

In Memoriam	xi
Contributors	xiii
Foreword to the First Edition	xvii
Foreword to the Second Edition	xix
Foreword to the Third Edition	xxi
Foreword to the Fourth Edition	xxiii
Preface to the Fourth Edition	xxv

Section I Biophysical Chemistry, Metabolism, Second Messengers, and Ultrastructure

1. Biophysical Chemistry of Physiological Solutions	3
<i>Jeffrey C. Freedman</i>	
2. Physiological Structure and Function of Proteins	19
<i>Matthew R. Pincus</i>	
3. Cell Membranes	49
<i>Jeffrey C. Freedman</i>	
4. Ionophores in Planar Lipid Bilayers	61
<i>Jeffrey C. Freedman</i>	
5. Cell Structure	67
<i>Michael S. Forbes</i>	
6. Signal Transduction and Second Messengers	85
<i>Aldebaran M. Hofer</i>	
7. Calcium as an Intracellular Second Messenger: Mediation by Calcium-Binding Proteins	99
<i>John R. Dedman and Marcia A. Kaetzel</i>	

Section II Membrane Potential, Transport Physiology, Pumps, and Exchangers

8. Diffusion and Permeability	113
<i>Nicholas Sperelakis and Jeffrey C. Freedman</i>	
9. Origin of Resting Membrane Potentials	121
<i>Nicholas Sperelakis</i>	
10. Gibbs–Donnan Equilibrium Potentials	147
<i>Nicholas Sperelakis</i>	
11. Mechanisms of Carrier-Mediated Transport: Facilitated Diffusion, Cotransport and Countertransport	153
<i>Steven M. Grassl</i>	
12. Active Ion Transport by ATP-Driven Ion Pumps	167
<i>Robert A. Farley</i>	
13. Ca ²⁺ -ATPases	179
<i>Tracy J. Pritchard, Istvan Edes and Evangelia G. Kranias</i>	
14. Na ⁺ -Ca ²⁺ Exchange Currents	195
<i>John H.B. Bridge, Natalia S. Torres and Michela Ottolia</i>	
15. Intracellular Chloride Regulation	221
<i>Francisco J. Alvarez-Leefmans</i>	

16. Osmosis and Regulation of Cell Volume	261	27. Why are So Many Ion Channels Mechanosensitive?	493
<i>Clive M. Baumgarten and Joseph J. Feher</i>		<i>Catherine E. Morris</i>	
17. Intracellular pH Regulation	303		
<i>Robert W. Putnam</i>			
Section III		Section IV	
Membrane Excitability and Ion Channels		Ion Channels as Targets for Toxins, Drugs, and Genetic Diseases	
18. Cable Properties and Propagation of Action Potentials	325	28. Ion Channels as Targets for Toxins	509
<i>Nicholas Sperelakis</i>		<i>Kenneth M. Blumenthal</i>	
19. Electrogenesis of Membrane Excitability	345	29. Ion Channels as Targets for Drugs	525
<i>Nicholas Sperelakis</i>		<i>Seth Robey, Kevin J. Sampson and Robert S. Kass</i>	
20. Patch-Clamp Techniques	369	30. Inherited Diseases of Ion Transport	535
<i>Laura Conforti</i>		<i>Robert A. Farley</i>	
21. Structure and Mechanism of Voltage-Gated Ion Channels	383	Section V	
<i>Simon Rock Levinson and William A. Sather</i>		Synaptic Transmission and Sensory Transduction	
22. Biology of Gap Junctions	409	31. Ligand-Gated Ion Channels	549
<i>Richard D. Veenstra</i>		<i>Kenneth R. Tovar and Gary L. Westbrook</i>	
23. Regulation of Cardiac Ion Channels by Cyclic Nucleotide-Dependent Phosphorylation	431	32. Synaptic Transmission	563
<i>Gordon M. Wahler and Nicholas Sperelakis</i>		<i>Janusz B. Suszkiw</i>	
24. Direct Regulation of Ion Channels by GTP-Binding Proteins	445	33. Excitation—Secretion Coupling	579
<i>Atsushi Inanobe and Yoshihisa Kurachi</i>		<i>Nicole Gallo-Payet and Marcel Daniel Payet</i>	
25. Developmental Changes in Ion Channels	453	34. Stimulus—Response Coupling in Metabolic Sensor Cells	601
<i>Takeshi Kobayashi, Noritsugu Tohse, Hisashi Yokoshiki and Nicholas Sperelakis</i>		<i>Stan Mislér</i>	
26. Regulation of Ion Channel Localization and Activity Through Interactions with the Cytoskeleton	475	35. Cyclic Nucleotide-Gated Ion Channels	621
<i>Stephen Lambert</i>		<i>Anita L. Zimmerman</i>	
		36. Sensory Receptors and Mechanotransduction	633
		<i>Andrew S. French and Päivi H. Torkkeli</i>	

37. Acoustic Transduction	649	46. Contraction of Muscles: Mechanochemistry	801
<i>Daniel C. Marcus</i>		<i>Richard J. Paul</i>	
38. Visual Transduction	669	47. Flagella, Cilia, Actin- and Centrin-based Movement	823
<i>Anita L. Zimmerman</i>		<i>Kenneth W. Foster</i>	
39. Gustatory and Olfactory Sensory Transduction	681	48. Electrocytes of Electric Fish	855
<i>Stephen D. Roper</i>		<i>Anthony L. Gotter, Marcia A. Kaetzel and John R. Dedman</i>	
40. Infrared Sensory Organs	699		
<i>Stephen D. Roper and Michael S. Grace</i>		Section VII	
41. Electoreceptors and Magnetoreceptors	705	Protozoa and Bacteria	
<i>Timothy C. Tricas and Bruce A. Carlson</i>		49. Physiological Adaptations of Protists	873
		<i>Michael Levandowsky</i>	
Section VI		50. Physiology of Prokaryotic Cells	891
Muscle and Other Contractile Systems		<i>Dennis W. Grogan</i>	
42. Skeletal Muscle Excitability	729		
<i>Nicholas Sperelakis, Judith Heiny and Hugo Gonzalez-Serratos</i>		Section VIII	
43. Cardiac Action Potentials	757	Specialized Processes: Photosynthesis and Bioluminescence	
<i>Gordon M. Wahler</i>		51. Photosynthesis	909
44. Smooth Muscle Excitability	771	<i>Darrell Fleischman</i>	
<i>Neil D. Detweiler, Anup K. Srivastava, Asif R. Pathan, Sujay V. Kharade and Nancy J. Rusch</i>		52. Bioluminescence	925
45. Excitation–Contraction Coupling in Skeletal Muscle	783	<i>J. Woodland Hastings</i>	
<i>Judith A. Heiny and Gerhard Meissner</i>		Appendix	949
		Index	957