PREFACE

Among recent advances in mathematics and science, computational science stands out as a new, third branch for discovery in addition to theory and experiment in research and education. Aiming to address the current need and the trend of computational science and its education and promote new developments in this area, the organization of the International Workshop on Computational Science and Its Education (IWSEC) was initiated in February 2005 under the suggestions of Professor Qun Lin, Academician of the Chinese Academy of Science. The aims of the workshop are:

- To encourage multidisciplinary and interdisciplinary research;
- To promote international collaborations among researchers and educators;
- To stimulate curriculum reform in computational science education.

In particular, the workshop emphasizes the theme "curriculum reform in computational science begins with the reshaping of basic mathematical training". Co-organized by Capital Normal University (China) and Ohio University (USA), the workshop was held with success in Beijing, the capital city of China during August 29 to September 2, 2005.

The workshop was honored by having distinguished leading researchers and educators at the frontiers of computational science and its education from around the world. It had more than 50 presentations and attended by over 100 mathematicians, scientists, engineers and graduate students from 12 countries/regions: Australia, Canada, China (including Hong Kong and Taiwan), Cyprus, England, France, Germany, Israel, Norway, Singapore, Thailand and United State of America. The workshop also had the privilege to hold two panel discussion sessions: Contemporary teaching issues in curriculum reform and NSF-NSFC open discussion on Trends and Directions in research.

This volume contains 24 selected articles from papers presented at the workshop. It presents state-of-the-art lectures delivered by international academic and industrial experts in the field of computational science and its

education, covering a wide spectrum from theory to practice. Topics include new developments in finite element methods (FEMs), finite volume methods and Splines, such as Moving Mesh Methods, Galerkin and Discontinuous Galerkin Schemes, Shape Gradient, Mixed FEMs, Superconvergences and Fourier spectral approximations with applications in multidimensional fluid dynamics; Maxwell equations in discrepancy media; and phase-field equations. It also covers some interesting topics related to Stokes equations and Schrodinger equations, approximation theory, computational harmonic analysis and applications in signal/image processing. Contemporary teaching issues in curriculum reform also form an integral part of the book. This book will therefore be of significant interest and value to all graduates, research scientists and practitioners facing complex computational problems.

ACKNOWLEDGMENTS

The workshop was fortunate to be sponsored by National Science Foundation of United States, National Science Foundation of China, Beijing Municipal Commission of Science and Technology (China) and Beijing Municipal Commission of Education (China), Capital Normal University (China) and Ohio University (USA). In any event, the Local Organizing and Program Committees deserve great thanks in creating a well-run and productive meeting. It is a pleasure to thank all of them for their hard work. Our special thanks go to Dr. Junping Wang, National Science Foundation of United States, for his encouragements and consistent support. The Editorial Committee would like to thank 36 unusually devoted peer reviewers for their constructive suggestions and comments which have lead to significant improvement of the quality of this volume.

Finally, but certainly not least, our sincere thanks go to Ms. E. H. Chionh, the editor at World Scientific for her dedicated work, to Mr. Rajesh Babu and Ms. Koh Yolande for their technical support during editing this volume.

Xiaoping Shen
On behalf of the Editorial Committee
Athens, Ohio, USA
October, 2006