



BioMed Research International

Special Issue on
Simulations of Heart Function

CALL FOR PAPERS

The heart is a robust and reliable organ, which, approximately once per second, pumps the blood to the whole body. This activity involves the fine coupling of numerous components, involving a large variety of physical processes and covering a wide range of scales. For instance, heart function depends on cell metabolism, electrophysiology, and mechanics; ion channels, ion concentrations, and gap junction distribution; material and electrical properties of cardiac tissue and the anatomical organization of this tissue in fibers and sheets; material properties and organization of heart vascular tree and their relation to cardiac perfusion. Understanding the details of these complex systems, as well as the interaction between them, is crucial for understanding heart function in health and disease.

This special issue focuses on cardiac modeling and simulations that can contribute to improving the understanding of this multifaceted system, under normal conditions or different cardiac pathologies. Multiple types of computational and mathematical models are being used to describe heart function at different levels of details. For instance, relatively simple models have been employed to characterize the main properties of action potential propagation and wave dynamics in cardiac tissue. Detailed physiological models have been employed to improve our understanding of arrhythmia generation, fibrillation, and defibrillation. Coupled models of cardiac electromechanics that involve multiple scales, from intracellular to whole organ, were developed to describe the relation between electric signals, such as the electrocardiogram and heart contraction. In summary, cardiac modeling has been developed over several decades to become a valuable tool for studying heart function.

We invite investigators to contribute original research articles as well as review articles on modeling of cardiac tissue.

Potential topics include, but are not limited to:

- ▶ Basic theory of heart function: action potential wave propagation in cardiac tissue, cardiac contraction, cardiac metabolism, and perfusion
- ▶ Models that couple different physics and scales, for example, models of electromechanical coupling
- ▶ Relation between anatomy, microstructures, and heart function, for example, the impact of gap junction distribution and fibrosis on cardiac arrhythmia
- ▶ New techniques to bring cardiac simulations closer to the clinics, for example, via the development of new models, numerical methods, and/or the use of parallel techniques
- ▶ The use of models as a platform for the development of new treatments and drugs for cardiac pathologies, for example, to suppress cardiac arrhythmias and in particular ventricular fibrillation, to stop the progression of heart failure and hypertrophy
- ▶ The use of models to better understand the relations between cardiac function and clinical invasive and noninvasive measurements, such as the electrocardiogram

Authors can submit their manuscripts via the Manuscript Tracking System at <http://mts.hindawi.com/submit/journals/bmri/cardiology/sihf/>.

Lead Guest Editor

Rodrigo W. dos Santos, Federal University of Juiz de Fora, Juiz de Fora, Brazil
rodrigo.weber@uff.edu.br

Guest Editors

Sergio Alonso, Physikalisch-Technische Bundesanstalt, Braunschweig, Germany
sergio.alonso@ptb.de

Elizabeth M. Cherry, Rochester Institute of Technology, Rochester, USA
excsm@rit.edu

Joakim Sundnes, Simula Research Laboratory, Fornebu, Norway
sundnes@simula.no

Manuscript Due

Friday, 31 October 2014

First Round of Reviews

Friday, 23 January 2015

Publication Date

Friday, 20 March 2015