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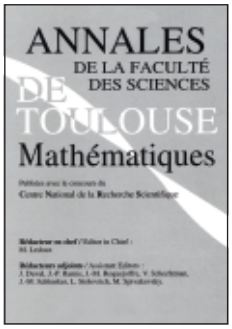

Annales de la faculté des sciences de Toulouse mathématiques

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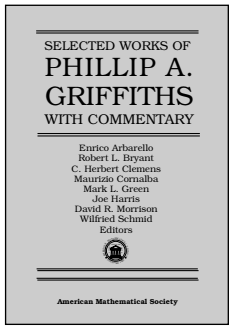
Algebra and Algebraic Geometry



Selected Works of Phillip A. Griffiths with Commentary

Enrico Arbarello, *Università "La Sapienza", Rome*, **Robert L. Bryant**, *Duke University, Durham, NC*, **C. Herbert Clemens**, *University of Utah, Salt Lake City*, **Maurizio Cornalba**, *Università di Pavia, Italy*, **Mark L. Green**, *University of California, Los Angeles*, **Joe Harris**, *Harvard University, Cambridge, MA*, **David R. Morrison**, *Duke University, Durham, NC*, and **Wilfried Schmid**, *Harvard University, Cambridge, MA*, Editors

Over the last four decades, Phillip Griffiths has been a central figure in mathematics. During this time, he made crucial contributions in several fields, including complex analysis, algebraic geometry, and differential systems. His books and papers are distinguished by a remarkably lucid style that invites the reader to understand not only the subject at hand, but also the connections among seemingly unrelated areas of mathematics. Even today, many of Griffiths' papers are used as a standard source on a subject. Another important feature of Griffiths' writings is that they often bring together classical and modern mathematics.

The four parts of *Selected Works—Analytic Geometry*, *Algebraic Geometry*, *Variations of Hodge Structures*, and *Differential Systems*—are organized according to the subject matter and are supplemented by Griffiths' brief, but extremely illuminating, personal reflections on the mathematical content and the times in which they were produced.

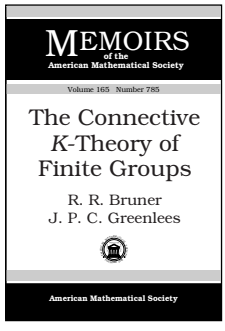
Griffiths' *Selected Works* provide the reader with a panoramic view of important and exciting mathematics during the second half of the 20th century.

This book is jointly published by the AMS and the International Press.

Contents: ***Part I. Analytic Geometry:*** **P. Griffiths**, Commentary on Vector bundles; *Vector Bundles:* **Ph. A. Griffiths**, The extension problem for compact submanifolds of complex manifolds I; **P. A. Griffiths**, The extension problem in complex analysis II; embeddings with positive normal bundle; **P. A. Griffiths**, Hermitian differential geometry, Chern classes, and positive vector bundles; **P. A. Griffiths**, Period spaces and Hodge theory; **P. A. Griffiths** and **W. Schmid**, Locally homogeneous complex manifolds; **P. Griffiths** and **W. Schmid**, Recent developments in Hodge theory: A discussion of techniques and results; **P. R. Deligne**, **P. Griffiths**, **J. Morgan**, and **D. Sullivan**, Real homotopy theory of Kähler manifolds; *Analytic geometry:* **P. A. Griffiths**, Holomorphic mapping into canonical algebraic varieties; **J. Carlson** and **P. Griffiths**, A defect relation for equidimensional holomorphic mappings between algebraic varieties; **P. Griffiths**, Complex differentiable and integral geometry and curvature integrals associated to singularities of complex analytic varieties; **M. Cornalba** and **P. Griffiths**, Analytic cycles and vector bundles on non-compact algebraic varieties; **M. Green** and **P. Griffiths**, Two applications of algebraic geometry to entire holomorphic mappings; Acknowledgments; Selected titles; ***Part 2. Algebric Geometry:*** **P. A. Griffiths**, Introductory comments to Part 2; *Cycles and deformation theory:* **P. A. Griffiths**, Some results on algebraic cycles on algebraic manifolds; **P. A. Griffiths**, Complex-analytic properties of certain Zariski open sets on algebraic varieties; **C. H. Clemens** and **P. A. Griffiths**, The intermediate Jacobian of the cubic threefold; *Abel's theorem:* **P. A. Griffiths**, Variations on a theorem of Abel; **P. Griffiths** and **J. Harris**, A Poncelet theorem in space; **P. Griffiths** and **J. Harris**, Residues and zero-cycles on algebraic varieties; **S. S. Chern** and **P. Griffiths**, Abel's theorem and webs; *Algebraic and differential geometry:* **P. A. Griffiths**, Complex analysis and algebraic geometry; **P. Griffiths** and **J. Harris**, Algebraic geometry and local differential geometry; *Loci of divisors:* **P. Griffiths** and **J. Harris**, The variety of special linear systems on a general algebraic curve; **P. Griffiths** and **J. Harris**, On the Noether-Lefschetz theorem and some remarks on codimension-two cycles; **E. Arbarello**, **M. Cornalba**, **P. Griffiths**, and **J. Harris**, Special divisors on algebraic curves; Acknowledgments; Selected Titles; ***Part 3. Variations of Hodge Structures:*** **P. A. Griffiths**, Introductory comments to part 3; *Periods of integrals:* **P. A. Griffiths**, Periods of integrals on algebraic naifolds, I (Construction and properties of the modular varieties); **P. A. Griffiths**, Periods of integrals on algebraic manifolds, II (Local study of the period mapping); **Ph. A. Griffiths**, Periods of integrals on algebraic manifolds III (some global differential-geometric properties of the period mapping); **P. A. Griffiths**, On the periods of certain rational integrals I; **P. A. Griffiths**, On the periods of certain rational integrals: II; **P. A. Griffiths**, Periods of integrals on algebraic manifolds: Summary of main results and discussion of open problems; *Variations of Hodge structures:* **J. Carlson**, **M. Green**, **P. Griffiths**, and **J. Harris**, Infinitesimal variations of Hodge structure (I); **P. Griffiths** and **J. Harris**, Infinitesimal variations of Hodge structure (II): An infinitesimal invariant of Hodge classes; **P. A. Griffiths**, Infinitesimal variations of Hodge structure (III): Determinantal varieties and the infinitesimal invariant of normal functions; Acknowledgments; Selected Titles; ***Part 4. Differential Systems:*** **P. A. Griffiths**, Introductory comments to part 4; *Moving frames and differential geometry:* **P. Griffiths**, On Cartan's method of Lie groups and moving frames as applied to uniqueness and existence questions in differential geometry; *Differential systems and Hodge structure:* **P. A. Griffiths**, Poincaré and algebraic geometry; **R. L. Bryant** and **P. A. Griffiths**, Some observations on the infinitesimal period relations for regular threefolds with trivial canonical bundle; **R. L. Bryant** and **P. Griffiths**, Reduction for constrained variational problems and $\int \frac{1}{2}\kappa^2 ds$; *Integrability:* **P. A. Griffiths**, Linearizing flows and a cohomological interpretation of Lax equations; *The characteristic variety and its geometry:* **P. A. Griffiths**, Some aspects of exterior differential systems; **R. L. Bryant** and **P. A. Griffiths**, Characteristic cohomology of differential systems (I): General theory; **R. L. Bryant** and **P. A. Griffiths**, Characteristic cohomology of differential systems II: conservation laws for a class of parabolic equations; **R. Bryant**, **P. Griffiths**, and **L. Hsu**, Hyperbolic exterior differential systems and their conservation laws, Part I; **R. Bryant**, **P. Griffiths**, and **L. Hsu**, Hyperbolic exterior differential systems and their conservation laws, Part II; Acknowledgments; Selected Titles.

Collected Works, Volume 18

Part 1: October 2003, 654 pages, Hardcover, ISBN 0-8218-2086-9, LC 2003050345, 2000 *Mathematics Subject Classification*: 32G20, 32L10, **All AMS members $79**, List $99, Order code CWORKS/18.1N
Part 2: October 2003, 782 pages, Hardcover, ISBN 0-8218-2087-7, LC 2003050345, 2000 *Mathematics Subject Classification*: 14C25, 14C34, 14H51, **All AMS members $79** List $99, Order code CWORKS/18.2N
Part 3: October 2003, 564 pages, Hardcover, ISBN 0-8218-2088-5, LC 2003050345, 2000 *Mathematics Subject Classification*: 14C30, 14D07, 32J25, **All AMS members $79**, List $99, Order code CWORKS/18.3N
Part 4: October 2003, 598 pages, Hardcover, ISBN 0-8218-2089-3, LC 2003050345, 2000 *Mathematics Subject Classification*: 58A14, 58A15, **All AMS members $79**, List $99, Order code CWORKS/18.4N
Set: October 2003, 2598 pages, Hardcover, ISBN 0-8218-1066-9, LC 2003050345, 2000 *Mathematics Subject Classification*: 32G20, 32L10, 14C25, 14C34, 14H51, 14C30, 14D07, 32J25, 58A14, 58A15, **All AMS members $239**, List $299, Order code CWORKS/18N



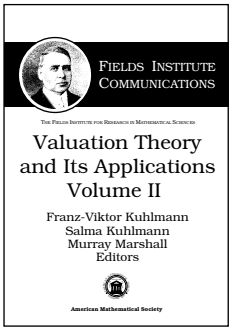
The Connective K-Theory of Finite Groups

R. R. Bruner, *Wayne State University, Detroit, MI*, and **J. P. C. Greenlees**, *University of Sheffield, UK*

Contents: Introduction; General properties of the ku-cohomology of finite groups; Examples of ku-cohomology of finite groups; The ku-homology of finite groups; The ku-homology and ku-cohomology of elementary abelian groups; Appendix A. Conventions; Appendix B. Indices; Appendix. Bibliography.

Memoirs of the American Mathematical Society, Volume 165, Number 785

September 2003, 127 pages, Softcover, ISBN 0-8218-3366-9, LC 2003051902, 2000 *Mathematics Subject Classification*: 19L41, 19L47, 19L64, 55N15; 20J06, 55N22, 55N91, 55T15, 55U20, 55U30, **Individual member $32**, List $53, Institutional member $42, Order code MEMO/165/785N



Valuation Theory and Its Applications, Volume II

Franz-Viktor Kuhlmann, **Salma Kuhlmann**, and **Murray Marshall**, *University of Saskatchewan, Saskatoon, Canada*, Editors

This book is the second of two proceedings volumes stemming from the International Conference and Workshop on Valuation Theory held at the University of Saskatchewan (Saskatoon, SK, Canada). It contains the most recent applications of valuation theory to a broad range of mathematical ideas. Valuation theory arose in the early part of the twentieth century in connection with number theory and continues to have many important applications to algebra, geometry, and analysis.

The research and survey papers in this volume cover a variety of topics, including Galois theory, the Grunwald-Wang Theorem, algebraic geometry, resolution of singularities, curves over Prüfer domains, model theory of valued fields and the Frobenius, Hardy fields, Hensel's Lemma, fixed point theorems, and computations in valued fields.

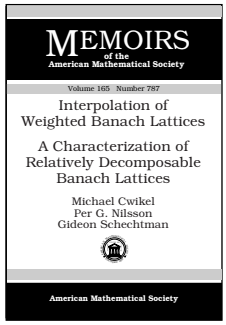
It is suitable for graduate students and research mathematicians interested in algebra, algebraic geometry, number theory, and mathematical logic.

Contents: K. Aghigh and **S. K. Khanduja**, A note on tame fields; **M. Aschenbrenner**, Some remarks about asymptotic couples; **H. H. Brungs**, **H. Marubayashi**, and **E. Osmanagic**, Prime segments for cones and rings; **V. Cossart** and **G. Moreno-Socías**, Irreducibility criterion: A geometric point of view; **J. Denef** and **H. Schoutens**, On the decidability of the existential theory of $\mathbb{F}_p[[t]]$; **W. Gao**, **D. B. Leep**, **J. Mináč**, and **T. L. Smith**, Galois groups over nonrigid fields; **B. Green**, Automorphisms of formal power series rings over a valuation ring; **H. Knaf**, Regular curves over Prüfer domains; **J. Koenigsmann**, Encoding valuations in absolute Galois groups; **F.-V. Kuhlmann**, **H. Lombardi**, and **H. Perdry**, Dynamic computations inside the algebraic closure of a valued field; **G. Leloup**, Preorders, rings, lattice-ordered groups and formal power series; **F. Lorenz** and **P. Roquette**, The theorem of Grunwald-Wang in the setting of valuation theory; **R. I. Michler**, Invariants of singular plane curves; **J. Ohm**, $\mathcal{V}$-rational fields; **H. Perdry**, A generalization of Hensel's lemma; **F. Pop**, Classically projective groups and pseudo classically closed fields; **P. Popescu-Pampu**, Approximate roots; **T. Scanlon**, Quantifier elimination for the relative Frobenius; **E. Schörner**, Ultrametric fixed point theorems and applications; **B. Teissier**, Valuations, deformations, and toric geometry.

Fields Institute Communications, Volume 33

September 2003, 459 pages, Hardcover, ISBN 0-8218-3206-9, LC 2002021581, 2000 *Mathematics Subject Classification*: 12–XX; 03–XX, 11–XX, 13–XX, 14–XX, 16–XX, 20–XX, **All AMS members $95**, List $119, Order code FIC/33N

Analysis



Interpolation of Weighted Banach Lattices/A Characterization of Relatively Decomposable Banach Lattices

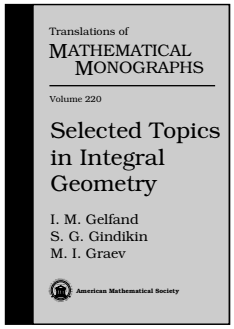
Michael Cwikel, *Technion-Israel Institute of Technology, Haifa*, **Per G. Nilsson**, *Lund, Sweden*, and **Gideon Schechtman**, *Weizmann Institute of Science, Rehovot, Israel*

Contents: *Interpolation of weighted Banach lattices, by Michael Cwikel and Per G. Nilsson:* Introduction; Definitions, terminology and preliminary results; The main results; A uniqueness theorem; Two properties of the K-functional for a couple of Banach lattices; Characterizations of couples which are uniformly Calderón-Mityagin for all weights; Some uniform boundedness principles for interpolation of Banach lattices; Appendix: Lozanovskii's formula for general Banach lattices of measurable functions; References; *A characterization of relatively decomposable Banach lattices, by Michael Cwikel, Per G. Nilsson and Gideon Schechtman:* Introduction; Equal norm upper and lower p-estimates and some other preliminary results; Completion of the proof of the main theorem; Application to the problem of characterizing interpolation spaces; References.

Memoirs of the American Mathematical Society, Volume 165, Number 787

September 2003, 127 pages, Softcover, ISBN 0-8218-3382-0, LC 2003051900, 2000 *Mathematics Subject Classification*: 46B70, 46E30, **Individual member $32**, List $53, Institutional member $42, Order code MEMO/165/787N

Independent Study



Selected Topics in Integral Geometry

I. M. Gelfand and **S. G. Gindikin**, *Rutgers University, New Brunswick, NJ*, and **M. I. Graev**, *Institute of System Studies, RAS, Moscow*

The miracle of integral geometry is that it is often possible to recover a function on a manifold just from the knowledge of its integrals over certain submanifolds. The founding example is the Radon transform, introduced at the beginning of the 20th century. Since then, many other transforms were found, and the general theory was developed. Moreover, many important practical applications were discov-

ered. The best known, but by no means the only one, being to medical tomography.

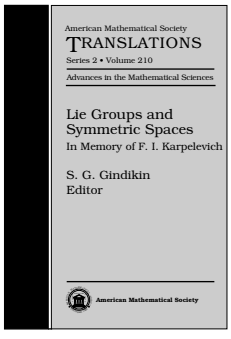
This book is a general introduction to integral geometry, the first from this point of view for almost four decades. The authors, all leading experts in the field, represent one of the most influential schools in integral geometry. The book presents in detail basic examples of integral geometry problems, such as the Radon transform on the plane and in space, the John transform, the Minkowski–Funk transform, integral geometry on the hyperbolic plane and in the hyperbolic space, the horospherical transform and its relation to representations of $SL(2,\mathbb{C})$, integral geometry on quadrics, etc. The study of these examples allows the authors to explain important general topics of integral geometry, such as the Cavalieri conditions, local and nonlocal inversion formulas, and overdetermined problems in integral geometry. Many of the results in the book were obtained by the authors in the course of their career-long work in integral geometry.

This book is suitable for graduate students and researchers working in integral geometry and its applications.

Contents: Radon transform; John transform; Integral geometry and harmonic analysis on the hyperbolic plane and in the hyperbolic space; Integral geometry and harmonic analysis on the group $G = SL(2,\mathbb{C})$; Integral geometry on quadrics; Bibliography; Index.

Translations of Mathematical Monographs, Volume 220

September 2003, 170 pages, Hardcover, ISBN 0-8218-2932-7, LC 2003052222, 2000 *Mathematics Subject Classification*: 53C65; 42A38, 42B10, 43A32, 44A12, 46F12, 60D05, 60E05, 60E10, 65R10, 92C55, **All AMS members $47**, List $59, Order code MMONO/220N



Lie Groups and Symmetric Spaces

In Memory of F. I. Karpelevich

S. G. Gindikin, *Rutgers University, New Brunswick, NJ*, Editor

The book contains survey and research articles devoted mainly to geometry and harmonic analysis of symmetric spaces and to corresponding aspects of group representation theory. The volume is dedicated to the memory of Russian mathematician, F. I. Karpelevich (1927–2000).

Of particular interest are the survey articles by Sawyer on the Abel transform on noncompact Riemannian symmetric spaces, and by Anker and Ostellari on estimates for heat kernels on such spaces, as well as the article by Bernstein and Gindikin on integral geometry for families of curves. There are also many research papers on topics of current interest.

The book is suitable for graduate students and research mathematicians interested in harmonic analysis and representation theory.

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

Contents: D. N. Akhiezer, Asymptotic distribution of eigenvalues for certain elements of the group ring of a compact Lie group; **D. V. Alekseevsky** and **A. J. Di Scala**, Minimal homogeneous submanifolds of symmetric spaces; **J.-P. Anker** and **P. Ostellari**, The heat kernel on noncompact symmetric spaces; **E. M. Baruch**, **I. Piatetski-Shapiro**, and **S. Rallis**, On the uniqueness of Fourier Jacobi models for representations of $U(2,1)$; **J. Bernstein** and **S. Gindikin**, Notes on integral geometry for manifolds of curves; **B. Enriquez** and **P. Etingof**, Quantization of Alekseev-Meinrenken dynamical r-matrices; **J. Faraut**, Analysis on the crown of a Riemannian symmetric space; **I. Gelfand**, **V. Retakh**, and **R. L. Wilson**, Quaternionic quasideterminants and determinants; **S. Gindikin**, Product-formula for c-function and inverse horospherical transform; **J. Hilgert**, **A. Pasquale**, and **E. B. Vinberg**, The dual horospherical Radon transform as a limit of spherical Radon transforms; **A. W. Knapp**, The Gindikin-Karpelevič formula and intertwining operators; **T. Kobayashi** and **S. Nasrin**, Multiplicity one theorem in the orbit method; **B. Krötz** and **G. Ólafsson**, The c-function for non-compactly causal symmetric spaces and its relations to harmonic analysis and representation theory; **I. G. Macdonald**, A formal identity for affine root systems; **V. F. Molchanov**, Canonical representations and overgroups; **Y. A. Neretin**, Pencils of geodesics in symmetric spaces, Karpelevich boundary, and associahedron-like polyhedra; **M. A. Olshanetsky** and **V.-B. K. Rogov**, Poisson formula for a family of non-commutative Lobachevsky spaces; **A. L. Onishchik**, Real semisimple Lie algebras and their representations; **T. Oshima**, A calculation of c-functions for semisimple symmetric spaces; **P. Sawyer**, The Abel transform on symmetric spaces of noncompact type.

American Mathematical Society Translations—Series 2 (*Advances in the Mathematical Sciences*), Volume 210

September 2003, 355 pages, Hardcover, ISBN 0-8218-3472-X, LC 91-640741, 2000 *Mathematics Subject Classification*: 22Exx, 53C35, **All AMS members $95**, List $119, Order code TRANS2/210N

Autour de l'analyse microlocale

Volume en l'honneur de Jean-Michel Bony

Gilles Lebeau, *Université de Nice, France*, Editor

This volume is dedicated to Jean-Michel Bony by his former students, collaborators, and friends on the occasion of his sixtieth birthday. It contains research articles by leading mathematicians on linear, nonlinear, and algebraic microlocal analysis, illustrating the vividness of the field to which he contributed so much.

The volume is suitable for graduate students and research mathematicians interested in microlocal analysis.

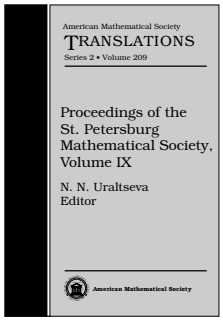
A publication of the Société Mathématique de France (SMF). Distributed by the AMS in North America. Orders from other countries should be sent to the SMF. Members of the SMF receive a 30% discount from list.

Contents: S. Alinhac, An example of blowup at infinity for a quasilinear wave equation; **H. Bahouri** and **J.-Y. Chemin**, Microlocal analysis, bilinear estimates and cubic quasilinear wave equation; **M. Kashiwara** and **P. Schapira**, Microlocal

study of ind-sheaves I: micro-support and regularity; **Y. Laurent**, Regularity of $\mathcal{D}$-modules associated to a symmetric pair; **A. Melin** and **J. Sjöstrand**, Bohr-Sommerfeld quantization condition for non-selfadjoint operators in dimension 2; **Y. Morimoto** and **C.-J. Xu**, Logarithmic Sobolev inequality and semi-linear Dirichlet problems for infinitely degenerate elliptic operators; **Jeffrey Rauch**, Group velocity at smooth points of hyperbolic characteristic varieties; **J.-M. Trépreau**, Discrimination analytique des difféomorphismes résonnants de $(\mathbb{C}, 0)$ et réflexion de Schwarz.

Astérisque, Number 284

May 2003, 320 pages, Softcover, ISBN 2-85629-132-5, 2000 *Mathematics Subject Classification*: 17B15, 30C35, 30D05, 31C10, 35Axx, 35A07, 35A27, 32C38, 35D10, 35Hxx, 35L25, 35L40, 35L55, 35L70, 35Nxx, 35P05, 37F99, 37J40, 37K05, 47J20, 58J52, **Individual member $50**, List $55, Order code AST/284N



Proceedings of the St. Petersburg Mathematical Society, Volume IX

N. N. Uraltseva, *Saint Petersburg State University, St Petersburg, Russia*, Editor

The articles in this collection present new results in analysis, combinatorics, probability, theory of functions, and partial differential equations. The material presented in the book will be of interest to a broad range of specialists.

In several papers, the authors study the classical solvability of the Cauchy-Dirichlet problem for a class of parabolic systems, the solvability of the Dirichlet problem for the quasilinear second order parabolic systems, estimates for solutions of uniformly elliptic systems, and generalizations of the embedding theorems. In other papers, the authors describe a new method for the computation of correlation dimension, present generalizations of the fast Fourier transform method for wavelet expansions, and study the spectrum of two-dimensional periodic magnetic Schrödinger operator.

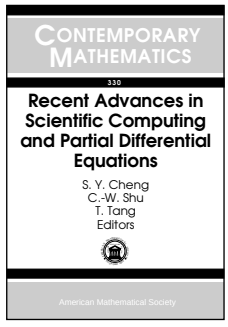
This item will also be of interest to those working in discrete mathematics and combinatorics, probability, and differential equations.

Contents: A. A. Arkhipova, On classical solvability of the Cauchy-Dirichlet problem for nondiagonal parabolic systems in the case of two spatial variables; **A. D. Baranov**, The Bernstein inequality in the de Branges spaces and embedding theorems; **V. O. Kal'vin**, The oblique derivative problem in spaces with asymptotics on edges; **V. N. Malozemov** and **S. M. Masharsky**, Glassman's formula, fast Fourier transform, and wavelet expansions; **A. I. Nazarov**, Dirichlet problem for quasilinear parabolic equations in domains with smooth closed edges; **S. I. Repin**, Two-sided estimates of deviation from exact solutions of uniformly elliptic equations; **J. V. Romanovsky** and **L. A. Evdokimov**, Calculation of correlation dimension of a time series based on enumeration of suboptimal solutions; **N. A. Shirokov**, Approximation by entire functions of an infinite system of closed intervals; **R. G. Shterenberg**, Absolute continuity of the spectrum of the two-dimensional magnetic periodic Schrödinger operator with positive electric potential.

American Mathematical Society Translations—Series 2, Volume 209

October 2003, approximately 232 pages, Hardcover, ISBN 0-8218-3405-3, 2000 *Mathematics Subject Classification*: 00B15; 00B55, **All AMS members $78**, List $97, Order code TRANS2/209N

Applications



Recent Advances in Scientific Computing and Partial Differential Equations

S. Y. Cheng, *Hong Kong University of Science & Technology, Kowloon*, **C.-W. Shu**, *Brown University, Providence, RI*, and **T. Tang**, *Hong Kong Baptist University, Kowloon*, Editors

The volume is from the proceedings of the international conference held in celebration of Stanley Osher's sixtieth birthday. It presents recent developments and exciting new directions in scientific computing and partial differential equations for time dependent problems and its interplay with other fields, such as image processing, computer vision and graphics. Over the past decade, there have been very rapid developments in the field. This volume emphasizes the strong interaction of advanced mathematics with real-world applications and algorithms.

The book is suitable for graduate students and research mathematicians interested in scientific computing and partial differential equations.

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

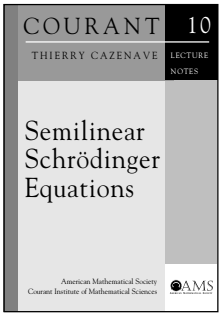
Contents: Y. Brenier, Systems of particles involving permutations and their continuous limits; **R. E. Caflisch** and **D. G. Meyer**, A reduced order model for epitaxial growth; **T. F. Chan** and **J. Shen**, On the role of the BV image model in image restoration; **L.-T. Cheng** and **W. E**, The heterogeneous multi-scale method for interface dynamics; **A. Ditkowski** and **D. Gottlieb**, On the Engquist Majda absorbing boundary conditions for hyperbolic systems; **M.-H. Giga** and **Y. Giga**, Minimal vertical singular diffusion preventing diffusion preventing overturning for the Burgers equation; **K. Harriman**, **P. Houston**, **B. Senior**, and **E. Süli**, hp-version discontinuous Galerkin methods with interior penalty for partial differential equations with nonnegative characteristic form; **D. Li** and **F. J. Hickernell**, Trigonometric spectral collocation methods on lattices; **L. Ju**, **M. D. Gunzburger**, and **L. S. Hou**, Approximation of exact boundary controllability problems for the 1-D wave equation by optimization-based methods; **P. Ming** and **Z.-c. Shi**, Some low order quadrilateral Reissner-Mindlin plate elements; **H. Tang** and **T. Tang**, Multi-dimensional moving

mesh methods for shock computations; **D. D. Vvedensky**, **C. Baggio**, **A. Chua**, **C. Haselwandter**, and **R. Vardavas**, Stochastic differential equations for driven lattice systems; **T. Yabe**, **K. Takizawa**, **F. Xiao**, and **A. Ikehata**, Universal solver CIP for all phases of matter.

Contemporary Mathematics, Volume 330

August 2003, 222 pages, Softcover, ISBN 0-8218-3155-0, LC 2003050344, 2000 *Mathematics Subject Classification*: 35–02, 35–06, 65–02, 65–06, 68U10, **All AMS members $47**, List $59, Order code CONM/330N

Differential Equations



Semilinear Schrödinger Equations

Thierry Cazenave, *Université de Paris VI, Pierre et Marie Curie*

The nonlinear Schrödinger equation has received a great deal of attention from mathematicians, particularly because of its applications to nonlinear optics. It is also a good model dispersive equation, since it is often technically simpler than other dispersive equations, such as the wave or the Korteweg-de Vries equation. From the mathematical point of view, Schrödinger's equation is a delicate problem, possessing a mixture of the properties of parabolic and elliptic equations. Useful tools in studying the nonlinear Schrödinger equation are energy and Strichartz's estimates.

This book presents various mathematical aspects of the nonlinear Schrödinger equation. It studies both problems of local nature (local existence of solutions, uniqueness, regularity, smoothing effect) and problems of global nature (finite-time blowup, global existence, asymptotic behavior of solutions). In principle, the methods presented apply to a large class of dispersive semilinear equations. The first chapter recalls basic notions of functional analysis (Fourier transform, Sobolev spaces, etc.). Otherwise, the book is mostly self-contained.

It is suitable for graduate students and research mathematicians interested in nonlinear partial differential equations and applications to mathematical physics.

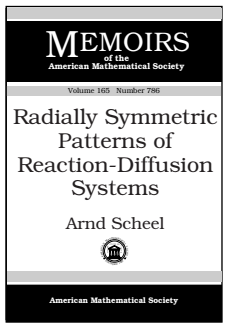
This item will also be of interest to those working in mathematical physics.

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

Contents: Preliminaries; The linear Schrödinger equation; The Cauchy problem in a general domain; The local Cauchy problem; Regularity and the smoothing effect; Global existence and finite-time blowup; Asymptotic behavior in the repulsive case; Stability of bound states in the attractive case; Further results; Bibliography.

Courant Lecture Notes, Volume 10

October 2003, 323 pages, Softcover, ISBN 0-8218-3399-5, 2000 *Mathematics Subject Classification*: 35Q55; 35A05, 35B30, 35B33, 35B35, 35B40, 35B45, 35B65, **All AMS members $34**, List $42, Order code CLN/10N



Radially Symmetric Patterns of Reaction-Diffusion Systems

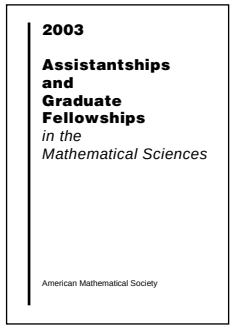
Arnd Scheel, *University of Minnesota, Minneapolis*

Contents: Introduction; Instabilities in one space dimension; Stationary radially symmetric patterns; Time-periodic radially symmetric patterns; Discussion; Bibliography.

Memoirs of the American Mathematical Society, Volume 165, Number 786

September 2003, 86 pages, Softcover, ISBN 0-8218-3373-1, LC 2003051901, 2000 *Mathematics Subject Classification*: 35K57, 35B32, 37L10, 37L15, 34C37; 35J60, 35B40, 37G40, **Individual member $31**, List $51, Institutional member $41, Order code MEMO/165/786N

General and Interdisciplinary



Assistantships and Graduate Fellowships 2003

Review of a previous edition:

This directory is a tool for undergraduate mathematics majors seeking information about graduate programs in mathematics. Although most of the information can be gleaned from the Internet, the usefulness of this directory for the prospective graduate student is the consistent format for comparing different mathematics graduate programs without the hype. Published annually, the information is up-to-date, which is more than can be said of some Websites. Support for graduate students in mathematics is a high priority of the American Mathematical Society, which also provides information for fellowships and grants they offer as well as support from other societies and foundations. The book is highly recommended for academic and public libraries.

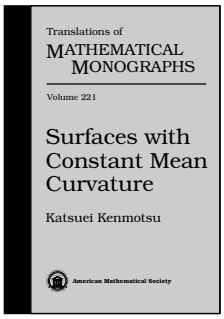
—American Reference Books Annual

This valuable reference source brings together a wealth of information about resources available for graduate study in mathematical sciences departments in the U.S. and Canada.

November 2003, approximately 128 pages, Softcover, ISBN 0-8218-3470-3, **Individual member $14**, List $23, Order code ASST/2003N

Geometry and Topology

Supplemental Reading



Surfaces with Constant Mean Curvature

Katsuei Kenmotsu, *Tohoku University, Sendai, Japan*

The mean curvature of a surface is an extrinsic parameter measuring how the surface is curved in the three-dimensional space. A surface whose mean curvature is zero at each point is a minimal surface, and it is known that such surfaces are models for soap film. There is a rich and well-known theory of minimal surfaces. A surface whose mean curvature is constant but nonzero is obtained when we try to minimize the area of a closed surface without changing the volume it encloses. An easy example of a surface of constant mean curvature is the sphere. A nontrivial example is provided by the constant curvature torus, whose discovery in 1984 gave a powerful incentive for studying such surfaces. Later, many examples of constant mean curvature surfaces were discovered using various methods of analysis, differential geometry, and differential equations. It is now becoming clear that there is a rich theory of surfaces of constant mean curvature.

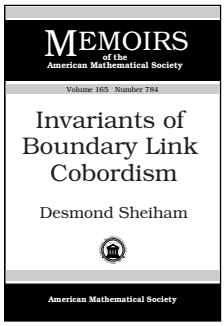
In this book, the author presents numerous examples of constant mean curvature surfaces and techniques for studying them. Many finely rendered figures illustrate the results and allow the reader to visualize and better understand these beautiful objects.

The book is suitable for advanced undergraduates, graduate students and research mathematicians interested in analysis and differential geometry.

Contents: Preliminaries from the theory of surfaces; Mean curvature; Rotational surfaces; Helicoidal surfaces; Stability; Tori; The balancing formula; The Gauss map; Intricate constant mean curvature surfaces; Supplement; Programs for the figures; Postscript; Bibliography; List of sources for the figures; Index; Other titles in this series.

Translations of Mathematical Monographs, Volume 221

October 2003, approximately 160 pages, Softcover, ISBN 0-8218-3479-7, 2000 *Mathematics Subject Classification*: 53-01, 53A10, **All AMS members $28**, List $35, Order code MMONO/221N



Invariants of Boundary Link Cobordism

Desmond Sheiham, *University of California, Riverside*

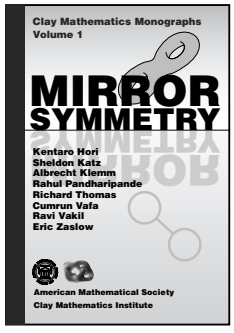
Contents: Introduction; Main results; Preliminaries; Morita Equivalence; Devissage; Varieties of representations; Generalizing Pfister's theorem; Characters; Detecting rationality and integrality; Representation varieties: Two examples; Number theory invariants; All division algebras occur; Appendix I. Primitive element theorems; Appendix II. Hermitian categories; Bibliography; Index.

Memoirs of the American Mathematical Society, Volume 165, Number 784

September 2003, 110 pages, Softcover, ISBN 0-8218-3340-5, LC 2003051903, 2000 *Mathematics Subject Classification*: 18F25, 57Q45, 57Q60, 16G20, **Individual member $31**, List $52, Institutional member $42, Order code MEMO/165/784N

Mathematical Physics

Independent Study



Mirror Symmetry

Kentaro Hori, *University of Toronto, ON, Canada*, **Sheldon Katz**, *University of Illinois at Urbana-Champaign,* **Albrecht Klemm**, *Humboldt-University, Berlin, Germany*, **Rahul Pandharipande**, *Princeton University, NJ*, **Richard Thomas**, *Imperial College, London*, **Cumrun Vafa**, *Harvard University, Cambridge, MA*, **Ravi Vakil**, *Stanford University, CA*, and **Eric Zaslow**, *Northwestern University, Evanston, IL*

This thorough and detailed exposition is the result of an intensive month-long course on mirror symmetry sponsored by the Clay Mathematics Institute. It develops mirror symmetry from both mathematical and physical perspectives with the aim of furthering interaction between the two fields. The material will be particularly useful for mathematicians and physicists who wish to advance their understanding across both disciplines.

Mirror symmetry is a phenomenon arising in string theory in which two very different manifolds give rise to equivalent physics. Such a correspondence has significant mathematical consequences, the most familiar of which involves the enumeration of holomorphic curves inside complex manifolds by solving differential equations obtained from a "mirror" geometry. The inclusion of D-brane states in the equivalence has led to further conjectures involving calibrated submanifolds of the mirror pairs and new (conjectural) invariants of complex manifolds: the Gopakumar-Vafa invariants.

This book gives a single, cohesive treatment of mirror symmetry. Parts 1 and 2 develop the necessary mathematical and physical background from "scratch". The treatment is focused, developing only the material most necessary for the task. In Parts 3 and 4 the physical and mathematical proofs of mirror symmetry are given. From the physics side, this means demonstrating that two different physical theories give isomorphic physics. Each physical theory can be described geometrically, and thus mirror symmetry gives rise to a "pairing" of geometries. The proof involves applying $R \leftrightarrow 1/R$ circle duality to the phases of the fields in the gauged linear sigma model. The mathematics proof develops Gromov-Witten theory in the algebraic setting, beginning with the moduli spaces of curves and maps, and uses localization techniques to show that certain hypergeometric functions encode the Gromov-Witten invariants in genus zero, as is predicted by mirror symmetry. Part 5 is devoted to advanced topics in mirror symmetry, including the role of D-branes in the context of mirror symmetry, and some of their applications in physics and mathematics: topological strings and large N Chern-Simons theory; geometric engineering; mirror symmetry at higher genus; Gopakumar-Vafa invariants; and Kontsevich's formulation of the mirror phenomenon as an equivalence of categories.

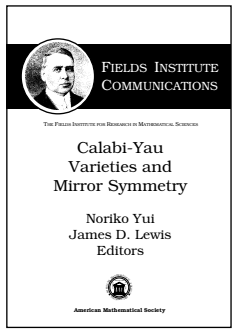
This one-of-a-kind book is suitable for graduate students and research mathematicians interested in mathematics and mathematical and theoretical physics.

Titles in this series are published by the AMS for the Clay Mathematics Institute (Cambridge, MA).

Contents: *Part 1. Mathematical Preliminaries:* Differential geometry; Algebraic geometry; Differential and algebraic topology; Equivariant cohomology and fixed-point theorems; Complex and Kähler geometry; Calabi-Yau manifolds and their moduli; Toric geometry for string theory; *Part 2. Physics Preliminaries:* What is a QFT?; QFT in $d = 0$; QFT in dimension 1: Quantum mechanics; Free quantum field theories 1 + 1 dimensions; $\mathcal{N} = (2,2)$ supersymmetry; Non-linear sigma models and Landau-Ginzburg models; Renormalization group flow; Linear sigma models; Chiral rings and topological field theory; Chiral rings and the geometry of the vacuum bundle; BPS solitons in $\mathcal{N} = 2$ Landau-Ginzburg theories; D-branes; *Part 3. Mirror Symmetry: Physics Proof:* Proof of mirror symmetry; *Part 4. Mirror Symmetry: Mathematics Proof:* Introduction and overview; Complex curves (non-singular and nodal); Moduli spaces of curves; Moduli spaces $\bar{\mathcal{M}}_{g,n}(X,\beta)$ of stable maps; Cohomology classes on $\bar{\mathcal{M}}_{g,n}$ and $(\bar{\mathcal{M}})_{g,n}(X,\beta)$; The virtual fundamental class, Gromov-Witten invariants, and descendant invariants; Localization on the moduli space of maps; The fundamental solution of the quantum differential equation; The mirror conjecture for hypersurfaces I: The Fano case; The mirror conjecture for hypersurfaces II: The Calabi-Yau case; *Part 5. Advanced Topics:* Topological strings; Topological strings and target space physics; Mathematical formulation of Gopakumar-Vafa invariants; Multiple covers, integrality, and Gopakumar-Vafa invariants; Mirror symmetry at higher genus; Some applications of mirror symmetry; Aspects of mirror symmetry and D-branes; More on the mathematics of D-branes: Bundles, derived categories and Lagrangians; Boundary $\mathcal{N} = 2$ theories; References; Bibliography; Index.

Clay Mathematics Monographs, Volume 1

September 2003, 929 pages, Hardcover, ISBN 0-8218-2955-6, LC 2003052414, 2000 *Mathematics Subject Classification*: 14J32; 14-02, 14N10, 14N35, 32G81, 32J81, 32Q25, 81T30, **All AMS members $99**, List $124, Order code CMIM/1N



Calabi-Yau Varieties and Mirror Symmetry

Noriko Yui, *Queen's University, Kingston, ON, Canada*, and **James D. Lewis**, *University of Alberta, Edmonton, Canada*, Editors

The idea of mirror symmetry originated in physics, but in recent years, the field of mirror symmetry has exploded onto the mathematical scene. It has inspired many new developments in algebraic and arithmetic geometry, toric geometry, the theory of Riemann surfaces, and infinite-dimensional Lie algebras among others.

The developments in physics stimulated the interest of mathematicians in Calabi-Yau varieties. This led to the realization that the time is ripe for mathematicians, armed with many concrete examples and alerted by the mirror symmetry phenomenon, to focus on Calabi-Yau varieties and to test for these special varieties some of the great outstanding conjectures, e.g., the modularity conjecture for Calabi-Yau threefolds defined over the rationals, the Bloch-Beilinson conjectures, regulator maps of higher algebraic cycles, Picard-Fuchs differential equations, GKZ hypergeometric systems, and others.

The articles in this volume report on current developments. The papers are divided roughly into two categories: geometric methods and arithmetic methods. One of the significant outcomes of the workshop is that we are finally beginning to understand the mirror symmetry phenomenon from the arithmetic point of view, namely, in terms of zeta-functions and L-series of mirror pairs of Calabi-Yau threefolds.

The book is suitable for researchers interested in mirror symmetry and string theory.

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

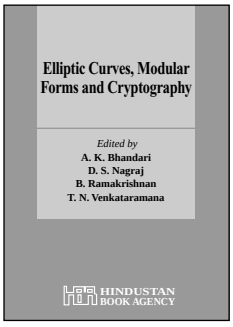
Contents: *Geometric methods:* **V. V. Batyrev** and **E. N. Materov**, Mixed toric residues and Calabi-Yau complete intersections; **L. Chiang** and **S.-s. Roan**, Crepant resolutions of $\mathbb{C}^n/A_1(n)$ and flops of n-folders for $n = 4, 5$; **P. L. del Angel** and **S. Müller-Stach**, Picard-Fuchs equations, integrable systems and higher algebraic K-theory; **S. Hosono**, Counting BPS states via holomorphic anomaly equations; **J. D. Lewis**, Regulators of Chow cycles on Calabi-Yau varieties; *Arithmetic methods:* **P. Candelas**, **X. de la Ossa**, and **F. Rodriguez-Villegas**, Calabi-Yau manifolds over finite fields, II; **L. Dieulefait** and **J. Manoharmayum**, Modularity of rigid Calabi-Yau threefolds over $\mathbb{Q}$; **Y. Goto**, $K3$ surfaces with symplectic group actions; **T. Ito**, Birational smooth minimal models have equal Hodge numbers in all dimensions; **B. H. Lian** and **S.-T. Yau**, The nth root of the mirror map; **L. Long**, On a Shioda-Inose structure of a family of K3 surfaces; **M. Lynker**, **V. Periwal**, and **R. Schimmrigk**, Black hole attractor varieties and complex multiplication; **F. Rodriguez-Villegas**, Hypergeometric families of Calabi-Yau manifolds; **R. Schimmrigk**, Aspects of conformal field theory from Calabi-Yau arithmetic; **J. Stienstra**, Ordinary Calabi-Yau-3 crystals; **J. Stienstra**, The ordinary limit for varieties over $\mathbb{Z}[x_1, \ldots, x_r]$; **N. Yui**, Update on the modularity of Calabi-Yau

varieties with appendix by Helena Verrill; **N. Yui** and **J. D. Lewis**, Problems.

Fields Institute Communications, Volume 38

October 2003, approximately 384 pages, Hardcover, ISBN 0-8218-3355-3, 2000 *Mathematics Subject Classification*: 14J32, **All AMS members $88**, List $110, Order code FIC/38N

Number Theory



Elliptic Curves, Modular Forms and Cryptography

A. K. Bhandari, *Panjab University, Chandigarh, India*, **D. S. Nagaraj**, *Institute of Mathematical Science, CIT Campus, Chennai, India*, **B. Ramakrishnan**, *Harish-Chandra Research Institute, Allahabad, India*, and **T. N. Venkataramana**, *Tata Institute of Fundamental Research, Mumbai, India*

The theory of elliptic curves has been the source of new approaches to classical problems in number theory, which have also found applications in cryptography. This volume represents the proceedings of the Advanced Instructional Workshop on Algebraic Number Theory held at the Harish-Chandra Research Institute. The theme of the workshop was algebraic number theory with special emphasis on elliptic curves.

The volume is in three parts, the first part contains articles in the field of elliptic curves, the second contains articles on modular forms. The third part presents some basics on cryptography, as well as some advanced topics. Each part contains an introduction, which, in some sense, gives the overall picture of the contents of that part. Most of the articles are presented in a self-contained style and they give a different flavor to the subject. In some cases, the authors have chosen to include material that is already available in textbooks in order to make this volume more complete. Graduate students who want to pursue their research career in number theory will benefit from this volume.

The book is suitable for graduate students and researchers in number theory and applications to cryptography.

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

A publication of the Hindustan Book Agency. Distributed exclusively by the American Mathematical Society in North America and worldwide on the AMS Bookstore.

Contents: *Part I. Elliptic Curves:* **D. S. Nagaraj**, An overview; **D. S. Nagaraj** and **B. Sury**, A quick introduction to algebraic geometry and elliptic curves; **B. Sury**, Elliptic curves over finite fields; **R. Tandon**, The Nagell-Lutz theorem; **C. S. Rajan**, Weak Mordell-Weil theorem; **D. S. Nagaraj** and **B. Sury**, The Mordell-Weil theorem; **E. Ghate**, Complex multiplication; **D. Prasad**, The main theorem of complex multiplication; **T. N. Shorey**, Approximations of algebraic numbers by rationals: A theorem of Thue; **S. D. Adhikari** and **D. S. Ramana**, Siegel's theorem: Finiteness of integral points; **A. F. Brown**, p-adic theta functions and Tate curves; **D. S. Nagaraj**, l-adic representation attached to an elliptic curve over a number field; **C. S. Dalawat**, Arithmetic on curves; *Part II. Modular Forms:* **B. Ramakrishnan**, Introduction; **P. Shastri**, Elliptic functions; **M. Manickam** and **B. Ramakrishnan**, An introduction to modular forms and Hecke operators; **C. S. Yogananda**, I-functions of modular forms; **T. N. Venkataramana**, On the Eichler-Shimura congruence relation; *Part III. Cryptography:* **A. K. Bhandari**, Cryptography; **R. Thangadurai**, Classical cryptosystems; **A. K. Bhandari**, The public key cryptography; **A. Nongkynrih**, Primality and factoring; **R. Balasubramanian**, Elliptic curves and cryptography.

Hindustan Book Agency

July 2003, 354 pages, Hardcover, ISBN 81-85931-42-9, 2000 *Mathematics Subject Classification*: 11–06, 11Fxx, 11Gxx, 11T71, 14H45, **All AMS members $42**, List $52, Order code HIN/14N