

Cells, tissues, and biomaterials: mechanics of life at different scales

From morphogenesis, which initially forms the bodies of organisms, to regenerative medicine, which promises to improve the quality of life in our graying societies, mechanical forces and motion play extremely important roles. The effects of mechanical forces and corresponding motions travel back and forth between several spatial and times scales. Multi-scale computational mechanics is therefore an important tool to study mechanically regulated phenomena in proteins, cells, and tissues and the biomaterials that interact with them. This special issue aims to present a carefully selected collection of studies at the forefront of developments in computational mechanics of proteins, cells, tissues, and biomaterials. We are particularly interested in studies that 1. Combine different spatial and time scales, 2. Model the interactions of living cells and tissues with advanced biomaterials with novel properties, 3. Investigate the interactions between mechanical systems and chemical/biological systems, 4. Use mechanistic approaches such as the approaches based on systems biology, and 5. Present clear diagnostic, therapeutic, and/or preventive opportunities. There is no restriction regarding the computational techniques or the scale(s) at which the problems are studied. Studies dealing with all types of proteins, cells, tissues, and biomaterials are welcome. A partial list of topics includes:

- Bone, cartilage, and soft tissue mechanics
- Morphogenesis and tissue growth, adaptation, and differentiation
- Patient-specific biomechanical modeling of tissues
- Protein and cell mechanics
- Optimal design of scaffolds, implants, and biomaterials
- Mechanical characterization of cells and tissues
- Reaction-diffusion, chemotaxis, and mixture theory models

Interested authors are invited to submit their abstract to the related mini-symposium, “computational mechanics of cells, tissues, and biomaterials” that is organized as a part of 5th European Conference on Computational Mechanics (ECCM V)¹. After the conference, the authors of a number of selected presentations will be invited to submit their full-length papers for review and possible publication in a special issue of ASME Journal of Biomechanical Engineering. The review process will be similar to the regular review process of the journal with at least three referee reports solicited for every manuscript.

The important dates are as follows:

- First call for papers: fall 2013
- Deadline for submission: Summer 2014 (1-2 months after the conference)
- Reviews due: Fall/Winter 2014
- Publication date: Spring/Summer 2015

Guest editors

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¹ <http://www.wccm-eccm-ecfd2014.org>