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978-1-107-03339-9 - Logic and Algebraic Structures in Quantum Computing

Edited by Jennifer Chubb, Ali Eskandarian and Valentina Harizanov

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Logic and Algebraic Structures in Quantum Computing

Arising from a special session held at the 2010 North American Annual Meeting of the ASL, this volume is an international cross-disciplinary collaboration with contributions from leading experts exploring connections across their respective fields. Themes range from philosophical examination of the foundations of physics and quantum logic, to exploitations of the methods and structures of operator theory, category theory, and knot theory in an effort to gain insight into the fundamental questions in quantum theory and logic.

The book will appeal to researchers and students working in related fields, including logicians, mathematicians, computer scientists, and physicists. A brief introduction provides essential background on quantum mechanics and category theory, which, together with a thematic selection of articles, may also serve as the basic material for a graduate course or seminar.

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LECTURE NOTES IN LOGIC 45

*Logic and Algebraic Structures in
Quantum Computing*

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ASSOCIATION FOR SYMBOLIC LOGIC



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PREFACE

This project grew out of a Special Session on *Logic and the Foundations of Physics* at the 2010 North American Annual Meeting of the Association for Symbolic Logic¹. Many of the session's lecturers investigated the role of algebraic structures in the context of the foundations of quantum physics, especially in quantum information and computation. In addition to this session, attendees heard tutorial lectures on quantum computing (given by Bob Coecke, University of Oxford) and an invited lecture on intuitionistic quantum logic (by Klaas Landsman, Radboud University, Nijmegen). The talks were so well-received by conference participants that we felt a volume of collected works on this subject would be a valuable addition to the literature.

The articles in this volume by mathematicians, philosophers, and scientists address foundational issues and fundamental abstract structures arising in highly active areas of theoretical, mathematical, and even experimental physics relevant to quantum information and quantum computation. We hope that the present collection advances this worthwhile program of scientific and mathematical progress.

We would like to thank the authors that contributed to this volume, and the ASL and Cambridge University Press for publishing it. This project was partially supported by the George Washington University Centers & Institutes Facilitating Fund Grant and by the University of San Francisco Faculty Development Fund. Many thanks also to Bryan Fregoso (a University of San Francisco student) for his invaluable assistance in assembling this volume.

Jennifer Chubb
Ali Eskandarian
Valentina Harizanov
Summer, 2015, Washington, D. C.

¹The full program is available in the *Bulletin of Symbolic Logic*, vol. 17 (2011), no. 1, pp. 135–137, available online at <https://www.math.ucla.edu/~asl/bsl/1701-toc.htm>.