

## Preface

The Conference on Mathematical Modeling in the Medical Sciences was held May 18-21, 2009 at Vanderbilt University. The conference was the 24th in the series of Annual Shanks Conferences held at Vanderbilt University. The Annual Shanks Conferences, endowed by Judith Olivia Shanks Denton and Eugene Baylis Shanks, Jr., honor the service of their parents Olivia and Baylis Shanks to Vanderbilt University. The National Science Foundation contributed funds to support the participation of young researchers. The conference was combined with the Atlantic Coast Symposium on the Mathematical Sciences in Biology and Biomedicine.

The conference focused on the development, analysis, simulation, and application of continuous and discrete mathematical models for the medical sciences. The primary purpose of the conference was to bring together mathematicians, biologists, and medical researchers to a forum that promoted communication, since interdisciplinary communication is necessary for successful application of these models to fundamental research in medical and health sciences.

The 24th Annual Shanks Lecturer was Nicola Bellomo, Professor of Physics and Applied Mathematics at Politecnico di Torino, Italy. Professor Bellomo is President of the Italian Society of Applied and Industrial Mathematics and Editor-in-Chief of the Journal *Mathematical Models and Methods in Applied Sciences*. The title of his lecture was "Conceptual paths from system biology to modeling mutations and progression of tumor cells." The plenary speakers at the conference were Linda J. S. Allen, Department of Mathematics, Texas Tech University, Peter J. Basser, Department of Tissue Biophysics and Biomimetics, National Institutes of Health, Carlos Castillo-Chavez, Executive Director, Mathematical and Theoretical Biology Institute, Arizona State University, Gilles Clermont, Medical Director of the Center for Inflammation and Regenerative Modeling, University of Pittsburgh, Zhilan Feng, Department of Mathematics, Purdue University, John Hotchkiss, Department of Critical Care Medicine, University of Pittsburgh, Yi Jiang, Theoretical Division, Los Alamos National Laboratory, Harold Layton, Department of Mathematics, Duke University, and Steven Wise, Department of Mathematics, University of Tennessee.

The themes of the conference were anchored in four areas of biomathematics: (1) models of epidemics, (2) models of cancer, (3) models in physiology and clinical practice, and (4) models of medical imaging. A sampling of the interdisciplinary presentations at the conference included models of virus mutations by methods of the kinetic theory of active particles, models of medical education and life support, models of antibiotic resistance in hospital patients, models of cell proliferation and mitosis, Monte Carlo models of peritoneal antimicrobial pharmacokinetics, systems biology models of mutation and progression of tumor cells, models of tissue microstructure and diffusion MRI, and predictive models of optimizing therapeutic strategies for inflammation con-

trol. A complete list of participants at the conference and titles and abstracts of the conference presentations is available at <http://www.math.vanderbilt.edu/shanks2009/>.

This volume contains articles contributed by the participants at the conference. All of the articles were refereed by peer review. We the editors, express our thanks to the participants of the conference and the contributors to this volume. It is our hope that their efforts will encourage medical researchers to appreciate the value of mathematical modeling in advancing their scientific work.

Philip Crooke, Joanna Pressley, Glenn Webb

Vanderbilt University Nashville, Tennessee

January 2010