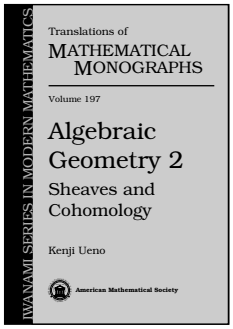
New Publications Offered by the AMS

Algebra and Algebraic Geometry

Recommended Text



Algebraic Geometry 2
Sheaves and Cohomology

Kenji Ueno, *Kyoto University, Japan*

Modern algebraic geometry is built upon two fundamental notions: schemes and sheaves. The theory of schemes was explained in *Algebraic Geometry 1: From Algebraic Varieties to Schemes* (see Volume 185 in the same series, Translations of Mathematical Monographs). In the present book, Ueno turns to the theory of sheaves and their cohomology. Loosely speaking, a sheaf is a way of keeping track of local information defined on a topological space, such as the local holomorphic functions on a complex manifold or the local sections of a vector bundle. To study schemes, it is useful to study the sheaves defined on them, especially the coherent and quasicoherent sheaves. The primary tool in understanding sheaves is cohomology. For example, in studying ampleness, it is frequently useful to translate a property of sheaves into a statement about its cohomology.

The text covers the important topics of sheaf theory, including types of sheaves and the fundamental operations on them, such as …
· coherent and quasicoherent sheaves.
· proper and projective morphisms.
· direct and inverse images.
· Čech cohomology.

For the mathematician unfamiliar with the language of schemes and sheaves, algebraic geometry can seem distant. However, Ueno makes the topic seem natural through his concise style and his insightful explanations. He explains why things are done this way and supplements his explanations with illuminating examples. As a result, he is able to make algebraic geometry very accessible to a wide audience of nonspecialists.

The book contains numerous problems and exercises with solutions. It would be an excellent text for the second part of a course in algebraic geometry.

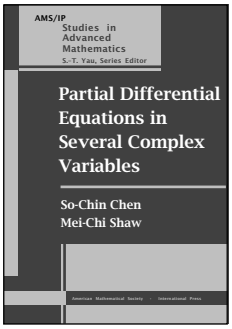
Contents: Coherent sheaves; Proper and projective morphisms; Cohomology of coherent sheaves; Solutions to problems; Solutions to exercises; Index.

Translations of Mathematical Monographs (*Iwanami Series in Modern Mathematics*), Volume 197

April 2001, approximately 200 pages, Softcover, ISBN 0-8218-1357-9, LC 99-22304, 2000 *Mathematics Subject Classification*: 14–01, 14F99, **All AMS members $23**, List $29, Order code MMONO/197N

Analysis

Supplementary Reading



Partial Differential Equations in Several Complex Variables

So-Chin Chen, *National Tsing-Hua University, Hsinchu, Taiwan*, and **Mei-Chi Shaw**, *University of Notre Dame, IN*

This book is intended as both an introductory text and a reference book for those interested in studying several complex variables in the context of partial differential equations. In the last few decades, significant progress was made in the study of Cauchy-Riemann and tangential Cauchy-Riemann operators; this progress greatly influenced the development of PDEs and several complex variables. After the background material in complex analysis is developed in Chapters 1 through 3, the next three chapters are devoted to the solvability and regularity of the Cauchy-Riemann equations using Hilbert space techniques. The authors provide a systematic study of the Cauchy-Riemann equations and the $\bar{\partial}$-Neumann problem, including Hórmander's L^2 existence progress on the global regularity and irregularity of the $\bar{\partial}$-Neumann operators. The second part of the book gives a comprehensive study of the tangential Cauchy-Riemann equations, another important class of equations in several complex variables first studied by Lewy. An up-to-date account of the L^2 theory for $\bar{\partial}_b$ operator is given. Explicit integral solution representations are constructed both on the Heisenberg groups and on strictly convex boundaries with estimates in Hölder and L^2 spaces. Embeddability of abstract *CR* structures is discussed in detail here for the first time.

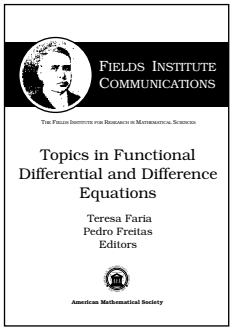
This fairly self-contained book provides a much-needed introductory text to several complex variables and PDEs. It also provides a rich source of information to experts.

Titles in this series are copublished with International Press, Cambridge, MA.

Contents: Real and complex manifolds; The Cauchy integral formula and its applications; Holomorphic extension and pseudoconvexity; L^2 theory for $\overline{\partial}$ on pseudoconvex domains; The $\overline{\partial}$-Neumann problem on strongly pseudoconvex manifolds; Boundary regularity for $\overline{\partial}$ on pseudoconvex domains; Cauchy-Riemann manifolds and the tangential Cauchy-Riemann complex; Subelliptic estimates for second order differential equations and $\Box_b$; The tangential Cauchy-Riemann complex on pseudoconvex *CR* manifolds; Fundamental solutions for $\Box_b$ on the Heisenberg group; Integral representations for $\overline{\partial}$ and $\overline{\partial}_b$; Embeddability of abstract *CR* structures; Appendix; Bibliography; Table of notation; Index.

AMS/IP Studies in Advanced Mathematics, Volume 19

January 2001, 380 pages, Hardcover, ISBN 0-8218-1062-6, LC 00-049584, 2000 *Mathematics Subject Classification*: 32–XX; 35–XX, **All AMS members $39**, List $49, Order code AMSIP/19N



Topics in Functional Differential and Difference Equations

Teresa Faria, *Universidade de Lisboa, Portugal*, and **Pedro Freitas**, *Instituto Superior Técnico, Lisboa, Portugal*, Editors

This volume contains papers written by participants at the Conference on Functional Differential and Difference Equations held at the Instituto Superior Técnico in Lisbon, Portugal. The conference brought together mathematicians working in a wide range of topics, including qualitative properties of solutions, bifurcation and stability theory, oscillatory behavior, control theory and feedback systems, biological models, state-dependent delay equations, Lyapunov methods, etc. Articles are written by leading experts in the field. A comprehensive overview is given of these active areas of current research. The book will be of interest to both theoretical and applied mathematical scientists.

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

Contents: S. Amraoui and **S. Lalaoui Rhali**, Monotonicity for some reaction-diffusion systems with delay and Dirichlet boundary conditions; **O. V. Anashkin**, Lyapunov's direct method and parametric resonance in linear systems with delay; **O. Arino**, **E. Sánchez**, and **A. Fathallah**, State-dependent delay differential equations in population dynamics: Modeling and analysis; **M. Bachar** and **P. Magal**, Existence of periodic solution for a class of delay differential equations with impulses; **A. Bátkai** and **S. Piazzera**, Damped wave equations with delay; **H. Bouzahir** and **K. Ezzinbi**, Global attractor for a class of partial functional differential equations with infinite delay; **R. Ceppitelli** and **L. Faina**, Differential equations with hereditary structure induced by a Volterra type property; **G. Derfel** and **F. Vogl**, Asymptotic analysis of binomial recurrences; **L. Fichmann** and **W. M. Oliva**, Collision of global orbits in C^∞ retarded functional differential equations; **L. Fichmann** and **W. M. Oliva**, One-to-oneness and hyperbolicity; **W. E. Fitzgibbon**, **M. Langlais**, and **J. J. Morgan**, Modeling the spread of feline leukemia virus in heterogeneous habitats; **F. Giannakopoulos**, **C. Hauptmann**, and **A. Zapp**, Bursting activity in a model of a neuron with recurrent synaptic feedback; **E. A. Grove**, **C. Kent**, **G. Ladas**, and **M. A. Radin**, On $x_{n+1} = \max\left\{\frac{1}{x_n}, \frac{A_n}{x_{n-1}}\right\}$ with a period 3 parameter; **I. Győri** and **F. Hartung**, Stability in delay perturbed differential and difference equations; **J. K. Hale**, Some problems in FDE; **U. an der Heiden**, Non-linear feedback systems with memory: From 0-th to higher order, discrete and continuous; **L. Huang** and **J. Wu**, Dynamics of inhibitory artificial neural networks with threshold nonlinearity; **W. Huang**, Dimension of space of solutions for a linear nonautonomous infinite delay differential equation; **T. Krisztin**, Unstable sets of periodic orbits and the global attractor for delayed feedback; **E. Litsyn**, **Y. V. Nepomnyashchikh**, and **A. Ponosov**, Uniform exponential stability of controlled quasilinear systems and functional differential equations; **S. Nakagiri**, Finite pole assignment of retarded dynamical systems in Hilbert spaces; **S. M. Verduyn Lunel**, Inverse problems for nonself-adjoint evolutionary systems; **H.-O. Walther**, Contracting return maps for some delay differential equations; **M. Weedermann**, Normal forms for neutral functional differential equations; **G. J. Wirsching**, A functional differential equation and $3n + 1$ dynamics.

Fields Institute Communications, Volume 29

March 2001, 378 pages, Hardcover, ISBN 0-8218-2701-4, 2000 *Mathematics Subject Classification*: 34Kxx, 39Axx, 35Bxx, 35Rxx, **Individual member $66**, List $110, Institutional member $88, Order code FIC/29N

Operator Theoretical Methods

A. Gheondea, **R. N. Gologan**, and **D. Timotin**, *Romanian Academy, Bucharest*, Editors

A publication of the Theta Foundation.

The AMS has joined with the Theta Foundation of Bucharest, Romania, to distribute titles in a new series, the International Book Series of Mathematical Texts. Volumes will be published by the Theta Foundation and distributed by the AMS. The Theta Foundation also publishes the *Journal of Operator Theory*.

This volume contains carefully selected contributions by participants at the Seventeenth International Conference on Operator Theory held at the University of Timişoara (Romania). A large variety of topics are covered, including single operator theory, C^*-algebras, spectral theory, special classes of concrete operators, and holomorphic operator functions. The book also includes applications in other areas of mathematics and science.

Distributed worldwide, except in Romania, by the AMS.

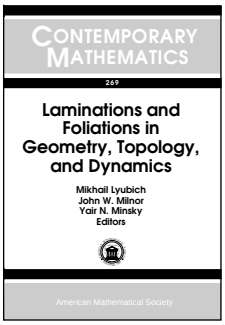
Contents: J. Agler and **J. E. McCarthy**, Nevanlinna-Pick kernels and localization; **C.-G. Ambrozie**, A note on moment problems; **Z. D. Arova**, On J-unitary nodes with strongly regular J-inner characteristic functions in the Hardy class $H_2^{n\times n}$; **E. Blanchard**, On finiteness of the number of N-dimensional Hopf C^*-algebras; **L. Burlando**, On the weighted reduced minimum

modulus; **L. P. Castro** and **F.-O. Speck**, An operator approach to a boundary value problem for the Helmholtz equation; **I. Cialenco**, On the nonselfadjoint perturbations of the Wiener-Hopf integral operators; **P. A. Cojuhari**, Estimates of the number of perturbed eigenvalues; **P. A. Cojuhari** and **S. Corsac**, Absence of the singular continuous spectrum for some perturbed Wiener-Hopf integral operators; **T. Constantinescu**, **A. H. Sayed**, and **T. Kailath**, Structured extensions of matrices; **V. Deaconu**, Continuous graphs and C^*-algebras; **D. Guido** and **T. Isola**, Singular traces, dimensions, and Novikov-Shubin invariants; **H. Helson** and **J. I. Tanaka**, Singular cocycles and the generator problem; **J. Janas** and **S. Naboko**, On subordination properties of one-dimensional discrete Schrödinger operator; **P. C. Kunstmann**, Kernel estimates and L^p spectral independence of differential and integral operators; **J.-Ph. Labrousse**, Geodesics in the space of linear relations on a Hilbert space; **S. Litvinov**, On Besicovitch weighted ergodic theorem in von Neumann algebras; **Z. Liu**, On adjoints of operators on L^1; **V. M. Manuilov**, Almost commutativity implies asympotic commutativity; **C.-K. Ng**, Amenability of Hopf C^*-algebras; **C. Peligrad** and **L. Zsidó**, Open projections of C^*-algebras: Comparison and regularity; **D. Poguntke**, Banach algebras associated to Laplace operators on the Heisenberg group and on the affine group of the real line; **C. Pop**, Bimodules normés représentables sur des espaces hilbertiens; **J. Renault**, Cuntz-like algebras; **E. A. Suciu**, Elementary replacements and Ext^2 groups for Hilbert modules over a function algebra; **F.-H. Vasilescu**, Operator theoretic characterizations of moment functions.

International Book Series of Mathematical Texts

August 2000, 415 pages, Hardcover, ISBN 973-99097-2-8, 2000 *Mathematics Subject Classification*: 47A20, 44A60, 49J99, 47A48, 16W30, 46L05, 47A55, 35J05, 35J25, 45E10, 47A05, 47A68, 47B35, 47A57, 46L51, 43A17, 47B37, 45P05, 35P05, 47A10, 47D03, 46A32, 46B25, 46B42, 47B38, 47C05, 46L55, 22D25, 43A20, 43A80, 43A90, 46L10, 43A35, 47B25; 46E20, 93B05, 93B07, 47A10, 47A75, 47B35, 47A20, 93B36, 46L55, 42A50, 47B39, 47A35, 46L05, 20K99, 46L35, 43A07, 43A15, 43A22, 28B99, **All AMS members $30**, List $38, Order code THETA/1N

Geometry and Topology



Laminations and Foliations in Geometry, Topology, and Dynamics

Mikhail Lyubich, **John W. Milnor**, and **Yair N. Minsky**, *SUNY at Stony Brook, NY*, Editors

This volume is based on a conference held at SUNY, Stony Brook (NY). The concepts of laminations and foliations appear in a diverse number of fields, such as topology, geometry, analytic differential equations, holomorphic dynamics, and renormalization theory. Although these areas have developed deep relations, each has developed distinct research fields with little interaction among practitioners. The conference brought together the diverse points of view of researchers from different areas. This book includes surveys and research papers reflecting the broad spectrum of themes presented at the event.

Of particular interest are the articles by F. Bonahon, "Geodesic Laminations on Surfaces", and D. Gabai, "Three Lectures on Foliations and Laminations on 3-manifolds", which are based on minicourses that took place during the conference.

Contents: F. Bonahon, Geodesic laminations on surfaces; **C. Camacho**, Dicritical singularities of holomorphic vector fields; **J. E. Fornæss** and **N. Sibony**, Dynamics of $\mathbb{P}^2$ (Examples); **D. Gabai**, 3 lectures on foliations and laminations on 3-manifolds; **J. Kiwi**, Rational laminations of complex polynomials; **J. Seade** and **A. Verjovsky**, Actions of discrete groups on complex projective spaces; **S. Zakeri**, Dynamics of singular holomorphic foliations on the complex projective plane.

Contemporary Mathematics, Volume 269

March 2001, approximately 232 pages, Softcover, ISBN 0-8218-1985-2, 2000 *Mathematics Subject Classification*: 53–06, 57–06, 37–06, 32–06, 53C12, 57R30, 57Mxx, 57M25, 37Fxx, 37F10, 37F75, **Individual member $35**, List $59, Institutional member $47, Order code CONM/269N

Previously Announced Publications

Une Dégustation Topologique: Homotopy Theory in the Swiss Alps

Dominique Arlettaz, *Université de Lausanne, Switzerland*, and **Kathryn Hess**, *Ecole Polytechnique Fédérale de Lausanne, Switzerland*, Editors

The talks given at the Arolla Conference on Algebraic Topology covered a broad spectrum of current research in homotopy theory, offering participants the possibility to sample and relish selected morsels of homotopy theory, much as a participant in a wine tasting partakes of a variety of fine wines. True to the spirit of the conference, the proceedings included in this volume present a savory sampler of homotopical delicacies. Readers will find within these pages a compilation of articles describing current research in the area, including classical stable and unstable homotopy theory, configuration spaces, group cohomology, K-theory, localization, p-compact groups, and simplicial theory.

Contributors include: C. Casacuberta, J. Scherer, F. R. Cohen, F. P. Peterson, J. Cornick, I. J. Leary, E. D. Farjoun, P. G. Goerss, M. J. Hopkins, M. Jakob, J.-L. Loday, S. A. Mitchell, J. Neisendorfer, A. Osse, U. Suter, P. A. Østvær, D. C. Ravenel, J. L. Rodríguez, D. Scevenels, A. Viruel, and M. A. Xicoténcatl.

Contemporary Mathematics, Volume 265

December 2000, 249 pages, Softcover, ISBN 0-8218-2078-8, LC 00-061797, 2000 *Mathematics Subject Classification*: 55–06; 00B25, 13–06, 18–06, 19–06, 20–06, 57–06, **Individual member $41**, List $69, Institutional member $55, Order code CONM/265RT101

Supplementary Reading

Lectures on Tensor Categories and Modular Functors

Bojko Bakalov, *University of California, Berkeley*, and **Alexander Kirillov, Jr.**, *SUNY at Stony Brook, NY*

This book gives an exposition of the relations among the following three topics: monoidal tensor categories (such as a category of representations of a quantum group), 3-dimensional topological quantum field theory, and 2-dimensional modular functors (which naturally arise in 2-dimensional conformal field theory). The following examples are discussed in detail: the category of representations of a quantum group at a root of unity and the Wess-Zumino-Witten modular functor.

The idea that these topics are related first appeared in the physics literature in the study of quantum field theory. Pioneering works of Witten and Moore-Seiberg triggered an avalanche of papers, both physical and mathematical, exploring various aspects of these relations. Upon preparing to lecture on the topic at MIT, however, the authors discovered that the existing literature was difficult and that there were gaps to fill.

The text is wholly expository and finely succinct. It gathers results, fills existing gaps, and simplifies some proofs. The book makes an important addition to the existing literature on the topic. It would be suitable as a course text at the advanced-graduate level.

University Lecture Series, Volume 21

December 2000, 221 pages, Softcover, ISBN 0-8218-2686-7, LC 00-045141, 2000 *Mathematics Subject Classification*: 18D10, 81T40, 57R56, 81T45; 57M27, 81R10, 81R50, 17B67, 17B37, **All AMS members $23**, List $29, Order code ULECT/21RT101

Supplementary Reading

Orthogonal Polynomials and Random Matrices: A Riemann-Hilbert Approach

Percy Deift, *New York University-Courant Institute of Mathematical Sciences, New York*

This volume expands on a set of lectures held at the Courant Institute on Riemann-Hilbert problems, orthogonal polynomials, and random matrix theory. The goal of the course was to prove universality for a variety of statistical quantities arising in the theory of random matrix models. The central question was the following: Why do very general ensembles of random $n \times n$ matrices exhibit universal behavior as $n \to \infty$? The main ingredient in the proof is the steepest descent method for oscillatory Riemann-Hilbert problems.

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

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

Courant Lecture Notes, Volume 3

October 2000, 261 pages, Softcover, ISBN 0-8218-2695-6, LC 00-0618, 2000 *Mathematics Subject Classification*: 30–XX, 33–XX, 60–XX, 15A90, 26Cxx, **All AMS members $25**, List $31, Order code CLN/3RT101

Recommended Text

Fourier Analysis

Javier Duoandikoetxea, *Universidad del País Vasco/Euskal Herriko Unibertsitatea, Bilbao, Spain*

Fourier analysis encompasses a variety of perspectives and techniques. This volume presents the real variable methods of Fourier analysis introduced by Calderón and Zygmund. The text was born from a graduate course taught at the Universidad Autónoma de Madrid and incorporates lecture notes from a course taught by José Luis Rubio de Francia at the same university.

Motivated by the study of Fourier series and integrals, classical topics are introduced, such as the Hardy-Littlewood maximal function and the Hilbert transform. The remaining portions of the text are devoted to the study of singular integral operators and multipliers. Both classical aspects of the theory and more recent developments, such as weighted inequalities, H^1, BMO spaces, and the $T1$ theorem, are discussed.

Chapter 1 presents a review of Fourier series and integrals; Chapters 2 and 3 introduce two operators that are basic to the field: the Hardy-Littlewood maximal function and the Hilbert transform. Chapters 4 and 5 discuss singular integrals, including modern generalizations. Chapter 6 studies the relationship between H^1, BMO, and singular integrals; Chapter 7 presents the elementary theory of weighted norm inequalities. Chapter 8 discusses Littlewood-Paley theory, which had developments that resulted in a number of applications. The final chapter concludes with an important result, the $T1$ theorem, which has been of crucial importance in the field.

This volume has been updated and translated from the Spanish edition that was published in 1995. Minor changes have been made to the core of the book; however, the sections, "Notes and Further Results" have been considerably expanded and incorporate new topics, results, and references. It is geared toward graduate students seeking a concise introduction to the main aspects of the classical theory of singular operators and multipliers. Prerequisites include basic knowledge in Lebesgue integrals and functional analysis.

Graduate Studies in Mathematics, Volume 29

January 2001, 222 pages, Hardcover, ISBN 0-8218-2172-5, LC 00-064301, 2000 *Mathematics Subject Classification*: 42B15, 42B20, 42B25, **All AMS members $28**, List $35, Order code GSM/29RT101

Recommended Text

An Introduction to Game-Theoretic Modelling

Second Edition

Michael Mesterton-Gibbons, *Florida State University, Tallahassee*

From reviews for the First Edition:

Readers will be hard-pressed to find a general introduction to game theory that blends biological and mathematical approaches more expertly. It is both a well-rounded survey and a reference work of lasting value.

—Behavioral Ecology

Continued

This book is an introduction to game theory with two specific features: it is written by a mathematician … and it is written from the perspective of a mathematical modeller. This last characteristic implies that all chapters start with examples and the general concepts are only presented once the specific examples have been carefully developed … I find this book excellent and … worth considering when teaching an undergraduate course in game theory to students having some mathematical maturity (some calculus, some knowledge of matrix analysis and probability).

—Zentralblatt für Mathematik

This book is about using game theory in mathematical modelling. It is an introductory text, covering the basic ideas and methods of game theory as well as the necessary ideas from the vast spectrum of scientific study where the methods are applied.

It has by now become generally apparent that game theory is a fascinating branch of mathematics with both serious and recreational applications. Strategic behavior arises whenever the outcome of an individual's action depends on actions to be taken by other individuals—whether human, as in the Prisoners' Dilemma, or otherwise, as in the "duels of damselflies". As a result, game-theoretic mathematical models are applicable in both the social and natural sciences. In reading this book, you can learn not just about game theory, but also about how to model real situations so that they can be analyzed mathematically.

Mesterton-Gibbons includes the familiar game theory examples where they are needed for explaining the mathematics or when they provide a valuable application. There are also plenty of new examples, in particular from biology, such as competitions for territory or mates, games among kin versus games between kin, and cooperative wildlife management.

Prerequisites are modest. Students should have some mathematical maturity and a familiarity with basic calculus, matrix algebra, probability, and some differential equations. As Mesterton-Gibbons writes, "The recurring theme is that game theory is fun to learn, doesn't require a large amount of mathematical rigor, and has great potential for application."

This new edition contains a significant amount of updates and new material, particularly on biological games. An important chapter on population games now has virtually all new material. The book is absolutely up-to-date with numerous references to the literature. Each chapter ends with a commentary which surveys current developments.

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

Student Mathematical Library, Volume 11

October 2000, 368 pages, Softcover, ISBN 0-8218-1929-1, LC 00-059399, 2000 *Mathematics Subject Classification*: 91–01, 91A10, 91A12, 91A22, 91A40, 91A80; 92–02, 92D50, **All AMS members $31**, List $39, Order code STML/11RT101

Recommended Text

Infinite-Dimensional Lie Algebras

Minoru Wakimoto, *Kyushu University, Fukuoka, Japan*

This volume begins with an introduction to the structure of finite-dimensional simple Lie algebras, including the representation of $\widehat{\mathfrak{sl}}(2,\mathbb{C})$, root systems, the Cartan matrix, and a Dynkin diagram of a finite-dimensional simple Lie algebra. Continuing on, the main subjects of the book are the structure (real and imaginary root systems) of and the character formula for Kac-Moody superalgebras, which is explained in a very general setting. Only elementary linear algebra and group theory are assumed. Also covered is modular property and asymptotic behavior of integrable characters of affine Lie algebras. The exposition is self-contained and includes examples. The book can be used in a graduate-level course on the topic.

Translations of Mathematical Monographs (*Iwanami Series in Modern Mathematics*), Volume 195

December 2000, 304 pages, Softcover, ISBN 0-8218-2654-9, LC 00-045101, 2000 *Mathematics Subject Classification*: 17B62, 17B65, 17B67, 17B69, 81R10, 81T05, 81T40, **All AMS members $39**, List $49, Order code MMONO/195RT101