

CONTEMPORARY MATHEMATICS

611

Group Theory, Combinatorics, and Computing

International Conference in Honor of
Daniela Nikolova-Popova's 60th Birthday
on Group Theory, Combinatorics and Computing
October 3–8, 2012
Florida Atlantic University, Boca Raton, Florida

Robert Fitzgerald Morse
Daniela Nikolova-Popova
Sarah Witherspoon
Editors



American Mathematical Society

Group Theory, Combinatorics, and Computing

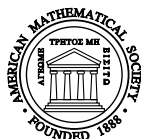
CONTEMPORARY MATHEMATICS

611

Group Theory, Combinatorics, and Computing

International Conference in Honor of
Daniela Nikolova-Popova's 60th Birthday
on Group Theory, Combinatorics and Computing
October 3–8, 2012
Florida Atlantic University, Boca Raton, Florida

Robert Fitzgerald Morse
Daniela Nikolova-Popova
Sarah Witherspoon
Editors



American Mathematical Society
Providence, Rhode Island

EDITORIAL COMMITTEE

Dennis DeTurck, managing editor

Michael Loss Kailash Misra Martin J. Strauss

2000 *Mathematics Subject Classification*. Primary 05E18, 08A99, 20B15, 20D05, 20E45, 20F14, 20F65, 20N05, 51E15, 94A99.

Library of Congress Cataloging-in-Publication Data

International Conference on Group Theory and Combinatorics (2012 : Boca Raton, Fla.)

Group theory, combinatorics and computing : International Conference on Group Theory and Combinatorics in honor of Daniela Nikolova-Popova's 60th birthday, October 3–8, 2012, Florida Atlantic University, Boca Raton, FL / Robert Fitzgerald Morse, Daniela Nikolova-Popova, Sarah Witherspoon, editors.

pages cm. – (Contemporary mathematics ; volume 611)

Includes bibliographical references.

ISBN 978-0-8218-9435-4 (alk. paper)

1. Combinatorial analysis—Congresses. 2. Group theory—Congresses. I. Morse, Robert Fitzgerald, editor of compilation. II. Nikolova-Popova, Daniela, 1952– editor of compilation. III. Witherspoon, Sarah J., 1966– editor of compilation. IV. Title.

QA164.I5816 2012

511'.6—dc23

2013036467

Contemporary Mathematics ISSN: 0271-4132 (print); ISSN: 1098-3627 (online)

DOI: <http://dx.doi.org/10.1090/conm/611>

Copying and reprinting. Material in this book may be reproduced by any means for educational and scientific purposes without fee or permission with the exception of reproduction by services that collect fees for delivery of documents and provided that the customary acknowledgment of the source is given. This consent does not extend to other kinds of copying for general distribution, for advertising or promotional purposes, or for resale. Requests for permission for commercial use of material should be addressed to the Acquisitions Department, American Mathematical Society, 201 Charles Street, Providence, Rhode Island 02904-2294, USA. Requests can also be made by e-mail to reprint-permission@ams.org.

Excluded from these provisions is material in articles for which the author holds copyright. In such cases, requests for permission to use or reprint should be addressed directly to the author(s). (Copyright ownership is indicated in the notice in the lower right-hand corner of the first page of each article.)

© 2014 by the American Mathematical Society. All rights reserved.

The American Mathematical Society retains all rights
except those granted to the United States Government.

Copyright of individual articles may revert to the public domain 28 years
after publication. Contact the AMS for copyright status of individual articles.

Printed in the United States of America.

⊗ The paper used in this book is acid-free and falls within the guidelines
established to ensure permanence and durability.

Visit the AMS home page at <http://www.ams.org/>

10 9 8 7 6 5 4 3 2 1 19 18 17 16 15 14

Contents

Preface	vii
List of Lectures	ix
List of Participants	xi
On the regularity of a graph related to conjugacy classes of groups: Small valencies MARIAGRAZIA BIANCHI, MARCEL HERZOG, and EMANUELE PACIFICI	1
Self-similar groups acting essentially freely on the boundary of the binary rooted tree ROSTISLAV GRIGORCHUK and DMYTRO SAVCHUK	9
Non-symmetric lexicographic configurations CHRISTOPH HERING, ANDREAS KREBS, and THOMAS EDGAR	49
Algebraic structures for communications TED HURLEY	59
Finite coverings: A journey through groups, loops, rings and semigroups LUISE-CHARLOTTE KAPPE	79
Decompositions of Kramer-Mesner matrices REINHARD LAUE	89
Recent results on groups with few isomorphism classes of derived subgroups PATRIZIA LONGOBARDI, MERCEDE MAJ, and DEREK J. S. ROBINSON	121
Designs and codes from $PSL_2(q)$ J. MOORI	137
Algebraic logic and logical geometry in arbitrary varieties of algebras BORIS PLOTKIN	151
A uniform upper bound for the character degree sums and Gelfand-Graev-like characters for finite simple groups PABLO SPIGA and ALEXANDRE ZALESSKI	169

Preface

This book contains the Proceedings of the international conference on Group Theory, Combinatorics and Computing held in Boca Raton, Florida, October 3–October 8, 2012 in honor of the 60th birthday of Daniela Nikolova-Popova. The event was organized by Florida Atlantic University in cooperation with the American Mathematical Society, the Association for Women in Mathematics, and the Institute of Combinatorics and its Applications.

The Scientific Committee for the conference consisted of D. Nikolova-Popova and S. Magliveras, Florida Atlantic University; T. Hurley, National University of Ireland – Galway; R. F. Morse, University of Evansville; L.-C. Kappe, Binghamton University; M. Klin, Ben Gurion University of the Negev (Israel); S. Witherspoon, Texas A&M University; and E. Ruet d’Auteuil, Institute of Combinatorics and its Applications (Canada).

The purpose of the conference was to bring together experts in group theory, combinatorics and computing to discuss computational, algorithmic and application aspects that have recently emerged at the interface between these areas. This meeting has helped to establish a scientific network among the participating universities and research centers in Europe and North America.

The conference included one-hour invited lectures and twenty-minute contributed talks. Two special sessions were organized: the first for women’s careers in mathematics and the second for young researchers. The event was also linked with the AMS regional meeting held October 13–14, 2012 at Tulane University in New Orleans.

This volume is a combination of survey and research articles from international experts in group theory and combinatorics. The contributions cover topics ranging from combinatorial group theory to graph and design theory, coding theory, cryptography and related areas in communications and computing. The survey articles are particularly useful for any advanced undergraduate students or new postgraduates wishing to acquire background material for projects or research.

It is our pleasure to thank the speakers and participants who made this conference a great success, the authors of these proceedings for their significant contributions, and the referees for their effective and accurate work.

The organizers thank Florida Atlantic University, the Davimos Family Foundation and the Institute of Combinatorics and its Applications for making this conference possible through their financial support.

Robert Fitzgerald Morse
Daniela Nikolova-Popova
Sarah Witherspoon

List of Lectures

- N. APOSTOLAKIS: On liftable braids I: Coverings of the disk by disks
- J. BEOKU-BETTS: “Those of us who wanted to do mathematics had more or less to swim against the current”: Case study of a Nigerian mathematician
- M. BIANCHI: Graphs associated with conjugacy class sizes in finite groups (Part I)
- B. CLAIBORNE: Gender issues in research
- R. GRIGORCHUK: On Gap Conjecture concerning group growth
- C. HERING: Naive configurations
- T. HURLEY: Group ring matrices
- D. KAHROBAEI: Applications of polycyclic groups in information security
- L. KLINGLER: On a conjecture of Zassenhaus
- M. KRZYWKOWSKI: Minimal total dominating sets in graph classes: Combinatorial bounds and enumeration
- R. LAUE: Decompositions of Kramer-Mesner matrices
- P. LONGOBARDI: Some results on products of subsets of groups
- S. MAGLIVERAS: Non-abelian cryptography
- M. MAJ: On groups with few isomorphism types of derived subgroups
- J. MOORI: Designs and codes from $\mathrm{PSL}_2(q)$
- M. NEUMANN-BROSIG: On the hyperbolicity of strict Pride groups
- D. NIKOLOVA-POPOVA: Life challenges of a female group theorist
- A. YU. OLSHANSKIY: On the embeddings of solvable and amenable groups
- E. PACIFICI: Graphs associated with conjugacy class sizes in finite groups (Part II)
- P. PLAUMANN: Partitions of connected Lie groups
- F. RICHMAN: Walker’s cancellation theorem
- D. SAVCHUK: Self-similar groups acting essentially freely on the boundary of a rooted tree
- M. SCHMIDMEIER: Operations on arc diagrams and a degeneration result for linear operators
- S. SMITH: Motion, distinguishing number and orbit equivalence in infinite groups
- A. ZALESSKI: On generalizations of the Gelfand-Graev and the Steinberg characters
- M. ZYMAN: Adjunction of roots in exponential A -Groups

List of Participants

- N. Apostolakis
Bronx Community College of the City
University of New York, USA
- J. Beoku-Betts
Florida Atlantic University, USA
- M. Bianchi
Università di Milano, Italy
- B. Claiborne
Florida Atlantic University, USA
- R. Grigorchuk
Texas A&M University, USA
- C. Hering
Universität Tübingen, Germany
- T. Hurley
National University of Ireland –
Galway, Ireland
- D. Kahrobaei
City University of New York, USA
- L. Klingler
Florida Atlantic University, USA
- M. Krzywkowski
Politechnika Gdańska, Poland
- R. Laue
Universität Bayreuth, Germany
- P. Longobardi
Università di Salerno, Italy
- S. Magliveras
Florida Atlantic University, USA
- M. Maj
Università di Salerno, Italy
- J. Moori
North–West University (Mafikeng),
Republic of South Africa
- M. Neumann-Brosig
Technische Universität Braunschweig,
Germany
- D. Nikolova-Popova
Florida Atlantic University, USA
- A. Yu. Olshanskiy
Vanderbilt University, USA
- E. Pacifici
Università di Milano, Italy
- P. Plaumann
Universität Erlangen–Nürnberg,
Germany and
Universidad Autonoma “Benito Juárez”
de Oaxaca, Mexico
- F. Richman
Florida Atlantic University, USA
- E. Ruet d’Auteuil
Institute of Combinatorics and Its
Applications, Canada
- D. Savchuk
University of South Florida, USA
- M. Schmidmeier
Florida Atlantic University, USA
- S. Smith
New York City College of Technology of
the City University of New York, USA

A. Zalesski
University of East Anglia, United
Kingdom and
Università degli Studi di
Milano–Bicocca, Italy

M. Zyman
Borough of Manhattan Community
College of the City University of New
York, USA

This volume contains the proceedings of the International Conference on Group Theory, Combinatorics and Computing held from October 3–8, 2012, in Boca Raton, Florida.

The papers cover a number of areas in group theory and combinatorics. Topics include finite simple groups, groups acting on structured sets, varieties of algebras, classification of groups generated by 3-state automata over a 2-letter alphabet, new methods for construction of codes and designs, groups with constraints on the derived subgroups of its subgroups, graphs related to conjugacy classes in groups, and lexicographical configurations. Application of computer algebra programs is incorporated in several of the papers.

This volume includes expository articles on finite coverings of loops, semigroups and groups, and on the application of algebraic structures in the theory of communications.

This volume is a valuable resource for researchers and graduate students working in group theory and combinatorics. The articles provide excellent examples of the interplay between the two areas.

ISBN 978-0-8218-9435-4



9 780821 894354

CONM/611

AMS on the Web
www.ams.org