

# Contents

<b>Preface</b> .....	<b>v</b>
<b>List of Contributors</b> .....	<b>xi</b>

## Part I. Introduction

<b>1 Ion Channels, from Fantasy to Fact in Fifty Years</b> .....	<b>3</b>
<i>Peter C. Jordan</i>	

## Part II. Specific Channel Types

<b>2 Gramicidin Channels: Versatile Tools</b> .....	<b>33</b>
<i>Olaf S. Andersen, Roger E. Koeppe II, and Benoît Roux</i>	
<b>3 Voltage-Gated Ion Channels</b> .....	<b>81</b>
<i>Francisco Bezanilla</i>	
<b>4 Voltage-Gated Potassium Channels</b> .....	<b>119</b>
<i>Stephen J. Korn and Josef G. Trapani</i>	
<b>5 BK<sub>Ca</sub>-Channel Structure and Function</b> .....	<b>171</b>
<i>Daniel H. Cox</i>	
<b>6 Voltage-Gated Sodium Channels</b> .....	<b>219</b>
<i>Dorothy A. Hanck and Harry A. Fozzard</i>	
<b>7 Calcium Channels</b> .....	<b>241</b>
<i>Ben Corry and Livia Hool</i>	
<b>8 Chloride Transporting CLC Proteins</b> .....	<b>301</b>
<i>Michael Pusch</i>	
<b>9 Ligand-Gated Ion Channels: Permeation and Activation</b> .....	<b>335</b>
<i>Joseph W. Lynch and Peter H. Barry</i>	
<b>10 Mechanosensitive Channels</b> .....	<b>369</b>
<i>Boris Martinac</i>	

**Contents**

**11 TRP Channels** ..... 399  
*Thomas Voets, Grzegorz Owsianik, and Bernd Nilius*

**12 Ion Channels in Epithelial Cells** ..... 425  
*Lawrence G. Palmer*

**Part III. Theoretical Approaches**

**13 Poisson–Nernst–Planck Theory of Ion Permeation Through Biological Channels** ..... 449  
*Rob D. Coalson and Maria G. Kurnikova*

**14 A Mesoscopic–Microscopic Perspective on Ion Channel Permeation Energetics: The Semi-Microscopic Approach** ..... 485  
*Peter C. Jordan*

**15 Brownian Dynamics Simulation for Ion Channel Permeation** ..... 507  
*Shin-Ho Chung and Vikram Krishnamurthy*

**16 Molecular Dynamics Simulation Approaches to K Channels** ..... 545  
*Alessandro Grottesi, Shozeb Haider, and Mark S. P. Sansom*

**Part IV. Emerging Technologies**

**17 Patch-Clamp Technologies for Ion Channel Research** ..... 571  
*Fred J. Sigworth and Kathryn G. Klemic*

**18 Gated Ion Channel-Based Biosensor Device** ..... 595  
*Frances Separovic and Bruce A. Cornell*

**19 Signal Processing Based on Hidden Markov Models for Extracting Small Channel Currents** ..... 623  
*Vikram Krishnamurthy and Shin-Ho Chung*

**Index** ..... 651