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On the Inaugural of MCB: Molecular & Cellular Biomechanics

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On behalf of the Board of Editors, it is a true pleasure to present to you the Inaugural Issues of our new Journal entitled: Molecular and Cellular Biomechanics (MCB). We sincerely hope that we have assembled in this first issues of the Journal under its new name: Molecular and Cellular Biomechanics, a glimpse of the bright future of this new and exciting field.

At the end of past century, the scientific world had experienced multiple explosions of developments in modern biology with new molecular and genomic approaches, molecular and cellular imaging tools, and advances in large-scale computations. We feel that this concatenation of developments has led to some unprecedented opportunities for major advances in molecular and cellular biomechanics using the gains made in large-scale computation, if an appropriate forum became available. The concept for this Journal germinated at a National Academies Workshop at UC Irvine held in February of 2003, and rapidly progressed toward the development of this new Journal. We hope that this Journal will serve as an important and pivotal forum for molecular and cellular biomechanics in this new millennium.

The field of biomechanics concerns with motion, deformation, and forces in biological systems. With the progresses made in molecular biology, genomic engineering, and nanotechnology, it is very apparent that biomechanics focusing on single molecules, sub-cellular components or single cell interactions would need quantitative theories and computational models, and these would then an important aspect of modern 21^{st} century biological sciences. As Dr. Bruce Alberts, former President of the U.S. National Academy of Science and one of the most prominent cell biologists, pointed out in an editorial published in the journal Cell, a cell is a collection of protein machine and all biological functions of life derives from the structure and the ordered conformational changes of several protein assemblies or assemblies of several cell types in a spatially orchestrated extracellular matrix (Cell, Vol. 92, 291-294, February, 1998). The aim of this new journal is therefore to facilitate the studies of the mechanics of biomolecules including proteins and nucleic acid and the mechanics of single cells and their interactions with extracellular matrix.

The scope of the journal is broad-based, and includes:

- **Mechanical Behaviors of Biomolecules:** Studies of how mechanical forces and deformation affect the conformation, binding/reaction, and transport of biomolecules. Studies of how the structural rigidity of DNA, RNA and proteins under stretching, twisting, bending and shearing affects DNA condensation, gene replication and transcription, DNA-protein/RNA-protein interactions, protein function, protein-protein and receptor-ligand interactions. Studies of mechanobiochemical coupling in biomolecular motors. Studies of the mechanics of subcellular structures and protein assemblies/complexes.
- **Mechanical Behaviors of Single Cells:** Studies of how cells sense mechanical forces or deformations, and transduce them into biological responses. Specifically, studies of how mechanical forces alter cell growth, differentiation, movement, signal transduction, protein secretion and transport, gene expression and regulation. Studies of single cell behavior, including viscoelastic properties, cell growth, spreading, rounding, crawling, cell adhesion, cell cytoskeleton dynamics, cell-cell and cell-ECM interactions.
- **Multiscale Computational Tools:** Development of simulation models and numerical methods for the analysis, modeling, and prediction of the biomechanical behaviors and function of single cells (and their extracellular matrix) and biomolecules. Methodologies include Molecular and Langevin dynamics of biomolecules and Mesoscopic modeling techniques. Multi-spatial and-time-scale modeling methodologies, and seamless coupling of nano-micro-macro computational models.

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- **Experimental Biomechanics Methods:** Development of experimental techniques to study the mechanical behavior of cells including local probes to deform a portion of the cell, mechanical deformation of a single cell, and simultaneous mechanical stressing of a population of cells. Methods for single-molecule biomechanics studies, including attachment, positioning and manipulating of single molecules, imaging and measuring deformation, and applying simple or combined loads.

This is a journal of, and for, all researchers in the field of molecular and cellular biomechanics, organized and edited by the leaders in the field, and published solely for the advancement of the field. We feel that this is a much-needed forum dedicated to molecular and cellular biomechanics and, with your support and nurturing, MCB will be a great success.