

Table of contents

<i>Coordinators and contributors</i>	v
<i>Preface</i>	xiii
1 Some biology basic principles	1
1 Introduction	1
2 At the cellular level	2
3 At the molecular scale	13
Bibliography	30
2 Fluorescence microscopy for biological imaging	31
1 Introduction	31
2 Fluorescence	32
3 Fluorescence microscopy	37
4 Single molecule imaging	42
5 Conclusion and perspectives	47
Bibliography	48
3 Mechanical studies on single molecules:	
general considerations	49
1 Elements of molecular biology	49
2 Advantages and drawbacks of single molecule studies	53
3 Order of magnitude of the relevant parameters at the single molecule level	55

4	Single molecule manipulation techniques	58
5	Comparison of the different techniques	61
6	DNA mechanical properties	62
7	Conclusion	69
	Bibliography	69
4	Molecular motors	71
1	A rotating motor: ATP synthase	71
2	Myosins: a linear motor example	77
3	A motor on DNA: the example of the RNA polymerase	83
4	Conclusion	89
	Bibliography	90
5	Cellular mechanics and motility	91
1	Mechanical properties of eukaryotic cells	93
2	Cell movement or cell motility	102
3	Simplified systems for a controlled study	104
4	Conclusion and perspectives	107
	Bibliography	108
6	Exploring neuronal activity with photons	109
1	Introduction	109
2	Information coding	111
3	Optical recordings of neuronal activity	114
4	Functional organization of the cortex at the level of a cortical column	117
5	Microarchitecture of a cortical column	119
6	Dynamics of neuronal populations	122
7	Outlook	124
	Bibliography	125
7	Physical principles of hearing	127
1	Psychophysical properties of hearing	127
2	The cochlear amplifier	130
3	Mechanosensory hair cells	133
4	The "critical" oscillator as a general principle of auditory detection	144
	Bibliography	146

8 Sensing through friction: the biomechanics of texture perception in rodents and primates	149
1 Cutaneous mechanoreceptors of the human glabrous skin	150
2 The neural basis of roughness perception	153
3 Mechanical filtering of tactile information by the skin tissue	155
4 Whisker perception in rodents	160
5 The whisker as a transduction line	163
6 Conclusion	166
Bibliography	166
9 Intermittent search strategies	169
1 Introduction	169
2 Animals looking for food	171
3 Model of intermittent search	171
4 Minimizing the search time	172
5 Should animals really perform Lévy strategies?	174
6 How does a protein find its target sequence on DNA?	174
7 Active intermittent transport in cells	176
8 Optimizing the kinetic rate constant	177
9 Robustness of the results	178
10 Conclusion	180
Bibliography	180
Index	181