New Publications Offered by the AMS

To subscribe to email notification of new AMS publications, please go to http://www.ams.org/bookstore-email.

Algebra and Algebraic Geometry

**New Trends in Noncommutative Algebra**

**P. Ara**, University Autonoma de Barcelona, Spain, K. A. Brown, University of Glasgow, United Kingdom, T. H. Lenagan, University of Edinburgh, United Kingdom, E. S. Letzter, Temple University, Philadelphia, PA, J. T. Stafford, University of Manchester, United Kingdom, and J. J. Zhang, University of Washington, Seattle, WA, Editors

This volume contains the proceedings of the conference “New Trends in Noncommutative Algebra”, held at the University of Washington, Seattle, in August 2010, in honor of Ken Goodearl’s 65th birthday.

The articles reflect the wide interests of Goodearl and will provide researchers and graduate students with an indispensable overview of topics of current interest. Specific fields covered include: noncommutative algebraic geometry, representation theory, Calabi-Yau algebras, quantum algebras and deformation quantization, Poisson algebras, growth of algebras, group algebras, and noncommutative Iwasawa algebras.

**Contents:** G. Abrams and K. M. Rangaswamy, Row-finite equivalents exist only for row-countable graphs; K. Ardakov, The controller subgroup of one-sided ideals in completed group rings; J.P. Bell, K. Casteels, and S. Launois, Enumeration of torus-invariant strata with respect to dimension in the big cell of the quantum minuscule Grassmannian of type $B_n$; J. P. Bell, L. W. Small, and A. Smoktunowicz, Primitive algebraic algebras of polynomially bounded growth; D. Chan and C. Ingalls, Conic bundles and Clifford algebras; M. Chlouveraki, I. Gordon, and S. Griffeth, Cell modules and canonical basic sets for Hecke algebras from Cherednik algebras; E. Coskun, R. S. Kulkarni, and Y. Mustopa, On representations of Clifford algebras of ternary cubic forms; D. Goldstein and R. M. Guralnick, Certain subgroups of Weyl groups are split; K. R. Goodearl and T. H. Lenagan, Primitive ideals in quantum $SL_3$ and $GL_3$; B. Huisgen-Zimmermann and K. R. Goodearl, Irreducible components of module varieties; Projective equations and rationality; D. A. Jordan and S.-Q. Oh, Poisson brackets and Poisson spectra in polynomial algebras; L.-Y. Liu, Q.-S. Wu, and C. Zhu, Hopf action on Calabi-Yau algebras; M. Musson, Finitely generated, non-Artinian monolithic modules; D. Rogalski and J. J. Zhang, Regular algebras of dimension 4 with 3 generators; D. Izychev and O. Venjakob, Galois invariants of $K_1$-groups of Iwasawa algebras; M. Yakimov, Strata of prime ideals of the De Concini-Kac-Procesi algebras and Poisson geometry; A. Yekutieli, Twisted deformation quantization of algebraic varieties. \[ \text{Contemporary Mathematics, Volume 562} \]


Analysis

**Invitation to Classical Analysis**

Peter Duren, University of Michigan, Ann Arbor, MI

This book gives a rigorous treatment of selected topics in classical analysis, with many applications and examples. The exposition is at the undergraduate level, building on basic principles of advanced calculus without appeal to more sophisticated techniques of complex analysis and Lebesgue integration.

Among the topics covered are Fourier series and integrals, approximation theory, Stirling’s formula, the gamma function, Bernoulli numbers and polynomials, the Riemann zeta function, Tauberian theorems, elliptic integrals, ramifications of the Cantor set, and a theoretical discussion of differential equations including power series solutions at regular singular points, Bessel functions, hypergeometric functions, and Sturm comparison.
theory. Preliminary chapters offer rapid reviews of basic principles and further background material such as infinite products and commonly applied inequalities.

This book is designed for individual study but can also serve as a text for second-semester courses in advanced calculus. Each chapter concludes with an abundance of exercises. Historical notes discuss the evolution of mathematical ideas and their relevance to physical applications. Special features are capsule scientific biographies of the major players and a gallery of portraits.

Although this book is designed for undergraduate students, others may find it an accessible source of information on classical topics that underlie modern developments in pure and applied mathematics.

Contents: Basic principles; Special sequences; Power series and related topics; Inequalities; Infinite products; Approximation by polynomials; Tauberian theorems; Fourier series; The gamma function; Two topics in number theory; Bernoulli numbers; The Cantor set; Differential equations; Elliptic integrals; Index.

Pure and Applied Undergraduate Texts, Volume 17


Applications

Mathematical Methods in Immunology

Jerome K. Percus, Courant Institute of Mathematics, New York, NY, and Department of Physics, New York University, NY

Any organism, to survive, must use a variety of defense mechanisms. A relatively recent evolutionary development is that of the adaptive immune system, carried to a quite sophisticated level by mammals. The complexity of this system calls for its encapsulation by mathematical models, and this book aims at the associated description and analysis. In the process, it introduces tools that should be in the armory of any current or aspiring applied mathematician, in the context of, arguably, the most effective system nature has devised to protect an organism from its manifold invisible enemies.

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

Contents: The HIV pandemic; Basic facts of immunology; Quantifying the immune response (assays); Modeling humoral immune responses; Modeling cell-mediated response; Control of immune response; Viewpoint of the virus; General references; Index.

Courant Lecture Notes, Volume 23


Differential Equations

Hyperbolic Partial Differential Equations and Geometric Optics

Jeffrey Rauch, University of Michigan, Ann Arbor, MI

This book introduces graduate students and researchers in mathematics and the sciences to the multifaceted subject of the equations of hyperbolic type, which are used, in particular, to describe propagation of waves at finite speed.

Among the topics carefully presented in the book are nonlinear geometric optics, the asymptotic analysis of short wavelength solutions, and nonlinear interaction of such waves. Studied in detail are the damping of waves, resonance, dispersive decay, and solutions to the compressible Euler equations with dense oscillations created by resonant interactions. Many fundamental results are presented for the first time in a textbook format. In addition to dense oscillations, these include the treatment of precise speed of propagation and the existence and stability questions for the three wave interaction equations.

One of the strengths of this book is its careful motivation of ideas and proofs, showing how they evolve from related, simpler cases. This makes the book quite useful to both researchers and graduate students interested in hyperbolic partial differential equations. Numerous exercises encourage active participation of the reader.

The author is a professor of mathematics at the University of Michigan. A recognized expert in partial differential equations, he has made important contributions to the transformation of three areas of hyperbolic partial differential equations: nonlinear microlocal analysis, the control of waves, and nonlinear geometric optics.

Contents: Simple examples of propagation; The linear Cauchy problem; Dispersive behavior; Linear elliptic geometric optics; Linear hyperbolic geometric optics; The nonlinear Cauchy problem; One phase nonlinear geometric optics; Stability for one phase nonlinear geometric optics; Resonant interaction and quasilinear systems; Examples of resonance in one dimensional space; Dense oscillations for the compressible Euler equations; Bibliography; Index.

Graduate Studies in Mathematics, Volume 133


458 Notices of the AMS Volume 59, Number 3
Fifth International Congress of Chinese Mathematicians

Lizhen Ji, University of Michigan, Ann Arbor, MI; Yat Sun Poon, Tsinghua University, Beijing, China; Lo Yang, Chinese Academy of Sciences, Beijing, China, and Shing-Tung Yau, Harvard University, Cambridge, MA, Editors

This two-part volume represents the proceedings of the Fifth International Congress of Chinese Mathematicians, held at Tsinghua University, Beijing, in December 2010. The Congress brought together eminent Chinese and overseas mathematicians to discuss the latest developments in pure and applied mathematics. Included are 60 papers based on lectures given at the conference.

Titles in this series are co-published with International Press, Cambridge, MA.


AMS/IP Studies in Advanced Mathematics, Volume 51


New AMS-Distributed Publications

Schémas en Groupes (SGA 3)
Volume I (Propriétés Générales des Schémas en Groupes)
Michel Demazure and Alexandre Grothendieck

This volume introduces the language of representable functors and sheaves and proves general results about group schemes (Exp. I to VII) and formal groups (Exp. VII).


Documents Mathématiques, Number 7


Schémas en Groupes (SGA 3)
Volume II (Schémas en Groupes et Réductifs)
Michel Demazure and Alexandre Grothendieck

This volume gives the structure of reductive S-group schemes (Exp. XIX to XXV), and their parabolic subgroups (Exp. XXVI), over an arbitrary base scheme S.

A publication of the Société Mathématique de France, Marseilles (SMF), distributed by the AMS in the U.S., Canada, and Mexico. Orders from other countries should be sent to the SMF. Members of the SMF receive a 30% discount from list.

Contents: Groupes réductifs—Généralités; Groupes réductifs de rang semi-simple 1; Données radicielles; Groupes réductifs: déploiements, sous-groupes, groupes quotients; Groupes réductifs: unicité des groupes épinglés; Automorphismes des groupes réductifs; Le théorème d’existence; Sous-groupes paraboliques des groupes réductifs; Index.

Documents Mathématiques, Number 8


Frobenius Algebras I
Basic Representation Theory
Andrzej Skowroński, Nicolaus Copernicus University, Torun, Poland, and Kunio Yamagata, Tokyo University of Agriculture and Technology, Fuchu, Japan

This is the first of two volumes which will provide a comprehensive introduction to the modern representation theory of Frobenius algebras. The first part of the book serves as a general introduction to basic results and techniques of the modern representation theory of finite dimensional associative algebras over fields, including the Morita theory of equivalences and dualities and the Auslander–Reiten theory of irreducible morphisms and almost split sequences. The second part is devoted to fundamental classical and recent results concerning the Frobenius algebras and their module categories. Moreover, the prominent classes of Frobenius algebras, the Hecke algebras of Coxeter groups, and the finite dimensional Hopf algebras over fields are exhibited. This volume is self contained and the only prerequisite is a basic knowledge of linear algebra. It includes complete proofs of all
results presented and provides a rich supply of examples and exercises.  
The text is primarily addressed to graduate students starting research in the representation theory of algebras as well mathematicians working in other fields.  
A publication of the European Mathematical Society (EMS). Distributed within the Americas by the American Mathematical Society.  

**Contents:** Algebras and modules; Morita theory; Auslander–Reiten theory; Selfinjective algebras; Hecke algebras; Hopf algebras; Bibliography; Index.  

**EMS Textbooks in Mathematics, Volume 12** 

---

**Analysis**

*Decorated Teichmüller Theory*

**Robert C. Penner, Aarhus University, Denmark, and California Institute of Technology, Pasadena, CA**

There is an essentially “tinker-toy” model of a trivial bundle over the classical Teichmüller space of a punctured surface, called the decorated Teichmüller space, where the fiber over a point is the space of all tuples of horocycles, one about each puncture. This model leads to an extension of the classical mapping class groups called the Ptolemy groupoids and to certain matrix models solving related enumerative problems, each of which has proved useful both in mathematics and in theoretical physics. These spaces enjoy several related parametrizations leading to a rich and intricate algebro-geometric structure tied to the already elaborate combinatorial structure of the tinker-toy model. Indeed, the natural coordinates give the prototypical examples not only of cluster algebras but also of tropicalization.

This interplay of combinatorics and coordinates admits further manifestations, for example, in a Lie theory for homeomorphisms of the circle, in the geometry underlying the Gauss product, in profinite and pronilpotent geometry, in the combinatorics underlying conformal and topological quantum field theories, and in the geometry and combinatorics of macromolecules.

This volume gives the story a wider context of these decorated Teichmüller spaces as developed by the author over the last two decades in a series of papers, some of them in collaboration. Sometimes correcting errors or typos, sometimes simplifying proofs, and sometimes articulating more general formulations than the original research papers, this volume is self contained and requires little formal background. Based on a master’s course at Aarhus University, it gives the first treatment of these works in monographic form.

A publication of the European Mathematical Society (EMS). Distributed within the Americas by the American Mathematical Society.

---

**General Interest**

**Séminaire Bourbaki**

**Volume 2009/2010**

Exposés 1012–1026

As in the preceding volumes of this seminar, at which more than one thousand talks have been presented, this volume features fifteen survey lectures on topics of current interest: five lectures about group theory, three about mathematical physics, two related to Langlands’ program, two on algebraic geometry, one about differential geometry, one on clusters algebras, and one about random matrices.

A publication of the Société Mathématique de France, Marseilles (SMF), distributed by the AMS in the U.S., Canada, and Mexico. Orders from other countries should be sent to the SMF. Members of the SMF receive a 30% discount from list.

**Contents:** November 2009: J.-L. Colliot-Thélène, Groupe de Chow des zéro-cycles sur les variétés p-adiques; M. Emerton, p-adic families of modular forms; B. Keller, Algèbres amassées et applications; S. Klainerman, Linear stability of black holes; A. Kupiainen, Ergodicity of two dimensional turbulence; Mars 2010: L. Berger, La correspondance de Langlands locale p-adique pour $\text{GL}_n$; O. Biquard, Métriques kählériennes extrémales sur les surfaces toriques; A. Guionnet, Grandes matricies aléatoires et théorèmes d’universalité; B. Olivier, La classification des groupes p-compacts; B. Rémy, Groupes algébriques pseudo-réductifs et applications; Juin 2010: M. Burger, Fundamental groups of Kähler manifolds and geometric group theory; F. Paulin, Sur les automorphismes de groupes libres et de groupes de surface; S. Serfaty, Lois de conservation et régularité par compensation pour les systemes antisymétriques et les surfaces de Willmore; B. Totaro, The ACC conjecture for log canonical thresholds; J. S. Wilson, Finite index subgroups and verbal subgroups in profinite groups.

**Astérisque, Number 339**