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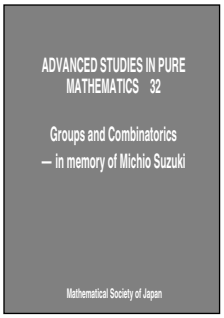
Algebra and Algebraic Geometry



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.

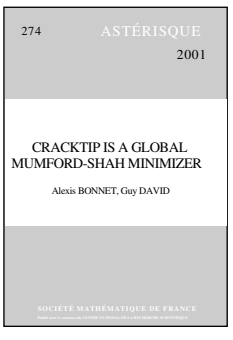
Published for the Mathematical Society of Japan by Kinokuniya, Tokyo, and distributed worldwide, except in Japan, by the AMS.

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 $\tilde{K}$ is another closed set in the plane with locally finite Hausdorff measure, $\tilde{u}$ is a function on $\mathbb{R}^2\setminus\tilde{K}$ with a derivative in $L^2_{\mathrm{loc}}(\mathbb{R}^2\setminus\tilde{K})$, and the pair $(\tilde{u},\tilde{K})$ coincides with (u,K) outside some disk B, then $H^1(K\cap B)+\int_{B\setminus K}|\nabla u|^2\le H^1(\tilde{K}\cap B)+\int_{B\setminus G}|\nabla\tilde{u}|^2$, where H^1 denotes Hausdorff measure.

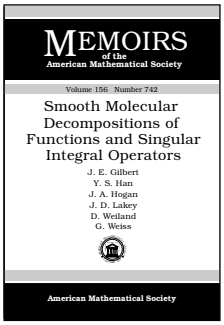
The authors also show that every global Mumford-Shah minimizer (u', K') that is sufficiently close to (u, K) near infinity must be equivalent to it. This is the case, for instance, if some blow-in limit of (u', K') equals (u, K).

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

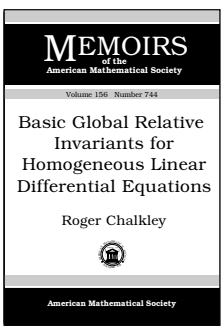
J. E. Gilbert, *University of Texas, Austin,* **Y. S. Han**, *Auburn University, AL*, **J. A. Hogan**, *University of Arkansas, Fayetteville,* **J. D. Lakey**, *New Mexico State University, Las Cruces,* **D. Weiland**, *Austin, TX*, and **G. Weiss**, *Washington University, St. Louis, MO*

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

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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.