

# 《细胞力学进展》

## 图书基本信息

书名：《细胞力学进展》

13位ISBN编号：9787040317305

10位ISBN编号：7040317303

出版时间：2011-5

出版社：高等教育出版社

页数：284

版权说明：本站所提供下载的PDF图书仅提供预览和简介以及在线试读，请支持正版图书。

更多资源请访问：[www.tushu111.com](http://www.tushu111.com)

# 《细胞力学进展》

## 内容概要

《细胞力学进展(英文版)》从交叉学科的角度系统地介绍和总结了细胞力学和细胞物理研究领域的前沿课题和最新进展。其显著的特点是用分子力学和复杂连续介质力学的方法研究和计算细胞的演变和分化；将定量的数学力学分析方法与实验手段相结合来探讨细胞的生物物理特性。

《细胞力学进展(英文版)》适合作为从事分子生物学、生物工程和力学、软物质力学和物理、计算力学，以及生物化学和医学的科研人员和研究生的参考书。

《细胞力学进展(英文版)》的主编是美国加州大学伯克利分校的李少凡教授和南非科学院院士、开普半岛科技大学的孙博华教授。

## 书籍目录

### Chapter 1 Modeling and Simulations of the Dynamics of Growing Cell Clusters

- 1.1 Introduction
- 1.2 Single cell geometry and kinematics
  - 1.2.1 The continuum model
  - 1.2.2 The numerical model for the cell geometry
- 1.3 Single cell equilibrium and material model
  - 1.3.1 Cell equilibrium
  - 1.3.2 The material model
  - 1.3.3 Determination of material constants
- 1.4 Modeling cell interactions
  - 1.4.1 Cell-to-cell contact
  - 1.4.2 Cell-to-cell adhesion
  - 1.4.3 Cell-to-cell interaction test
- 1.5 Modeling the cell life cycle
- 1.6 Details of the numerical implementation
  - 1.6.1 The finite element model
  - 1.6.2 Contact/adhesion interface detection
  - 1.6.3 Time integration
  - 1.6.4 Parallelization
- 1.7 Numerical results
- 1.8 Summary and conclusions
- References

### Chapter 2 Multiscale Biomechanical Modeling of Stem Cell-Extracellular Matrix Interactions

- 2.1 Introduction
- 2.2 Cell and ECM modeling
  - 2.2.1 Basic hypothesis and assumptions
  - 2.2.2 Hyperelastic model
  - 2.2.3 Liquid crystal model
- 2.3 Contact and adhesion models for cell-substrate interactions
  - 2.3.1 The adhesive body force with continuum mechanics contact
  - 2.3.2 The cohesive contact model
- 2.4 Meshfree Galerkin formulation and the computational algorithm
- 2.5 Numerical simulations
  - 2.5.1 Validation of the material models
  - 2.5.2 Cell response in four different stiffness substrates
  - 2.5.3 Cell response to a stiffness-varying substrate
  - 2.5.4 Comparison of two different contact algorithms
  - 2.5.5 Three-dimensional simulation of cell spreading
- 2.6 Discussion and conclusions
- References

### Chapter 3 Modeling of Proteins and Their Interactions with Solvent

- 3.1 Introduction
- 3.2 Classical molecular dynamics

- 3.2.1 Coarse-grained model
  - 3.2.2 High performance computing
  - 3.3 Principal component analysis
    - 3.3.1 Three oscillators system analysis with PCA
    - 3.3.2 Quasi-harmonic analysis
    - 3.3.3 Equilibrium conformational analysis
  - 3.4 Methods and procedures
    - 3.4.1 Framework
    - 3.4.2 Overlap coefficients
    - 3.4.3 Correlation analysis
    - 3.4.4 PCA with MD simulation
    - 3.4.5 Kabsch algorithm
    - 3.4.6 Positional correlation matrix
    - 3.4.7 Cluster analysis
  - 3.5 MD simulation with T4 lysozyme
    - 3.5.1 Equilibration measures
    - 3.5.2 Fluctuation analysis
    - 3.5.3 Mode selection and evaluation
    - 3.5.4 Eigenvalue analysis
    - 3.5.5 Overlap evaluation
    - 3.5.6 Identification of slow conformational flexibility
    - 3.5.7 Correlation analysis of T4 lysozyme
  - 3.6 Hemoglobin and sickle cell anemia
    - 3.6.1 Molecular dynamic simulation with NAMD
    - 3.6.2 Conformational change analysis
    - 3.6.3 PCA analysis
    - 3.6.4 Correlation analysis with HbS interaction
  - 3.7 Conclusion
  - References
- Chapter 4 Structural , Mechanical and Functional Properties of Intermediate Filaments from the Atomistic to the Cellular Scales
- 4.1 Introduction
    - 4.1.1 Hierarchical structure of vimentin intermediate filaments
    - 4.1.2 The structural and physiological character of keratin
  - 4.2 Connecting filaments to cells level function and pathology
    - 4.2.1 Bending and stretching properties of IFs in cells
    - 4.2.2 IFs responding differently to tensile and shear stresses
    - 4.2.3 Mechanotransduction through the intermediate filament network
  - 4.3 Experimental mechanics
    - 4.3.1 Single filament mechanics
    - 4.3.2 Rheology of IF networks in vitro
    - 4.3.3 IF networks rheology in cells
  - 4.4 Case studies
    - 4.4.1 Single vimentin filament mechanics
    - 4.4.2 Network mechanics
    - 4.4.3 The mechanical role of intermediate filament in cellular system

## 4.5 Conclusion

### References

## Chapter 5 Cytoskeletal Mechanics and Rheology

### 5.1 Introduction

### 5.2 Modelling semiflexible filament dynamics

### 5.3 Experimental measurements

#### 5.3.1 Glass microneedles

#### 5.3.2 Cell poking

#### 5.3.3 Atomic force microscopy

#### 5.3.4 Micropipette aspiration

#### 5.3.5 Microplates

#### 5.3.6 Parallel-plate flow chambers

#### 5.3.7 Optical tweezers

#### 5.3.8 Magnetic traps

### 5.4 Computational models

### 5.5 Conclusion

### References

## Chapter 6 On the Application of Multiphasic Theories to the Problem of Cell-substrate Mechanical Interactions

### 6.1 Introduction

### 6.2 The physics of contractile fibroblasts and their interactions with an elastic substrate

#### 6.2.1 Cell spreading, contractility and substrate elasticity

#### 6.2.2 Molecular mechanisms of cell contractility

### 6.3 Multiphasic mixture theory and cell contractility

#### 6.3.1 The cytoplasm as a quadriphasic medium

#### 6.3.2 Mass transport and mass exchange within the cell

#### 6.3.3 Contractility and force balance

#### 6.3.4 Model's prediction for simple cases

### 6.4 Interaction between contractile cells and compliant substrates

#### 6.4.1 Two-dimensional plane stress formulation

#### 6.4.2 Numerical strategy: XFEM-level methods

### 6.4.3 Analysis of mechanical interactions between a contractile cell and an elastic substrate

### 6.5 Summary and conclusion

#### 6.5.1 Summary

#### 6.5.2 Limitations of the multiphasic approach

#### 6.5.3 Concluding remark

### References

## Chapter 7 Effect of Substrate Rigidity on the Growth of Nascent Adhesion Sites

### 7.1 Introduction

### 7.2 Model

### 7.3 Results and Discussion

### 7.4 Conclusion

### References

## Chapter 8 Opto-Hydrodynamic Trapping for Multiaxial Single-Cell Biomechanics

8.1 Introduction

8.2 Optical-hydrodynamic trapping.

8.2.1 Optical physics and microfluidics

8.2.2 Theoretical stress analysis

8.2.3 Experimental and computational flow validation

8.2.4 Applied stresses and strain response

8.2.5 Multiaxial single-cell biomechanics

8.3 Discussion

References

Chapter 9 Application of Nonlocal Shell Models to Microtubule

Buckling in Living Cells

9.1 Introduction

9.2 Nonlocal shell theories

9.2.1 Constitutive relations

9.2.2 Shear deformable shell model

9.2.3 Thin shell model

9.3 Bending buckling analysis

9.4 Numerical results and discussion

9.5 Conclusions

Appendix A

Appendix B

Appendix C

Appendix D

References

## 章节摘录

版权页：插图：In this method, the fluid flow through a chamber surface coated with a cell monolayer is used to study response of cells to fluid flow; a cellular probe is used to measure this response. Several cell types such as vascular endothelial cells and osteocytes are physiologically exposed to fluid flow and shear stress. Cells sense these external forces and react accordingly; this process is crucial for many regulatory processes. For example, endothelial surface layer has multifaceted physiological functions and behaves as a transport barrier, as a porous hydrodynamic interface in the motion of red and white cells in microvessels, and as a mechanotransducer of fluid shearing stresses to the actin cortical cytoskeleton of the endothelial cell. Endothelial cells adopt an elongated shape in the flow direction if they are subjected to a shear flow. A similar situation exists for osteocytes in bone where mechanosensing controls bone repair and adaptive restructuring processes. It is believed that strain-derived flow of interstitial fluid through lacuno-canalicular porosity mechanically activates the osteocytes. There are three candidates stimulating cells: wall shear stress, streaming potentials, and chemotransport. Controlling the wall shear stress and measuring its effect on fluid transport, bone cell nitric oxide, and prostaglandin production can be used to study the nature of the flow-derived cell stimuli. Fluid shear stress rate is also an important parameter for bone cell activation.

# 《细胞力学进展》

## 编辑推荐

《细胞力学进展(英文版)》是“十二五”国家重点图书。



# 《细胞力学进展》

## 精彩短评

- 1、全书由几篇兼顾综述和实验的论文组成。要注意的是本书是从力学和数学模型的角度来进行研究的，对于信号转导和生化过程只是略微提及。
- 2、介绍近期进展，学了不少东西，很有启发性。
- 3、书的质量很好，价格也便宜，很划算。

# 《细胞力学进展》

## 版权说明

本站所提供下载的PDF图书仅提供预览和简介，请支持正版图书。

更多资源请访问:[www.tushu111.com](http://www.tushu111.com)