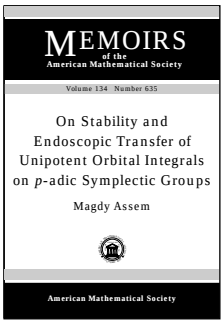
New Publications Offered by the AMS

Algebra and Algebraic Geometry



On Stability and Endoscopic Transfer of Unipotent Orbital Integrals on p-adic Symplectic Groups

Magdy Assem

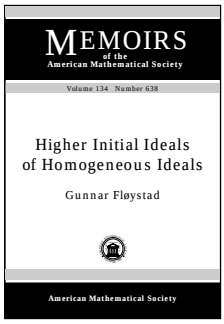
The theory of endoscopy is an intriguing part of the Langlands program, as it provides a way to attack the functoriality principle of Langlands for certain pairs of reductive groups (G, H), in which H is what is known as an endoscopic group for G. The starting point for this method is a close study of the relationship of orbital integrals on G with stable orbital integrals on H.

This volume investigates unipotent orbital integrals of spherical functions on p-adic symplectic groups. The results are then put into a conjectural framework, that predicts (for split classical groups) which linear combinations of unipotent orbital integrals are stable distributions.

Contents: Introduction; Unipotent orbits and prehomogeneous spaces; The Hecke algebra and some Igusa local orbital zeta functions; The evaluation of f^H at the identity; Matching of unipotent orbital integrals; Remarks on stability and endoscopic transfer; Appendix I; Appendix II; References.

Memoirs of the American Mathematical Society, Volume 134, Number 635

July 1998, 101 pages, Softcover, ISBN 0-8218-0765-X, LC 98-18262, 1991 *Mathematics Subject Classification*: 22E35, 22E50, **Individual member $24**, List $40, Institutional member $32, Order code MEMO/134/635N



Higher Initial Ideals of Homogeneous Ideals

Gunnar Fløystad, *University of Bergen, Norway*

Given a homogeneous ideal I and a monomial order, one may form the initial ideal $\mathrm{in}(I)$. The initial ideal gives information about I, for instance I and $\mathrm{in}(I)$ have the same Hilbert function. However, if $\mathcal{I}$ is the sheafification of I one cannot read the higher cohomological dimensions $h^i(\mathbf{P}^n, \mathcal{I}(\nu))$ from $\mathrm{in}(I)$. This work remedies this by defining a series of higher initial ideals $\mathrm{in}_s(I)$ for $s \geq 0$. Each cohomological dimension $h^i(\mathbf{P}^n, \mathcal{I}(\nu))$ may be read from the $\mathrm{in}_s(I)$. The $\mathrm{in}_s(I)$ are however more refined invariants and contain considerably more information about the ideal I.

This work considers in particular the case where I is the homogeneous ideal of a curve in $\mathbf{P}^3$ and the monomial order is reverse lexicographic. Then the ordinary initial ideal $\mathrm{in}_0(I)$ and the higher initial ideal $\mathrm{in}_1(I)$ have very simple representations in the form of plane diagrams.

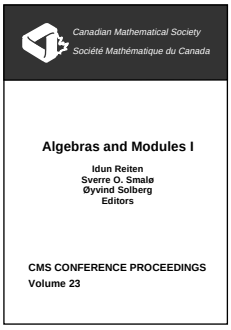
Features:
- enables one to visualize cohomology of projective schemes in $\mathbf{P}^n$
- provides an algebraic approach to studying projective schemes
- gives structures which are generalizations of initial ideals

Contents: Introduction; Borel-fixed ideals; Monomial orders; Some algebraic lemmas; Defining the higher initial ideals; Representing the higher initial ideals; Group action on $R^{s+1}(I)$; Describing the action on $R^{s+1}(I)$; Borel-fixedness; Higher initial ideals of hyperplane sections; Representing the higher initial ideals of general hyperplane sections; Higher initial ideals as combinatorial structures; Reading cohomological information; Examples: Points and curves in $\mathbf{P}^3$; References.

Memoirs of the American Mathematical Society, Volume 134, Number 638

July 1998, 68 pages, Softcover, ISBN 0-8218-0853-2, LC 98-18255, 1991 *Mathematics Subject Classification*: 13D25, 14H50; 13P10, 14J99, **Individual member $22**, List $36, Institutional member $29, Order code MEMO/134/638N

Algebras and Modules I



Idun Reiten, **Sverre O. Smalø**, and **Øyvind Solberg**, *Norwegian University of Science and Technology, Trondheim,* Editors

This volume contains recent results on geometric aspects of representations of algebras, a thorough treatment of the theory of quasitilted algebras, new developments on infinite dimensional representations of finite dimensional algebras, a bridge between representation of algebraic groups and representation theory of finite dimensional algebras, and recent discoveries on modular representation theory. In addition, the volume contains two papers devoted to some of Maurice Auslander's many contributions both in the representation theory of finite dimensional algebras and in commutative ring theory. The invited contributions to this volume are based on lectures given by leading researchers in the field at the Workshop on Representations of Algebras and Related Topics, Trondheim, Norway, in 1996.

Features:

- a unique collection of survey papers containing old and new developments in the representation theory of finite dimensional algebras and related topics
- an outstanding source for examples of different techniques developed in recent years in this area of research
- papers presented with emphasis on clarity and readability

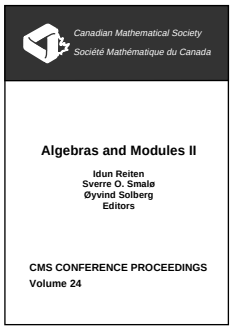
A general background in noncommutative algebra including rings, modules and homological algebra is required. Given that, parts of this volume would be suitable as a textbook for an advanced graduate course in algebra.

Members of the Canadian Mathematical Society may order at the AMS member price.

Contents: K. Bongartz, Some geometric aspects of representation theory; **W. Crawley-Boevey**, Infinite-dimensional modules in the representation theory of finite-dimensional algebras; **D. Happel**, Quasitilted algebras; **H. Lenzing**, Auslander's work on artin algebras; **B. Parshall**, Some finite dimensional algebras arising in group theory; **J. Rickard**, Some recent advances in modular representation theory; **Y. Yoshino**, Auslander's work on Cohen-Macaulay modules and recent development.

Conference Proceedings, Canadian Mathematical Society, Volume 23

June 1998, 198 pages, Softcover, ISBN 0-8218-0850-8, LC 98-3695, 1991 *Mathematics Subject Classification*: 16Gxx; 16Dxx, 16Exx, 18Gxx, 20Cxx, **Individual member $23**, List $39, Institutional member $31, Order code CMSAMS/23N



Algebras and Modules II

Idun Reiten, **Sverre O. Smalø**, and **Øyvind Solberg**, *Norwegian University of Science and Technology, Trondheim,* Editors

This volume contains 43 research papers based on results presented at the Eighth International Conference on Representations of Algebras (ICRA VIII) held in Geiranger, Norway, in 1996. The papers, written by experts in the field, cover the most recent developments in the representation theory of artin algebras and related topics.

The papers cover: representation of tame, biserial, cellular, factorial hereditary, Hopf, Koszul, non-polynomial growth, preprojective, Temperley-Lieb, tilted and quasitilted algebras. Other topics include: tilting/cotilting modules and generalizations as $*$-modules, exceptional sequences of modules and vector bundles, homological conjectures, Hochschild cohomology, cyclic homology, homologically finite subcategories, representations of posets, regular modules, vector space categories, triangulated categories, moduli spaces of representations of quivers, postprojective (and preprojective) partitions, stable and derived equivalences, and pure-injective, infinite dimensional, and endofinite representations. A general background in noncommutative algebra including rings, modules and homological algebra is required.

Features:

- a unique source for the developments in the representation theory of finite dimensional and artin algebras and related topics
- a wide variety of important papers by leading researchers in the field, with references to earlier developments in the field

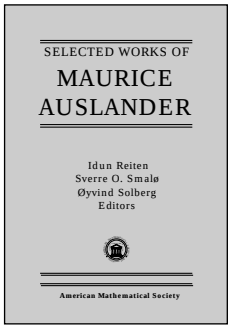
Members of the Canadian Mathematical Society may order at the AMS member price.

Contents: L. Angeleri-Hügel and **F. U. Coelho**, A note on a certain class of tilted algebras; **H. Asashiba**, Derived equivalence and stable equivalence of repetitions of algebras of finite global dimension; **I. Assem**, **A. Beligiannis**, and **N. Marmaridis**, Right triangulated categories with right semi-equivalences; **Ø. Bakke**, The existence of short exact sequences with some of the terms in given subcategories; **M. J. Bardzell** and **E. N. Marcos**, Induced boundary maps for the cohomology of monomial and Auslander algebras; **M. Barot**, The repetitive partition of the repetitive category of a tubular algebra; **A. V. Roiter**, **K. I. Belousov**, and **L. A. Nazarova**, Representations of finitely represented dyadic sets; **A. B. Buan** and **Ø. Solberg**, Relative cotilting theory and almost complete cotilting modules; **C. Cibils**, Hochschild cohomology algebra of radical square zero algebras; **R. Colpi** and **G. D'Este**, Equivalences represented by faithful non-tilting $*$-modules; **T. Dana-Picard** and **M. Schaps**, Non reduced components of Alg_n; **A. P. Dean** and **F. Okoh**, Extensionless modules of infinite rank; **B. Deng** and **J. Xiao**, A quiver description of hereditary categories and its application to the first Weyl algebra; **E. Dieterich**, Power-associative real division algebras; **P. Dräxler** and **C. Geiss**, A note on the $\mathbb{D}_n$-pattern; **Y. A. Drozd**, Representations of bisected posets and reflection functors; **O. Enge**, Quasitilted triangular algebras; **K. Erdmann** and **N. Snashall**, Preprojective algebras of Dynkin type, periodicity, and the second Hochschild cohomology; **J. Feldvoss** and

L. Klingler, Tensor powers and projective modules for Hopf algebras; **K. R. Goodearl** and **B. Huisgen-Zimmermann**, Repetitive resolutions over classical orders and finite dimensional algebras; **E. L. Green** and **R. Martínez-Villa**, Koszul and Yoneda algebras. II; **R. M. Green**, On representations of affine Temperley-Lieb algebras; **J. Y. Guo**, **R. Martínez-Villa**, and **M. Takane**, Koszul generalized Auslander regular algebras; **D. Happel** and **I. H. Slungård**, One-point extensions of hereditary algebras; **D. Happel** and **L. Unger**, Complements and the generalized Nakayama conjecture; **L. Hille**, Toric quiver varieties; **T. Hübner**, Hereditary module categories arising as categories perpendicular to exceptional vector bundles; **B. Keller**, An overview of results on cyclic homology of exact categories; **O. Kerner** and **M. Takane**, Universal filtrations for modules in perpendicular categories; **S. König** and **C. Xi**, On the structure of cellular algebras; **H. Krause**, Stable equivalence and representation type; **D. Kussin**, Factorial algebras, quaternions and preprojective algebras; **D. Madsen**, Almost split sequences for commutative artinian rings; **H. Meltzer**, Exceptional sequences and tilting complexes for hereditary algebras of type $\mathbb{A}_n$; **J. A. de la Peña** and **A. Skowroński**, Substructures of non-polynomial growth algebras with weakly non-negative Tits form; **M. I. Platzeck**, Relations and modules of finite projective dimension over algebras whose idempotent ideals are projective; **M. Prest**, Morphisms between finitely presented modules and infinite-dimensional representations; **I. Reiten**, Homological properties of almost split sequences; **C. M. Ringel**, The preprojective algebra of a quiver; **K. W. Roggenkamp**, Biserial algebras and graphs; **M. Schmidmeier**, Endofinite modules over hereditary artinian PI-rings; **C. Xi**, Twisted doubles of algebras. I: Deformations of algebras and the Jones index; **A. Zavadskij**, On tame vectorspace categories. II; **P. Zhang**, Selforthogonal radical algebras.

Conference Proceedings, Canadian Mathematical Society, Volume 24

July 1998, 569 pages, Softcover, ISBN 0-8218-1076-6, LC 98-6550, 1991 *Mathematics Subject Classification*: 16Gxx; 16Exx, 18Gxx, 20Cxx, **Individual member $59**, List $99, Institutional member $79, Order code CMSAMS/24N



Selected Works of Maurice Auslander

Idun Reiten, **Sverre O. Smalø**, **Øyvind Solberg,** *Norwegian University of Science and Technology, Trondheim*, Editors

In view of Maurice Auslander's important contributions to many parts of algebra, there is great interest in the present volume. This book features a broad selection of the core of his work, including commutative algebra, singularity theory, the theory of orders, and the representation theory of artin algebras.

Although Auslander worked in many areas, there are characteristics common to most of his research. Of particular note is his use of homological methods, including functor categories. While his early work was concerned mostly with commutative rings and his later work mainly with artin algebras, he was always interested in finding common features and common settings.

The broad range and impact of Auslander's contributions are reflected clearly in this volume. The editors have included background material, interrelationships between papers and indications of further developments. A paper of note and one that is not available readily is included: the Queen Mary College Notes on "Representation Dimension of Artin Algebras". This book is of interest for the historical development of algebra over a 40-year period and for the use of homological methods in algebra, covering both commutative ring theory and artin algebra theory.

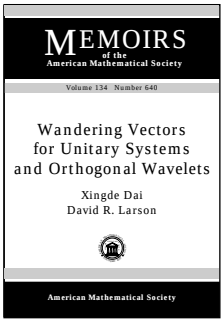
Contents: *Part 1. Chapter I:* Homological dimension and local rings; On the dimension of modules and algebras. III: Global dimension; Commutator subgroups of free groups; On the dimension of modules and algebras. VI: Comparison of global and algebra dimension; On regular group rings; Homological dimension in local rings; Homological dimension in noetherian rings. II; Codimension and multiplicity; Codimension and multiplicity (corrections); Unique factorization in regular local rings; A remark on a paper of M. Hironaka; *Chapter II:* Ramification theory; On ramification theory in noetherian rings; Maximal orders; The Brauer group of a commutative ring; Modules over unramified regular local rings; On the purity of the branch locus; Ramification index and multiplicity; Modules over unramified regular local rings; Brauer groups of discrete valuation rings; Galois actions on rings and finite Galois coverings; *Chapter III:* Functors; Coherent functors; Stable equivalence of artin algebras; Stable equivalence of dualizing R-varieties; A functorial approach to representation theory; Adjoint functors and an extension of the Green correspondence for group representations; D Tr-periodic modules and functors; *Chapter IV:* Almost split sequences and artin algebras; Representation dimension of artin algebras; A characterization of orders of finite lattice type; Representation theory of artin algebras. I; Representation theory of artin algebras. II; Representation theory of artin algebras. III: Almost split sequences; Large modules over artin algebras; Representation theory of artin algebras. IV: Invariants given by almost split sequences; Representation theory of artin algebras. V: Methods for computing almost split sequences and irreducible morphisms; Representation theory of artin algebras. VI: A functorial approach to almost split sequences; Representation theory of hereditary artin algebras; Almost split sequences whose middle term has at most two indecomposable summands; Relations for Grothendieck groups of artin algebras; *Chapter V:* Some topics in representation theory; On a generalized version of the Nakayama conjecture; Modules with waists; Modules determined by their composition factors; Almost split sequences and group rings; On a theorem of E. Green on the dual of the transpose; *Part 2. Chapter VI:* Lattices over general orders; Functors and morphisms determined by objects; Applications of morphisms determined by modules; A survey of existence theorems for almost split sequences; *Chapter VII:* Tilting theory and homologically finite subcategories; Coxeter functors without diagrams; Preprojective modules over artin algebras; Almost split sequences in subcategories; Applications of contravariantly finite subcategories; Homological theory of idempotent ideals; *Chapter VIII:* Almost split sequences and commutative rings; Isolated singularities and existence of almost split sequences; Rational singularities and almost split sequences; Almost split sequences for rational double points; The Cohen-Macaulay type of Cohen-Macaulay rings; Almost split sequences for Cohen-Macaulay-modules; The what, where, and why of almost split sequences; Cohen-Macaulay modules for graded Cohen-Macaulay rings and their completions; Graded modules and their completions; *Chapter IX:* Grothendieck groups and Cohen-Macaulay approximations; Grothendieck groups of algebras and orders; Grothendieck

groups of algebras with nilpotent annihilators; The homological theory of maximal Cohen-Macaulay approximations; Liftings and weak liftings of modules; *Chapter X:* Relative theory and syzygy modules; Relative homology and representation theory. I: Relative homology and homologically finite subcategories; Relative homology and representation theory. II: Relative cotilting theory; k-Gorenstein algebras and syzygy modules; Syzygy modules for noetherian rings.

Collected Works, Volume 10

Part 1: August 1998, 895 pages, Hardcover, ISBN 0-8218-0998-9, LC 98-2926,1991 *Mathematics Subject Classification:* 13–XX, 14–XX, 16–XX, 18–XX, 19–XX, 20–XX, **Individual member $99**, List $165, Institutional member $132, Order code CWORKS/10.1N
Part 2: August 1998, 743 pages, Hardcover, ISBN 0-8218-1000-6, LC 98-2926, 1991 *Mathematics Subject Classification:* 13–XX, 14–XX, 16–XX, 18–XX, 19–XX, **Individual member $93**, List $155, Institutional member $124, Order code CWORKS/10.2N
Set: August 1998, 1638 pages, Hardcover, ISBN 0-8218-0679-3, LC 98-2926, 1991 *Mathematics Subject Classification:* 13–XX, 14–XX, 16–XX, 18–XX, 19–XX, 20–XX, **Individual member $179**, List $299, Institutional member $239, Order code CWORKS/10N

Analysis



Wandering Vectors for Unitary Systems and Orthogonal Wavelets

Xingde Dai, *University of North Carolina, Charlotte*, and **David R. Larson**, *Texas A&M, College Station*

This volume concerns some general methods for the analysis of those orthonormal bases for a separable complex infinite dimensional Hilbert space which are generated by the action of a system of unitary transformations on a single vector, which is called a complete wandering vector for the system. The main examples are the orthonormal wavelet bases. Topological and structural properties of the set of all orthonormal dyadic wavelets are investigated in this way by viewing them as complete wandering vectors for an affiliated unitary system and then applying techniques of operator algebra and operator theory.

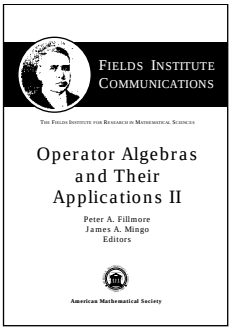
Features:
- describes an operator-theoretic perspective on wavelet theory that is accessible to functional analysts
- describes some natural generalizations of standard wavelet systems
- contains numerous examples of computationally elementary wavelets
- poses many open questions and directions for further research

This book is particularly accessible to operator theorists and operator algebraists who are interested in a functional analytic approach to some of the pure mathematics underlying wavelet theory.

Contents: Introduction; The local commutant; Structural theorems; The wavelet system $\langle D, T \rangle$; Wavelet sets; Operator interpolation of wavelets; Concluding remarks; Appendix: Examples of interpolation maps; Bibliography.

Memoirs of the American Mathematical Society, Volume 134, Number 640

July 1998, 68 pages, Softcover, ISBN 0-8218-0800-1, LC 98-4219, 1991 *Mathematics Subject Classification*: 46N99, 47N40, 47N99; 47D25, 47C05, 47D15, 46B28, **Individual member $22**, List $36, Institutional member $29, Order code MEMO/134/640N



Operator Algebras and Their Applications II

Peter A. Fillmore, *Dalhousie University, Halifax, NS, Canada*, and **James A. Mingo**, *Queens University, Kingston, ON, Canada*, Editors

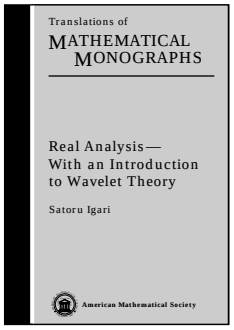
The study of operator algebras, which grew out of von Neumann's work in the 1920s and 30s on modelling quantum mechanics, has in recent years experienced tremendous growth and vitality, with significant applications in other areas both within mathematics and in other fields. For this reason, and because of the existence of a strong Canadian school in the subject, the topic was a natural candidate for an emphasis year at The Fields Institute.

This volume is the second selection of papers that arose from the seminars and workshops of a year-long program, "Operator Algebras and Applications", that took place at The Fields Institute. Topics covered include the classification of amenable C*-algebras, lifting theorems for completely positive maps, and automorphisms of von Neumann algebras of type III.

Contents: B. V. Rajarama Bhat, A generalized intertwining lifting theorem; **O. Bratteli**, **G. A. Elliott**, **D. E. Evans**, and **A. Kishimoto**, On the classification of C*-algebras of real rank zero, III: The infinite case; **G. A. Elliott**, **G. Gong**, and **H. Su**, On the classification of C*-algebras of real rank zero, IV: Reduction to local spectrum of dimension two; **I. Stevens**, Simple approximate circle algebras; **K. H. Stevens**, The classification of certain non-simple approximate interval algebras; **C. E. Sutherland** and **M. Takesaki**, Right inverse of the module of approximately finite dimensional factors of type III and approximately finite ergodic principal measured groupoids; Workshop speakers and titles.

Fields Institute Communications, Volume 20

September 1998, 170 pages, Hardcover, ISBN 0-8218-0908-3, 1991 *Mathematics Subject Classification*: 46–06, **Individual member $28**, List $46, Institutional member $37, Order code FIC/20



Real Analysis—With an Introduction to Wavelet Theory

Satoru Igari, *Tohoku University, Sendai, Japan*

This introduction to real analysis is based on a series of lectures by the author at Tohoku University. The text covers real numbers, the notion of general topology, and a brief treatment of the Riemann integral, followed by chapters on the classical theory of the Lebesgue integral on Euclidean spaces; the differentiation theorem and functions of bounded variation; Lebesgue spaces; distribution theory; the classical theory of the Fourier transform and Fourier series; and wavelet theory.

Features:

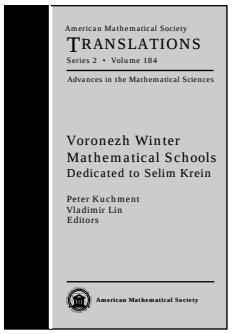
- presents the core subjects of real analysis
- provides the fundamentals for students who are interested in harmonic analysis, probability or partial differential equations
- introduces Fourier analysis
- introduces wavelet theory

This volume would be a suitable textbook for an advanced undergraduate or first year graduate courses in analysis.

Contents: Euclidean spaces and the Riemann integral; Lebesgue measure on Euclidean spaces; The Lebesgue integral on Euclidean spaces; Differentiation; Measures in abstract spaces; Lebesgue spaces and continuous functions; Schwartz space and distributions; Fourier analysis; Wavelet analysis; Appendix A; Appendix B; Solutions to problems; Bibliography; Index.

Translations of Mathematical Monographs

August 1998, approximately 272 pages, Hardcover, ISBN 0-8218-0864-8, LC 98-7552, 1991 *Mathematics Subject Classification*: 26–01, 28Axx; 42–01, 46Fxx, 42C15, **Individual member $53**, List $89, Institutional member $71, Order code MMONO-IGARIN



Voronezh Winter Mathematical Schools

Dedicated to Selim Krein

Peter Kuchment, *Wichita State University, KS*, and **Vladimir Lin**, *Technion—Israel Institute of Technology, Haifa*, Editors

This volume is devoted to the 25 year old Voronezh Winter Mathematical School and to the scientific work of its founder, Selim Krein. The Voronezh Winter Mathematical School was a unique annual event in the scientific life of the former Soviet Union. Over the years it attracted thousands of mathematicians, from undergraduates to world-renowned experts, and played a major role in spreading information about cutting edge results of mathematical research, triggering cooperation and educating new generations of mathematicians. The articles in this book, written by prominent mathematicians and former lecturers and participants of the school, cover a wide range of subjects in analysis and geometry, including global analysis, harmonic analysis, function theory, operator theory, spectral theory, dynamical systems, mathematical physics, homogenization, algebraic geometry, differential geometry, and geometric analysis.

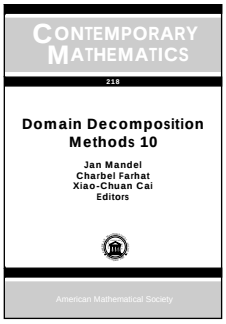
This text will also be of interest to those working in geometry and topology.

Contents: G. Belitskii and **V. Tkachenko**, Fredholm property of functional equations with affine transformations of argument; **Y. M. Berezansky**, Construction of generalized translation operators from the system of Appell characters; **D. Burghelea**, **L. Friedlander**, and **T. Kappeler**, Witten deformation of the analytic torsion and the Reidemeister torsion; **Y. L. Daletskii**, Formal operator power series and the noncommutative Taylor formula; **G. Dethloff**, **S. Orevkov**, and **M. Zaidenberg**, Plane curves with a big fundamental group of the complement; **B. Fridman**, **P. Kuchment**, **D. Ma**, and **V. G. Papanicolaou**, Solution of the linearized inverse conductivity problem in a half space via integral geometry; **M. Gelfand** and **I. M. Spitkovsky**, Almost periodic factorization: Applicability of the division algorithm; **V. Y. Lin** and **M. Zaidenberg**, Liouville and Carathéodory coverings in Riemannian and complex geometry; **M. Lyubich**, How big is the set of infinitely renormalizable quadratics?; **Y. Lyubich**, Linear operators in one-dimensional extensions of Banach spaces; **S. Montgomery-Smith** and **E. Semenov**, Random rearrangements and operators; **V. I. Ovchinnikov**, On reiteration theorems; **A. Pankov**, Statistical homogenization theorem for multivalued monotone elliptic operators; **I. Pesenson**, Reconstruction of Paley-Wiener functions on the Heisenberg group; **M. Shubin**, De Rham theorem for extended L^2-cohomology; **M. Solomyak**, On the discrete spectrum of a class of problems involving the Neumann Laplacian in unbounded domains; **N. Zobin**, Szegő-type extremal problems.

American Mathematical Society Translations—Series 2, (*Advances in the Mathematical Sciences*), Volume 184

May 1998, 263 pages, Hardcover, ISBN 0-8218-0976-8, LC 91-640741, 1991 *Mathematics Subject Classification*: 35–06, 47–06, 58–06, **Individual member $59**, List $99, Institutional member $79, Order code TRANS2/184N

Applications



Domain Decomposition Methods 10

Jan Mandel, *University of Colorado, Denver*, **Charbel Farhat** and **Xiao-Chuan Cai**, *University of Colorado, Boulder*, Editors

This volume contains the proceedings of the Tenth International Conference on Domain Decomposition Methods, which focused on the latest developments in realistic applications in structural mechanics, structural dynamics, computational fluid dynamics, and heat transfer. The proceedings of these conferences have become standard references in the field and contain seminal

papers as well as the latest theoretical results and reports on practical applications.

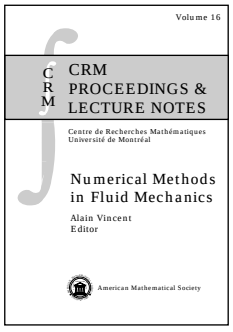
This volume is divided into four parts: the first part contains invited papers (some of which survey developments over the past decade), and the other parts gather material from minisymposia and contributed presentations under three headings: Algorithms, Theory, and Applications.

An electronic version is available at no additional charge to purchasers of the print volume. Access instructions are provided in the book. There is also the option to purchase only the electronic version.

Contents: *Invited presentations:* **Y. Achdou**, **G. Abdoulaev**, **J.-C. Hontand**, **Y. A. Kuznetsov**, **O. Pironneau**, and **C. Prud'homme**, Nonmatching grids for fluids; **T. J. Barth**, **T. F. Chan**, and **W.-P. Tang**, A parallel non-overlapping domain-decomposition algorithm for compressible fluid flow problems on triangulated domains; **A. de La Bourdonnaye**, **C. Farhat**, **A. Macedo**, **F. Magoulès**, and **F.-X. Roux**, A non-overlapping domain decomposition method for the exterior Helmholtz problem; **T. F. Chan**, **J. Xu**, and **L. Zikatanov**, An agglomeration multigrid method for unstructured grids; **Z. Dostál**, **A. Friedlander**, and **S. A. Santos**, Solution of coercive and semicoercive contact problems by FETI domain decomposition; **M. Dryja**, An iterative substructuring method for elliptic mortar finite element problems with discontinuous coefficients; **M. S. Espedal**, **K. J. Hersvik**, and **B. G. Ersland**, Domain decomposition methods for flow in heterogeneous porous media; **R. Glowinski**, **T.-W. Pan**, **T. I. Hesla**, **D. D. Joseph**, and **J. Periaux**, A fictitious domain method with distributed Lagrange multipliers for the numerical simulation of particulate flow; **L. F. Pavarino**, Domain decomposition algorithms for saddle point problems; **F.-X. Roux** and **C. Farhat**, Parallel implementation of direct solution strategies for the coarse grid solvers in 2-level FETI method; **Y. Saad**, **M. Sosonkina**, and **J. Zhang**, Domain decomposition and multi-level type techniques for general sparse linear systems; **S. J. Sherwin**, **T. C. E. Warburton**, and **G. E. Karniadakis**, Spectral/*hp* methods for elliptic problems on hybrid grids; **M. F. Wheeler** and **I. Yotov**, Physical and computational domain decompositions for modeling subsurface flows; *Algorithms:* 18 papers; *Theory:* 13 papers; *Applications:* 10 papers.

Contemporary Mathematics, Volume 218

August 1998, 554 pages, Softcover, ISBN 0-8218-0988-1, LC 98-15580, 1991 *Mathematics Subject Classification*: 65–06; 65N55, 65M55, 65Y05, 73–06, 76–06, **Individual member $66**, List $110, Institutional member $88, Order code CONM/218N



Numerical Methods in Fluid Mechanics

Alain Vincent, *Université de Montreal, PQ, Canada*, Editor

After centuries of research, turbulence in fluids is still an unsolved problem. The graduate-level lectures in this volume cover the state of the art of numerical methods for fluid mechanics.

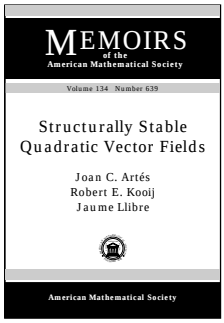
The research in this collection covers wavelet-based methods, the semi-Lagrangian method, the Lagrangian multi-pole method, continuous adaptation of curvilinear grids, finite volume methods, shock-capturing methods, and ENO schemes. The most recent research on large eddy simulations and Reynolds stress modeling is presented in a way that is accessible to engineers, postdoctoral researchers, and graduate students. Applications cover industrial flows, aerodynamics, two-phase flows, astrophysical flows, and meteorology. This volume would be suitable as a textbook for graduate students with a background in fluid mechanics.

Contents: C. Basdevant, Wavelet based methods for PDEs; **J. Côté**, **S. Gravel**, **M. Roch**, **A. Méthot**, **A. Patoine**, **J. Caveen**, **M. Valin**, **S. Thomas**, and **A. Staniforth**, Forecasting with a variable-resolution global model; **D. G. Dritschel**, The simulation and analysis of vortex dynamics in nearly-inviscid 2D and layerwise-2D flows; **J. H. Ferziger**, Direct and large eddy simulation of turbulence; **B. Fiedler**, Continuous adaptation of a curvilinear grid; **S. Gravel**, The semi-Lagrangian method; **B. E. Launder**, An introduction to single-point closure methodology; **M. Meneguzzi**, Numerical simulation of two-phase flows; **U.-L. Pen**, A high-resolution adaptive moving mesh hydrodynamic algorithm.

CRM Proceedings & Lecture Notes, Volume 16

August 1998, 201 pages, Softcover, ISBN 0-8218-0813-3, LC 98-15581, 1991 *Mathematics Subject Classification*: 76–XX, 76Fxx, 76Mxx, **Individual member $35**, List $59, Institutional member $47, Order code CRMP/16N

Differential Equations



Structurally Stable Quadratic Vector Fields

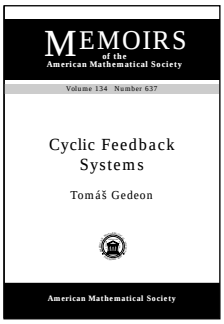
Joan C. Artés, *Universitat Autonoma de Barcelona, Spain*, **Robert E. Kooij**, *Technische Universiteit Delft, Netherlands*, and **Jaume Llibre**, *Universitat Autonoma de Barcelona, Spain*

This book solves a problem that has been open for over 20 years—the complete classification of structurally stable quadratic vector fields modulo limit cycles. The 1950s saw the first real impetus given to the development of the qualitative theory of quadratic vector fields, although prior and ongoing interest in the topic can be shown by the more than 800 papers that have been published on the subject. One of the problems in the qualitative theory of quadratic vector fields is the classification of all structurally stable ones: In this work the authors solve this problem completely modulo limit cycles and give all possible phase portraits for such structurally stable quadratic vector fields.

Contents: Introduction; Preliminary definitions; Structural stability theorems; Some preliminary tools; Proof of Theorem 1.1(a); Proof of Theorem 1.1(b); Proofs of Theorems 1.2, 1.3 and 1.4; Structural stability and the parameter space; Bibliography.

Memoirs of the American Mathematical Society, Volume 134, Number 639

July 1998, 108 pages, Softcover, ISBN 0-8218-0796-X, LC 98-4217, 1991 *Mathematics Subject Classification*: 34D30, 58F10, **Individual member $24**, List $40, Institutional member $32, Order code MEMO/134/639N



Cyclic Feedback Systems

Tomáš Gedeon, *Montana State University, Bozeman*

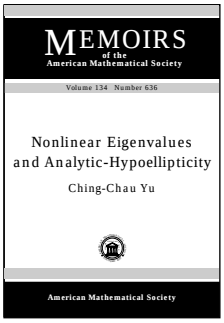
Study of dynamical systems usually concentrates on the properties and the structure of invariant sets, since the understanding of these is the first step in describing the long time behavior of orbits of the entire dynamical system. There are two different sets of problems related to the study of dynamical systems. One, the study of the dynamics in the neighborhood of the critical elements like fixed points or periodic orbits, is relatively well understood. This volume tackles the second set of problems, related to a global dynamics and the global bifurcations.

In this volume the author studies dynamics of cyclic feedback systems. The global dynamics is described by a Morse decomposition of the global attractor, defined with the help of a discrete Lyapunov function. The author shows that the dynamics inside individual Morse sets may be very complicated. A three-dimensional system of ODEs with two linear equations is constructed, such that the invariant set is at least as complicated as a suspension of a full shift on two symbols. The questions posed are perhaps as significant as the reported results.

Contents: Introduction; Linear theory; Main results; Proofs of the Lemmas; Proof of Theorem 1.13.

Memoirs of the American Mathematical Society, Volume 134, Number 637

July 1998, 73 pages, Softcover, ISBN 0-8218-0783-8, LC 98-18263, 1991 *Mathematics Subject Classification*: 34A26, 34C35, 58F12, 58F13, **Individual member $23**, List $38, Institutional member $30, Order code MEMO/134/637N



Nonlinear Eigenvalues and Analytic-Hypoellipticity

Ching-Chau Yu, *Federal Home Loan Bank of San Francisco, CA*

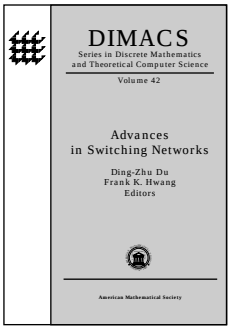
This work studies the failure of analytic-hypoellipticity, abbreviated AH, of two partial differential operators. The operators studied are sums of squares of real analytic vector fields and satisfy Hormander's condition; a condition on the rank of the Lie algebra generated by the brackets of the vector fields. These operators are necessarily C^∞-hypoelliptic. By reducing to an ordinary differential operator, the author shows the existence of nonlinear eigenvalues, which is used to disprove analytic-hypoellipticity of the original operators.

Contents: Statement of the problems and results; Sums of squares of vector fields on $\mathbb{R}^3$; Sums of squares of vector fields on $\mathbb{R}^5$; Bibliography.

Memoirs of the American Mathematical Society, Volume 134, Number 636

July 1998, 92 pages, Softcover, ISBN 0-8218-0784-6, LC 98-18251, 1991 *Mathematics Subject Classification*: 35B65; 35P20, 34E20, **Individual member $23**, List $39, Institutional member $31, Order code MEMO/134/636N

Discrete Mathematics and Combinatorics



Advances in Switching Networks

Ding-Zhu Du, *University of Minnesota, Minneapolis*, and **Frank K. Hwang**, *National Chiao Tung University, Hsinchu, Taiwan*, Editors

The articles collected in this book were presented at the DIMACS Workshop on Network Switching, held in July 1997 at Princeton University. These papers cover a variety of issues related to network switching, including network environment, routing, network topology, switching components, nonblockingness, and optimization.

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

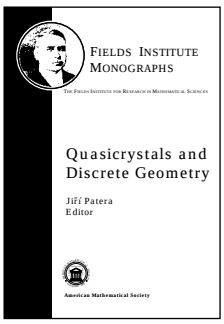
Contents: N. Pippenger, Average-case bounds for the complexity of path-search; **G. W. Richards** and **F. K. Hwang**, Extended generalized shuffle networks: Sufficient conditions for strictly nonblocking operation; **C.-F. Chan** and **C.-T. Lea**, Constructing nonblocking multicast switching networks with fanout reduction; **D. S. Kim** and **D.-Z. Du**, Multirate broadcast switching networks nonblocking in a wide sense; **A. Jajszczyk** and **M. Kubale**, Repackable networks–The concept and applications; **Y. Yang** and **N. H. Kessler**, Modeling the blocking behavior of Clos networks; **J. D. Carpinelli** and **C. B. Wang**, Performance of a new decomposition algorithm for rearrangeable fault-tolerant Clos interconnection networks under sub-maximal and no-fault conditions; **I. Busi** and **A. Pattavina**, Non-blocking multistage interconnection networks with limited depth; **M. D. McIlroy** and **J. P. Savicki**, Isomorphism of classical rearrangeable networks; **G. J. Chang**, **F. K. Hwang**, and **L.-D. Tong**, Characterizing bit permutation networks; **E. Gündüzhan** and **A. Y. Oruç**, Structure and density of sparse crossbar concentrators; **T. T. Lee** and **P. P. To**, Non-blocking routing properties of Clos networks; **S.-Y. R. Li**, **G. M. Koo**, and **H. Li**, An algorithm for the construction of concentrators from 2 x 2 sorters; **Y. Du** and **G. M. Masson**, Strictly nonblocking conferencing meshes; **E. S. Elmallah** and **C.-H. Lam**, An $O(N^{1.695})$ permutation routing algorithm on augmented data manipulators; **H. Çam**, Preventing conflicts in input buffering baseline-based ATM switches; **D. Huang** and **K. Kiasaleh**, Routing strategy and performance evaluation of multiple-ring

ShuffleNet topology for high speed wavelength-division multiplexed optical communications; **J. Gu**, **B. Du**, **D. H. K. Tsang**, and **W. Wang**, Multispace search for quorumcast routing; **G.-H. Lin**, **D.-Z. Du**, **W. Wu**, and **K. Yoo**, On 3-rate rearrangeability of Clos networks.

DIMACS: Series in Discrete Mathematics and Theoretical Computer Science, Volume 42

May 1998, 333 pages, Hardcover, ISBN 0-8218-0831-1, LC 98-6284, 1991 *Mathematics Subject Classification*: 05C40, 05C90, **Individual member $42**, List $70, Institutional member $56, Order code DIMACS/42N

Geometry and Topology



Quasicrystals and Discrete Geometry

Jiří Patera, *Centre de Recherches Mathématiques, Université de Montréal, PQ, Canada*, Editor

The common topic of the eleven articles in this volume is ordered aperiodic systems realized either as point sets with the Delone property or as tilings of a Euclidean space. This emerging field of study is found at the crossroads of algebra, geometry, Fourier analysis, number theory, crystallography, and theoretical physics. The volume brings together contributions by leading specialists. Important advances in understanding the foundations of this new field are presented.

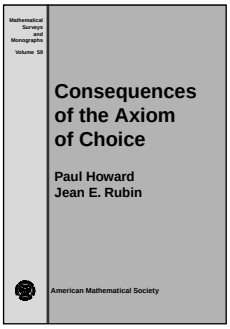
This text will also be of interest to those working in algebra and algebraic geometry.

Contents: M. Baake and **R. V. Moody**, Similarity submodules and semigroups; **D. Barache**, **B. Champagne**, and **J.-P. Gazeau**, Pisot-cyclotomic quasilattices and their symmetry semigroups; **N. A. Bulienkov**, Three possible branches of determinate modular generalization of crystallography; **L. Chen**, **R. V. Moody**, and **J. Patera**, Non-crystallographic root systems; **L. Danzer**, Upper bounds for the lengths of bridges based on Delone sets; **N. Dolbilin** and **D. Schattschneider**, The local theorem for tilings; **A. Hof**, Uniform distribution and the projection method; **D. Schattschneider** and **N. Dolbilin**, One corona is enough for the Euclidean plane; **M. Schlottmann**, Cut-and-project sets in locally compact Abelian groups; **B. Solomyak**, Spectrum of dynamical systems arising from Delone sets; **G. van Ophuysen**, Non-locality and aperiodicity of d-dimensional tilings; Index.

Fields Institute Monographs, Volume 10

August 1998, 289 pages, Hardcover, ISBN 0-8218-0682-3, LC 98-4530, 1991 *Mathematics Subject Classification*: 20H15, 52C07, 52C22, 11R06, 20M20, **Individual member $47**, List $79, Institutional member $63, Order code FIM/10N

Logic and Foundations



Consequences of the Axiom of Choice

Paul Howard, *Eastern Michigan University, Ypsilanti*, and **Jean E. Rubin**, *Purdue University, West Lafayette, IN*

This book, *Consequences of the Axiom of Choice*, is a comprehensive listing of statements that have been proved in the last 100 years using the axiom of choice. Each consequence, also referred to as a form of the axiom of choice, is assigned a number.

Part I is a listing of the forms by number. In this part each form is given together with a listing of all statements known to be equivalent to it (equivalent in set theory without the axiom of choice). In Part II the forms are arranged by topic. In Part III we describe the models of set theory which are used to show non-implications between forms. Part IV, the notes section, contains definitions, summaries of important sub-areas and proofs that are not readily available elsewhere. Part V gives references for the relationships between forms and Part VI is the bibliography.

Part VII is contained on the floppy disk which is enclosed in the book. It contains a table with form numbers as row and column headings. The entry in the table in row n, column k gives the status of the implication "form n implies form k". Software for easily extracting information from the table is also provided.

Features:
- complete summary of all the work done in the last 100 years on statements that are weaker than the axiom of choice
- software provided gives complete, convenient access to information about relationships between the various consequences of the axiom of choice and about the models of set theory
- descriptions of more than 100 models used in the study of the axiom of choice
- an extensive bibliography

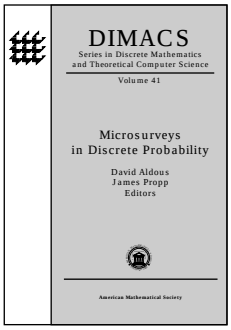
About the software: Tables 1 and 2 are accessible on the PC-compatible software included with the book. In addition, the program maketex.c in the software package will create TEX files containing copies of Table 1 and Table 2 which may then be printed. (Tables 1 and 2 are also available at the authors' Web sites: http://www.math.purdue.edu/~jer/ or http://www.emunix.emich.edu/~phoward/.) Detailed instructions for setting up and using the software are included in the book's Introduction, and technical support is available directly from the authors.

Contents: Numerical list of forms; Topical list of forms; Models; Notes; References for relations between forms; Bibliography; Table 1 and Table 2; Subject index; Author index; Software.

Mathematical Surveys and Monographs, Volume 59

August 1998, 432 pages, Hardcover, ISBN 0-8218-0977-6, LC 98-18622, 1991 *Mathematics Subject Classification*: 03E25, 04A25, **Individual member $53**, List $89, Institutional member $71, Order code SURV/59N

Probability



Microsurveys in Discrete Probability

David Aldous, *University of California, Berkeley*, and **James Propp**, *University of Wisconsin, Madison*, Editors

This book contains eleven articles surveying emerging topics in discrete probability. The papers are based on talks given by experts at the DIMACS "Microsurveys in Discrete Probability" workshop held at the Institute for Advanced Study, Princeton, NJ, in 1997. This compilation of current research in discrete probability provides a unique overview that is not available elsewhere in book or survey form.

Topics covered in the volume include: Markov chains (perfect sampling, coupling from the past, mixing times), random trees (spanning trees on infinite graphs, enumeration of trees and forests, tree-valued Markov chains), distributional estimates (method of bounded differences, Stein-Chen method for normal approximation), dynamical percolation, Poisson processes, and reconstructing random walk from scenery.

Features:
- surveys written and refereed by experts
- emerging areas of research in discrete probability theory not previously surveyed
- articles accessible to a broad readership

Contents: D. Aldous, Tree-valued Markov chains and Poisson-Galton-Watson distributions; **R. Arratia**, On the central role of scale invariant Poisson processes on $(0, \infty)$; **A. P. Godbole** and **P. Hitczenko**, Beyond the method of bounded differences; **O. Häggström**, Dynamical percolation: Early results and open problems; **H. Kesten**, Distinguishing and reconstructing sceneries from observations along random walk paths; **L. Lovász** and **P. Winkler**, Mixing times; **R. Lyons**, A bird's-eye view of uniform spanning trees and forests; **J. Pitman**, Enumerations of trees and forests related to branching processes and random walks; **J. Propp** and **D. Wilson**, Coupling from the past: A user's guide; **G. Reinert**, Couplings for normal approximations with Stein's method; **D. B. Wilson**, Annotated bibliography of perfectly random sampling with Markov chains.

DIMACS: Series in Discrete Mathematics and Theoretical Computer Science, Volume 41

May 1998, 220 pages, Hardcover, ISBN 0-8218-0827-3, LC 98-4520, 1991 *Mathematics Subject Classification*: 60C05; 60J10, 05C05, **Individual member $23**, List $39, Institutional member $31, Order code DIMACS/41N

Vieweg Verlag Publications now distributed by the AMS

The American Mathematical Society is pleased to offer the following selection of English-language works in mathematics published by Vieweg Verlag. Friedrich Vieweg founded the publishing house in 1786 in Berlin, and since that time Vieweg has published first editions of some of the revolutionary scientific discoveries of Marie Curie, Ernest Rutherford and Albert Einstein and others. Among the works now distributed by the AMS are those from the *Aspects of Mathematics* and A*dvanced Lectures in Mathematics* series.

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

Lie Group Actions in Complex Analysis

Dmitri N. Akhiezer, *University of Moscow, Russia*

The main topic of this book is the study of the interaction between two major subjects of modern mathematics, namely, the theory of Lie groups with its specific methods and ways of thinking as well as complex analysis with its analytic, algebraic and geometric aspects. More specifically, the author concentrates on the double role of Lie groups in complex analysis, namely, as groups of biholomorphic selfmaps of certain complex analytic objects on the one hand, and a special class of complex manifolds with an additional strong structure on the other. The book starts from the basics of this subject and introduces the reader into many fields of recent research.

Contents: Introduction; Lie theory; Automorphism groups; Compact homogeneous manifolds; Homogeneous vector bundles; Function theory on homogeneous manifolds; Concluding remarks; Bibliography; Index of notations; Index of terminology.

Vieweg Aspects of Mathematics, Volume 27

March 1998, 201 pages, Hardcover, ISBN 3-528-06420-X, 1991 *Mathematics Subject Classification*: 32M05; 22–02, 22E10, 32M10, **All AMS members $43**, List $48, Order code VWAM/27N

A History of Complex Dynamics

From Schröder to Fatou and Julia

Daniel S. Alexander, *Drake University, Des Moines, IA*

The contemporary study of complex dynamics, which has flourished so much in recent years, is based largely upon work by G. Julia (1918) and P. Fatou (1919–20). The goal of this book is to analyze this work from an historical perspective and show in detail how it grew out of a corpus regarding the iteration of complex analytic functions. This began with investigations by E. Schröder (1870–71), which he made when he studied Newton's method. In the 1880s, Gabriel Koenigs fashioned this study into a rigorous body of work and thereby strongly influenced the subsequent development. But only when Fatou and Julia applied set theory and Paul Montel's theory of normal families was it possible to develop a global approach to the iteration of rational maps. This book shows how this intriguing piece of modern mathematics became a reality.

Contents: Preface; Schröder, Cayley and Newton's Method; The next wave: Korkine and Farkas; Gabriel Koenigs; Iteration in

the 1890s: Grévy; Iteration in the 1890s: Leau; The Flower Theorem of Fatou and Julia; Fatou's 1906 note; Montel's theory of normal families; The contest; Lattès and Ritt; Fatou and Julia; Bibliography; Index.

Vieweg Aspects of Mathematics, Volume 24

March 1998, 165 pages, Hardcover, ISBN 3-528-06520-6, 1991 *Mathematics Subject Classification*: 01–02, 01A60, 01A55, 30D05, 30CXX, **All AMS members $38**, List $42, Order code VWAM/24N

The Riemann-Hilbert Problem

D. V. Anosov and **A. A. Bolibruch,** *Steklov Institute of Mathematics, Moscow, Russia*

The Riemann-Hilbert problem (Hilbert's 21st problem) belongs to the theory of linear systems of ordinary differential equations in the complex domain. The problem concerns the existence of a Fuchsian system with prescribed singularities and monodromy. Hilbert was convinced that such a system always exists. However, this turned out to be a rare case of a wrong forecast made by him. In 1989 the second author (A. B.) discovered a counterexample, thus obtaining a negative solution to Hilbert's 21st problem in its original form. A publication from the Steklov Institute of Mathematics. Adviser: Sergeev, Armen.

Contents: Introduction; Counterexample to Hilbert's 21st problem; The Plemelj theorem; Irreducible representations; Miscellaneous topics; The case $p = 3$; Fuchsian equations; Bibliography; Index.

Vieweg Aspects of Mathematics, Volume 22

March 1998, 190 pages, Hardcover, ISBN 3-528-06496-X, 1991 *Mathematics Subject Classification*: 34A20, **All AMS members $41**, List $46, Order code VWAM/22N

Models of the Real Projective Plane

Computer Graphics of Steiner and Boy Surfaces

François Apéry

In the present time, objects generated by computers are replacing models made from wood, wire and plaster. This book shows how computer graphics can help us to understand the geometry of surfaces and illustrates some recent results on representations of the real projective plane.

Contents: Preface; Introduction; Some representations of the real projective place before 1900; The boy surface; More about immersions in the 3-dimensional sphere; Appendix; Bibliography; Subject index; Plate index; Plates.

Vieweg Monographs

March 1998, 156 pages, Hardcover, ISBN 3-528-08955-5, **All AMS members $50**, List $56, Order code VW/7N

Das Fotoalbum für Weierstraß/A Photo Album for Weierstrass

Reinhard Bölling, *University of Potsdam, Germany*

… Faces from bygone days … Some well-known faces are there, others are unknown … many of these people had either studied in Berlin or had come to the city after finishing their education, in order to attend lectures at the Friedrich Wilhelm University given by Weierstrass and his two important colleagues Kummer (1810-1893) and Kronecker (1823-1891). In order to give some of the atmosphere of those days and to achieve more authenticity, several letters … have been added to the information given about the background of the album and the birthday celebration (to let some of the performers from 1885 speak for themselves).

—***from the* Preface**

The photograph album that was given to Karl Weierstrass on the occasion of his 70th birthday in Berlin, 31 October 1885, was discovered by the author in 1986 while researching the correspondence of this prominent mathematician. This volume includes the album's 340 photos of students, colleagues and friends of Weierstrass, supplemented with introductory biographical information about Weierstrass and with selected letters. 'A Photo Album for Weierstrass' is an extraordinary document of the life and times of Karl Weierstrass and the mathematical community in Berlin in the second half of the 19th century.

Contents: Karl Weierstrass; The album; Letters; Sources and bibliography; List of people featured in the album; Sources for the list of people; References for the list of people; List of people in alphabetical order; The portraits.

Vieweg Monographs

March 1998, 116 pages, Hardcover, ISBN 3-528-06602-4, 1991 *Mathematics Subject Classification*: 01A05, 01A55, 01A70, 01A72, **All AMS members $63**, List $70, Order code VW/8N

Supplementary Reading

Exploring Curvature

James Casey, *University of California, Berkeley*

This introductory book, which is intuitive and exploratory in nature, is intended as a bridge between Euclid's geometry and the modern geometry of curved spaces. It is organized around a collection of simple experiments which the reader can perform at home or in a classroom setting. Methods for physically exploring the intrinsic geometry of commonplace curved objects (such as bowls, balls and watermelons) are described. The concepts of Gaussian curvature, parallel transport, and geodesics are treated. The book also contains biographical chapters on Gauss, Riemann, and Levi-Civita.

Contents: To the reader: How to use this book; List of experiments; The evolution of geometry; Basic operations; Intersecting with a closed ball; Mappings; Preserving closeness: Continuous mappings; Keeping track of magnitude, direction and sense: Vectors; Curves; Arc length; Tangent; Curvature of curves; Surfaces; Surface measurements; Intrinsic geometry of a surface; Gauss (1777–1855); Normal sections; Gaussian curvature; Riemann (1826–1866); Levi-Civita (1873–1941); Parallel transport of a vector on a surface; Geodesics; Geometry and reality; Bibliography.

Vieweg Monographs

March 1998, 291 pages, Hardcover, ISBN 3-528-06475-7, *Mathematics Subject Classification*: 53–01, 51–01, **All AMS members $43**, List $48, Order code VW/1N

Complex Analysis

Klas Diederich, *University of Wuppertal, Germany,* Editor

This volume contains the Proceedings of the International Workshop "Complex Analysis", which was held February 12–16, 1990, in Wuppertal (Germany) in honour of H. Grauert, one of the most creative mathematicians in Complex Analysis

of this century. In accordance with the scope of the work of Grauert, the book contains research notes and longer articles of many important mathematicians from all areas of Complex Analysis (Altogether there are 49 articles in the volume). Some of the main subjects are: Cauchy-Riemann Equations with estimates, q-convexity, CR structures, deformation theory, envelopes of holomorphy, function algebras, complex group actions, Hodge theory, instantons, Kähler geometry, Lefschetz theorems, holomorphic mappings, Nevanlinna theory, complex singularities, twistor theory, and uniformization.

Contents: L. Alessandrini and **G. Bassanelli**, Smooth proper modifications of compact Kähler manifolds; **E. Amar**, L^p-estimates for $\bar\partial$ in C; **V. Ancona** and **G. Ottaviani**, Canonical resolutions in sheaves on Schubert and Brieskorn varieties; **D. Bartlet**, La forme hermitienne canonique pour une singularité presque isolée; **D. E. Barrett** and **B. A. Taylor**, A generalized cousin problem for subvarieties of the bidisk; **P. de Bartolomeis** and **L. Migliorini**, Scalar curvature and twistor geometry; **B. Berndtsson**, Some remarks on weighted estimates for $\bar\partial$; **J. Bland** and **T. Duchamp**, Circular models and normal forms for convex domains; **A. Bonami**, L^p-estimates with loss for the Bergman-projection and the canonical solution to $\bar\partial$; **T. Bouché**, Distortion function and the heat kernel of a positive line bundle; **F. Campana**, Twistor spaces and non-hyperbolicity of certain symplectic Kähler manifolds; **E. C. Tarabusi** and **S. Trapani**, Envelopes of holomorphy of domains in C^n; **U. Cegrell**, Representing measures in the spectrum of $H^\infty(\Omega)$; **J. Chaumat** and **A.-M. Chollet**, Estimées $C^{k,\alpha}$ pour l'equation $\bar\partial = f$ dans les convexes; **M. Colţoiu**, Local hyperconvexity and local hyperconcavity; **M. Derridj**, Domaines à estimation maximale; **G. Dethloff**, Deformation of compact Rieman surfaces with distinguished points; **K. Diederich** and **G. Herbort**, Local extension of holomorphic L^2-functions with weights; **A. A. Fadlalla**, On the boundary behavior of the Caratheodory and Kobayashi distances in strongly pseudoconvex domains in C^n; **K. Fritzsche**, Zur klassifikation der 1-konvexen komplexen Räume; **I. Graham**, Holomorphic mappings into convex domains; **P. Greiner**, On second order hypoelliptic differential operators and the $\bar\partial$-Neumann problem; **Z. Hajto**, Equisingularity of analytically constructible sets; **M. Hickel**, Fonction de Artin d'un germe d'espace analytique; **A. Iordan**, Local peaks sets and maximum modulus sets in products of strictly pseudoconvex domains; **L. Kaup** and **K.-H. Fieseler**, Hyperbolic C^*-actions on affine surfaces; **A. Kodama**, On complex manifolds exhausted by biholomorphic images of generalized complex ellipsoids $E(n; n_1, \ldots, n_s; p_1, \ldots, p_s)$; **S. Kosarew**, The hard Lefschetz theorem for concave and convex algebraic manifolds; **Ch. Laurent-Thiebaut**, Sur la résolution des équations de Cauchy-Riemann tangentielles pour les formes à support compact dans les variétes; **L. Lempert**, Imbedding pseudohermitian manifolds into a sphere; **K. Miyajima**, Deformations of strongly pseudo-convex CR structures and deformations of normal isolated singularities; **A. M. Nadel**, The behavior of multiplier ideal sheaves under morphisms; **J. D. McNeal**, Local geometry of decoupled pseudoconvex domains; **T. Ohsawa**, A vanishing theorem on Kähler manifolds with certain stratified structures; **Th. Peternell**, Hodge-Kohomologie und steinsche mannigfaltigkeiten; **J. C. Polking**, The Cauchy-Riemann equations in convex domains; **R. M. Range**, Integral kernels and Hölder estimates for $\bar\partial$ on pseudoconvex domains of finite type on C^2; **R. Remmert**, Complex analysis in the golden fifties; **W. Schwarz**, On q-convex exhaustion functions of complements of CR-submanifolds; **S. Shimizu**, A characterization of homogeneous bounded domains; **J. Siciak**, Singular sets of separately analytic functions; **Y.-T. Siu**, Some recent results related to the uniformization problem in several complex variables; **K. Spallek**, Product decomposition of non-reduced space germs; **H. Stieber**, Modular subgerms and the isomorphism problem in deformation theory; **K. Takegoshi**, A new method to introduce a-priori estimates for the $\bar\partial$-Neumann problem; **M. Derridj** and **D. S. Tartakoff**, Maximal and semi-maximal estimates for $\bar\partial_b$ on pseudoconvex manifolds; **M. Manuyama** and **G. Trautmann**, Degenerations of instantons; **P. M. Wong**, Second main theorems in number theory and Nevanlinna theory; **T. Wurzbacher**, Symplectic techniques in holomorphic group actions.

Vieweg Aspects of Mathematics, Volume 17

March 1998, 341 pages, Hardcover, ISBN 3-528-06413-7, 1991 *Mathematics Subject Classification*: 32–06, **All AMS members $58**, List $64, Order code VWAM/17N

Independent Study

Lattices and Codes

A Course Partially Based on Lectures by F. Hirzebruch

Wolfgang Ebeling, *University of Hannover, Germany*

The purpose of coding theory is the design of efficient systems for the transmission of information. The mathematical treatment leads to certain finite structures: the error-correcting codes. Surprisingly, problems which are interesting for the design of codes turn out to be closely related to problems studied (partly) earlier and independently in pure mathematics. In this book, *A Course Partially Based on Lectures by F. Hirzebruch*, examples of such connections are presented. The relation between lattices studied in number theory and geometry and error-correcting codes is discussed. The book provides at the same time an introduction to the theory of integral lattices and modular forms and to coding theory.

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

Vieweg Advanced Lectures in Mathematics

March 1998, 178 pages, Hardcover, ISBN 3-528-06497-8, 1991 *Mathematics Subject Classification*: 11H06, 11H31, 11H55, 11F11, 11F41, 11R04, 11R18, 94B05, 94B15, 94B75, 51F15, 51E10, **All AMS members $31**, List $34, Order code VWALM/1N

Rational Points

Gerd Faltings, *Max-Planck-Institute for Mathematics, Bonn, Germany,* and **Gisbert Wüstholz,** *ETH Zentrum, Zürich, Switzerland*

This book originates from the notes of a seminar on Arithmetic Algebraic Geometry. It contains a proof for the Mordell conjecture and may be useful as an introduction to Arakelov's point of view in iophantine geometry. The third edition includes an appendix in which a detailed survey on the spectacular recent developments in arithmetic algebraic geometry is given. These beautiful new results have their roots in the material covered by this book. A publication of the Max-Planck-Institut für Mathematik, Bonn.

Contents: Moduli Spaces (Gerd Faltings); Heights (Gerd Faltings); Some facts from the theory of group schemes (Fritz Grunewald); Tate's conjecture on the endomorphisms of abelian varieties (Norbert Schappacher); The finiteness theorems of Faltings (Gisbert Wüstholz); Complements to Mordell

(Gerd Faltings); Intersection theory on arithmetic surfaces (Ulrich Stuhler); Appendix: New developments in Diophantine and arithmetic algebraic geometry (Gisbert Wüstholz).

Vieweg Aspects of Mathematics, Volume 6

March 1998, 311 pages, Hardcover, ISBN 3-528-28593-1, 1991 *Mathematics Subject Classification*: 10BXX, 14G13, 14K10, 14K15, **All AMS members $50**, List $56, Order code VWAM/6N

Topics in the Calculus of Variations

Martin Fuchs, *Universität des Saarlandes, Saarbrüchen, Germany*

This book illustrates two basic principles in the calculus of variations which are the question of existence of solutions and the closely related problem of regularity of minimizers. Chapter One studies variational problems for nonquadratic energy functionals defined on suitable classes of vector-valued functions where nonlinear constraints are incorporated. Problems of this type arise for mappings between Riemannian manifolds or in nonlinear elasticity. Using direct methods, the existence of generalized minimizers is rather easy to establish and it is then shown that regularity holds up to a set of small measure. Chapter two contains a short introduction into Geometric Measure Theory which serves as a basis for developing an existence theory for (generalized) manifolds with prescribed mean curvature and boundary in arbitrary dimensions and codimensions. One major aspect of the book is to concentrate on techniques and to present methods which turn out to be useful for applications in regularity theorems as well as for existence problems.

Contents: Degenerate variational integrals with nonlinear side conditions, p-harmonic maps and related topics; Manifolds of prescribed mean curvature in the setting of geometric measure theory; Bibliography; Index.

Vieweg Advanced Lectures in Mathematics

March 1998, 145 pages, Hardcover, ISBN 3-528-06623-7, 1991 *Mathematics Subject Classification*: 49N60, 49Q15, 49Q20, 58E20, 58E30, 58E35, 73C50, **All AMS members $25**, List $28, Order code VWALM/2N

Value Distribution Theory of the Gauss Map of Minimal Surfaces in $\mathbf{R}^m$

Hirotaka Fujimoto, *Kanazawa University, Japan*

This book presents in a systematic and almost self-contained way the striking analogy between classical function theory, in particular the value distribution theory of holomorphic curves in projective space, on the one hand, and important and beautiful properties of the Gauss map of minimal surfaces on the other. Both theories are developed in the text, including many results of recent research. The relations and analogies between them become completely clear. The book is written for interested graduate students and mathematicians, who want to become more familiar with this modern development in the two classical areas of mathematics, as well as those who intend to do further research on minimal surfaces.

Contents: The Gauss map of minimal surfaces in $\mathbf{R}^3$; The derived curves of a holomorphic curve; The classical defect relations for holomorphic curves; Modified defect relation for holomorphic curves; The Gauss map of complete minimal surfaces in $\mathbf{R}^m$; Bibliography; Index.

Vieweg Aspects of Mathematics, Volume 21

March 1998, 207 pages, Hardcover, ISBN 3-528-06467-6, 1991 *Mathematics Subject Classification*: 53–02, 53A10, 30–02, 30D35, **All AMS members $41**, List $46, Order code VWAM/21N

Singular Nonlinear Partial Differential Equations

Raymond Gérard, *Université Louis Pasteur, Strasbourg, France,* and **Hidetoshi Tahara,** *Sophia University, Tokyo, Japan*

The main purpose of this book is to present all known results on the existence of formal, holomorphic and singular solutions of singular nonlinear ordinary and partial differential equations in the complex domain. It contains a new approach to regular singularities for nonlinear PDE, Maillet type theorems for nonlinear PDE, Briot-Bouquet type PDE, higher order nonlinear Fuchsian PDE, Poincaré's and Siegel's results for vector fields, and also a general form of the Cauchy-Kowalewski theorem. Readers of the book are assumed to be familiar with only the basics on differential equations and function theory of complex variables.

Contents: Preface; Operators with regular singularities: One variable case; Operators with regular singularities: Several variables case; Formal and convergent solutions of singular partial differential equations; Local study of differential equations of the form $xy' = f(x, y)$ near $x = 0$; Holomorphic and singular solutions of non linear singular first order partial differential equations; Maillet's type theorems for non linear singular partial differential equations; Maillet's type theorems for non linear singular partial differential equations without linear part; Holomorphic and singular solutions of non linear singular partial differential equations; On the existence of holomorphic solutions of the Cauchy problem for non linear partial differential equations; Maillet's type theorems for non linear singular integro-differential equations; Bibliography; Index.

Vieweg Aspects of Mathematics, Volume 28

March 1998, 269 pages, Hardcover, ISBN 3-528-06659-8, 1991 *Mathematics Subject Classification*: 47E05, 47F05, 34A20, 34G20, 35A10, 35F20, **All AMS members $63**, List $70, Order code VWAM/28N

Inverse Problems in the Mathematical Sciences

Charles W. Groetsch, *University of Cincinnati, OH*

Inverse problems are immensely important in modern science and technology. However, the broad mathematical issues raised by inverse problems receive scant attention in the university curriculum. This book aims to remedy this state of affairs by supplying an accessible introduction, at a modest mathematical level, to the alluring field of inverse problems. Many models of inverse problems from science and engineering are dealt with and nearly a hundred exercises, of varying difficulty, involving mathematical analysis, numerical treatment, or modelling of inverse problems are provided. The main themes of the book are: causation problems modeled as integral equations; model identification problems, posed as coefficient determination problems in differential equations; the functional analytic framework for inverse problems; and a survey of the principal numerical methods for inverse problems. An extensive annotated bibliography furnishes leads on

the history of inverse problems and a guide to the frontiers of current research.

Contents: Introduction; Inverse problems modeled by integral equations of the first kind: Causation; Parameter estimation in differential equations: Model indentification; Mathematical background for inverse problems; Some methodology for inverse problems; An annotated bibliography on inverse problems; Index.

Vieweg Monographs

March 1998, 152 pages, Hardcover, ISBN 3-528-06545-1, 1991 *Mathematics Subject Classification*: 00A09, 45B05, 65R30, **All AMS members $27**, List $30, Order code VW/2N

Manifolds and Modular Forms

Friedrich Hirzebruch, *Max-Planck-Institute for Mathematics, Bonn, Germany,* **Thomas Berger,** and **Rainer Jung**

This book provides a comprehensive introduction to the theory of elliptic genera due to Ochanine, Landweber, Stong, and others. The theory describes a new cobordism invariant for manifolds in terms of modular forms. The book evolved from notes of a course given at the University of Bonn. After providing some background material, elliptic genera are constructed, including the classical genera signature and the index of the Dirac operator as special cases. Various properties of elliptic genera are discussed, especially their behavior in fiber bundles and rigidity for group actions. The text is in most parts self-contained. The results are illustrated by explicit examples and by comparison with well-known theorems. The relevant aspects of the theory of modular forms are derived in a separate appendix, providing also a useful reference for mathematicians working in this field. A publication of the Max-Planck-Institut für Mathematik, Bonn.

Contents: Background; Elliptic genera; A universal addition theorem for genera; Multiplicativity in fibre bundles; The Atiyah-Singer index theorem; Twisted operators and genera; Riemann-Roch and elliptic genera in the complex case; A divisibility theorem for elliptic genera; Appendix I: Modular forms; Appendix II: The Dirac operator; Appendix III: Elliptic genera of level N for complex manifolds; Appendix IV: Zolotarev polynomials and the modular curve $X_1(N)$; Bibliography; Index; Symbols.

Vieweg Aspects of Mathematics, Volume 20

March 1998, 211 pages, Hardcover, ISBN 3-528-16414-X, 1991 *Mathematics Subject Classification*: 57–02, 11F11, 33C45, 33E05, 55N22, 55R10, 57R20, 58G10, **All AMS members $43**, List $48, Order code VWAM/20N

Ball and Surface Arithmetics

Rolf-Peter Holzapfel, *Humboldt-Universität Berlin, Germany*

This monograph presents an arithmetic theory of orbital surfaces with cusp singularities. As main invariants, orbital heights are introduced, not only for the surfaces but also for the components of orbital cycles. These invariants are rational numbers with nice functorial properties allowing precise formulas of Hurwitz type and a fine intersection theory for orbital cycles. For ball quotient surfaces, they appear as volumes of fundamental domains. In the special case of Picard modular surfaces they are discovered by special values of Dirichlet L-series or higher Bernoulli numbers. As a central point of the monograph, a general Proportionality Theorem in terms of orbital heights is proved. It yields a strong criterion to decide effectively whether a surface with given cycle supports a ball quotient structure being Kaehler-Einstein with negative constant holomorphic sectional curvature outside of this cycle. The theory is applied to the classification of Picard modular surfaces and to surfaces geography.

Contents: Abelian points; Orbital curves; Orbital surfaces; Ball quotient surfaces; Picard modular surfaces; Volumes of fundamental domains of Picard modular groups; $\mathbb{Q}$-orbital surfaces; Index; Bibliography.

Vieweg Aspects of Mathematics, Volume 29

March 1998, 414 pages, Hardcover, ISBN 3-528-06511-7, 1991 *Mathematics Subject Classification*: 14–02, 14JXX, 11GXX, 11FXX, **All AMS members $76**, List $84, Order code VWAM/29N

Étale Cohomology of Rigid Analytic Varieties and Adic Spaces

Roland Huber, *Bergische Universität, Wuppertal, Germany*

Rigid analytic spaces were invented by Tate about thirty years ago as a p-adic analog of complex analytic spaces. Later Raynaud introduced relative rigid spaces via formal geometry. Adic spaces used in this book generalize Tate's analytic spaces but they also cover the relative rigid spaces. The étale cohomology of rigid spaces, modelled on Grothendieck's étale cohomology theory for schemes, has applications in geometry and arithmetic. The book aims to give an introduction to adic spaces and to develop systematically their étale cohomology. First, general properties of the étale topos of an adic space are studied, in particular the points and the constructible sheaves of this topos. After this the basic results on the étale cohomology of adic spaces are proved: base change theorems, finiteness, Poincaré duality, comparison theorems with the algebraic case.

Contents: Introduction; Étale cohomology of rigid analytic varieties (summary); Adic spaces; The étale site of a rigid analytic variety and an adic space; Comparison theorems; Base change theorems; Cohomology with compact support; Finiteness; Poincaré Duality; Partially proper sites of rigid analytic varieties and adic spaces; Appendix; Bibliography; Index of notations; Index of terminology.

Vieweg Aspects of Mathematics, Volume 30

March 1998, 450 pages, Hardcover, ISBN 3-528-06794-2, 1991 *Mathematics Subject Classification*: 14F20; 32P05, **All AMS members $82**, List $91, Order code VWAM/30N

The Geometry of Moduli Spaces of Sheaves

Daniel Huybrechts, *University of Essen, Germany,* and **Manfred Lehn,** *University of Göttingen, Germany*

This book is intended to serve as an introduction to the theory of semistable sheaves and at the same time to provide a survey of recent research results on the geometry of moduli spaces. The first part introduces the basic concepts in the theory: Hilbert polynomials, slope, stability, Harder-Narasimhan filtration, Grothendieck's Quot-scheme. It presents detailed proofs of the Grauert-Mülich Theorem, the Bogomolov Inequality, the semistability of tensor products, and the boundedness of the

family of semistable sheaves. It also gives a self-contained account of the construction of moduli spaces of semistable sheaves on a projective variety à la Gieseker, Maruyama, and Simpson. The second part presents some of the recent results of the geometry of moduli spaces of sheaves on an algebraic surface, following work of Mukai, O'Grady, Gieseker, Li and many others. In particular, moduli spaces of sheaves on K3 surfaces and determinant line bundles on the moduli spaces are treated in some detail. Other topics include the Serre correspondence, restriction of stable bundles to curves, symplectic structures, irreducibility and Kodaira-dimension of moduli spaces. A publication of the Max-Planck-Institut für Mathematik, Bonn.

Contents: *General Theory:* Preliminaries; Families of sheaves; The Grauert-Mülich Theorem; Moduli spaces; *Sheaves on surfaces:* Construction methods; Moduli spaces on K3 surfaces; Restriction of sheaves to curves; Line bundles on the moduli space; Irreducibility and smoothness; Symplectic structures; Birational properties; Bibliography; Index; Glossary of Notations.

Vieweg Aspects of Mathematics, Volume 31

March 1998, 269 pages, Hardcover, ISBN 3-528-06907-4, 1991 *Mathematics Subject Classification*: 14D20, 14D22, 14J60, **All AMS members $63**, List $70, Order code VWAM/31N

Supplementary Reading

Algebraic Structures

George R. Kempf, *Johns Hopkins University, Baltimore, MD*

In algebra there are four basic structures: groups, rings, fields and modules. In this book the theory of these basic structures is presented and the laws of composition—the basic operations of algebra—are studied. Essentially no previous knowledge is required, it is only assumed as background that the reader has learned some linear algebra over the real numbers.

Contents: Introduction; Fundamentals of groups; Fundamentals of rings and fields; Modules; A little more group theory; Fields; More field theory; Modern linear algebra; Quadratic and alternating forms; Ring and field extensions; Noetherian rings and localization; Dedekind domains; Representations of groups; More modules; Categories; Completion; Lie algebra; The Clifford algebra; Commutative rings; Logic; Tor's; Glossary; Index.

Vieweg Monographs

March 1998, 165 pages, Hardcover, ISBN 3-528-06583-4, 1991 *Mathematics Subject Classification*: 15A27, 15A69, 15A75, 16–01, **All AMS members $26**, List $29, Order code VW/3N

Martingale Spaces and Inequalities

Ruilin Long, *Academy Sinica, Beijing, People's Republic of China*

This book gives a systematic introduction to the theory of martingale spaces and inequalities. Except those mainly concerned with the martingale $Hp, p > 1$, most parts of the book reflect the developments in the field in the past twenty years. The material is self-contained, only a familiarity with basic analysis is required. Both graduate students and mathematicians who want to know about the interaction between analysis and probability will find this book to be a valuable reference and text.

Co-published in cooperation with Peking University Press.

Contents: Probabilistic preliminaries; $H_p(p \geq 1)$ martingales; Φ-inequalities on martingales; BMO martingales; Martingale transforms; Weight theory and weighted Φ-inequalities; Regular martingales; Some applications of martingale techniques in harmonic analysis; References; Symbols; Index.

Vieweg Monographs

March 1998, 344 pages, Hardcover, ISBN 3-528-08397-2, 1991 *Mathematics Subject Classification*: 60GXX, 60HXX, **All AMS members $58**, List $64, Order code VW/4N

The Steiner Tree Problem

A Tour through Graphs, Algorithms, and Complexity

Hans-Jürgen Prömel, *Humboldt-Universität Berlin, Germany* and **Angelika Steger,** *Institute for Informatics, Munich, Germany*

In recent years, algorithmic graph theory has become increasingly important since it serves as a link between discrete mathematics and theoretical computer science. This textbook introduces interested students of mathematics and computer science to the interrelated fields of graph theory, algorithms and complexity. No specific previous knowledge is assumed. The central theme of the book is a geometrical problem dating back to Jakob Steiner. This problem, now called the Steiner tree problem, was initially of importance only within the context of land surveying. Recent applications as diverse as VLSI-layout and the study of phylogenetic trees have, however, lead to significant interest in the problem. The resulting progress has uncovered fascinating connections to and among graph theory, the study of algorithms, and complexity. The single problem thus serves to bind and motivate these areas. The book's topics include: Exact Algorithms, Computational Complexity, Approximation Algorithms, Limits of Approximability, Randomness Helps, The Manhattan Steiner Problem, Heuristics, Packing of Steiner Trees, Applications. A fundamental feature of this book is that each chapter ends with an "excursion" into some related area. These excursions reinforce the concepts and methods introduced for the Steiner tree problem by putting them in a broader context.

Vieweg Advanced Lectures in Mathematics

September 1998, approximately 230 pages, Hardcover, ISBN 3-528-06762-4, 1991 *Mathematics Subject Classification*: 05CXX, 05C05, 05C90, **All AMS members $32**, List $35, Order code VWALM/3N

Lectures on Nonlinear Evolution Equations

Initial Value Problems

Reinhard Racke, *University of Konstanz, Germany*

This book serves as an elementary, self-contained introduction to some important aspects of the theory of global solutions to initial-value problems for nonlinear evolution equations. The presentation is made using the classical method of continuation of local solutions with the help of a priori estimates obtained for small data.

Contents: Introduction; Global solutions to wave equations — existence theorems; L^p–L^q-decay estimates for the linear wave equation; Linear symmetric hyperbolic systems; Some inequalities; Local existence for quasilinear symmetric hyperbolic systems; High energy estimates; Weighted a priori estimates

for small data; Global solutions to wave equations — proofs; Other methods; Development of singularities; More evolution equations; Further aspects and questions; Appendix; References; Notation; Index.

Vieweg Aspects of Mathematics, Volume 19

March 1998, 259 pages, Hardcover, ISBN 3-528-06421-8, 1991 *Mathematics Subject Classification*: 35B40, 35K05, 35K55, 35L05, 35L45, 35L70, 35Q55, 35Q60, 35Q72, 73B30, 73C50, **All AMS members $47**, List $52, Order code VWAM/19N

The Basic Theory of Power Series

Jesús M. Ruiz, *Universidad Complutense de Madrid, Spain*

Power series techniques are indispensable in many branches of mathematics, in particular in complex and in real analytic geometry, in commutative algebra, in algebraic geometry, and in real algebraic geometry. The book covers in a comprehensive way and at an elementary level essentially all the theorems and techniques which are commonly used and needed in any of these branches. In particular, it presents Rückert's complex Nullstellensätz, Risler's real Nullstellensätz, Tougerons's implicit function theorem, and Artin's approximation theorem, to name a few. Up to now, a student of any of these subjects usually had to learn about power series within the framework of the vast theory of the subject. The present book opens another path: one gets acquainted with power series in a direct and elementary way, and then develops a good set of tools and examples to penetrate any of the subjects mentioned above, plus some others.

Contents: Power series; Analytic rings and formal rings; Normalization; Nullstellensätze; Approximation theory; Local algebraic rings; Bibliographical note; Index.

Vieweg Advanced Lectures in Mathematics

March 1998, 134 pages, Hardcover, ISBN 3-528-06525-7, 1991 *Mathematics Subject Classification*: 13–01, 13F20, 13F25, 13J05, **All AMS members $23**, List $26, Order code VWALM/4N

Supplementary Reading

Lectures on the Mordell-Weil Theorem

Jean-Pierre Serre, *Collège de France, Paris*

The book is based on a course given by J.-P. Serre at the Collège de France in 1980 and 1981. Basic techniques in Diophantine geometry are covered, such as heights, the Mordell-Weil theorem, Siegel's and Baker's theorems, Hilbert's irreducibility theorem, and the large sieve. Included are applications to, for example, Mordell's conjecture, the construction of Galois extensions, and the classical class number 1 problem. Comprehensive bibliographical references are also included.

Contents: Summary; Heights; Normalised heights; The Mordell-Weil theorem; Mordell's conjecture; Local calculation of normalised heights; Siegel's method; Baker's method; Hilbert's irreducibility theorem; Construction of Galois extensions; Construction of elliptic curves of large rank; The large sieve; Applications of the large sieve to thin sets; Appendix: The class number 1 problem and integral points on modular curves; Bibliography; Index.

Vieweg Aspects of Mathematics, Volume 15

March 1998, 218 pages, Hardcover, ISBN 3-528-28968-6, 1991 *Mathematics Subject Classification*: 14G13, 14K10, 14K15, **All AMS members $41**, List $45, Order code VWAM/15N

Algebraic Geometry and Its Applications

Alexander Tikhomirov, *State Pedagogical Institute of Yaroslavl, Moscow, Russia,* and **Andrej Tyurin,** *Steklov Institute of Mathematics, Moscow, Russia,* Editors

This volume contains 18 papers presented at the Algebraic Geometry Conference, Yaroslavl', August 10-14, 1992. These conferences in algebraic geometry have a great tradition in Russia and have been held since 1979 in Yaroslavl' every second year. The present conference, the eighth, was the first in which several foreign mathematicians participated. From the Russian side, there was a large group of specialists in algebraic geometry and related fields (invariant theory, topology of manifolds, theory of categories, mathematical physics, etc.). The book contains lectures on modern directions in algebraic geometry, such as the theory of exceptional bundles and helices on algebraic varieties; moduli of vector bundles on algebraic surfaces with applications to Donaldson's theory; geometry of Hilbert schemes of points, twistor spaces and applications to string theory; and more traditional areas, such as birational geometry of manifolds, adjunction theory, Hodge theory, problems of rationality in the invariant theory, topology of complex algebraic varieties, and more. A publication from the Steklov Institute of Mathematics. Adviser: Sergeev, Armen.

Contents: W. L. Baily, Jr., Three problems on an exceptional domain; **M. C. Beltrametti**, **G. M. Besana**, and **A. J. Sommese**, On the dimension of the adjoint linear system for quadric fibrations; **D. C. Butler**, On the stability of M_E; **H. D'Souza**, On a class of Del Pezzo fiber spaces; **M. H. Gizatullin**, The decomposition, inertia and ramification groups in birational geometry; **A. L. Gorodentsev**, Helic theory and nonsymmetrical bilinear forms; **P. I. Katsylo**, On the unramified 2-covers of the curves of genus 3; **A. A. Klyachko**, Spatial polygons and stable configurations of points in the projective line; **S. A. Kuleshov**, Rigid sheaves on surfaces; **V. S. Kulikov**, The Alexander polynomials of algebraic curves in C^2; **V. V. Nikulin**, On the Brauer group of real algebraic surfaces; **A. D. Popov** and **A. G. Sergeev**, Symplectic twistors and geometric quantization of strings; **Y. G. Prokhorov**, Compactifications of C^4 of index 3; **A. N. Rudakov**, A note on cohomologies of exceptional bundles on a quadric surface; **A. N. Rudakov**, Exceptional vector bundles on a Del Pezzo surface; **A. S. Tikhomirov**, Standard bundles on a Hilbert scheme of points on a surface; **A. S. Tikhomirov** and **T. L. Troshina**, Top segre class of a standard vector bundle E_D^4 on the Hilbert scheme $Hilb^4S$ of a surface S; **A. N. Tyurin**, Almost canonical polynomials of algebraic surfaces.

Vieweg Aspects of Mathematics, Volume 25

March 1998, 251 pages, Hardcover, ISBN 3-528-06599-0, 1991 *Mathematics Subject Classification*: 14C05, 14C30, 14D25, 14E05, 14E07, 14F05, 14F25, 14F45, 14JXX, 14J10, 81EXX, 10DXX, **All AMS members $57**, List $63, Order code VWAM/25N

An Introduction to Algebraic Inverse Eigenvalue Problems

Shu-fang Xu, *University of Peking, People's Republic of China*

An inverse algebraic eigenvalue problem, roughly speaking, is how to determine the elements of a matrix from its spectrum data. This kind of problem has been of great value for many applications, including control theory, structure mechanics, geology, molecular spectroscopy, and so on. Therefore, in recent years, many authors have been devoted to the study of this kind of problem and some significant progress has been made. One of the purposes of this book is to provide the reader with the recent developments in this field. This book is written for graduate students, computational scientists and engineers, numerical analysts, and mathematicians seeking an introduction to inverse algebraic eigenvalue problems. The text is largely self-contained and is based on classical analysis and modern matrix computation techniques.

Co-published in cooperation with Peking University Press.

Vieweg Monographs

July 1998, approximately 330 pages, Hardcover, ISBN 3-528-06684-9, 1991 *Mathematics Subject Classification*: 15A18; 65F15, **All AMS members $62**, List $69, Order code VW/5N

Infinite Element Methods

Lung-an Ying

As its name indicates, in the infinite element method the underlying domain is divided into infinitely many pieces. This leads to a system of infinitely many equations for infinitely many unknowns; but these can be reduced by analytical techniques to a finite system when some sort of scaling is present in the original problem. The simplest illustrative example, described carefully at the beginning of the first chapter of the book, is the solution of the Dirichlet problem in the exterior of some polygon. The exterior is subdivided into annular regions by a sequence of geometrically expanding images of the given polygon; these annuli are then further subdivided. The resulting variational equations take the form of a block tridiagonal Toeplitz matrix, with an inhomogeneous term in the zero component. Various efficient methods are described for solving such systems of equations … The infinite element method is, whereever applicable, an elegant and efficient approach to solving problems in physics and engineering. Professor Ying's welcome book makes it available to the community of numerical analysts and computational scientists.

—from the* Preface *by Peter D. Lax

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Contents: Algorithm; Foundations of algorithm; Convergence; Examples; Bibliography.

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Independent Study

Hypergeometric Functions, My Love

Modular Interpretations of Configuration Spaces

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The classical story of the hypergeometric functions—the configuration space of 4 points on the projective line, elliptic curves, elliptic modular functions and the theta functions—now evolves in this book to the story of hypergeometric functions in 4 variables, the configuration space of 6 points in the projective plane, K3 surfaces, theta functions in 4 variables. This modern theory has been established by the author and his collaborators in the 1990's; further development to different aspects is expected. It leads the reader to a fascinating 4-dimensional world. The author tells the story casually and visually in a plain language, starting from an elementary level such as equivalence relations, the exponential function, and so on. Undergraduate students should be able to enjoy the text.

Contents: *Part I: The Story of the Configuration Space $X(2,4)$ of Four Points on the Projective Line:* Configuration spaces – The simplest case; Elliptic curves; Modular interpretations of $X(2,4)$; Hypergeometric integrals and loaded cycles; *Part II: The Story of the Configuration Space $X(2,n)$ of n Points on the Projective Line:* The configuration space $X(2,5)$; Modular interpretation of the configuration space $X(2,n)$; *Part III: The Story of the Configuration Space $X(3,6)$ of Six Lines on the Projective Plane:* The configuration space $X(3,6)$; Hypergeometric functions of type $(3,6)$; Modular interpretation of the configuration space $X(3,6)$; Bibliography.

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