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COMPUTER METHODS IN CELL-SCALE BIOMECHANICS AND MECHANOBIOLOGY

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ABSTRACT

Biological tissues are living systems able to actively respond and adapt to physical cues from their environment. Mechanical loads at the tissue length scale play a particular role. They can be associated, e.g., with body motion or hemodynamics but, potentially less evident, changes in the mechanical field quantities accompany a variety of physiological and pathological conditions. The understanding of how these mechanical states translate into cues perceived by cells, and how the cells' sensory apparatus registers and converts them into intracellular cues that activate the cell's signalling pathways and finally elicit the biological response, poses problems at the interface between the disciplines of mechanics and cell biology.

During the recent years, computational analysis has played an increasing role in addressing such problems, e.g., to estimate cellular forces, to probe new biomechanisms, or to support studies on mechano-regulated cell behaviour and its role in tissue engineering [1, 2].

This minisymposium focuses on computational methods and models that help unravelling the complex interplay between mechanical loads at tissue length scale, changes in the physical properties of the local cell environment and the cells' mechanobiological response at short and long term. The topics addressed include but are not limited to models of the extracellular matrix, active cell forces and adhesion, nucleus mechanics, intra- and extracellular fibre networks, simulations of cells and cell layers and their interaction with substrates, analysis of signalling pathways, as well as experiments to inform and validate these approaches. Contributions from all related disciplines are welcome.

REFERENCES

[1] M. Bergert et al., "Confocal reference free traction force microscopy", Nat Commun, Vol. 7, 12814 (2016)

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