

Nanotechnology and Neuroscience: Nano-electronic, Photonic and Mechanical Neuronal Interfacing

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This book describes the use of modern micro- and nanofabrication technologies to develop improved tools for stimulating and recording electrical activity in neuronal networks. It provides an overview of the different ways in which the “nano-world” can be beneficial for neuroscientists, including improvement of mechanical adhesion of cells on electrodes, tight-sealed extracellular recordings or intracellular approaches with strongly reduced invasiveness and tools for localized electrical or optical stimulation in optogenetics experiments. Specific discussion of fabrication strategies is included, to provide a comprehensive guide to develop micro and nanostructured tools for biological applications. A perspective on integrating these devices with state-of-the-art technologies for large-scale in vitro and in vivo experiments completes the picture of neuronal interfacing with micro- and nanostructures.

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Editorial Review

From the Back Cover

This book provides an overview of the different ways in which the “nano-world” can be beneficial for neuroscientists. The volume encompasses the latest developments in the field of micro- and nanotechnology applied to neuroscience, discussing technological approaches applied to both in-vitro and in-vivo experiments. A variety of different nanotechnologies are presented that include nanostructured electrodes and their electrical, mechanical and biochemical properties, active and passive 2D and 3D multi-electrode arrays (MEAs), nanoscale transistors for sub-cellular re-cordings and an overview on methods, tools and applications in optoge-netics.

The book focuses specifically on fabrication strategies, to offer a compre-hensive guide for developing and applying micro- and nanostructured tools for neuroscientific applications. It is intended as a reference both for neuroscientists and nanotechnologists on the latest developments in neu-rotechnological tools.

• Provides readers with state-of-the-art information about developing advanced nanotechnology tools for communicating with the brain;
• Includes discussion of the compatibility of fabrication techniques optimized for different target devices, such as electric sensors/transducers based on metallic or semiconductor interfaces and optical probes to guide light into the brain;
• Offers a single-source reference to the mechanical, electrical and optical effects of nanostructures on neurons.

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Katherin Buerger:

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