

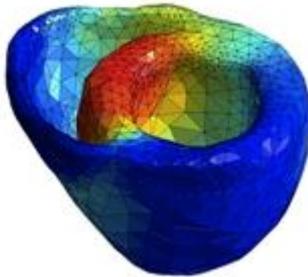


## Mechanics in biology: cells and tissues

Organised and edited by Davide Ambrosi, Krishna Garikipati and Ellen Kuhl

Published September 2009

**Special offer price: £47.50 (usual price: £58)**



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.

Subscribers to *Philosophical Transactions* can access this issue online at:  
[rsta.royalsocietypublishing.org/site/issues/biological\\_mechanics.xhtml](http://rsta.royalsocietypublishing.org/site/issues/biological_mechanics.xhtml)

Non-subscribers can purchase the print issue at the specially reduced price shown above. To place an order at the discounted price, please send payment by cheque (made payable to Portland Customer Services) or by Visa or MasterCard (quoting reference **TA 1902**) to:

Portland Customer Services, Commerce Way, Colchester CO2 8HP, UK

Tel: +44 (0)1206 796351

Email: [sales@portland-services.com](mailto:sales@portland-services.com)

**Please note that all content more than two years old (back to 2001) is FREE to view**

## Contents

---

### **Preface – Mechanics in biology: cells and tissues**

D Ambrosi, K Garikipati and E Kuhl

### **Mechanical strain enhances survivability of collagen micronetworks in the presence of collagenase: implications for load-bearing matrix growth and stability**

AP Bhole, BP Flynn, M Liles, N Saeidi, CA Dimarzio and JW Ruberti

### **Axial-symmetry breaking in constrained membranes**

P Biscari and G Napoli

### **Continuum model of epithelial morphogenesis during *Caenorhabditis elegans* embryonic elongation**

P Ciarletta, M Ben Amar and M Labouesse

### **Hierarchical poroelasticity: movement of interstitial fluid between porosity levels in bones**

SC Cowin, G Gailani and M Benalla

### **Constitutive modelling of passive myocardium: a structurally based framework for material characterization**

GA Holzapfel and RW Ogden

### **Simulation of the contractile response of cells on an array of micro-posts**

JP McGarry, J Fu, MT Yang, CS Chen, RM McMeeking, AG Evans and VS Deshpande

### **A microsphere-based remodelling formulation for anisotropic biological tissues**

A Menzel and T Waffenschmidt

### **Multi-scale models of cell and tissue dynamics**

MA Stolarska, Y Kim and HG Othmer

### **Towards a unified theory for morphomechanics**

LA Taber

### **Evaluation of fundamental hypotheses underlying constrained mixture models of arterial growth and remodelling**

A Valentín and JD Humphrey

### **Differential growth and residual stress in cylindrical elastic structures**

R Vandiver and Alain Goriely

 denotes articles that are free to access via *EXiS Open Choice*