MODELING OF COMPLEX BIOLOGICAL SYSTEMS: FROM CELL TO TISSUE

FILIPPO RECROSI [*], **GIULIO LUCCI** [†] **AND MATTIA SERPELLONI** [††]

[*] Department of Engineering and Geology (INGEO),
University of Chieti-Pescara
viale Pindaro 42, Pescara, Italy
filippo.recrosi@unich.it

[†] Department of Structural Engineering and Geothecnics (DISG),
La Sapienza University of Rome,
via Eudossiana 18, Roma, Italy
giulio.lucci@uniroma1.it

[†] Department of Mechanical Engineering,
University of Brescia
via Branze 38, Brescia, Italy
mattia.serpelloni@unibs.it

Key words: Complex Biological Systems, Computational Biomechanics, Tissue Mechanics.

ABSTRACT

This symposium is devoted to integrate, mathematical modeling, computational studies, and data-driven analysis, supported by experimental investigations, to address the challenges of multicomponent complex biological systems. The synergistic combination of different theoretical and computational techniques appears nowadays compelling to uncover the involved mechanisms underlying these systems. The primary focus is on tissue mechanics , cell dynamics, and mechanobiology, in order to provide a multiphysics perspective on the evolutionary processes driving tissue aging and degeneration phenomena, characterizing, for example, the pathogenesis of cancer diseases. The mathematical modeling topics we would cover in this symposium range a wide spectrum, including but not limited to: tissue growth & remodeling, phase field approaches for cell population dynamics and motility, damage models for connective tissue, multi-scale descriptions of cell and tissue mechanics. Computational studies will mainly concern finite element methods, homogenization techniques and data-driven approaches for heterogeneous materials, possibly having a stochastic variation.

The main goal is to provide a shared platform for multiphysics problems arising from biology and clinical sciences. The ambition is to bridge together different communities: from engineering and applied mathematics, but also from natural sciences and medicine, to effectively integrate different insights and multidisciplinary skills. This perspective could be fruitful for developing a robust description embracing the high complexity which characterizes such biological and clinical topics.