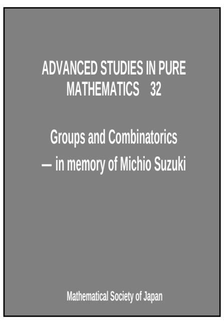
New Publications Offered by the AMS

Algebra and Algebraic Geometry



Groups and Combinatorics—in Memory of Michio Suzuki

Eiichi Bannai, *Kyushu University, Fukuoka, Japan*, **Hiroshi Suzuki**, *International Christian University, Tokyo, Japan*, **Hiroyoshi Yamaki**, *Kumamoto University, Japan*, and **Tomoyuki Yoshida**, *Hokkaido University, Sapporo, Japan*, Editors

A publication of the Mathematical Society of Japan.

In honor of Professor Michio Suzuki's 70th birthday, a conference was held at the International Christian University (Tokyo, Japan). This book presents the proceedings of that conference.

Professor Suzuki had a profound influence on the development of group theory over the last 50 years. It's generally believed that his work in the 1950s ignited work on the classification of finite simple groups, and in the 1960s and 1970s, he was a leader in its development.

Just prior to his death in 1998, Professor Suzuki completed a 150-page manuscript containing his most recent contribution to group theory. This paper, "On the Prime Graph of a Finite Simple Group—an Application of the Method of Feit-Thompson-Bender-Glauberman", is included in this volume. Here, the editors have been meticulous in making minimal corrections to the work in order to honor the writing style and original flow of Professor Suzuki's thoughts. The book also includes contributions from the speakers at the conference, as well as papers from researchers who shared close ties with Professor Suzuki.

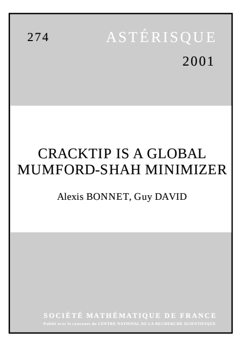
Published for the Mathematical Society of Japan by Kinokuniya, Tokyo, and distributed worldwide, except in Japan, by the AMS.

Contents: K. Harada, Michio Suzuki; **M. Suzuki**, On the prime graph of a finite simple group—an application of the method of Feit-Thompson-Bender-Glauberman; **M. Aschbacher**, a characterization of ${}^2E_6(2)$; **E. Bannai**, **M. Koike**, **A. Munemasa**, and **J. Sekiguchi**, Some results on modular forms—subgroups of the modular group whose ring of modular forms is a polynomial ring; **H. Bender**, Steiner systems and Mathieu groups revisited; **E. C. Dade**, Rationally determined group modules; **W. Feit** and **M. A. Shahabi**, On the lattice of all subgroups of a finite noncyclic simple group; **P. Flavell**, Generation theorems for finite groups; **A. A. Ivanov**, Non-abelian representations of geometries; **M. Kitazume** and **M. Miyamoto**, 3-transposition automorphism groups of VOA; **T. Kondo**, The calculation of the character of moonshine VOA; **S. Koshitani** and **N. Kunugi**, A remark on the Loewy structure for the three dimensional projective special unitary groups in characteristic 3; **J. McKay**, The essentials of monstrous moonshine; **T. Okuyama** and **K. Uno**, On the vertices of modules in the Auslander-Reiten quiver III; **T. Shoji**, Finite Chevalley groups —representations of finite Chevalley groups; **R. Solomon**, The shape of the classification of finite the simple groups; **G. Stroth**, 2F-modules with quadratic offender for the finite simple groups; **F. G. Timmesfeld**, On the structure of special rank one groups; **Y. Usami**, Principal blocks with extra-special defect groups of order 27; **J. Walter**, Bases of chambers of linear Coxeter groups; **A. Watanabe**, The Isaacs character correspondence and isotypies between blocks of finite groups; **H. Yamaki**, Either $71:35$ or $L_2(71)$ is a maximal subgroup of the monster; **S. Yoshiara**, Radical subgroups of the sporadic simple group of Suzuki; **T. Yoshida**, $|\mathrm{Hom}(A,G)|$ (III).

Advanced Studies in Pure Mathematics, Volume 32

November 2001, 474 pages, Hardcover, ISBN 4-931469-15-9, 2000 *Mathematics Subject Classification*: 20Dxx, 20Exx, 05Exx; 20Bxx, 20Cxx, 20Fxx, 20Gxx, **Individual member $74**, List $105, Institutional member $84, Order code ASPM/32N

Analysis



Cracktip is a Global Mumford-Shah Minimizer

Alexis Bonnet, *Goldman Sachs, London, England*, and **Guy David**, *Université de Paris-Sud, Orsay, France*

A publication of the Société Mathématique de France.

In this book, the authors show that the pair (u,K) given by $K=(-\infty,0]\subset\mathbb{R}^2$ and $u(r\cos\theta,r\sin\theta)=\sqrt{2/\pi}\,r^{1/2}\sin(\theta/2)$ for $r>0$ and $-\pi<\theta<\pi$ is a global Mumford-Shah minimizer. This means that if $\widetilde{K}$ is another closed set in the plane with locally finite Hausdorff measure, $\widetilde{u}$ is a function on $\mathbb{R}^2\setminus\widetilde{K}$ with a derivative in $L^2_{\mathrm{loc}}(\mathbb{R}^2\setminus\widetilde{K})$, and the pair $(\widetilde{u},\widetilde{K})$ coincides with (u,K) outside some disk B, then $H^1(K\cap B)+\int_{B\setminus K}|\nabla u|^2\le H^1(\widetilde{K}\cap B)+\int_{B\setminus G}|\nabla\widetilde{u}|^2$, where H^1 denotes Hausdorff measure.

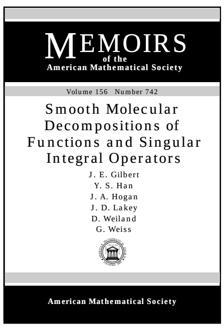
The authors also show that every global Mumford-Shah minimizer (u', K') that is sufficiently close to (u, K) near infinity must be equivalent to it. This is the case, for instance, if some blow-in limit of (u', K') equals (u, K).

The proofs are based on a detailed study of the harmonic function v' conjugated to u', and its level sets. Also used are blow-up techniques and the monotonicity of an energy integral.

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

Astérisque, Number 274

October 2001, 259 pages, ISBN 2-85629-108-2, 2000 *Mathematics Subject Classification*: 49K99, 49Q20, **Individual member $59**, List $66, Order code AST/274N



Smooth Molecular Decompositions of Functions and Singular Integral Operators

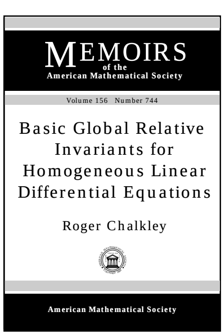
J. E. Gilbert, *University of Texas, Austin,* **Y. S. Han**, *Auburn University, AL*, **J. A. Hogan**, *University of Arkansas, Fayetteville,* **J. D. Lakey**, *New Mexico State University, Las Cruces,* **D. Weiland**, *Austin, TX*, and **G. Weiss**, *Washington University, St. Louis, MO*

Contents: Main results; Molecular decompositions of operators; Frames; Maximal theorems and equi-convergence; Appendix. Proof of basic estimates.

Memoirs of the American Mathematical Society, Volume 156, Number 742

March 2002, 74 pages, Softcover, ISBN 0-8218-2772-3, LC 2001056088, 2000 *Mathematics Subject Classification*: 42B20, 42C15, 42C40, **Individual member $28**, List $46, Institutional member $37, Order code MEMO/156/742N

Differential Equations



Basic Global Relative Invariants for Homogeneous Linear Differential Equations

Roger Chalkley, *University of Cincinnatti, Cincinnati, OH*

Contents: Introduction; Some problems of historical importance; Illustrations for some results in chapters 1 and 2; $\boldsymbol{L}_n$ and $\boldsymbol{I}_{n,i}$ as semi-invariants of the first kind; $\boldsymbol{V}_n$ and $\boldsymbol{J}_{n,i}$ as semi-invariants of the second kind; The coefficients of transformed equations; Formulas that involve $L_n(z)$ or $I_{n,n}(z)$; Formulas that involve $V_n(z)$ or $J_{n,n}(z)$; Verification of $\boldsymbol{I}_{n,n} \equiv \boldsymbol{J}_{n,n}$ and various observations; The local constructions of earlier research; Relations for $\boldsymbol{G}_i$, $\boldsymbol{H}_i$, and $\boldsymbol{L}_i$ that yield equivalent formulas for basic relative invariants; Real-valued functions of a real variable; A constructive method for imposing conditions on Laguerre-Forsyth canonical forms; Additional formulas for $\boldsymbol{K}_{i,j}$, $\boldsymbol{U}_{i,j}$, $\boldsymbol{A}_{i,j}$, $\boldsymbol{D}_{i,j}, \ldots$; Three canonical forms are now available; Interesting problems that require further study; Appendix A. Results needed for self-containment; Appendix B. Related studies for a class of nonlinear equations; Appendix C. Polynomials that are linear in a key variable; Appendix D. Rational semi-invariants and relative invariants; Appendix E. Generating additional relative invariants; Bibliography; Index.

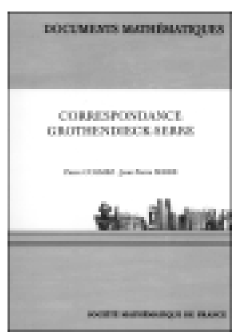
Memoirs of the American Mathematical Society, Volume 156, Number 744

March 2002, 204 pages, Softcover, ISBN 0-8218-2781-2, LC 2001056090, 2000 *Mathematics Subject Classification*: 34A30; 34M15, **Individual member $35**, List $58, Institutional member $46, Order code MEMO/156/744N

General and Interdisciplinary

New Series!

Documents Mathématiques is published by the Sociéte Mathématique de France and distributed in North America by the AMS. Books in this series include mathematical texts of historical interest. Published are new editions of seminar talks or books out of print, original correspondence, lectures, and complete works of well-known researchers.



Correspondance Grothendieck-Serre

Pierre Colmez and **Jean-Pierre Serre**, Editors

A publication of the Société Mathématique de France.

Alexandre Grothendieck and Jean-Pierre Serre are two dominant figures in the development of algebraic geometry in the middle of the twentieth century. Serre's FAC and GAGA papers and Grothendieck's use of schemes completely changed the way people did algebraic geometry.

This remarkable volume contains a large part of the mathematical correspondence between A. Grothendieck and J.-P. Serre. This correspondence forms a vivid introduction to the study of algebraic geometry during the years 1955–1965. For example, readers will discover the genesis of some of Grothendieck's ideas on Sheaf cohomology, schemes, Riemann-Roch, the fundamental group, motives, and more. They also will get an idea of the mathematical athomsphere of this time (Bourbaki, seminars in Paris, Harvard, Princeton, war in Algeria, etc.). This is a remarkable book.

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

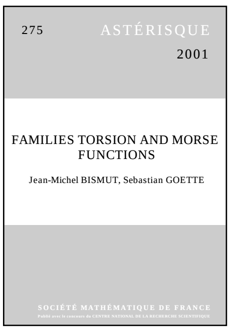
Distributed by the AMS in the United States, Canada, and Mexico. Orders from other countries should be sent to the SMF, Maison de la SMF, B.P. 67, 13274 Marseille cedex 09, France, or to Institut Henri Poincaré, 11 rue Pierre et Marie Curie, 75231 Paris cedex 05, France. Members of the SMF receive a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

Contents: Correspondence; Notes; Références; Index.

Number 2

July 2001, 288 pages, Hardcover, ISBN 2-85629-104-X, 2000 *Mathematics Subject Classification*: 11–XX, 14–XX, **Individual member $50**, List $55, Order code SMFDM/2N

Geometry and Topology



Families Torsion and Morse Functions

Jean-Michel Bismut, *Université Paris-Sud, Orsay, France*, and **Sebastian Goette**, *Universität Tübingen, Germay*

A publication of the Société Mathématique de France.

To a flat vector bundle, one can associate odd real characteristic classes. Bismut and Lott have proved a Riemann-Roch-Grothendieck theorem for such classes, when taking the direct image of a flat vector bundle by a proper submersion. They have also constructed associated secondary invariants, the analytic torsion forms in de Rham theory. The component of degree 0 of these forms is the classical Ray-Singer torsion.

The present paper has five purposes:

- to extend the theory of analytic torsion forms to the equivariant setting
- to give a proper normalization of these torsion forms
- to prove rigidity formulas, showing that in positive degree, and up to locally computable terms, these forms are rigid under deformation of the flat connection
- to evaluate the equivariant analytic torsion forms modulo coboundaries, under the assumption that there exists a fiberwise gradient vector field which verifies the Morse-Smale transversality conditions in every fiber
- to compute the equivariant analytic torsion forms of sphere bundles associated to vector bundles.

The main formula generalizes the results of Cheeger, Müller, Lott-Rothenberg and Bismut-Zhang on the relation of Ray-Singer torsion to Reidemeister torsion, and also computations by Bunke for sphere bundles.

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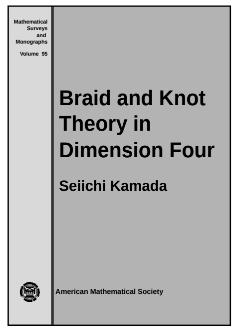
Contents: Introduction; Flat superconnections and equivariant torsion forms; Rigidity of torsion forms and their Chern normalization; Analytic torsion forms: rigidity and the Chern character; The analytic torsion forms of a $\mathbf{Z}_2$-graded vector bundle; A family of Thom-Smale gradient vector fields; Fibrations, Berezin integrals and Euler currents; Analytic torsion forms and Morse-Smale vector fields; A contour integral; A proof of the main result; Generalized metrics: a first proof of Theorem 9.8; Fibrewise nice functions: a second proof of Theorem 9.8; An asymptotic expansion for $\mathrm{Tr_s}[fgh'(D_{t,T})]$ as $T \to +\infty$; The asymptotics of $\mathrm{Tr_s}[fgh'(D_{t,T/\sqrt{t}})]$ as $t \to 0$; The asymptotics of $\mathrm{Tr_s}[fgh'(D_{t,T/t})]$ as $t \to 0$; The asymptotics of $\mathrm{Tr_s}[fgh'(D_{t,T/t})]$ as $T \to +\infty$; The analytic torsion forms of unit sphere bundles; Bibliography; Index.

Number 275

November 2001, 293 pages, ISBN 2-85629-109-0, 2000 *Mathematics Subject Classification*: 37D15, 57R20, 58–XX, **Individual member $69**, List $77, Order code AST/275N

Supplementary Reading



Braid and Knot Theory in Dimension Four

Seiichi Kamada, *Osaka City University, Japan*

Braid theory and knot theory are related via two famous results due to Alexander and Markov. Alexander's theorem states that any knot or link can be put into braid form. Markov's theorem gives necessary and sufficient conditions to conclude that two braids represent the same knot or link. Thus, one can use braid theory to study knot theory and vice versa.

In this book, the author generalizes braid theory to dimension four. He develops the theory of surface braids and applies it to study surface links. In particular, the generalized Alexander and Markov theorems in dimension four are given. This book is the first to contain a complete proof of the generalized Markov theorem.

Surface links are studied via the motion picture method, and some important techniques of this method are studied. For surface braids, various methods to describe them are introduced and developed: the motion picture method, the chart description, the braid monodromy, and the braid system. These tools are fundamental to understanding and computing invariants of surface braids and surface links.

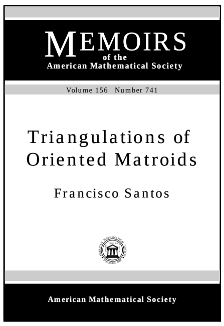
Included is a table of knotted surfaces with a computation of Alexander polynomials. Braid techniques are extended to represent link homotopy classes. The book is geared toward a wide audience, from graduate students to specialists. It would make a suitable text for a graduate course and a valuable resource for researchers.

Contents: Basic notions and notation; *Classical braids and links:* Braids; Braid automorphisms; Classical links; Braid presentation of links; Deformation chain and Markov's theorem; *Surface knots and links:* Surface links; Surface link diagrams; Motion pictures; Normal forms of surface links; Examples (Spinning); Ribbon surface links; Presentations of surface link groups; *Surface braids:* Branched coverings; Surface braids; Products of surface braids; Braided surfaces; Braid monodromy; Chart descriptions; Non-simple surface braids; 1-handle surgery on surface braids; *Braid presentation of surface links:* The normal braid presentation; Braiding ribbon surface links; Alexander's theorem in dimension four; Split union and connected sum; Markov's theorem in dimension four; Proof of Markov's theorem in dimension four;

Surface braids and surface links: Knot groups; Unknotted surface braids and surface links; Ribbon surface braids and surface links; 3-braid 2-knots; Unknotting surface braids and surface links; Seifert algorithm for surface braids; Basic symmetries in chart descriptions; Singular surface braids and surface links; Bibliography; Index.

Mathematical Surveys and Monographs, Volume 95

April 2002, 305 pages, Hardcover, ISBN 0-8218-2969-6, 2000 *Mathematics Subject Classification*: 57Q45; 20F36, 57M05, 57M12, 57M25, 57Q35, **Individual member $47**, List $79, Institutional member $63, Order code SURV/95N



Triangulations of Oriented Matroids

Francisco Santos, *University of Cantabria, Santander, Spain*

Contents: Introduction; Preliminaries on oriented matroids; Triangulations of oriented matroids; Duality between triangulations and extensions; Subdivisions of Lawrence polytopes; Lifting triangulations; Bibliography.

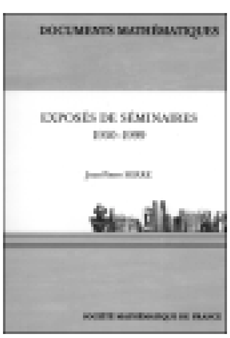
Memoirs of the American Mathematical Society, Volume 156, Number 741

March 2002, 80 pages, Softcover, ISBN 0-8218-2769-3, LC 2001056087, 2000 *Mathematics Subject Classification*: 52C40; 52B11, 52B35, **Individual member $28**, List $46, Institutional member $37, Order code MEMO/156/741N

Number Theory

New Series!

Documents Mathématiques is published by the Société Mathématique de France and distributed in North America by the AMS. Books in this series include mathematical texts of historical interest. Published are new editions of seminar talks or books out of print, original correspondence, lectures, and complete works of well-known researchers.



Exposés de Séminaires 1950–1999

Jean-Pierre Serre

A publication of the Société Mathématique de France.

Jean-Pierre Serre has made significant contributions to several areas of mathematics, in particular to topology, algebraic geometry, and number theory. He is also renowned for his remarkable expository skill.

This volume gathers seminar talks he gave between 1950 and 1999 in various seminars: Bourbaki, Cartan, Chevalley, and Delange-Pisot-Poitou. The themes extend from algebraic topology to number theory, covering also Lie group theory, algebraic geometry and modular forms. It gives both a presentation of works by other mathematicians (Borel, Dwork, etc.) and personal works, such as his talk at the Chevalley seminar on algebraic fibre spaces, which inspired Grothendieck in his construction of étale cohomology. None of these texts is available in the four volumes of J.-P. Serre's *Collected Papers*.

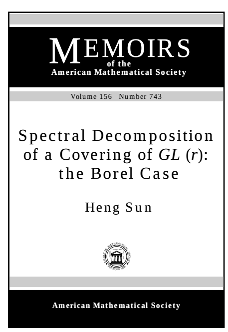
This item will also be of interest to those working in geometry and topology, algebra and algebraic geometry, and general and interdisciplinary areas.

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

Contents: Extensions de groupes localement compacts; Applications algébriques de la cohomologie des groupes I; Applications algébriques de la cohomologie des groupes I: Théorie des algébres simples; Fonctions automorphes d'une variable: application du théorème de Riemann-Roch; Deux théorèmes sur les applications complètement continues; Faisceaux analytiques sur l'espace projectif; Fonctions automorphes; Représentations linéaires et espaces homogènes kähleriens des groupes de Lie compacts; Les espaces $K(\Pi, n)$; Groupes d'homotopie des bouquets de sphères; Espaces fibrés algébriques; Morphismes universels et variétés d'Albanese; Morphismes universels et différentielles de troisième espèce; Rationalité des fonctions ζ des variétés algébriques; Revêtements ramifiés du plan projectif; Groupes finis à cohomologie périodique; Dépendance d'exponentielles p-adiques; Groupes p-divisibles; Points rationnels des courbes modulaires $X_0(N)$; Sous-groupes finis des groupes de Lie; Notes.

Number 1

July 2001, 259 pages, Hardcover, ISBN 2-85629-103-1, 2000 *Mathematics Subject Classification*: 11–XX, 14–XX, 16–XX, 20–XX, 22–XX, **Individual member $50**, List $55, Order code SMFDM/1N



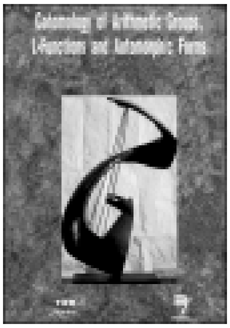
Spectral Decomposition of a Covering of $GL(r)$: the Borel Case

Heng Sun, *University of Toronto, ON, Canada*

Contents: Introduction; Preliminaries; Local intertwining operators; Spectrum associated with the diagonal subgroup; Contour integration (after MW); Bibliography; Index.

Memoirs of the American Mathematical Society, Volume 156, Number 743

March 2002, 63 pages, Softcover, ISBN 0-8218-2775-8, LC 2001056089, 2000 *Mathematics Subject Classification*: 11F70, 11F72; 22D12, **Individual member $25**, List $42, Institutional member $34, Order code MEMO/156/743N



Cohomology of Arithmetic Groups, L-Functions and Automorphic Forms

T. N. Venkataramana, *Tata Institute of Fundamental Research, Mumbai, India*

A publication of the Tata Institute of Fundamental Research.

This collection of papers is based on lectures delivered at the Tata Institute of Fundamental Research (TIFR) as part of a special year on arithmetic groups, L-functions and automorphic forms. The volume opens with an article by Cogdell and Piatetski-Shapiro on Converse Theorems for GL_n and applications to liftings. It ends with some remarks on the Riemann Hypothesis by Ram Murty. Other talks cover topics such as Hecke theory for Jacobi forms, restriction maps and L-values, congruences for Hilbert modular forms, Whittaker models for p-adic $GL(4)$, the Seigel formula, newforms for the Maaß Spezialchar, an algebraic Chebotarev density theorem, a converse theorem for Dirichlet series with poles, Kirillov theory for $GL_2(\mathcal{D})$, and the L^2 Euler characteristic of arithmetic quotients. The present volume is the latest in the Tata Institute's tradition of recognized contributions to number theory.

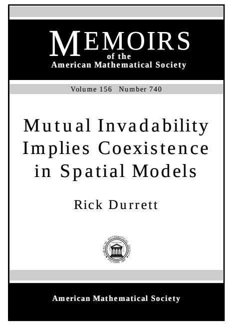
Distributed worldwide except in India, Bangladesh, Bhutan, Maldavis, Nepal, Pakistan, and Sri Lanka.

Contents: Cogdell and **Piatetski-Shapiro**, Converse theorems for GL_n and their application to liftings; **E. Ghate**, Congruences between base-change and non-base-change Hilbert modular forms; **C. Khare**, Restriction maps and L-values; **M. Manickam**, On Hecke theory for Jacobi forms; **A. N. Nair**, The L^2 Euler characteristic of arithmetic quotients; **D. Prasad**, The space of degenerate Whittaker models for GL(4) over p-adic fields; **S. Raghavan**, The Seigel formula and beyond; **R. Raghunathan**, A converse theorem for Dirichlet series with poles; **A. Raghuram**, Kirillov theory for $\mathrm{GL}_2(\mathcal{D})$; **C. S. Rajan**, An algebraic Chebotarev density theorem; **B. Ramakrishnan**, Theory of newforms for the Maaß Spezialschar; **M. R. Murty**, Some remarks on the Riemann hypothesis; **D. Prasad** and **N. Sanat**, On the restriction of cuspidal representations to unipotent elements; **W. Kohnen** and **J. Sengupta**, Nonvanishing of symmetric square L-functions of cusp forms inside the critical strip; **H. H. Kim** and **F. Shahidi**, Symmetric cube for GL_2; **D. S. Thakur**, L-functions and modular forms in finite characteristic; **T. C. Vasudevan**, Automorphic forms for Siegel and Jacobi modular groups; **T. N. Venkataramana**, Restriction maps between cohomology of locally symmetric varieties.

Tata Institute of Fundamental Research

November 2001, 251 pages, Softcover, ISBN 81-7319-421-1, 2000 *Mathematics Subject Classification*: 11M26; 11F06, **All AMS members $26**, List $32, Order code TIFR/4N

Probability



Mutual Invadability Implies Coexistence in Spatial Models

Rick Durrett, *Cornell University, Ithaca, NY*

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

Contents: Introduction; Perturbations of one-dimensional systems; Two-species examples; Lower bounding lemmas for PDE; Perturbations of higher-dimensional systems; Lyapunov functions for two-species Lotka Volterra systems; Three species linear competition models; Three species predator-prey systems; Some asymptotic results for our ODE and PDE; A list of the invadability conditions; References.

Memoirs of the American Mathematical Society, Volume 156, Number 740

March 2002, 118 pages, Softcover, ISBN 0-8218-2768-5, LC 2001056086, 2000 *Mathematics Subject Classification*: 60K35; 34–XX, 35–XX, **Individual member $30**, List $50, Institutional member $40, Order code MEMO/156/740N

Previously Announced Publications

q-Series with Applications to Combinatorics, Number Theory, and Physics

Bruce C. Berndt, *University of Illinois, Urbana,* and **Ken Ono**, *University of Wisconsin, Madison, WI*, Editors

The subject of q-series can be said to begin with Euler and his pentagonal number theorem. In fact, q-series are sometimes called Eulerian series. Contributions were made by Gauss, Jacobi, and Cauchy, but the first attempt at a systematic development, especially from the point of view of studying series with the products in the summands, was made by E. Heine in 1847. In the latter part of the nineteenth and in the early part of the twentieth centuries, two English mathematicians, L. J. Rogers and F. H. Jackson, made fundamental contributions.

In 1940, G. H. Hardy described what we now call Ramanujan's famous ${}_1\psi_1$ summation theorem as "a remarkable formula with many parameters." This is now one of the fundamental theorems of the subject.

Despite humble beginnings, the subject of q-series has flourished in the past three decades, particularly with its applications to combinatorics, number theory, and physics. During the year 2000, the University of Illinois embraced *The Millennial Year in Number Theory.* One of the events that year was the conference q-Series with Applications to Combinatorics, Number Theory, and Physics. This event gathered mathematicians from the world over to lecture and discuss their research.

This volume presents nineteen of the papers presented at the conference. The excellent lectures that are included chart pathways into the future and survey the numerous applications of q-series to combinatorics, number theory, and physics.

Contributors include: B. C. Berndt and K. Ono.

Contemporary Mathematics, Volume 291

December 2001, 277 pages, Softcover, ISBN 0-8218-2746-4, LC 2001053662, 2000 *Mathematics Subject Classification*: 05Axx, 05Exx, 11Exx, 11Fxx, 11Mxx, 11Pxx, 33Dxx, 33Exx, 81Rxx, 82Bxx, **Individual member $41**, List $69, Institutional member $55, Order code CONM/291RT203

The Regulators of Beilinson and Borel

José I. Burgos Gil, *Universidad de Barcelona, Spain*

This book contains a complete proof of the fact that Borel's regulator map is twice Beilinson's regulator map. The strategy of the proof follows the argument sketched in Beilinson's original paper and relies on very similar descriptions of the Chern-Weil morphisms and the van Est isomorphism.

The book has two different parts. The first one reviews the material from algebraic topology and Lie group theory needed for the comparison theorem. Topics such as simplicial objects, Hopf algebras, characteristic classes, the Weil algebra, Bott's Periodicity theorem, Lie algebra cohomology, continuous group cohomology and the van Est Theorem are discussed.

The second part contains the comparison theorem and the specific material needed in its proof, such as explicit descriptions of the Chern-Weil morphism and the van Est isomorphisms, a discussion about small cosimplicial algebras, and a comparison of different definitions of Borel's regulator.

CRM Monograph Series, Volume 15

January 2002, approximately 120 pages, Hardcover, ISBN 0-8218-2630-1, LC 2001053829, 2000 *Mathematics Subject Classification*: 19F27; 14G10, **Individual member $20**, List $34, Institutional member $27, Order code CRMM/15RT203

Knots, Braids, and Mapping Class Groups—Papers Dedicated to Joan S. Birman

Jane Gilman, *Rutgers University, Newark, NJ*, **William W. Menasco**, *State University of New York, Buffalo,* and **Xiao-Song Lin**, *University of California, Riverside,* Editors

There are a number of specialties in low-dimensional topology that can find in their "family tree" a common ancestry in the theory of surface mappings. These include knot theory as studied through the use of braid representations and 3-manifolds as studied through the use of Heegaard splittings. The study of the surface mapping class group (the modular group) is of course a rich subject in its own right, with relations to many different fields of mathematics and theoretical physics. But its most direct and remarkable manifestation is probably in the vast area of low-dimensional topology. Although the scene of this area has been changed dramatically and experienced significant expansion since the original publication of Professor Joan Birman's seminal work, *Braids, Links, and Mapping Class Groups* (Princeton University Press), she brought together mathematicians whose research span many specialties, all of common lineage.

The topics covered are quite diverse. Yet they reflect well the aim and spirit of the conference: to explore how these various specialties in low-dimensional topology have diverged in the past 20–25 years, as well as to explore common threads and potential future directions of development. This volume is dedicated to Joan Birman by her colleagues with deep admiration and appreciation of her contribution to low-dimensional topology.

Contributors include: J. Cantarella, D. DeTurck, H. Gluck, O. T. Dasbach, B. S. Mangum, R. Ghrist, J. Gilman, S. P. Humphries, O. Kharlampovich, A. Myasnikov, M. E. Kidwell, T. B. Stanford, W. Li, X.-S. Lin, Z. Wang, F. Luo, W. W. Menasco, J. H. Przytycki, T. Stanford, and R. Trapp.

AMS/IP Studies in Advanced Mathematics, Volume 24

January 2002, 176 pages, Softcover, ISBN 0-8218-2966-1, LC 2001053661, 2000 *Mathematics Subject Classification*: 42C40, **All AMS members $28**, List $35, Order code AMSIP/24RT203

Boundary Cohomology of Shimura Varieties, III: Coherent Cohomology on Higher-Rank Boundary Strata and Applications to Hodge Theory

Michael Harris, *Université Paris, France*, and **Steven Zucker**, *Johns Hopkins University, Baltimore, Maryland*

A publication of the Société Mathématique de France.

In this book, the authors complete the verification of the following fact: The nerve spectral sequence for the cohomology of the Borel-Serre boundary of a Shimura variety Sh is a spectral sequence of mixed Hodge-de Rham structures over the field of definition of its canonical model. To achieve that, they develop the machinery of automorphic vector bundles on *mixed* Shimura varieties, for the latter enter in the boundary of the toroidal compactifications of Sh; and study the nerve spectral sequence for the automorphic vector bundles and the toroidal boundary. They also extend the technique of averting issues of base-change by taking cohomology with growth conditions. They give and apply formulas for the Hodge gradation of the cohomology of both Sh and its Borel-Serre boundary.

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

Mémoires de la Société Mathématique de France, Number 85

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Entire Functions in Modern Analysis
Boris Levin Memorial Conference

Yuri Lyubich, *Technion-Israel Institute of Technology, Haifa, Israel*, **Vitali Milman**, *Tel Aviv University, Israel*, **Iossif Ostrovskii**, *Bilkent University, Ankara, Turkey*, **Mikhail Sodin**, *Tel Aviv University, Ramat-Aviv, Israel*, **Vadim Tkachenko**, *Ben Gurion University of the Negev, Beer-Sheva, Israel*, and **Lawrence Zalcman**, *Bar Ilan University, Ramat Gan, Israel*, Editors

A publication of the Bar-Ilan University.

This volume presents the proceedings from the conference, "Entire Functions in Modern Analysis" held at Tel-Aviv University (Ramat-Aviv, Israel) in memory of Professor Boris Levin, an outstanding mathematician and a brilliant teacher whose mathematical activity spanned over 60 years. Levin's scientific interests lay principally in the theory of analytic functions and its applications to harmonic analysis, functional analysis, and operator theory. His ideas and results in this area, as expressed both through his personal influence and his papers and books, have influenced several generations of mathematicians.

Contributors include: A. Aleman, H. Hedenmalm, S. Richter, C. Sundberg, N. Arakelian, A. Hakobian, V. Azarin, D. Drasin, G. Belitskii, E. Dyn'kin, V. Tkachenko, R. Brooks, E. Makover, A. Brudnyi, S. Yu. Favorov, A. Yu. Rashkovskii, L. I. Ronkin, B. Freydin, A. Fryntov, J. Rossi, M. Girnyk, A. Goldberg, A. F. Grishin, T. I. Malyutina, V. P. Havin, A. H. Nersessian, O. M. Katkova, A. M. Vishnyakova, B. N. Khabibullin, S. L. Krushkal, Y. Lyubarskii, K. Seip, V. Matsaev, M. Sodin, V. V. Napalkov, Jr., R. S. Youlmukhametov, M. Novitskii, Yu. Safarov, A. Olevskiĭ, I. V. Ostrovskii, R. Rocha-Chávez, M. Shapiro, N. Roytvarf, N. Skiba, V. Zahariuta, and A. Ulanovskii.

Israel Mathematical Conference Proceedings, Volume 15

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Taniguchi Conference on Mathematics Nara 1998

Masaki Maruyama, *Kyoto University, Japan*, and **Toshikazu Sunada**, *Tohoku University, Japan*, Editors

A publication of the Mathematical Society of Japan.

In 1929, Mr. Toyosaburo Taniguchi established the Taniguchi Foundation with the goal of promoting research in the basic sciences in Japan and to engender mutual understanding on an international level via the exchange of ideas and research. In 1956, he instituted a division for mathematics within the Foundation and sponsored the first summer seminar. Since that time, the seminar has been held each year on various mathematical topics.

In 1974, Mr. Taniguchi promoted and sponsored an International Symposium in various fields of science on a smaller scale. His aim was to raise the level of scientific thought and research, while providing a forum where promising young scholars the world over could gather informally to exchange thoughts and to contribute their knowledge. These gatherings were held until 1999.

This volume is a collection of the research manuscripts written by the invited speakers at the final conference set up by the Taniguchi Foundation, the Taniguchi Conference on Mathematics 1998, held in Nara, Japan. The conference was aimed at gathering all previous participants of Taniguchi Symposia. The subject areas were chosen to include all important and active fields of mathematics. Hence the topics in this volume are quite diverse. The contributors are world-class mathematicians who are generally reporting on subjects for which they are well known. For example, contributions include R. E. Borcherds on vertex algebras, M. Kontsevich on noncommutative algebraic manifolds, P.-L. Lions on fluid mechnics, M. Kashiwara on micro-localization, J. Kollár on the topology of algebraic varieties, S. Mori on rational curves in algebraic varieties, and others.

Published for the Mathematical Society of Japan by Kinokuniya, Tokyo, and distributed worldwide, except in Japan, by the AMS.

Contributors include: H. Arai, R. E. Borcherds, K. Fukaya, K. Ono, M.-H. Giga, Y. Giga, R. Kobayashi, J. Kollár, S. Kusuoka, G. Lusztig, P. Malliavin, S. Mochizuki, A. Ocneanu, and S. R. S. Varadhan.

Advanced Studies in Pure Mathematics, Volume 31

July 2001, 286 pages, Hardcover, ISBN 4-931469-13-2, 2000 *Mathematics Subject Classification*: 00B20; 11G99, 11R99, 11F99, 14A22, 20C99, 35J99, 46L99, 53C99, 60G99, 81Q99, **Individual member $46**, List $66, Institutional member $53, Order code ASPM/31RT203

Proceedings on Moonshine and Related Topics

John McKay, *Concordia University, Montreal, PQ, Canada*, and **Abdellah Sebbar**, *University of Ottawa, ON, Canada*, Editors

This volume contains the proceedings of the Moonshine workshop held at the Centre de Recherches Mathématiques (CRM) in Montréal. A glance at the contents will reveal that the connection of some papers to Moonshine is not immediate; however, Moonshine has proved to be a very fertile area, and it does not stretch the imagination to believe that many more threads will be drawn together before we understand what is really going on.

In this volume, all the classical Moonshine themes are presented, namely the Monster simple group and other finite groups, automorphic functions and forms and related congruence groups, and vertex algebras and their representations. These topics appear in either a pure form or in a blend of algebraic geometry dealing with algebraic surfaces, Picard-Fuchs equations, and hypergeometric functions.

Contributors include: A. Baker, H. Tamanoi, C. Dong, G. Mason, C. F. Doran, G. Glauberman, S. P. Norton, K. Harada, M. L. Lang, W. L. Hoyt, C. F. Schwartz, M. Kaneko, N. Todaka, C. H. Lam, H. Li, J. McKay, A. Sebbar, M. Miyamoto, N. Narumiya, H. Shiga, S. Norton, Y. Ohyama, K. Saito, C. S. Simons, M. P. Tuite, and H. Verrill.

CRM Proceedings & Lecture Notes, Volume 30

January 2002, 268 pages, Softcover, ISBN 0-8218-2879-7, LC 2001055232, 2000 *Mathematics Subject Classification*: 20D08, 11F03, **Individual member $43**, List $71, Institutional member $57, Order code CRMP/30RT203

Invariant Theory of Finite Groups

Mara D. Neusel, *University of Notre Dame, IN*, and
Larry Smith, *Mathemtatisches Institut, Göttingen, Germany*

The questions that have been at the center of invariant theory since the 19th century have revolved around the following themes: finiteness, computation, and special classes of invariants. This book begins with a survey of many concrete examples chosen from these themes in the algebraic, homological, and combinatorial context. In further chapters, the authors pick one or the other of these questions as a departure point and present the known answers, open problems, and methods and tools needed to obtain these answers. Chapter 2 deals with algebraic finiteness. Chapter 3 deals with combinatorial finiteness. Chapter 4 presents Noetherian finiteness. Chapter 5 addresses homological finiteness. Chapter 6 presents special classes of invariants, which deal with modular invariant theory and its particular problems and features. Chapter 7 collects results for special classes of invariants and coinvariants such as (pseudo) reflection groups and representations of low degree. If the ground field is finite, additional problems appear and are compensated for in part by the emergence of new tools. One of these is the Steenrod algebra, which the authors introduce in Chapter 8 to solve the inverse invariant theory problem, around which the authors have organized the last three chapters.

The book contains numerous examples to illustrate the theory, often of more than passing interest, and an appendix on commutative graded algebra, which provides some of the required basic background. There is an extensive reference list to provide the reader with orientation to the vast literature.

Mathematical Surveys and Monographs, Volume 94

January 2002, 371 pages, Hardcover, ISBN 0-8218-2916-5, LC 2001053841, 2000 *Mathematics Subject Classification*: 13A50, 55S10, **Individual member $49**, List $81, Institutional member $65, Order code SURV/94RT203

Theorie d'Iwasawa des Representations p-Adiques Semi-Stables

Bernadette Perrin-Riou, *Université Paris-Sud, Orsay, France*

A publication of the Société Mathématique de France.

Let F be a finite unramified extension of $\mathbb{Q}_p$ and V a p-adic galois semi-stable representation on F of dimension d. The author develops Iwasawa theory for V and the $\mathbb{Z}_p$-cyclotomic extension: she constructs a logarithm (regulator map) from the Iwasawa module associated to the Galois cohomology of V in a very explicit module on an algebra generated by analytic functions on the annulus $\{p^{-1/(p-1)} < |x| < 1\}$ and $\log x$.

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Mémoires de la Société Mathématique de France, Number 84

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