

Contents

Preface.....	ix
Acknowledgments	xi
Editor	xiii
Contributors	xv

PART I Nano-Bio Interfacing

1 Quantum Dots: Basics to Biological Applications	1-1
<i>Sarwat B. Rizvi, Mo Keshtgar, and Alexander Marcus Seifalian</i>	
2 Viral Biology and Nanotechnology	2-1
<i>Vaibhav Saini and Maaike Everts</i>	
3 Nano-Bio Interfacing with Living Cell Biochips	3-1
<i>Yosi Shacham-Diamand, Ronen Almog, Ramiz Daniel, Arthur Rabner, and Rachela Popovtzer</i>	
4 Micro- and Nanomechanical Biosensors.....	4-1
<i>Maria Arroyo-Hernandez, Priscila M. Kosaka, Johann Mertens, Montserrat Calleja, and Javier Tamayo</i>	
5 Enzymatic Nanolithography.....	5-1
<i>Manfred Radmacher</i>	
6 Biomimetic Synthesis of Nanostructures Inspired by Biomineralization.....	6-1
<i>Eike Brunner, Hermann Ehrlich, and Martin Kammer</i>	
7 Nanotubes for Biotechnology	7-1
<i>Jonathan C. G. Jeynes, Vanesa Sanz-Beltran, Johnjoe McFadden, and S. R. P. Silva</i>	
8 Nanoscale Forces in Protein Recognition and Adhesion.....	8-1
<i>Deborah Leckband</i>	
9 Force Spectroscopy on Cells	9-1
<i>Martin Benoit</i>	
10 Nanoscale Magnetic Biotransport	10-1
<i>Edward P. Furlani</i>	
11 Nanomechanical Sensors for Biochemistry and Medicine	11-1
<i>Hans Peter Lang and Christoph Gerber</i>	
12 Analyzing Individual Biomolecules Using Nanopores	12-1
<i>Meni Wanunu, Gautam V. Soni, and Amit Meller</i>	

PART II Nanotoxicology

- 13 Chances and Risks of Nanotechnology 13-1
Armin Grunwald
- 14 Human and Natural Environment Effects of Nanomaterials 14-1
Birgit Gaiser, Martin J. D. Clift, Helinor J. Johnston, Matthew S. P. Boyles, and Teresa F. Fernandes
- 15 Toxicology, Diagnostics, and Therapy Functions of Nanomaterials 15-1
Stefano Bellucci
- 16 Cell Oxidative Stress: Risk of Metal Nanoparticles 16-1
Marija Poljak-Blazi, Morana Jaganjac, and Neven Zarkovic
- 17 Fullerene C₆₀ Toxicology 17-1
Crystal Y. Usenko, Stacey L. Harper, Michael T. Simonich, and Robert L. Tanguay

PART III Clinical Significance of Nanosystems

- 18 Pharmacological Significance of Nanoparticles 18-1
Carlos Medina and Marek W. Radomski
- 19 Organs from Nanomaterials 19-1
Maqsood Ahmed and Alexander Marcus Seifalian
- 20 Nanotechnology for Implants 20-1
Lijie Zhang and Thomas J. Webster
- 21 Nanotechnology for the Urologist 21-1
Hashim Uddin Ahmed, Lyndon Gommersall, Iqbal S. Shergill, Manit Arya, and Mark Emberton

PART IV Medical Imaging

- 22 Quantum Dots for Nanomedicine 22-1
Sarah H. Radwan and Hassan M. E. Azzazy
- 23 Relaxivity of Nanoparticles for Magnetic Resonance Imaging 23-1
Gustav J. Strijkers and Klaas Nicolay
- 24 Nanoparticle Contrast Agents for Medical Imaging 24-1
David P. Cormode, Willem J. M. Mulder, and Zahi A. Fayad
- 25 Optical Nanosensors for Medicine and Health Effect Studies 25-1
Tuan Vo-Dinh and Yan Zhang

PART V Drug Delivery

- 26 Multifunctional Pharmaceutical Nanocarriers 26-1
Vladimir P. Torchilin
- 27 Nanotechnology and Drug Delivery 27-1
Fahima Dilnawaz, Sarbari Acharya, Ranjita Misra, Abhalaxmi Singh, and Sanjeeb Kumar Sahoo
- 28 Targeting Magnetic Particles for Drug Delivery 28-1
Javed Ally and Alidad Amirfazli
- 29 Biodegradable Nanoparticles for Drug Delivery 29-1
Jason Park and Tarek M. Fahmy

PART VI Response to Nanomaterials

30	Uptake of Carbon-Based Nanoparticles by Mammalian Cells and Plants.....	30-1
	<i>Pu-Chun Ke, Sijie Lin, Jason Reppert, Apparao M. Rao, and Hong Luo</i>	
31	Penetration of Metallic Nanomaterials in Skin	31-1
	<i>Biancamaria Baroli</i>	
32	Nanoparticulate Systems and the Dermal Barrier	32-1
	<i>Frank Stracke and Marc Schneider</i>	
33	Cellular Response to Continuous Nanostructures	33-1
	<i>Kevin J. Chalut, Karina Kulangara, and Kam W. Leong</i>	

PART VII Cancer Therapy

34	Nanotechnology for Targeting Cancer	34-1
	<i>Venkataraman Soundararajan and Ram Sasisekharan</i>	
35	Cancer Nanotechnology: Targeting Tumors with Nanoparticles.....	35-1
	<i>Erem Bilensoy</i>	
36	Gold Nanoparticles for Plasmonic Photothermal Cancer Therapy.....	36-1
	<i>Xiaohua Huang, Ivan H. El-Sayed, and Mostafa A. El-Sayed</i>	
37	Fullerenes in Photodynamic Therapy of Cancer.....	37-1
	<i>Pawel Mroz, Ying-Ying Huang, Tim Wharton, and Michael R. Hamblin</i>	

PART VIII Quantum Engines and Nanomotors

38	Energy Transport and Heat Production in Quantum Engines.....	38-1
	<i>Liliana Arrachea and Michael Moskalets</i>	
39	Artificial Chemically Powered Nanomotors	39-1
	<i>Yu-Guo Tao and Raymond Kapral</i>	
40	Nanobatteries	40-1
	<i>Dale Teeters and Paige L. Johnson</i>	
41	Nanoheaters.....	41-1
	<i>Christian Falconi</i>	

PART IX Nanorobotics

42	Atomic-Force-Microscopy-Based Nanomanipulation Systems	42-1
	<i>Cagdas D. Onal, Onur Ozcan, and Metin Sitti</i>	
43	Nanomanipulation and Nanorobotics with the Atomic Force Microscope	43-1
	<i>Robert W. Stark</i>	
44	Nanorobotic Manipulation	44-1
	<i>Lixin Dong and Bradley J. Nelson</i>	
45	MRI-Guided Nanorobotic Systems for Drug Delivery	45-1
	<i>Panagiotis Vartholomeos, Matthieu Fruchard, Antoine Ferreira, and Constantinos Mavroidis</i>	

46	Medical Micro- and Nanorobots	46-1
	<i>Sylvain Martel</i>	
47	Nanohandling Robot Cells.....	47-1
	<i>Sergej Fatikow, Thomas Wich, Christian Dahmen, Daniel Jasper, Christian Stolle, Volkmar Eichhorn, Saskia Hagemann, and Michael Weigel-Jech</i>	
Index.....		Index-1
PART VI	Diagnosis and Therapy-Focused Applications	
48	Nanoballoon Catheter System for Minimally Invasive Interventional Radiology	48-1
	<i>Matthew S. L. Park, Matthew S. Perlman, and Matthew J. Fischbeck</i>	
49	Nanoballoon Catheter System for Minimally Invasive Interventional Radiology	49-1
	<i>Matthew S. L. Park, Matthew S. Perlman, and Matthew J. Fischbeck</i>	
50	Cellular Responses to Cytotoxic Nanomaterials and Nanoparticles	50-1
	<i>Carlo Pollici-Blini, Melania Jagauer, and Neven Zarkovic</i>	
51	Fullerenes C₆₀: Toxicology	51-1
	<i>Crystal V. Usenka, Stacey L. Harper, Michael T. Simonich, and Robert L. Tanguay</i>	
52	Cancer Nanotechnology: Targeting Tumors With Nanoballoons	52-1
	<i>Matthew S. L. Park, Matthew S. Perlman, and Matthew J. Fischbeck</i>	
53	Organic Nanomaterials	53-1
	<i>Matthew S. L. Park, Matthew S. Perlman, and Matthew J. Fischbeck</i>	
54	Nanotechnology for Targeting Cancer Cells	54-1
	<i>Matthew S. L. Park, Matthew S. Perlman, and Matthew J. Fischbeck</i>	
55	Pharmacological Significance of Nanoparticles	55-1
	<i>Matthew S. L. Park, Matthew S. Perlman, and Matthew J. Fischbeck</i>	
56	Organs from Nanomaterials	56-1
	<i>Matthew S. L. Park, Matthew S. Perlman, and Matthew J. Fischbeck</i>	
57	Nanotechnology for Implants	57-1
	<i>Matthew S. L. Park, Matthew S. Perlman, and Matthew J. Fischbeck</i>	
58	Nanotechnology for the Urologist	58-1
	<i>Hassim Uddin Ahmed, Lyndon Cormackall, Taylor S. Sherrill, Mandava, and Mark Emberton</i>	
PART VII	Custom Diagnoses and Nanosensors	
PART IV	Medical Imaging	
59	Quantum Dots for Nanomedicine	59-1
	<i>Sarah H. Radwan and Hassan M. R. Azaay</i>	
60	Relativity of Nanoparticles for Magnetic Resonance Imaging	60-1
	<i>Gustav J. Strijkers and Klaus Meinel</i>	
61	Nanoparticle Contrast Agents for Medical Imaging	61-1
	<i>David P. Cormode, Willem J. M. Mulder, and Zaid A. Fayad</i>	
62	Optical Nanosensors for Medicine and Health Effect Studies	62-1
	<i>Tuan Vo-Dinh and Yan Zhang</i>	
PART V	Drug Delivery	
63	Multi-functional Pharmaceutical Nanosubinjection Systems	63-1
	<i>Vladimir P. Torchilin</i>	
64	Nanosubinjection and Nanosurgery with the Atomic Force Microscope	64-1
	<i>Rakesh K. Singh, Soham Acharya, Ranjita Mitra, Abhik Kumar Saha, and Sanjeev Kumar Saha</i>	
65	Targeting Magnetic Particles for Drug Delivery Using a Magnetic Field and Ultrasound	65-1
	<i>Javed and Ghida Antia</i>	
66	MRI-Guided Nanosurgery for Drug Delivery	66-1
	<i>Tian Dong and Pramod K. Mehta</i>	
PART IX	Microscopy	
67	Atomic-Force-Microscopy-Based Nanosubinjection	67-1
	<i>Charles D. Ouellet, Odile Ouellet, and Michel Zitelli</i>	
68	Nanosubinjection and Nanosurgery with the Atomic Force Microscope	68-1
	<i>Rakesh K. Singh, Soham Acharya, Ranjita Mitra, Abhik Kumar Saha, and Sanjeev Kumar Saha</i>	
69	Ultrasound-Mediated Nanosurgery	69-1
	<i>Tian Dong and Pramod K. Mehta</i>	
70	MRI-Guided Nanosurgery Systems for Drug Delivery and Coagulation	70-1
	<i>Yihui Li, Chuan-Kun Xiang, and Kejun Wu</i>	