Biomedical Engineering

Cell and Matrix Mechanics

"This timely and ambitious book covers biomechanics and mechanobiology from the perspective of multiple length scales, ranging from molecules to tissues to cells. In doing so, this book acknowledges two important open questions within the field: How are forces applied to tissues at the macroscale translated into molecular signaling events that ultimately control cell behavior? And, conversely, how are forces generated by individual cells integrated throughout a tissue to give rise to macroscale physiology? While these lofty issues are surely beyond the scope of any single book, this volume does an excellent job of recognizing these challenges and presenting a hierarchy through which they may be approached."

—**Sanjay Kumar**, University of California, Berkeley, USA

Explores a Range of Multiscale Biomechanics/Mechanobiology Concepts

Cell and Matrix Mechanics presents cutting-edge research at the molecular, cellular, and tissue levels in the field of cell mechanics. This book involves key experts in the field and covers crucial areas of cell and tissue mechanics, with an emphasis on the roles of mechanical forces in cell–matrix interactions. Providing material in each chapter that builds on the previous chapters, it effectively integrates length scales and contains, for each length scale, key experimental observations and corresponding quantitative theoretical models.

Summarizes the Three Hierarchical Levels of Cell Mechanics

The book contains 14 chapters and is organized into three sections. The first section focuses on the molecular level, the second section details mechanics at the cellular level, and the third section explores cellular mechanics at the tissue level. The authors offer a thorough description of the roles of mechanical forces in cell and tissue biology and include specific examples. They incorporate descriptions of associated theoretical models and provide the data and modeling framework needed for a multi-scale analysis. In addition, they highlight the pioneering studies in cell–matrix mechanics by Albert K. Harris.

Cell and Matrix Mechanics succinctly and systematically explains the roles of mechanical forces in cell–matrix biology. Practitioners and researchers in engineering and physics, as well as graduate students in biomedical engineering and mechanical engineering related to mechanobiology, can benefit from this work.

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711 Third Avenue
New York, NY 10017
2 Park Square, Milton Park
Abingdon, Oxon OX14 4RN, UK

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