Mechanics in biology: cells and tissues

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Biology is becoming one of the most important areas for application of physics and mathematics. The discoveries that have characterised the biological sciences in the last decades, the insight of smaller and smaller spatial scales at a cellular and sub-cellular level offer most fertile matter for a formal description of biological phenomena in terms of the classical methods of physics. The effort is to understand the very complex rules that govern the living matter by the precise formal framework provided by the balance laws of mechanics.

Living organisms show the remarkable ability to change not only their geometry, but also their internal architecture and their material properties in response to environmental changes. Mechanics in biology apply to several branches, essentially depending on the specific spatial scale size under consideration: molecular scale, cellular scale (i.e. motility, aggregation and morphogenesis), tissue scale, and organ scale.

The contributions collected in this Theme Issue of Philosophical Transactions A focus on continuum mechanics as applied to the tissue and cell scale. They offer a state-of-the-art overview of current research in the field, including papers with an experimental, numerical, and theoretical perspective.

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