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MICROSTRUCTURE-BASED MODELING OF BIOMECHANICAL SYSTEMS

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ABSTRACT

In recent years, the application of computational modeling to biomechanics has increased significantly. This growth has reached a point where in silico simulation of complex biological processes and surgical procedures is becoming an integral part of the regulatory approval process for new medical devices. Advances in computational methods recognize the close relationship between structure and functionality in living systems. The mechanical properties of tissue building blocks including extracellular matrix, e.g., collagen fibers and cells, as well as their ability to respond to external stimuli or internal changes, are unique features of living biomechanical systems. Furthermore, mechanobiological cues at the cell level are considered fundamental to the healthy functioning of organs and provide insights into the development of pathologies.

As a result, research in this field is progressing towards the integration of biomechanics, biochemistry, and mechanobiology in a multiscale and multiphysics computational environment. This mini-symposium aims to collect contributions on innovative computational methods applied to various biomechanical systems including lung, bone, cartilage, brain, cardiovascular system, and biocompatible materials used in biomedical applications. Relevant topics include but are not limited to:

- Multiscale modeling of fibrous tissues
- Growth, remodeling, and healing of tissues
- Damage and fracture
- Poroelasticity and multiphase models
- Multi-physics models (e.g., chemo-mechano-biological models)
- Mechanical models of living cells
- Structure-mechanics relationship
- Tissue engineering applications