

CONTENTS

CONTRIBUTORS	ix
PREFACE	xi

The New New Biomaterials

MICHAEL V. SEFTON

I. What Happened to Inert Biomaterials?	1
II. Biocompatibility of Modern Biomaterials	2
References	5

Cell–Material Interactions

KRISTYN S. MASTERS AND KRISTI S. ANSETH

I. Introduction	7
II. Cell Surface Receptors and their Ligands	8
A. Integrins	10
B. Proteoglycans and Selectins	13
C. Immunoglobulins	16
D. Anti-adhesive Matrix Molecules	17
III. Integrin–Ligand Binding and Signal Transduction	18
A. Focal Adhesions	19
B. Effect of Cell Adhesion and Shape on Cell Function	21
IV. Nonspecific Interactions of Cells with Materials	25
A. Dynamics of Protein Adsorption	26
B. Surface Chemistry	28
C. Surface Topography	31
V. Controlled Cell–Material Interactions	33
A. Ideal Surfaces	34
B. Adhesion Ligands	36
VI. Conclusion	41
References	42

CONTENTS

Polymeric Biomaterials for Nerve Regeneration

SURYA K. MALLAPRAGADA AND JENNIFER B. RECKNOR

I.	Introduction	47
II.	Polymers for Regeneration in the Peripheral Nervous System	48
	A. Nondegradable Polymers for Entubulization	50
	B. Degradable Polymers for Entubulization	52
	C. Comparative Studies	57
III.	Polymers for Regeneration in the Central Nervous Systems	60
IV.	Polymers for Controlled Release	64
V.	Cell Encapsulation	66
VI.	Conclusions	68
	Acknowledgments	68
	References	68

Structural and Dynamic Response of Neutral and Intelligent Networks in Biomedical Environments

ANTHONY M. LOWMAN, THOMAS D. DZIUBLA, PETR BURES,
AND NICHOLAS A. PEPPAS

I.	Introduction	75
II.	Structure of Three-dimensional Polymeric Networks as Biomaterials	76
	A. Hydrogel Classification	77
	B. Network Structure of Hydrogels	77
	C. Solute Transport in Hydrogels	83
	D. Environmentally Responsive Hydrogels	88
	E. Complexation in Polymers	92
	F. Tissue Engineering Aspects of Neutral Networks	98
III.	Applications of Hydrogels	105
	A. Neutral Hydrogels	105
	B. Responsive Networks	110
	C. Oral Insulin Delivery Systems	119
	D. Protein Based Hydrogels	120
	E. Other Promising Applications	121
	References	122

Biomaterials and Gene Therapy

F. KURTIS KASPER AND ANTONIOS G. MIKOS

I.	Introduction	131
	A. Gene Therapy and Protein Delivery	132
	B. Methods of Gene Delivery	133
II.	Biomaterials for Nonviral Gene Therapy	136
	A. Cationic Lipids	136