

Cambridge University Press

0521537401 - Groups St Andrews 2001 in Oxford, Volume II

Edited by C. M. Campbell, E. F. Robertson and G. C. Smith

Frontmatter

[More information](#)

LONDON MATHEMATICAL SOCIETY LECTURE NOTE SERIES

Managing Editor: Professor N.J. Hitchin, Mathematical Institute,
University of Oxford, 24–29 St Giles, Oxford OX1 3LB, United Kingdom

The titles below are available from booksellers, or, in case of difficulty, from Cambridge University Press at www.cambridge.org.

- 159 Groups St Andrews 1989 volume 1, C.M. CAMPBELL & E.F. ROBERTSON (eds)
 160 Groups St Andrews 1989 volume 2, C.M. CAMPBELL & E.F. ROBERTSON (eds)
 161 Lectures on block theory, BURKHARD KÜLSHAMMER
 163 Topics in varieties of group representations, S.M. VOVSİ
 164 Quasi-symmetric designs, M.S. SHRIKANDÉ & S.S. SANE
 166 Surveys in combinatorics, 1991, A.D. KEEDWELL (ed)
 168 Representations of algebras, H. TACHIKAWA & S. BRENNER (eds)
 169 Boolean function complexity, M.S. PATERSON (ed)
 170 Manifolds with singularities and the Adams-Novikov spectral sequence, B. BOTVINNIK
 171 Squares, A.R. RAJWADE
 172 Algebraic varieties, GEORGE R. KEMPF
 173 Discrete groups and geometry, W.J. HARVEY & C. MACLACHLAN (eds)
 174 Lectures on mechanics, J.E. MARSDEN
 175 Adams memorial symposium on algebraic topology 1, N. RAY & G. WALKER (eds)
 176 Adams memorial symposium on algebraic topology 2, N. RAY & G. WALKER (eds)
 177 Applications of categories in computer science, M. FOURMAN, P. JOHNSTONE & A. PITTS (eds)
 178 Lower K- and L-theory, A. RANICKI
 179 Complex projective geometry, G. ELLINGSRUD *et al*
 180 Lectures on ergodic theory and Pesin theory on compact manifolds, M. POLLICOTT
 181 Geometric group theory I, G.A. NIBLO & M.A. ROLLER (eds)
 182 Geometric group theory II, G.A. NIBLO & M.A. ROLLER (eds)
 183 Shintani zeta functions, A. YUKIE
 184 Arithmetical functions, W. SCHWARZ & J. SPILKER
 185 Representations of solvable groups, O. MANZ & T.R. WOLF
 186 Complexity: knots, colourings and counting, D.J.A. WELSH
 187 Surveys in combinatorics, 1993, K. WALKER (ed)
 188 Local analysis for the odd order theorem, H. BENDER & G. GLAUBERMAN
 189 Locally presentable and accessible categories, J. ADAMEK & J. ROSICKY
 190 Polynomial invariants of finite groups, D.J. BENSON
 191 Finite geometry and combinatorics, F. DE CLERCK *et al*
 192 Symplectic geometry, D. SALAMON (ed)
 194 Independent random variables and rearrangement invariant spaces, M. BRAVERMAN
 195 Arithmetic of blowup algebras, WOLMER VASCONCELOS
 196 Microlocal analysis for differential operators, A. GRIGIS & J. SJÖSTRAND
 197 Two-dimensional homotopy and combinatorial group theory, C. HOG-ANGELONI *et al*
 198 The algebraic characterization of geometric 4-manifolds, J.A. HILLMAN
 199 Invariant potential theory in the unit ball of C^n , MANFRED STOLL
 200 The Grothendieck theory of dessins d'enfant, L. SCHNEPS (ed)
 201 Singularities, JEAN-PAUL BRASSELET (ed)
 202 The technique of pseudodifferential operators, H.O. CORDES
 203 Hochschild cohomology of von Neumann algebras, A. SINCLAIR & R. SMITH
 204 Combinatorial and geometric group theory, A.J. DUNCAN, N.D. GILBERT & J. HOWIE (eds)
 205 Ergodic theory and its connections with harmonic analysis, K. PETERSEN & I. SALAMA (eds)
 207 Groups of Lie type and their geometries, W.M. KANTOR & L. DI MARTINO (eds)
 208 Vector bundles in algebraic geometry, N.J. HITCHIN, P. NEWSTEAD & W.M. OXBURY (eds)
 209 Arithmetic of diagonal hypersurfaces over finite fields, F.Q. GOUVEA & N. YUI
 210 Hilbert C^* -modules, E.C. LANCE
 211 Groups 93 Galway/St Andrews I, C.M. CAMPBELL *et al* (eds)
 212 Groups 93 Galway/St Andrews II, C.M. CAMPBELL *et al* (eds)
 214 Generalised Euler-Jacobi inversion formula and asymptotics beyond all orders, V. KOWALENKO *et al*
 215 Number theory 1992–93, S. DAVID (ed)
 216 Stochastic partial differential equation, A. ETHERIDGE (ed)
 217 Quadratic forms with applications to algebraic geometry and topology, A. PFISTER
 218 Surveys in combinatorics, 1995, PETER ROWLINSON (ed)
 220 Algebraic set theory, A. JOYAL & I. MOERDIJK
 221 Harmonic approximation, S.J. GARDINER
 222 Advances in linear logic, J.-Y. GIRARD, Y. LAFONT & L. REGNIER (eds)
 223 Analytic semigroups and semilinear initial boundary value problems, KAZUAKITAIRA
 224 Computability, enumerability, unsolvability, S.B. COOPER, T.A. SLAMAN & S.S. WAINER (eds)
 225 A mathematical introduction to string theory, S. ALBEVERIO, J. JOST, S. PAYCHA, S. SCARLATTI
 226 Novikov conjectures, index theorems and rigidity I, S. FERRY, A. RANICKI & J. ROSENBERG (eds)
 227 Novikov conjectures, index theorems and rigidity II, S. FERRY, A. RANICKI & J. ROSENBERG (eds)
 228 Ergodic theory of Z^d actions, M. POLLICOTT & K. SCHMIDT (eds)
 229 Ergodicity for infinite dimensional systems, G. DA PRATO & J. ZABCZYK

Cambridge University Press

0521537401 - Groups St Andrews 2001 in Oxford, Volume II

Edited by C. M. Campbell, E. F. Robertson and G. C. Smith

Frontmatter

[More information](#)

- 230 Prolegomena to a middlebrow arithmetic of curves of genus 2, J.W.S. CASSELS & E.V. FLYNN
- 231 Semigroup theory and its applications, K.H. HOFMANN & M.W. MISLOVE (eds)
- 232 The descriptive set theory of Polish group actions, H. BECKER & A.S. KECHRIS
- 233 Finite fields and applications, S. COHEN & H. NIEDERREITER (eds)
- 234 Introduction to subfactors, V. JONES & V.S. SUNDER
- 235 Number theory 1993–94, S. DAVID (ed)
- 236 The James forest, H. FETTER & B. GAMBOA DE BUEN
- 237 Sieve methods, exponential sums, and their applications in number theory, G.R.H. GREAVES *et al*
- 238 Representation theory and algebraic geometry, A. MARTSINKOVSKY & G. TODOROV (eds)
- 239 Clifford algebras and spinors, P. LOUNESTO
- 240 Stable groups, FRANK. O. WAGNER
- 241 Surveys in combinatorics, 1997, R.A. BAILEY (ed)
- 242 Geometric Galois actions I, L. SCHNEPS & P. LOCHAK (eds)
- 243 Geometric Galois actions II, L. SCHNEPS & P. LOCHAK (eds)
- 244 Model theory of groups and automorphism groups, D. EVANS (ed)
- 245 Geometry, combinatorial designs and related structures, J.W.P. HIRSCHFELD *et al*
- 246 p -Automorphisms of finite p -groups, E.I. KHUKHRO
- 247 Analytic number theory, Y. MOTOHASHI (ed)
- 248 Tame topology and o -minimal structures, LOU VAN DEN DRIES
- 249 The atlas of finite groups: ten years on, ROBERT CURTIS & ROBERT WILSON (eds)
- 250 Characters and blocks of finite groups, G. NAVARRO
- 251 Gröbner bases and applications, B.BUCHBERGER & F. WINKLER (eds)
- 252 Geometry and cohomology in group theory, P. KROPHOLLER, G. NIBLO, R. STÖHR (eds)
- 253 The q -Schur algebra, S. DONKIN
- 254 Galois representations in arithmetic algebraic geometry, A.J. SCHOLL & R.L. TAYLOR (eds)
- 255 Symmetries and integrability of difference equations, P.A. CLARKSON & F.W. NIJHOFF (eds)
- 256 Aspects of Galois theory, HELMUT VÖLKEIN *et al*
- 257 An introduction to noncommutative differential geometry and its physical applications 2ed, J. MADORE
- 258 Sets and proofs, S.B. COOPER & J. TRUSS (eds)
- 259 Models and computability, S.B. COOPER & J. TRUSS (eds)
- 260 Groups St Andrews 1997 in Bath, I, C.M. CAMPBELL *et al*
- 261 Groups St Andrews 1997 in Bath, II, C.M. CAMPBELL *et al*
- 263 Singularity theory, BILL BRUCE & DAVID MOND (eds)
- 264 New trends in algebraic geometry, K. HULEK, F. CATANESE, C. PETERS & M. REID (eds)
- 265 Elliptic curves in cryptography, I. BLAKE, G. SEROUSSI & N. SMART
- 267 Surveys in combinatorics, 1999, J.D. LAMB & D.A. PREECE (eds)
- 268 Spectral asymptotics in the semi-classical limit, M. DIMASSI & J. SJÖSTRAND
- 269 Ergodic theory and topological dynamics, M.B. BEKKA & M. MAYER
- 270 Analysis on Lie Groups, N.T. VAROPOULOS & S. MUSTAPHA
- 271 Singular perturbations of differential operators, S. ALBEVERIO & P. KURASOV
- 272 Character theory for the odd order function, T. PETERFALVI
- 273 Spectral theory and geometry, E.B. DAVIES & Y. SAFAROV (eds)
- 274 The Mandelbrot set, theme and variations, TAN LEI (ed)
- 275 Computational and geometric aspects of modern algebra, M.D. ATKINSON *et al* (eds)
- 276 Singularities of plane curves, E. CASAS-ALVERO
- 277 Descriptive set theory and dynamical systems, M.FOREMAN *et al* (eds)
- 278 Global attractors in abstract parabolic problems, J.W. CHOLEWA & T. DLOTKO
- 279 Topics in symbolic dynamics and applications, F. BLANCHARD, A. MAASS & A. NOGUEIRA (eds)
- 280 Characters and Automorphism Groups of Compact Riemann Surfaces, T. BREUER
- 281 Explicit birational geometry of 3-folds, ALESSIO CORTI & MILES REID (eds)
- 282 Auslander-Buchweitz approximations of equivariant modules, M. HASHIMOTO
- 283 Nonlinear elasticity, R. OGDEN & Y. FU (eds)
- 284 Foundations of computational mathematics, R. DEVORE, A. ISERLES & E. SULI (eds)
- 285 Rational points on curves over finite fields: Theory and Applications, H. NIEDERREITER & C. XING
- 286 Clifford algebras and spinors 2nd edn, P. LOUNESTO
- 287 Topics on Riemann surfaces and Fuchsian groups, E. BUJALANCE, A.F. COSTA & E. MARTINEZ (eds)
- 288 Surveys in combinatorics, 2001, J.W.P. HIRSCHFELD (ed)
- 289 Aspects of Sobolev-type inequalities, L. SALOFF-COSTE
- 290 Quantum groups and Lie theory, A. PRESSLEY
- 291 Tits buildings and the model theory of groups, K. TENT
- 292 A quantum groups primer, S. MAJID
- 293 Second order partial differential equations in Hilbert spaces, G. DA PRATO & J. ZABCZYK
- 294 Introduction to operator space theory, G. PISIER
- 296 Lectures on invariant theory, I. DOLGACHEV
- 297 The homotopy category of simply connected 4-manifolds, H.-J. BAUES
- 298 Higher Operads, higher categories, T. LEINSTER
- 299 Kleinian groups and hyperbolic 3-manifolds, Y. KOMORI, V. MARKOVIC & C. SERIES (eds)
- 300 Introduction to Möbius differential geometry, U. HERTRICH-JEROMIN
- 301 Stable modules and the $D(2)$ -problem, F. E. A. JOHNSON
- 302 Discrete and continuous nonlinear Schrödinger systems, M. ABLOWITZ, B. PRINARI & D. TRUBATCH
- 304 Groups St Andrews 2001 in Oxford v1, C. M. CAMPBELL, E. F. ROBERTSON & G. C. SMITH (eds)
- 305 Groups St Andrews 2001 in Oxford v2, C. M. CAMPBELL, E. F. ROBERTSON & G. C. SMITH (eds)

Cambridge University Press
0521537401 - Groups St Andrews 2001 in Oxford, Volume II
Edited by C. M. Campbell, E. F. Robertson and G. C. Smith
Frontmatter
[More information](#)

London Mathematical Society Lecture Note Series. 305

Groups St Andrews 2001 in Oxford

Volume II

Edited by

C.M. Campbell
University of St Andrews

E.F. Robertson
University of St Andrews

G.C. Smith
University of Bath



CAMBRIDGE
UNIVERSITY PRESS

Cambridge University Press
0521537401 - Groups St Andrews 2001 in Oxford, Volume II
Edited by C. M. Campbell, E. F. Robertson and G. C. Smith
Frontmatter
[More information](#)

PUBLISHED BY THE PRESS SYNDICATE OF THE UNIVERSITY OF CAMBRIDGE
The Pitt Building, Trumpington Street, Cambridge, United Kingdom

CAMBRIDGE UNIVERSITY PRESS
The Edinburgh Building, Cambridge CB2 2RU, UK
40 West 20th Street, New York, NY 10011-4211, USA
477 Williamstown Road, Port Melbourne, VIC 3207, Australia
Ruiz de Alarcón 13, 28014 Madrid, Spain
Dock House, The Waterfront, Cape Town 8001, South Africa
<http://www.cambridge.org>

© Cambridge University Press 2003

This book is in copyright. Subject to statutory exception
and to the provisions of relevant collective licensing agreements,
no reproduction of any part may take place without
the written permission of Cambridge University Press.

First published 2003

Printed in the United Kingdom at the University Press, Cambridge

Typeface Computer Modern 11/13.5 pt. *System* L^AT_EX [TB]

A catalogue record for this book is available from the British Library

Library of Congress Cataloguing in Publication data

ISBN 0 521 53740 1 hardback

Contents of Volume 2

Introduction	xi
Gracefulness, group sequencings and graph factorizations <i>G Kaplan, A Lev & Y Roditty</i>	295
Orbits in finite group actions <i>T M Keller</i>	306
Groups with finitely generated integral homologies <i>D H Kochloukova</i>	332
Invariants of discrete groups, Lie algebras and pro- p groups <i>D H Kochloukova</i>	344
Groups with all non-subnormal subgroups of finite rank <i>L A Kurdachenko & P Soules</i>	366
On some infinite dimensional linear groups <i>L A Kurdachenko & I Y Subbotin</i>	377
Groups and semisymmetric graphs <i>S Lipschutz & Ming-Yao Xu</i>	385
On the covers of finite groups <i>M S Lucido</i>	395
Groupland <i>O Macedońska</i>	400
On maximal nilpotent π -subgroups <i>J Medina</i>	405

vi	CONTENTS: VOLUME 2
Characters of p -groups and Sylow p -subgroups <i>A Moretó</i>	412
On the relation between group theory and loop theory <i>M Niemenmaa</i>	422
Groups and lattices <i>P P Pálffy</i>	428
Finite generalized tetrahedron groups with a cubic relator <i>G Rosenberger, M Scheer & R M Thomas</i>	455
Character degrees of the Sylow p -subgroups of classical groups <i>J Sangroniz</i>	487
Character correspondences and perfect isometries <i>L Sanus</i>	494
The characters of finite projective symplectic group $PSp(4, q)$ <i>M A Shahabi & H Mohtadifar</i>	496
Exponent of finite groups with automorphisms <i>P Shumyatsky</i>	528
Classifying irreducible representations in characteristic zero <i>A Turull</i>	537
Lie methods in group theory <i>M R Vaughan-Lee</i>	547
Chevalley groups of type G_2 as automorphism groups of loops <i>P Vojtěchovský</i>	586

Contents of Volume 1

Introduction	xi
Permutability and subnormality in finite groups <i>M J Alejandro, A Ballester-Bolinches,</i> <i>R Esteban-Romero & M C Pedraza-Aguilera</i>	1
(Pro)-finite and (topologically) locally finite groups with a CC-subgroup <i>Z Arad & W Herfort</i>	6
Table algebras generated by elements of small degrees <i>Z Arad & M Muzychuk</i>	12
Subgroups which are a union of a given number of conjugacy classes <i>A R Ashrafi & H Sahraei</i>	22
Some results on finite factorized groups <i>A Ballester-Bolinches, J Cossey, X Guo</i> <i>& M C Pedraza-Aguilera</i>	27
On nilpotent-like Fitting formations <i>A Ballester-Bolinches, A Martínez-Pastor,</i> <i>M C Pedraza-Aguilera & M D Pérez-Ramos</i>	31
Locally finite groups with $\min-p$ for all primes p <i>A Ballester-Bolinches & T Pedraza</i>	39
Quasi-permutation representations of 2-groups of class 2 with cyclic centre <i>H Behravesht</i>	44

Groups acting on bordered Klein surfaces with maximal symmetry <i>E Bujalance, F J Cirre & P Turbek</i>	50
Breaking points in subgroup lattices <i>G Calugareanu & M Deaconescu</i>	59
Group actions on graphs, maps and surfaces with maximum symmetry <i>M D E Conder</i>	63
On dual pronormal subgroups and Fitting classes <i>A D'Aniello & M D Pérez-Ramos</i>	92
(p, q, r) -generations of the sporadic group O'N <i>M R Darafsheh, A R Ashrafi & G A Moghani</i>	101
Computations with almost-crystallographic groups <i>K Dekimpe & B Eick</i>	110
Random walks on groups: characters and geometry <i>P Diaconis</i>	120
On distances of 2-groups and 3-groups <i>A Drápal</i>	143
Zeta functions of groups: the quest for order versus the flight from ennui <i>M P F du Sautoy</i>	150
Some factorizations involving hypercentrally embedded subgroups in finite soluble groups <i>L M Ezquerro & X Soler-Escrivà</i>	190
Elementary theory of groups <i>B Fine, A M Gaglione, A G Myasnikov, G Rosenberger & D Spellman</i>	197
Andrews-Curtis and Todd-Coxeter proof words <i>G Havas & C Ramsay</i>	232

CONTENTS: VOLUME 1	ix
Short balanced presentations of perfect groups <i>G Havas & C Ramsay</i>	238
Finite p -extensions of free pro- p groups <i>W Herfort & P A Zalesskii</i>	244
Elements and groups of finite length <i>M Herzog, P Longobardi & M Maj</i>	249
Logged rewriting and identities among relators <i>A Heyworth & C D Wensley</i>	256
A characterization of $F_4(q)$ where q is an odd prime power <i>A Iranmanesh & B Khosravi</i>	277
On associated groups of rings <i>Y B Ishchuk</i>	284

Cambridge University Press
0521537401 - Groups St Andrews 2001 in Oxford, Volume II
Edited by C. M. Campbell, E. F. Robertson and G. C. Smith
Frontmatter
[More information](#)

INTRODUCTION

Groups St Andrews 2001 in Oxford was another highly successful conference in the continuing series. The conference, held from 5 August 2001 to 18 August 2001, was attended by 230 mathematicians from 35 countries. The lectures and talks were given in the Mathematical Institute of the University of Oxford. We thank Lady Margaret Hall, St Anne's College, The Queen's College and Merton College for providing accommodation. We also acknowledge with gratitude the financial support of the Edinburgh and London Mathematical Societies. The Mathematical Institute of the University of Oxford generously made lecture rooms available, and supported the conference in various other important ways.

The organizing committee consisted of C M Campbell (University of St Andrews), D P Groves (Merton), R P Martineau (Wadham), P M Neumann (The Queen's College), E F Robertson (University of St Andrews), G C Smith (University of Bath), W B Stewart (Exeter) and G A Stoy (LMH). Administrative support was provided by Jan Campbell and Maureen White.

The main speakers, who were invited to give a series of talks, were Marston D E Conder (Auckland), Persi Diaconis (Stanford), Peter P Pálffy (Eötvös Loránd, Budapest), Marcus du Sautoy (Cambridge), and Michael R Vaughan-Lee (Oxford). As has become the tradition, all these invited speakers have written substantial articles for these Proceedings. All papers have been subjected to a formal refereeing process comparable to that of a major international journal. Publishing constraints have forced the editors to exclude some very worthwhile papers, and this is of course a matter of regret.

The Theory of Groups continues to move forward on many fronts, and twenty years on from the announcement of the classification of the finite simple groups, it prospers perhaps surprisingly well (rather like Mark Twain). It is a measure of the success of this conference series and this subject that mathematical libraries around the world are collecting the series of St Andrews Conference Proceedings.

As \LaTeX has become the almost universal typesetting language for mathematics, the nuts and bolts of the editorial job are perhaps getting a little easier. We hope that in future even more contributors will stick faithfully to the typesetting standard prescribed by the editors (so that these hacks will have more time to do research in group theory, lie on beaches and so on). Fran Burstall of the University of Bath provided typesetting counselling. It is hoped that the next conference in this series will be held in 2005 and will be Groups St Andrews in St Andrews (revisiting the scene of the original crime), and it is also hoped that in 2009 we will return once more to Bath.

As these proceedings go to press, news has just arrived that one of the grandfathers of the subject, B H Neumann, has died. He attended the first Groups St Andrews conference in 1981 and some later ones in the series. Many of our community knew him with great affection – his warm smile and shoestring tie will linger in the memory almost as long as his important contributions to mathematics.

CMC, EFR, GCS