



Neural Prosthesis Seminar

April 17, 2009

8:30 AM to 9:30 AM

Biomedical Research Building - BRB 105
Case Western Reserve University

“NEURAL INTERFACES AT THE NANOSCALE”

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Abstract

Advances in the fields of biomedical engineering, macromolecular science, Micro-Electro-Mechanical Systems (MEMS) processing, and neuroscience are all converging at the nanoscale. The nanoscale is particularly important for biological systems as it represents the size scale of the constituents of the cell, such as proteins and organelles. Essentially, all behavior of the body is governed by the interaction of cellular elements at the nanoscale. Protein function, for example, is a consequence of the nanoscale characteristics of its shape and orientation. Macroscale neural interfaces, e.g. peripheral nerve electrodes, have made significant clinical progress in spinal cord injury and stroke rehabilitation. These electrodes interact with whole nerves or fascicles within the nerve, resulting in a contact-to-nerve interaction ratio on the order of 1:1000. To continue improvement in functional outcome, the challenge is to improve this to the order of 1:100 or even 1:10. This intimate interaction with the nerve will require a better understanding and development of the neural interface at the nanoscale. To accomplish this goal, a complex team of several disciplines is required. Macromolecular science explores the synthesis and structure of long molecular chains, fabrication of composites of these nanometer scale chains with various matrices, and the properties emerging from these composites. MEMS processing has continued to improve both in decreasing the size scale of devices to sub-micron and in the processing of a wide array of novel materials. Thus, fabrication of neuron-scale devices from advanced polymer composites is possible. The interaction with neuroscience is critical to understanding the interaction between nanoscale devices and both neurons and non-neural glial cells. In this talk, the current state-of-the-art of nanoscale neural interfaces will be presented, as well as, a discussion of the challenges and required developments necessary to continue advancing the nanoscale biotic/abiotic interface.



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This seminar is sponsored by the FES and the APT Centers - For more information, please contact Cathy Walker at 216-707-6490

The Cleveland FES Center is a consortium in Functional Electrical Stimulation technology including the Louis Stokes Cleveland VAMC, Case Western Reserve University, and the MetroHealth Medical Center

