

# CONTEMPORARY MATHEMATICS

536

## Cross Disciplinary Advances in Quantum Computing

NSF Sponsored Research Conference on  
Representation Theory, Quantum Field Theory,  
Category Theory, and Quantum Information Theory  
October 1–4, 2009  
University of Texas at Tyler  
Tyler, Texas

Kazem Mahdavi  
Deborah Koslover  
Leonard L. Brown III  
Editors



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**American Mathematical Society**  
Providence, Rhode Island

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2000 *Mathematics Subject Classification*. Primary 81P68, 81-01, 81-02, 81-06.

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### Library of Congress Cataloging-in-Publication Data

Conference on Representation Theory (2009 : University of Texas at Tyler)

Cross disciplinary advances in quantum computing : Conference on Representation Theory, Quantum Field Theory, Category Theory, and Quantum Information Theory, October 1-4, 2009, University of Texas at Tyler, Tyler, Texas / Kazem Mahdavi, Deborah Koslover, Leonard L. Brown, III, editors.

p. cm. — (Contemporary mathematics ; v. 536)

Includes bibliographical references.

ISBN 978-0-8218-4975-0 (alk. paper)

1. Quantum theory—Mathematics—Congresses. 2. Quantum communication—Congresses. I. Mahdavi, Kazem. II. Koslover, Deborah. III. Brown, Leonard L., 1972– IV. Title.

QC174.17.M35C66 2009

530.12—dc22

2010045181

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## Preface

Building on the success of the 2007 conference, the 2009 Conference on Representation Theory, Quantum Field Theory, Category Theory, and Quantum Information Theory, was held October 1–4 at the University of Texas at Tyler. It was funded by the NSF for the purpose of bringing together scientists from a wide range of fields to share research and stimulate new ideas. Attendees included mathematicians, physicists, and computer scientists. Speakers came from major industries including IBM; major national laboratories including the Army Research Lab, Air Force Office of Scientific Research, Los Alamos and Argonne National Lab; and major education institutions including Harvard, Oxford, and Moscow State University.

Our main purpose in publishing this proceedings volume is to bring together papers from a wide spectrum of disciplines to stimulate progress in the field of computation and communication, in particular, quantum communication (QC). The seven contributed papers included in this volume cover a wide range of topics related to QC, including physical aspects, mathematical aspects and foundational issues of QC. All submissions were peer reviewed and the most outstanding have been chosen to appear here.

As a general rule, every book is written with the goal of expanding the horizon of human knowledge. We hope this volume will lead to advances in QC.

The editors would like to thank our co-organizers, Louis Kauffman (UIC) and Samuel Lomonaco (UMBC), of the Conference on Representation Theory, Quantum Field Theory, Category Theory, and Quantum Information Theory.

We would also like to thank our wonderful speakers: Samson Abramsky (Oxford), Paul Benioff (Argonne), Robert Bonneau (AFOSF), Howard Brandt (ARL), Sergey Bravyi (IBM), Bob Coecke (Oxford), Denis Ilyutko (Moscow), Louis Kauffman (Illinois), Vladimir Korepin (Stony Brook), Sam Lomonaco (Maryland), John Myers (Harvard), David Radford (Illinois) and Yong Shi Wu (Utah).

Next we would like to thank the University of Texas at Tyler for hosting the event.

Finally, the editors would like to thank the NSF for funding the conference (DMS 0901385).

Kazem Mahdavi  
Deborah Koslover  
Leonard L. Brown, III

## List of Participants

Samson Abramsky  
Oxford University Computing  
Laboratory

Paul Benioff  
Argonne National Laboratory

Robert Bonneau  
Air Force Office of Scientific Research

Howard Brandt  
Army Research Laboratory

Sergey Bravyi  
IBM Research

Leonard L. Brown, III  
University of Texas at Tyler

Goong Chen  
Texas A&M University

Bob Coecke  
Oxford University Computing  
Laboratory

Heather Dye  
McKendree University

Denis Ilyutko  
Moscow State University

Louis Kauffman  
University of Illinois at Chicago

Vladimir Korepin  
C.N. Yang Institute for Theoretical  
Physics,  
SUNY, Stony Brook

Deborah Koslover  
University of Texas at Tyler

Samuel Lomonaco  
University of Maryland, Baltimore  
County

Kazem Mahdavi  
University of Texas at Tyler

John Myers  
Harvard University

David Radford  
University of Illinois at Chicago

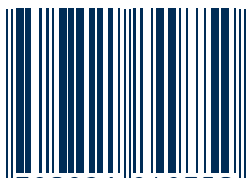
Eric Rowell  
Texas A&M University

Yong Shi Wu  
University of Utah

This volume contains a collection of papers, written by physicists, computer scientists, and mathematicians, from the Conference on Representation Theory, Quantum Field Theory, Category Theory, and Quantum Information Theory, which was held at the University of Texas at Tyler from October 1–4, 2009.

Quantum computing is a field at the interface of the physical sciences, computer sciences and mathematics. As such, advances in one field are often overlooked by practitioners in other fields. This volume brings together articles from each of these areas to make students, researchers and others interested in quantum computation aware of the most current advances. It is hoped that this work will stimulate future advances in the field.

ISBN 978-0-8218-4975-0



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