catégories dérivées; Index des notations; Index terminologique; Bibliographie; Table des matières.

Astérisque, Number 239

November 1997, 253 pages, 1991 *Mathematics Subject Classification*: 14F20; 18E30, 18E35, 18G05, 18G10, 18G15, 18G20, 18G35, 18G40, 55U15, 55U25, 55U30, **Individual member $62**, List $69, Order code AST/239N

Analysis



Pôles de Diffusion Engendrés par un Coin

Nicolas Burq, *Ecole Polytechnique, Palaiseau Cedex, France*

A publication of the Société Mathématique de France.

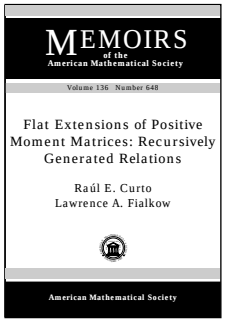
In this volume, the author studies the scattering poles generated by a trapped ray connecting a corner to itself. He gives an asymptotic expansion of (almost) every pole located under a curve $\mathrm{Im} z \leq N \log \mathrm{Re} z$ (for any N). It is shown that these poles are asymptotically on logarithmic curves.

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

Contents: Introduction; Propagation des singularités; La résolvante; Construction des opérateurs; Un problème de Grushin; Démonstration du théorème 1; Annexes.

Astérisque, Number 242

November 1997, 122 pages, 1991 *Mathematics Subject Classification*: 35P25, 35L05, 35L20, **Individual member $23**, List $25, Order code AST/242N



Flat Extensions of Positive Moment Matrices: Recursively Generated Relations

Raúl E. Curto, *University of Iowa, Iowa City*, and **Lawrence A. Fialkow**, *State University of New York, New Paltz*

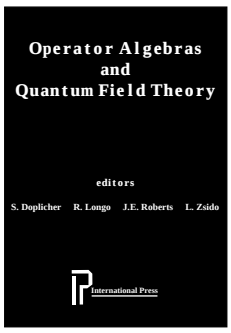
In this book, the authors develop new computational tests for existence and uniqueness of representing measures μ in the Truncated Complex Moment Problem: $\gamma_{ij} = \int \bar{z}^i z^j \, d\mu$ $(0 \leq i + j \leq 2n)$.

Conditions for the existence of finitely atomic representing measures are expressed in terms of positivity and extension properties of the moment matrix $M(n)(\gamma)$ associated with $\gamma \equiv \gamma^{(2n)}$: $\gamma_{00}, \ldots, \gamma_{0,2n}, \ldots, \gamma_{2n,0}$, $\gamma_{00} > 0$. This study includes new conditions for *flat* (i.e., rank-preserving) extensions $M(n+1)$ of $M(n) \geq 0$; each such extension corresponds to a distinct rank $M(n)$-atomic representing measure, and each such measure is *minimal* among representing measures in terms of the cardinality of its support. For a natural class of moment matrices satisfying the tests of *recursive generation*, *recursive consistency*, and *normal consistency*, the existence problem for minimal representing measures is reduced to the solubility of small systems of multivariable algebraic equations. In a variety of applications, including cases of the *quartic moment problem* ($n = 2$), the text includes explicit constructions of minimal representing measures via the theory of flat extensions. Additional computational texts are used to prove non-existence of representing measures or the non-existence of minimal representing measures. These tests are used to illustrate, in very concrete terms, new phenomena, associated with higher-dimensional moment problems that do not appear in the classical one-dimensional moment problem.

Contents: Introduction; Flat extensions for moment matrices; The singular quartic moment problem; The algebraic variety of γ; J. E. McCarthy's phenomenon and the proof of Theorem 1.5; Summary of results; Bibliography; List of symbols.

Memoirs of the American Mathematical Society, Volume 136, Number 648

November 1998, 56 pages, Softcover, ISBN 0-8218-0869-9, LC 98-35277, 1991 *Mathematics Subject Classification*: 47A57, 44A60, 30E05; 15A57, 15–04, 47N40, **Individual member $22**, List $36, Institutional member $29, Order code MEMO/136/648N



Operator Algebras and Quantum Field Theory

S. Doplicher, *Universita di Roma "La Sapienza", Rome, Italy*, and **R. Longo**, **J. E. Roberts**, and **L. Zsido**, *Universita di Roma "Tor Vergata", Rome, Italy*, Editors

A publication of International Press.

Operator algebras can be seen as a discipline encompassing noncommutative analysis, geometry, and topology. After the work of Haag in the 1950s and of Araki, Haag, and Kastler in the early 1960s, the original link with quantum mechanics has evolved into a much deeper relation with quantum field theory. This relationship has resulted in mutual interaction and motivation between pure mathematics and mathematical physics.

This volume presents the proceedings from a conference on "Operator Algebras and Quantum Field Theory" held at Accademia Nazionale dei Lincei (Rome, Italy). Additional articles have been included to cover topics not represented at the conference.

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

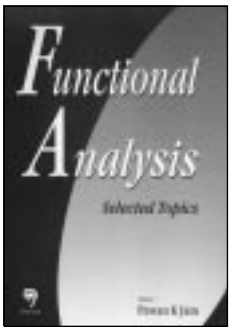
International Press publications are distributed worldwide, except in Japan, by the American Mathematical Society.

Contents: *I. C^*-Algebras and Their Invariants:* **G. K. Pedersen**, Extensions of C^*-algebras classification of inductive limits of the Toeplitz algebra tensored with $\mathcal{K}$; **G. A. Elliott**, **D. E. Evans**, and **H. Su**, Classification of inductive limits of the Toeplitz algebra tensored with $\mathcal{K}$; **M. Rørdam**, The stable rank of $C^*_{red}(F_n)$ is one—A survey; **K. Thomsen**, On the reduced C^*-exponential length; **N. C. Phillips**, Continuous embedding of the rotation algebras in the Cuntz algebra O_2; **I. Raeburn**, Crossed products of C^*-algebras by coactions of locally compact groups; **D. Pask**, Cuntz-Krieger algebras associated to directed graphs; **V. Arzumanian** and **J. Renault**, Examples of pseudogroups and their C^*-algebras; **J.-L. Sauvageot**, Strong Feller non commutative kernels, strong Feller semigroups and harmonic analysis; **T. A. Loring**, Almost multiplicative maps

between C^*-algebras; **D. E. Evans**, The Rohlin property and classification of trace scaling automorphisms of AF algebras; **C. Pinzari**, The ideal structure of Cuntz-Krieger-Pimsner algebras and Cuntz-Krieger algebras over infinite matrices; **O. Bratteli** and **P. E. T. Jorgensen**, A connection between multiresolution wavelet theory of scale N and representations of the Cuntz algebra O_N; *II. Von Neumann Algebras, Inclusions and Automorphisms:* **Y. Katayama**, **C. E. Sutherland**, and **M. Takesaki**, The strucutre of the automorphism group of a factor and cocycle conjugacy of discrete group actions; **S. Popa**, Amenability in the theory of subfactors; **D. Bisch**, A colored generalization of the Temperley-Lieb algebra via subfactors; **C. Anantharaman-Delaroche**, Amenability of bimodules and operator algebras; **H. Kosaki**, Automorphisms arising from composition of subfactors; **M. Izumi**, Goldman's type theorems in index theory; **Y. Kawahigashi**, Quantum doubles and orbifold subfactors; **K.-H. Rehren**, Generalized Cuntz algebras associated with subfactors; **U. Haagerup**, Orthogonal maximal abelian *-subalgebras of the $n \times n$ matrices and cyclic n-roots; **E. Christensen** and **A. M. Sinclair**, A cohomological characterization of approximately finite dimensional von Neumann algebras; *III. Noncommutative Geometry, Quantization and Deformations:* **A. Connes**, Noncommutative differential geometry and the structure of space time; **L. Carminati**, **B. Iochum**, **D. Kastler**, and **T. Schücker**, On Connes' new principle of general relativity: Can spinors hear the forces of spacetime?; **M. A. Rieffel**, On the operator algebra for the space-time uncertainty relations; **F. Radulescu**, Quantum dynamics and Berezin's deformation quantization; **M. B. Landstad**, Quantizations of groups and homogeneous spaces; **J. Rosenberg**, Behavior of K-theory under quantization; **R. Nest** and **B. Tsygan**, Product structures in (cyclic) homology and their applications; **D. Guido** and **T. Isola**, Singular traces and their applications to geometry; *IV. Free Entropy and Noncommutative Dynamical Systems:* **D. Voiculescu**, Topics in free entropy; **E. Stormer**, States on infinite free products of C^*-algebras and entropy of free shifts; **M. Choda**, Endomorphisms of shift type (entropy for endomorphisms of Cuntz algebras); **W. Arveson**, Dynamical invariants for noncommutative flows; **R. T. Powers**, Recent results concerning E_o-semigroups of $B(H)$; **J. Kaminker**, **I. Putnam**, and **J. Speilberg**, Operator algebras and hyperbolic dynamics; **C. Skau**, Orbit structure of topological dynamical systems and its invariants; *V. Quantum Field Theory:* **R. Brunetti** and **K. Fredenhagen**, Interacting quantum fields in curved space: Renormalizability of ϕ^4; **R. Verch**, Scaling algebras, the renormalization group and the principle of local stability in algebraic quantum field theory; **B. S. Kay**, Quantum fields in curved spacetime: Non global hyperbolicity and locality; **H.-J. Borchers**, Half-sided modular inclusions and structure analysis in quantum field theory; **H.-W. Wiesbrock**, Modular inclusions and intersections of algebras in QFT; **K. Szlachányi**, Weak Hopf algebras; **S. J. Summers**, Bell's inequalities and algebraic structure; **D. Buchholz**, **S. Doplicher**, **G. Morchio**, **J. E. Roberts**, and **F. Strocchi**, A model for charges of electromagnetic type; **R. Longo**, On the spin-statistics relation for topological charges; Addresses of Authors; List of participants.

International Press

October 1997, 677 pages, Hardcover, ISBN 1-57146-047-0, 1991 *Mathematics Subject Classification*: 46Lxx, 81Txx, 46-01, **All AMS members $36**, List $45, Order code INPR/27N



Functional Analysis

P. K. Jain, *University of Delhi, India*

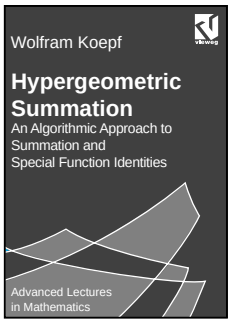
A publication of Narosa Publishing House.

This book consists of 23 refereed articles covering several major areas in modern functional analysis and operator theory. It contains both research and survey articles that can be broadly categorized in five parts: topological vector spaces, topological algebras, Banach spaces, operator theory and variational inequalities. Lastly, there is a general section containing six articles, each connected to a separate major topic area.

Distributed by the AMS exclusively in North America and Europe and non-exclusively elsewhere.

Contents: *Topological Vector Spaces:* **A. A. Albanese** and **V. B. Moscatelli**, A method of construction of Fréchet spaces; **J. Kakol**, Baire-type properties of spaces of continuous functions; *Topological Algebras:* **W. Congxin** and **L. Peng-Yee**, Topological algebras of infinite matrices; **A. K. Gaur**, Relative numerical ranges in topological algebras; **W. Zelazko**, Topologization of algebras—The results and open problems; *Banach Spaces:* **R. C. James**, The Eberlein-Šmulian theorem; **P. K. Jain** and **D. P. Sinha**, Some recent breakthroughs in the theory of bases in Banach spaces; **P. K. Jain**, **D. P. Sinha**, and **K. K. Arora**, Projectional resolutions of the identity on Banach spaces; **B.-L. Lin** and **W. Zhang**, Three-space property of Kadec-Klee renorming in Banach spaces; **M. A. Sofi**, Nuclear operators and the geometry of Banach spaces; **M. Valdivia**, Certain reflexive Banach spaces with no copy of l_p; *Operator Theory:* **S. C. Arora** and **M. Mukherjee**, Composition operators and Hilbert space valued functions; **A. K. Gaur** and **N. R. Nandakumar**, Derivation pairs of operators on algebras of analytic functions; **B. S. Komal** and **S. Gupta**, Weighted composition operators on the space of entire functions; **R. K. Singh** and **J. S. Manhas**, Invertibility of operators on locally convex spaces; *Variational Inequalities:* **K. Ahmad** and **A. A. Khan**, Solution of variational inequalities by operator method of regularization; **P. A. Daffer** and **H. Kaneko**, On a variational principle of Ekeland; **D. Goeleven** and **D. Motreanu**, Minimax methods of Szuilkin's type in unilateral problems; *General:* **A. Bendikov**, Lévy measures for symmetric stable semigroups on tours T^∞; **G. Godefroy** and **D. Li**, Strictly convex functions on compact convex sets and applications; **M. Gupta** and **K. Kaushal**, Order decompositions; **L. Jaafar** and **K. Trimèche**, Wavelets on the product of Euclidean hypergroup and Chébli-Trimèche hypergroup; **G. Rangan**, Recent trends in p-adic functional analysis.

November 1998, 232 pages, Hardcover, ISBN 81-7319-199-9, 1991 *Mathematics Subject Classification*: 46-06, **All AMS members $52**, List $65, Order code FASTN



Hypergeometric Summation

Wolfram Koepf, *Hochschule für Technik Wirtschaf und Kultur, Leipzig, Germany*

A publication of the Vieweg Verlag.

In this book, modern algorithmic techniques for summation—most of which have been introduced within the last decade—are developed and carefully implemented via computer algebra system software (which can be downloaded from the Web; URL is given in the text).

The algorithms of Gosper, Zeilberger, and Petkovšek on hypergeometric summation and recurrence equations and their q-analogues are covered, and similar algorithms on differential equations are considered. An equivalent theory of hyperexponential integration due to Almkvist and Zeilberger completes the volume.

The combination of all results considered gives work with orthogonal polynomials and (hypergeometric type) special functions a solid algorithmic foundation. Hence, many examples from this very active field are given.

The book is designed for use as framework for a seminar on the topic, but is also suitable for use in an advanced lecture course.

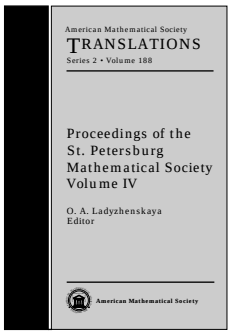
This text will also be of interest to those working in discrete mathematics and combinatorics.

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

Contents: Introduction; The gamma function; Hypergeometric identities; Hypergeometric database; Holonomic recurrence equations; Gosper's algorithm; The Wilf-Zeilberger method; Zeilberger's algorithm; Extensions of the algorithms; Petkovš ek's algorithm; Differential equations for sums; Hyperexponential antiderivatives; Holonomic equations for integrals; Rodrigues formulas and generating functions; Appendix: Installation and software; Bibliography; List of symbols; Index.

Vieweg Advanced Lectures in Mathematics, Volume 5

July 1998, 230 pages, Softcover, ISBN 3-528-06950-3, 1991 *Mathematics Subject Classification*: 33C20, 33D20, 68Q40, 33C45, 11B37, 05A19, 05A30, 11B65, 13P05, 13P10, 33D45, **All AMS members $44**, List $49, Order code VWALM/5N



Proceedings of the St. Petersburg Mathematical Society Volume IV

O. A. Ladyzhenskaya, *Russian Academy of Sciences, Steklov Mathematical Institute, St. Petersburg, Russia*

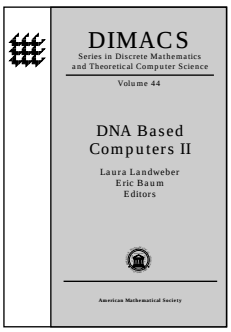
This volume is devoted to analysis, probablility and applications. It includes useful surveys by Pastur on random operators and their applications, Feldman on harmonic analysis and analogues of Levi-Khinchin formulas on abelian groups, and Kerov on application of representation theory of symmetric groups to classical analysis. Also featured are products of random operators, convolution of abelian groups, orthogonal polynomials, and semiordered Banach spaces.

Contents: S. G. Bobkov, The Gaussian oscillation on convex sets; **V. V. Borzov**, On the limit distribution of a homogeneous polynomial on the unit sphere of large dimension; **I. K. Daugavet**, The splitting method in the operator approximation problem; **G. M. Fel′dman**, Measures on Abelian groups (a survey); **A. Kaneko**, On extension of analytic solutions of linear partial differential equations; **S. Kerov**, A differential model for the growth of Young diagrams; **V. V. Zhuk** and **G. I. Natanson**, Approximation of functions on standard simplexes; **L. A. Pastur**, Spectral properties of random selfadjoint operators and matrices (a survey); **T. A. Suslina**, Asymptotics of the spectrum for two model problems in the theory of liquid vibrations; **A. I. Veksler** and **A. V. Koldunov**, Countable analogues of pseudocompact and Stone-Č ech extensions; **N. S. Ermolaeva**, Julian Vasil′evich Sokhotskiĭ (1842–1927).

American Mathematical Society Translations—Series 2, Volume 188

October 1998, 250 pages, Hardcover, ISBN 0-8218-0613-0, 1991 *Mathematics Subject Classification*: 01A, 20C, 35D, 35P, 41A, 47A, 47B, 54D, 60B, 60G, 60H; 47A, 78D, 94A, **Individual member $69**, List $115, Institutional member $92, Order code TRANS2/188N

Applications



DNA Based Computers II

Laura Landweber, *Princeton University, NJ*, and **Eric Baum**, *NEC Research Institute, Princeton, NJ*, Editors

The fledgling field of DNA computers began in 1994 when Leonard Adleman surprised the scientific community by using DNA molecules, protein enzymes, and chemicals to solve an instance of a hard computational problem. This volume presents results from the second annual meeting on DNA computers held at Princeton only one and one-half years after Adleman's discovery. By drawing on the analogy between DNA computing and cutting-edge fields of biology (such as directed evolution), this volume highlights some of the exciting progress in the field and builds a strong foundation for the theory of molecular computation.

DNA computing is a radically different approach to computing that brings together computer science and molecular biology in a way that is wholly distinct from other disciplines. This book outlines important advances in the field and offers comprehensive discussion on potential pitfalls and the general practicality of building DNA based computers.

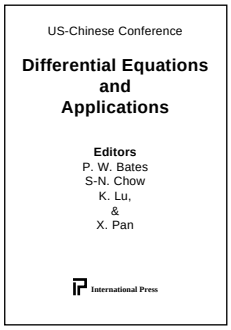
Contents: S. Roweis, **E. Winfree**, **R. Burgoyne**, **N. V. Chelyapov**, **M. F. Goodman**, **P. W. K. Rothemund**, and **L. M. Adleman**, A sticker based model for DNA computation; **L. M. Adleman**, **P. W. K. Rothemund**, **S. Roweis**, and

E. Winfree, On applying molecular computation to the data encryption standard; **T. H. Leete**, **M. D. Schwartz**, **R. M. Williams**, **D. H. Wood**, **J. S. Salem**, and **H. Rubin**, Massively parallel DNA computation: Expansion of symbolic determinants; **G. Păun**, Universal DNA computing models based on the splicing operation; **E. B. Baum** and **D. Boneh**, Running dynamic programming algorithms on a DNA computer; **N. Jonoska** and **S. A. Karl**, A molecular computation of the road coloring problem; **P. D. Kaplan**, **G. Cecchi**, and **A. Libchaber**, DNA based molecular computation: Template-template interactions in PCR; **F. Guarnieri** and **C. Bancroft**, Use of a horizontal chain reaction for DNA-based addition; **J. S. Oliver**, Computation with DNA: Matrix multiplication; **Q. Liu**, **Z. Guo**, **Z. Fei**, **A. E. Condon**, **R. M. Corn**, **M. G. Lagally**, and **L. M. Smith**, A surface-based approach to DNA computation; **J.-T. Amenyo**, Mesoscopic computer engineering: Automating DNA-based molecular computing via traditional practices of parallel computer architecture design; **M. Amos**, **A. Gibbons**, and **D. Hodgson**, Error-resistant implementation of DNA computations; **D. Boneh**, **C. Dunworth**, **R. J. Lipton**, and **J. Sgall**, Making DNA computers error resistant; **S. A. Kurtz**, **S. R. Mahaney**, **J. S. Royer**, and **J. Simon**, Active transport in biological computing; **L. F. Landweber**, RNA based computing: Some examples from RNA catalysis and RNA editing; **E. Winfree**, **X. Yang**, and **N. C. Seeman**, Universal computation via self-assembly of DNA: Some theory and experiments; **N. C. Seeman**, **H. Wang**, **B. Liu**, **J. Qi**, **X. Li**, **X. Yang**, **F. Liu**, **W. Sun**, **Z. Shen**, **R. Sha**, **C. Mao**, **Y. Wang**, **S. Zhang**, **T.-J. Fu**, **S. Du**, **J. E. Mueller**, **Y. Zhang**, and **J. Chen**, The perils of polynucleotides: The experimental gap between the design and assembly of unusual DNA structures; **E. B. Baum**, DNA sequences useful for computation; **K. U. Mir**, A restricted genetic alphabet for DNA computing; **R. Deaton**, **R. C. Murphy**, **M. Garzon**, **D. R. Franceschetti**, and **S. E. Stevens, Jr.**, Good encodings for DNA-based solutions to combinatorial problems; **R. J. Lipton**, DNA computations can have global memory; **R. M. Williams** and **D. H. Wood**, Exascale computer algebra problems interconnect with molecular reactions and complexity theory.

DIMACS: Series in Discrete Mathematics and Theoretical Computer Science, Volume 44

November 1998, 275 pages, Hardcover, ISBN 0-8218-0756-0, LC 98-35278, 1991 *Mathematics Subject Classification*: 92–06, 92B05, 92C40, 68Q05, **Individual member $35**, List $59, Institutional member $47, Order code DIMACS/44N

Differential Equations



Differential Equations and Applications

P. W. Bates, *Brigham Young University, Provo, UT*, **S-N. Chow**, *Georgia Institute of Technology, Atlanta*, **K. Lu**, *Brigham Young University, Provo, UT*, and **X. Pan**, *Zhejiang University, Hangzhou, People's Republic of China*, Editors

A publication of International Press.

This book presents the proceedings of the U.S.-Chinese conference held in Hangzhou, PRC. The conference featured approximately one hundred specialists from the U.S., China, Japan, Korea, Taiwan, and Hong Kong. This was an exceptional opportunity for these scientists to review the state of the art in differential equations as practiced in these Pacific Rim countries. A list of the speakers and the titles of their talks are included.

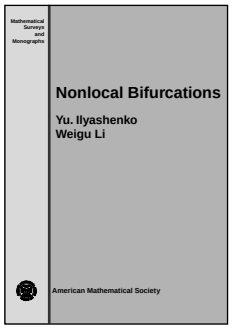
International Press publications are distributed worldwide, except in Japan, by the American Mathematical Society.

Contents: N. D. Alikakos, **X. Chen**, and **G. Fusco**, Motion of a drop by surface tension along a fixed boundary; **P. W. Bates**, **F. Chen**, and **J. Wang**, Global existence and uniqueness of solutions to a nonlocal phase-field system; **P. W. Bates**, **K. Lu**, and **C. Zeng**, Normally hyperbolic invariant manifolds for semiflow in a Banach space; **P. W. Bates**, **K. Lu**, and **C. Zeng**, Foliations for semiflows in Banach spaces near a normally hyperbolic invariant manifold; **B.-J. Bian**, An algorithm for mean curvature motion with Dirichlet condition; **C. Bu**, On the forced nonlinear systems; **X. Chen**, Existence, uniqueness and asymptotic stability of traveling waves in non-local evolution equations; **Z. Chen** and **X. Yan**, A class of pseudo-monotone operators and its applications in PDE; **G.-C. Dong**, New regularity results for nonlinear elliptic equations; **R. Gardner**, Spectral properties of oscillatory traveling wave and applications; **Z.-C. Guan**, Some mathematical results from the model of frozen soil; **C. Gui**, Three layered solutions and other related problems in multiple phase transition; **R. Jordan**, **D. Kinderlehrer**, and **F. Otto**, The route to stability through Fokker-Planck dynamics; **M. Kovalyov**, Why singular solutions of KdV should not be ignored; **Y.-C. Lai**, **C. Grebogi**, and **J. Yorke**, Intermingled basin and riddling bifurcation in chaotic dynamical systems; **A. Lair** and **W. Shaker**, Entire large solutions of semilinear elliptic problems; **J. Li**, **X.-Z. He**, and **W. Ge**, Hamiltonian systems and periodic solutions of differential delay equations; **Z.-Y. Li**, **J.-Y. Tao**, and **Q.-X. Ye**, A mathematical analysis for a diffusive epidemic model with criss-cross dynamics; **F.-H. Lin**, Revisiting the regularity of the Navier-Stokes equation; **K. Lu**, Structural stability for time periodic parabolic equations; **K. Lu** and **X.-B. Pan**, The first eigenvalues of Ginzburg-Landau operator; **Y. Morita**, Stable solutions with zeros to the Ginzburg-Landau equation under Neumann condition; **S. K. Ng**, Dissipative Schroedinger equation for QED and phase transition; **S. Nii**, An approach to eigenvalue problems associated with stability of travelling waves; **C. Pugh** and **M. Shub**, Stable ergodicity and stable accessibility; **S. Shao** and **R. C. Y. Chen**, An asymptotic-

numerical method for a time-dependent singularly perturbed system with turning points; **Y.-Q. Shen**, Computation of a Hopf bifurcation point via one singular value decomposition nearby; **P. E. Souganidis**, Recent developments in the theory of interface dynamics; **F. Talamucci**, A mathematical model of phase change in fine porous media; **G. Wayne**, Invariant manifolds and the asymptotics of parabolic equations in cylindrical domain; **J.-C. Wei**, On the effect of domain geometry and boundary geometry in some singular perturbation problem; **J. Zhan**, Harmonic map and Ginzburg-Landau type system; **S. Zheng**, Global existence and asymptotic behavior of weak solutions to nonlinear thermoviscoelastic systems; **T. Ouyang** and **J. Shi**, Exact multiplicity of solutions and global bifurcation of $\Delta u + \lambda f(u) = 0$.

International Press

August 1998, 363 pages, Hardcover, ISBN 1-57146-048-9, 1991 *Mathematics Subject Classification*: 35–06, **All AMS members $34**, List $42, Order code INPR/31N



Nonlocal Bifurcations

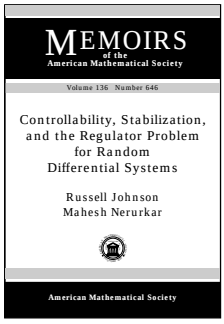
Yu. Ilyashenko, *Moscow State University, Russia*, and **Weigu Li**, *Beijing University, People's Republic of China*

This book studies nonlocal bifurcations that occur on the boundary of the domain of Morse-Smale systems in the space of all dynamical systems. These bifurcations provide a series of fascinating new scenarios for the transition from simple dynamical systems to complicated ones. The main effects are the generation of hyperbolic periodic orbits, nontrivial hyperbolic invariant sets and the elements of hyperbolic theory. All results are rigorously proved and exposed in a uniform way. The foundations of normal forms and hyperbolic theories are presented from the very first stages. The proofs are preceded by heuristic descriptions of the ideas. The book contains new results, and many results have not previously appeared in monograph form.

Contents: Introduction; Preliminaries; Bifurcations in the plane; Homoclinic orbits of nonhyperbolic singular points; Homoclinic tori and Klein bottles of nonhyperbolic periodic orbits: Noncritical case; Homoclinic torus of a nonhyperbolic periodic orbit: Semicritical case; Bifurcations of homoclinic trajectories of hyperbolic saddles; Elements of hyperbolic theory; Normal forms for local families: Hyperbolic case; Normal forms for unfoldings of saddlenodes; Bibliography.

Mathematical Surveys and Monographs

December 1998, approximately 290 pages, Hardcover, ISBN 0-8218-0497-9, LC 98-40047, 1991 *Mathematics Subject Classification*: 34A47, 58F14, **All AMS members $55**, List $69, Order code SURV-ILYASHENKN



Controllability, Stabilization, and the Regulator Problem for Random Differential Systems

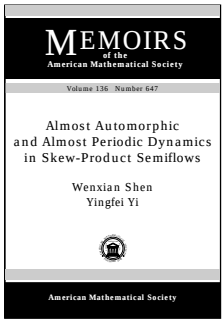
Russell Johnson, *University of Florence, Italy*, and **Mahesh Nerurkar**, *Rutgers University, Camden, NJ*

This volume develops a systematic study of time-dependent control processes. The basic problem of null controllability of linear systems is first considered. Using methods of ergodic theory and topological dynamics, general local null controllability criteria are given. Then the subtle question of global null controllability is studied. Next, the random linear feedback and stabilization problem is posed and solved. Using concepts of exponential dichotomy and rotation number for linear Hamiltonian systems, a solution of the Riccati equation is obtained which has extremely good robustness properties and which also preserves all the smoothness and recurrence properties of the coefficients. Finally, a general version of the local nonlinear feedback stabilization problem is solved.

Contents: Introduction; Basic dynamical notions; Random linear control processes; Some facts about random linear systems; Sufficiency conditions for uniform controllability; Dependence of controllability on the dynamics of the flow; Global null controllability; The feedback stabilization problem for random linear systems; The rotation number; The solution of the linear regulator and the stabilization problem; Linearization of the regulator and the stabilization problem.

Memoirs of the American Mathematical Society, Volume 136, Number 646

November 1998, 48 pages, Softcover, ISBN 0-8218-0865-6, LC 98-35279, 1991 *Mathematics Subject Classification*: 34C35, 93D15, **Individual member $21**, List $35, Institutional member $28, Order code MEMO/136/646N



Almost Automorphic and Almost Periodic Dynamics in Skew-Product Semiflows

Wenxian Shen, *Auburn University, AL*, and **Yingfei Yi**, *Georgia Institute of Technology, Atlanta*

This volume is devoted to the study of almost automorphic dynamics in differential equations. By making use of techniques from abstract topological dynamics, it is shown that almost automorphy, a notion which was introduced by S. Bochner in 1955, is essential and fundamental in the qualitative study of almost periodic differential equations.

Fundamental notions from topological dynamics are introduced in the first part of the book. Harmonic properties of almost automorphic functions such as Fourier series and frequency module are studied. A module containment result is provided.

In the second part, lifting dynamics of ω-limit sets and minimal sets of a skew-product semiflow from an almost periodic minimal base flow are studied. Skew-product semiflows with (strongly) order preserving or monotone natures on fibers are given particular attention. It is proved that a linearly stable minimal set must be almost automorphic and become almost periodic if it is also uniformly stable. Other issues such as flow extensions and the existence of almost periodic global attractors, etc., are also studied.

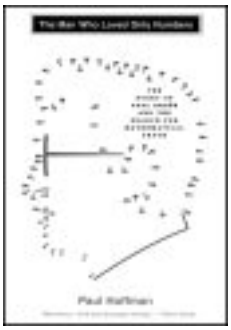
The third part of the book deals with dynamics of almost periodic differential equations. In this part, the general theory developed in the previous two parts is applied to study almost automorphic and almost periodic dynamics which are lifted from certain coefficient structures (e.g., almost automorphic or almost periodic) of differential equations. It is shown that (harmonic or subharmonic) almost automorphic solutions exist for a large class of almost periodic ordinary, parabolic and delay differential equations.

Contents: Acknowledgment; Abstract; Almost automorphy and almost periodicity; Skew-product semiflows; Applications to differential equations.

Memoirs of the American Mathematical Society, Volume 136, Number 647

November 1998, 93 pages, Softcover, ISBN 0-8218-0867-2, LC 98-30200, 1991 *Mathematics Subject Classification*: 34C27, 34D05, 35B15, 35B40, 35K57, 54H20, **Individual member $23**, List $39, Institutional member $31, Order code MEMO/136/647N

General and Interdisciplinary



The Man Who Loved Only Numbers

The Story of Paul Erdős and the Search for Mathematical Truth

Paul Hoffman

A publication of Hyperion Press.

Paul Hoffman, publisher for the *Encyclopaedia Brittanica*, first met Erdős in 1986 and later endeavored to follow the ultimate peripatetic mathematician on his journeys. Hoffman's book is the first full-length biography of Erdős. It offers an intimate look at this lifelong prodigy and his enormous circle of mathematical friends.

Readers learn many interesting facts about Erdős and his colleagues. Hoffman discusses Ron Graham's journey from acrobat and juggler to leading mathematician at AT&T Bell Labs. Included is information about Graham's role as "point of contact" for Erdős. Also revealed are interesting bits of "Erdős trivia". For example, how did Hank Aaron come to have an Erdős number of one?

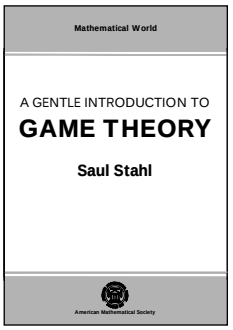
Through years of interviews with Erdős caretakers and devoted collaborators, the story emerges about the man and his magnificent obsession: the pursuit of mathematical truth. Against the backdrop of Fascism and the Cold War, the spirituality and universal beauty of numbers unfolds. The book captures the poetry of mathematics and shows what mathematics is for Erdős and his colleagues: pure order and beauty that transcends the physical world.

Distributed worldwide by the American Mathematical Society.

Contents: The two-and-a-half-billion-year-old man; Straight from the book; Epszi's enigma; Problems with Sam and Joe; Einstein vs. Dostoyevsky; Dr. worst case; Marginal revenge; "God made the intergers"; Getting the goat; Survivors' party; "We mathematicians are all a little bit crazy"; Acknowledgments and source notes; Bibliography; Index.

July 1998, 302 pages, Hardcover, ISBN 0-7868-6362-5, LC 98-14027, 1991 *Mathematics Subject Classification*: 00A15, **All AMS members $16**, List $23, Order code MLONN

Recommended Text



A Gentle Introduction to Game Theory

Saul Stahl, *University of Kansas, Lawrence*

The mathematical theory of games was first developed as a model for situations of conflict, whether actual or recreational. It gained widespread recognition when it was applied to the theoretical study of economics by von Neumann and Morgenstern in *Theory of Games and Economic Behavior* in the 1940s. The later bestowal in 1994 of the Nobel Prize in economics on Nash underscores the important role this theory has played in the intellectual life of the twentieth century.

This volume is based on courses given by the author at the University of Kansas. The exposition is "gentle" because it requires only some knowledge of coordinate geometry; linear programming is not used. It is "mathematical" because it is more concerned with the mathematical solution of games than with their applications.

Existing textbooks on the topic tend to focus either on the applications or on the mathematics at a level that makes the works inaccessible to most non-mathematicians. This book nicely fits in between these two alternatives. It discusses examples and completely solves them with tools that require no more than high school algebra.

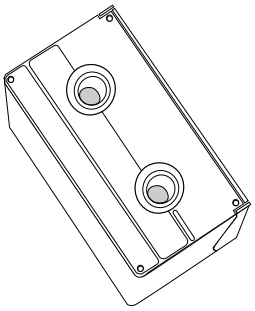
In this text, proofs are provided for both von Neumann's Minimax Theorem and the existence of the Nash Equilibrium in the 2×2 case. Readers will gain both a sense of the range of applications and a better understanding of the theoretical framework of these two deep mathematical concepts.

Contents: Introduction; The formal defintions; Optimal responses to specific strategies; The maximin strategy; The minimax strategy; Solutions of zero-sum games; $2 \times n$ and $m \times 2$ games; Dominance; Symmetric games; Poker-like games; Pure maximin and minimax strategies; Pure nonzero-sum games; Mixed strategies for nonzero-sum games; Finding mixed Nash equilibria for 2×2 nonzero-sum games; Bibliography; Solutions to selected exercies; Index.

Mathematical World, Volume 13

December 1998, approximately 178 pages, Softcover, ISBN 0-8218-1339-0, 1991 *Mathematics Subject Classification*: 90D05, 90D80, **All AMS members $20**, List $25, Order code MAWRLD/13N

AMS Video



M-Theory

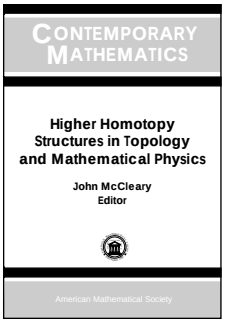
Edward Witten, *Institute for Advanced Study, Princeton, NJ*

The problem of unifying quantum mechanics and gravity in a single coherent theory represents an enormous obstacle to full understanding of the forces of nature. The mysterious M-theory has emerged as a likely candidate for such a unifying theory. Whether the "M" stands for marvel or matrix, magic or membrane, it is clear that this area of research is among the most exciting and most profound in all of science today. Edward Witten, one of the world's boldest innovators in this field, provides insights into these extraordinary developments in a completely expository presentation. Students and researchers specializing in mathematics and physics will find this lecture especially appealing. However, because it is completely nontechnical, large parts of it can easily be appreciated by viewers with little or no scientific or mathematical training.

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

August 1998, NTSC format on one-half inch VHS videotape, approximately 60 minutes, ISBN 0-8218-1350-1, 1991 Mathematics Subject Classification: 81, 83, **Individual member $34.95**, List $54.95, Institutional member $44.95, Order code VIDEO/101N

Geometry and Topology



Higher Homotopy Structures in Topology and Mathematical Physics

John McCleary, *Vassar College, Poughkeepsie, NY*, Editor

Since the work of Stasheff and Sugawara in the 1960s on recognition of loop space structures on H-spaces, the notion of higher homotopies has grown to be a fundamental organizing principle in homotopy theory, differential graded homological algebra and even mathematical physics. This book presents the proceedings from a conference held on the occasion of Stasheff's 60th birthday at Vassar in June 1996. It offers a collection of very high quality papers and includes some fundamental essays on topics that open new areas.

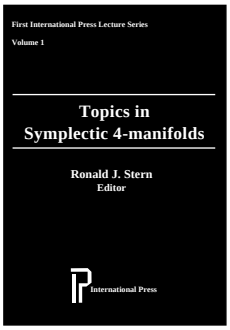
Features:

· Accessible to a broad audience interested in mathematics and physics.
· Offers a comprehensive overview of Stasheff's work.
· Contains papers on very current research topics, including operads, combinatorial polyhedra, and moduli spaces.

Contents: J. McCleary, An appreciation of the work of Jim Stasheff; **M. Arkowitz** and **H. Scheerer**, The cohomology flat product and the Berstein algebra of a co-H-space; **J. C. Becker** and **D. H. Gottlieb**, Spaces of local vector fields; **T. Beke**, Operads from the viewpoint of categorical algebra; **C. Berger**, Double loop spaces, braided monoidal categories and algebraic 3-type of space; **L. A. Dickey**, Poisson brackets with divergence terms in field theories: Three examples; **L. Friedlander** and **A. Schwarz**, Grassmannian and elliptic operators; **M. Gerstenhaber** and **C. W. Wilkerson**, On the deformation of rings and algebras. V: Deformation of differential graded algebras; **K. Hess**, Perturbation and transfer of generic algebraic structure; **J. Huebschmann**, Extensions of Lie-Rinehart algebras and the Chern-Weil construction; **I. M. James** and **W. Singhof**, On the category of fibre bundles, Lie groups, and Frobenius maps; **M. M. Kapranov** and **M. Saito**, Hidden Stasheff polytopes in algebraic K-theory and in the space of Morse functions; **T. Lada**, Commutators of A_∞ structures; **M. Markl**, Simplex, associahedron, and cyclohedron; **F. Neumann**, **M. D. Neusel**, and **L. Smith**, Rings of generalized and stable invariants and classifying spaces of compact Lie groups; **D. Randall**, Block bundle origin of stable block bundle homotopy; **J. A. Armario**, **P. Real**, and **B. Silva**, On p-minimal homological models of twisted tensor products of elementary complexes localised over a prime; **A. A. Voronov**, Stability of the rational homotopy type of moduli spaces.

Contemporary Mathematics

December 1998, approximately 321 pages, Softcover, ISBN 0-8218-0913-X, 1991 *Mathematics Subject Classification*: 55Pxx, 18–XX, 81T70; 58Fxx, 17Bxx, 55R20, 55D45, **Individual member $41**, List $69, Institutional member $55, Order code CONM-MCCLEARYN



Topics in Symplectic 4-Manifolds

Ronald J. Stern, *University of California, Irvine*, Editor

A publication of International Press.

The National Science Foundation, International Press, and the University of California at Irvine sponsored the first annual IP Lecture Series—conceived by Peter Li and S.T. Yau, organized by Richard Wentworth and Ronald J. Stern and assisted by Julie Crosby. Over 200 research mathematicians attended the conference and made it an important success.

The lecture series included three one-hour lectures on "Seiberg-Witten and Gromov Invariants" delivered by Clifford Taubes. In addition, ten one-hour invited lectures were delivered by prominent researchers in 4-dimensional smooth and symplectic topology. The lectures by M. Atiyah, R. Gompf, G. Tian, D. McDuff, Y. Ruan, and Z. Szabó were written up for this volume.

International Press publications are distributed worldwide, except in Japan, by the American Mathematical Society.

Contents: M. Atiyah, Duality and quantum field theory; **R. E. Gompf**, Kirby calculus for Stein surfaces; **J. Li** and **G. Tian**, Virtual moduli cycles and Gromov-Witten invariants of general symplectic manifolds; **D. McDuff**, From symplectic

deformation to isotopy; **Y. Ruan**, Virtual neighborhoods and the monopole equations; **J. W. Morgan** and **Z. Szabó**, On h-cobordisms and Seiberg-Witten invariants.

International Press

October 1997, 124 pages, Hardcover, ISBN 1-57146-019-5, 1991 *Mathematics Subject Classification*: 53F05, 57Mxx, **All AMS members $34**, List $42, Order code INPR/29N

Mathematical Physics

Quantum Classical Correspondence

D. H. Feng, *Drexel University, Philadelphia, PA*, and **B. L. Hu**, *University of Maryland, College Park*, Editors

A publication of International Press.

A serendipitous development of theoretical physics in the past decade was the apparent confluence of some major issues in several areas of physics: quantum measurement, quantum cosmology and semiclassical gravity, quantum chaos and mesoscopic physics. Although these areas address vastly different aspects of physics, covering atomic, molecular and quantum optics, condensed matter, nuclear physics, particle physics and general relativity, they all share the common concern of how the many quantum and classical features of matter and spacetime and their dynamics are related to each other. This fundmental issue—which lies at the base of all aspects of physics—was the theme of this conference, The Fourth Drexel Symposium on Quantum Nonintegrability.

The series of three conferences held at Drexel University (Philadelphia, PA) was designed to be a forum on quantum chaos and related topics. This book offers a broad perspective on the topic by encompassing the above-mentioned areas into one unifying conference theme: quantum-classical correspondence. The articles included in this volume help to bring into focus the basic issues these areas share.

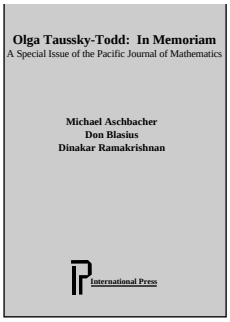
International Press publications are distributed worldwide, except in Japan, by the American Mathematical Society.

Contents: *I. Quantum Decoherence and Measurement:* **M. Gell-Mann** and **J. B. Hartle**, Strong decoherence; **R. Landauer**, Is quantum mechanically coherent computation useful?; **A. Peres**, The ambivalent quantum observer; **P. Pearle**, True collapse and false collapse; **L. Diosi**, **N. Gisin**, **J. Halliwell**, and **I. C. Percival**, On the equivalence of quantum state diffusion and decoherent histories for open quantum systems; **C.-P. Sun**, General dynamical model of quantum measurement and its application to quantum Zeno effect; **M. R. Gallis**, The emergence of classicality via decoherence: Beyond the Caldeira-Leggett environment; **S. Habib**, Quantum diffusion; **M. Revzen**, Bell's inequality for engineers and statistical mechanics; **D. I. Fivel**, Implications of the Markov property of quantum mechanics for the analysis of the EPR problem; **M. Dickson**, The quantum-classical connection in the Bohm theory: Aspects of the classical limit; **E. Lubkin** and **T. Lubkin**, A finite-dimensional model for thermodynamic isolation; *II. Quantum and Semiclassical Gravity:* **J. B. Hartle**, Generalized quantum mechanics of spacetime; **B. L. Hu**, Semiclassical gravity and mesoscopic physics; **L. Smolin**, Experimental signatures of quantum gravity; **L. N. Chang** and **C. Soo**, Chiral fermions, gravity and GUTs; *III. Quantum and Classical Dynamics:* **S. L. Adler**, Generalized quantum dynamics: A formalism encompassing both classical and quantum theory; **A. Anderson**, Coupling "classical" and quantum variables; **R. Sorkin**, Quantum measure theory and its interpretation; **T. A. Osborn** and **F. H. Molzahn**, Moyal quantum dynamics; **L. P. Horwitz** and **E. Eisenberg**, Lax-Phillips theory and the unstable system in quantum mechanics; **W. R. Greenberg**, **A. Klein**, and **C.-T. Li**, Invariant tori and Heisenberg matrix mechanics: A new window on the quantum-classical correspondence; **W.-M. Zhang** and **D. H. Feng**, Geometrical and dynamical controllings for quantum to classical transition; **L. H. Yu**, Wavelength exponential decay in a dissipative system; *IV. Quantum Chaos:* **G. Jona-Lasinio**, Chaos in quantum many-body systems; **R. Schack** and **C. M. Caves**, An information-theoretic characterization of quantum chaos; **L. E. Reichl**, **P. Alpatov**, and **S. Kim**, The effect of symmetry breaking on stochastic processes; **W. H. Zurek** and **J. P. Paz**, Why we don't need quantum plenetary dynamics: Decoherence and the correspondence principle for chaotic systems; **K. Shiokawa** and **B. L. Hu**, Environment-induced effects on quantum chaos: Decoherence, delocalization and irreversibility; **A. Tameshtit** and **J. E. Sipe**, Chaos in quantum baths: Making bigger splashes; **T. M. Antonsen, Jr.**, **E. Ott**, **Q. Chen**, and **R. N. Oerter**, The statistics of scars on wave functions; **D. Provost**, Semiclassical propagation of wavepackets in chaotic systems: The extraction of scarred eigenstates; **B. Georgeot** and **R. E. Prange**, Fredholm solution of quantum chaos; **B. Hu**, The Frenkel-Kontorova model: Classical generalizations and quantum glimpses; **E. Eisenberg**, **N. Shnerb**, and **I. Dana**, Solvable model for dynamical localization near quantum anti-resonance; **A. K. Pattanayak** and **W. C. Schieve**, Semiquantal and semiclassical dynamics and chaos; **J. Burgdörfer** and **C. Reinhold**, Evolution of Rydberg states in half-cycle pulses: Classical, semiclassical and quantum dynamics; **P. van Ede van der Pals** and **P. Gaspard**, Two-dimensional quantum spin Hamiltonians: Spectral and dynamical complexities; **D. C. Meredith**, **M. Baranger**, **M. R. Haggerty**, **B. Lauritzen**, **D. Provost**, and **M. A. M. de Aguiar**, Periodic orbits of nonscaling Hamiltonian systems from quantum mechanics; **Y. Duan**, **J.-M. Yuan**, and **C. Bao**, Periodic orbits of the hydrogen molecular ion; **X. Tang**, **Y. Gu**, and **J.-M. Yuan**, Roles of triple-collision orbits in collinear electron-helium ion collisions; **R. Schack** and **C. M. Caves**, Hypersensitivity to perturbation in the quantum kicked top (abstract); **H. Barnum**, **R. Schack**, and **C. M. Caves**, Hypersentivity to pertubation in a chaotic quantum optical system (abstract); **Z. Yan** and **R. Harris**, TRI symmetry breaking and level statistics (abstract); **S. G. Matinyan**, Classical chaos and high energy collisions; **A. Kudrolli** and **S. Sridhar**, Microwave 2-disk scattering; **E. S. Posmentier**, Quantization in climate dynamics—A new paradigm for quantum mechanics; *V. Mesoscopic Physics:* **M. Courtney**, **H. Jiao**, **N. Spellmeyer**, and **D. Kleppner**, Quantum chaos and Rydberg atoms in strong fields; **W. A. Lin** and **R. V. Jensen**, Contibutions of short classical orbits to the quantum conductance in semiconductor microstructures; **A. M. Chang**, Weak localization in chaotic versus nonchaotic cavities: A striking difference in the line shape; **R. Bluhm** and **V. A. Kostelecký**, Superrevivals of Rydberg wave packets; Conference program; Author index.

International Press

October 1997, 583 pages, Softcover, ISBN 1-57146-099-3, 1991 *Mathematics Subject Classification*: 81–06, 81Sxx, **All AMS members $34**, List $42, Order code INPR/28N

Number Theory



Olga Taussky-Todd: In Memoriam

Michael Aschbacher, *California Institute of Technology, Pasadena*, **Don Blasius**, *University of California, Los Angeles*, and **Dinakar Ramakrishnan**, *California Institute of Technology, Pasadena*, Editors

A publication of International Press.

This volume presents the refereed proceedings from a one-day conference held in memory of Olga Taussky-Todd. The event was sponsored by the *Pacific Journal of Mathematics* and by Caltech, where the conference was held. Featured speakers have contributed their talks. Additional contributors were added for this special issue.

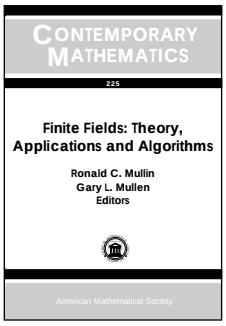
This text will also be of interest to those working in algebra and algebraic geometry.

International Press publications are distributed worldwide, except in Japan, by the American Mathematical Society.

Contents: M. Aschbacher, Finite groups acting on homology manifolds; **A.-M. Aubert**, Some properties of character sheaves; **D. Blasius**, Period relations and critical values of L-functions; **E. C. Dade**, Blocks of fully graded rings; **G. Denham** and **P. Hanlon**, On the Smith normal form of the Varchenko bilinear form of a hyperplane arrangement; **N. Elkies** and **B. H. Gross**, Embeddings into the integral octonions; **A. Freedman**, **R. N. Gupta**, and **R. M. Guralnick**, Shirshov's theorem and representations of semigroups; **F. Hajir**, On the class numbers of Hilbert class fields; **H. Hida** and **Y. Maeda**, Non-abelian base change for totally real fields; **H. Kisilevsky**, Olga Taussky-Todd's work in class field theory; **H. Kisilevsky**, A generalization of a result of Sinnott; **R. P. Langlands**, Representations of Abelian algebraic groups; **W. Luo** and **D. Ramakrishnan**, Determination of modular elliptic curves by Heegner points; **I. I. Piatetski-Shapiro**, L-functions for GSp_4; **K. A. Ribet**, Images of semistable Galois representations; **D. E. Rohrlich** and **J. B. Tunnell**, An elementary case of Serre's conjecture; **F. Shahidi**, On non-vanishing of twisted symmetric and exterior square L-functions for $GL(n)$; **H. Shapiro**, Commutators which commute with one factor; **R. Taylor**, Icosahedral Galois representations; **M.-F. Vignéras**, Extensions between irreducible representations of a p-adic $GL(n)$.

International Press

October 1997, 357 pages, Hardcover, ISBN 1-57146-051-9, 1991 *Mathematics Subject Classification*: 11–06, 22–06, List $20, Order code INPR/30N



Finite Fields: Theory, Applications and Algorithms

Ronald C. Mullin, *University of Waterloo, ON, Canada*, and **Gary L. Mullen**, *Pennsylvania State University, University Park*, Editors

The Fourth International Conference on "Finite Fields: Theory, Applications, and Algorithms" was held at the University of Waterloo in August 1997. This volume presents the refereed proceedings.

Because of its applications in so many diverse areas, finite fields continues to grow in importance in modern mathematics. Finite fields now play particularly important roles in number theory, algebra, and algebraic geometry. They also play a crucial role in computer science, statistics, and engineering. Areas of application include but are not limited to algebraic coding theory, cryptology, and combinatorial design theory. Computational and algorithmic aspects of finite field problems are also growing in significance.

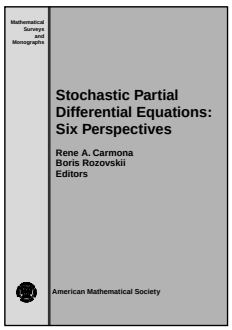
The conference drew workers in theoretical, applied, and algorithmic finite field theory. All papers were refereed. They are loosely classified as theoretical and applied and are listed under these general headings. The work contains up-to-date results from leading experts in the field.

Contents: J. V. Brawley, **S. Gao**, and **D. Mills**, Computing composed products of polynomials; **S. D. Cohen** and **D. Hachenberger**, Actions of linearized polynomials on the algebraic closure of a finite field; **P. Fleischmann** and **W. Lempken**, On degree bounds for invariant rings of finite groups over finite fields; **S. Gao**, **J. Howell**, and **D. Panario**, Irreducible polynomials of given forms; **Y. Hellegouarch**, An application of Galois calculus to $\mathbb{F}_t[t]$; **M. Henderson** and **R. Matthews**, Composition behavior of sub-linearised polynomials over a finite field; **P. Langevin** and **P. Solé**, Kernels and defaults; **H. Niederreiter** and **C. Xing**, Global function fields with many rational places and their applications; **G. Stein**, Traces of roots of unity over prime fields; **H. Stichtenoth**, The fermat curve in charcteristic p; **D. Wan**, Computing zeta functions over finite fields; **T. P. Berger**, Cyclic alternant codes induced by an automorphism of a GRS code; **C. Carlet**, On Kerdock codes; **J. Lacan** and **E. Delpeyroux**, Permutation group of the q-ary image of some q^m-ary cyclic codes; **O. Keren** and **S. Litsyn**, The number of solutions to a system of equations and spectra of codes; **W. More**, The LD probable prime test; **S. M. S. Müller**, Carmichael numbers and Lucas tests; **T. Blackmore** and **G. Norton**, On the state complexity of some long codes; **H. Sakazaki**, **E. Okamoto**, and **M. Mambo**, ID-based key distribution system over an elliptic curve; **R. Fuji-Hara** and **S. Shinohara**, Symmetric sets of curves and combinatorial arrays; **J. A. Wood**, Weight functions and the extension theorem for linear codes over finite rings.

Contemporary Mathematics, Volume 225

November 1998, 233 pages, Softcover, ISBN 0-8218-0817-6, LC 98-38826, 1991 *Mathematics Subject Classification*: 11T02; 05B05, 11Y16, 94S60, 94B05, **Individual member $29**, List $49, Institutional member $39, Order code CONM/225N

Probability



Stochastic Partial Differential Equations: Six Perspectives

Rene A. Carmona, *Princeton University, NJ*, and **Boris Rozovskii**, *University of Southern California, Los Angeles*, Editors

The field of Stochastic Partial Differential Equations (SPDEs) is one of the most dynamically developing areas of mathematics. It lies at the cross section of probability, partial differential equations, population biology, and mathematical physics. The field is especially attractive because of its interdisciplinary nature and the enormous richness of current and potential future applications.

This volume is a collection of six important topics in SPDEs presented from the viewpoint of distinguished scientists working in the field and related areas. Emphasized are the genesis and applications of SPDEs as well as mathematical theory and numerical methods.

Contents: *Part 1: SPDE's and Stochastic Modelling:* **J. Glimm** and **D. Sharp**, Stochastic partial differential equations: Selected applications in continuum physics; **D. A. Dawson** and **E. A. Perkins**, Measure-valued processes and renormalization of branching particle systems; **G. Giacomin**, **J. L. Lebowitz**, and **E. Presutti**, Deterministic and stochastic hydrodynamic equations arising from simple microscopic model systems; **R. A. Carmona** and **F. Cerou**, Transport by incompressible random velocity fields: Simulations & mathematical conjectures; *Part 2: Mathematical Theory of SPDE's:* **N. V. Krylov**, An analytic approach to SPDEs; **R. Mikulevicius** and **B. L. Rozovskii**, Martingale problems for stochastic PDE's; *Indexes:* Notation index; Subject index.

Mathematical Surveys and Monographs

December 1998, approximately 337 pages, Hardcover, ISBN 0-8218-0806-0, LC 98-38392, 1991 *Mathematics Subject Classification*: 60H15; 35R60, **All AMS members $39**, List $49, Order code SURV-CARMONAN