

# Preface

Cell behavior is modulated by a complex, spatio-temporally integrated set of biophysical mechanisms influenced by the biochemistry of extracellular and intracellular signaling, but also by the properties of the surrounding extracellular environment. A cell assimilates multiple cues from its microenvironment, including signals bound to the extracellular matrix and neighboring cells, mechanical stimuli, and soluble signals from both adjacent and distant cells. The cell then responds to these signals via multiple pathways, each involving multiple cascades of internal molecular interactions. While much has been learned over the past decade regarding the mechanobiology of how cells interact with their surrounding environment in cases of physiology and disease, many fundamental questions remain. New tools as well as experimental and modeling approaches now enable researchers to answer a host of complex questions regarding the biophysics of how cells sense and respond to each other as well as to the multitude of extrinsic signals present in their local microenvironment. Continued progress in the field requires continued, close interactions between researchers in engineering, biology, physics, and medicine, but promises significant advances in the fields of regenerative biology and tissue engineering.

This peer-reviewed book is one result of the Society of Engineering Science (SES) 45<sup>th</sup> Annual Technical Meeting, held October 12–15, 2008 at the University of Illinois at Urbana-Champaign. The meeting brought together scientists, engineers and mathematicians from around the world with the common belief that solutions to critical modern problems transcend traditional disciplinary boundaries and require bringing together diverse, interdisciplinary groups of researchers to discuss advances in highly focused symposia. We had the privilege of organizing the *Mechanobiology of Cell-Extracellular Matrix Interactions* Symposium at the meeting. The symposium focused on interdisciplinary research involving both experimental and modeling approaches to understanding the mechanisms of how individual or populations of cells respond to distinct extracellular cues. There were 28 oral presentations spread across six sessions, with the keynote address given by Prof. Yu-Li Wang (Carnegie Mellon University, USA). We would like to thank the

General Chair (H. Johnson, U. of Illinois at Urbana-Champaign, USA), Technical Program Chair (I. Jasiuk, U. of Illinois at Urbana-Champaign, USA), as well as the rest of the Organizing Committee for their support in helping to make the symposium a success.

This book has been organized into four technical sections that roughly reflect the organization of technical sessions at the SES symposium.

- Mechanisms of Cell Adhesion and Mechanotransduction
- Cooperative Cell Behavior and Mechanobiology
- Mechano-pathology of Disease
- Tools for Exploring Mechanobiology

We wish to acknowledge a number of key people who helped make this book a reality. We would like to thank Elaine Tham and Michael Luby at Springer for her initiation of the project and encouragement to publish this volume as well as his management of the process. This book would have not been possible without the technical assistance we received along the way, notably staff in the Department of Mechanical Science and Engineering including Ben Kaap, Susan Petry, Pam Vanetta, and Jennifer Carroll, our students Michael Poellmann and Emily Gonnerman, as well as our colleagues within and administrative support from the Depts. of Mechanical Science and Engineering, Chemical and Biomolecular Engineering, and the Institute for Genomic Biology at the University of Illinois.

This book was only possible due to the substantial effort of all of our authors, and we are extremely grateful for their tireless work in preparing their own chapters and in many cases serving as reviewers of additional chapters. We were also assisted by a multitude of colleagues who agreed to serve as reviewers of each chapter.

Finally, we are deeply grateful for the support and patience shown by our partners, Harley Johnson and Kathryn Clancy, throughout the process of putting this book together, as well as for the joy our children, Elise (7 years) and Will (3 years) Johnson and Joan Clancy-Harley (2 years), bring to our lives.

Urbana, IL  
September 2010

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<http://www.springer.com/978-1-4419-8082-3>

Mechanobiology of Cell-Cell and Cell-Matrix Interactions

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2011, XIII, 319 p., Hardcover

ISBN: 978-1-4419-8082-3