

NANOBIOTECHNOLOGY

BioInspired Devices and Materials of the Future

Edited by

ODED SHOSEYOV

*The Institute of Plant Science and Genetics in Agriculture
and The Otto Warburg Center for Agricultural Biotechnology,
The Hebrew University of Jerusalem, Rehovot, Israel*

and

ILAN LEVY

Intel Research Israel, Intel Electronics, Jerusalem, Israel

 **HUMANA PRESS**
TOTOWA, NEW JERSEY

CONTENTS

Preface	v
Contributors	ix
PART I INTRODUCTION	
1 Nanobiotechnology Overview	03
<i>Oded Shoseyov and Ilan Levy</i>	
PART II BIOTEMPLATING	
2 Experimental Strategies Toward the Use of the Porin MspA as a Nanotemplate and for Biosensors	19
<i>Stefan H. Bossmann, Katharine Janik, Megh Raj Pokhrel, and Michael Niederweis</i>	
3 Bionanotechnology and Bionanoscience of Artificial Bioassemblies	41
<i>Steven S. Smith and Katarzyna Lamparska-Kupsik</i>	
4 Genetically Engineered S-Layer Proteins and S-Layer-Specific Heteropolysaccharides as Components of a Versatile Molecular Construction Kit for Applications in Nanobiotechnology	55
<i>Eva-M. Egelseer, Margit Sára, Dietmar Pum, Bernhard Schuster, and Uwe B. Sleytr</i>	
PART III BIONANOELECTRONICS AND NANOCOMPUTING	
5 Photoinduced Electron Transport in DNA: Toward Electronic Devices Based on DNA Architecture	89
<i>Hans-Achim Wagenknecht</i>	
6 Effective Models for Charge Transport in DNA Nanowires	107
<i>Rafael Gutierrez and Gianaurelio Cuniberti</i>	
7 Optimizing Photoactive Proteins for Optoelectronic Environments by Using Directed Evolution	121
<i>Jason R. Hillebrecht, Jeremy F. Kosciulecki, Kevin J. Wise, Mark P. Krebs, Jeffrey A. Stuart, and Robert R. Birge</i>	
8 DNA-Based Nanoelectronics	141
<i>Rosa Di Felice and Danny Porath</i>	
9 Electrical Manipulation of DNA on Metal Surfaces	187
<i>Marc Tornow, Kenji Arinaga, and Ulrich Rant</i>	

10	Nanocomputing	215
	<i>Jennifer Sager, Joseph Farfel, and Darko Stefanovic</i>	
11	Biomolecular Automata	267
	<i>Nataša Jonoska</i>	
PART IV NANOMEDICINE, NANOPHARMACEUTICALS AND NANOSENSING		
12	Nanomedicine	303
	<i>Kewal K. Jain</i>	
13	Nano-Sized Carriers for Drug Delivery	329
	<i>Sanjeeb K. Sahoo, Tapan K. Jain, Maram K. Reddy, and Vinod Labhasetwar</i>	
14	Gene and Drug Delivery System with Soluble Inorganic Carriers	349
	<i>Jin-Ho Choy, Man Park, and Jae-Min Oh</i>	
15	Molecules, Cells, Materials, and Systems Design Based on NanoBiotechnology for Use in Bioanalytical Technology ...	369
	<i>Tetsuya Haruyama</i>	
PART V DE NOVO DESIGNED STRUCTURES		
16	Self-Assembly of Short Peptides for Nanotechnological Applications	385
	<i>Ehud Gazit</i>	
17	Nanotube Membranes for Biotechnology	397
	<i>Lane A. Baker and Charles R. Martin</i>	
18	Engineering a Molecular Railroad	433
	<i>Russell J. Stewart and Loren Limberis</i>	
19	Water-Based Nanotechnology: What if We Could Dope Water? .	461
	<i>Andreas Kage and Eran Gabbai</i>	
	Index	475