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Tuesday, March 3
12:15 pm, 117 EES

Teaching Seminar: *Soft Electroactive Materials for Neural Engineering*

There is a growing interest in soft electroactive materials, mainly, conducting polymers in today's science and engineering research laboratories. These materials can be formulated to have moderately high conductivity with large electroactive surface area and desired mechanical parameters with tunable chemical/physical properties. Recently, they have been successfully demonstrated for several biomedical applications such as controlled drug delivery, bioactuators, and neuronal probe coatings.
In this lecture, I would like to present the fundamentals of conducting polymers and propose their potential application in bio-electrodes which are critical elements for neuronal signal recording and/or stimulation in neuro-electronic devices such as neuronal prosthetics and brain-computer interfaces.

Tuesday, March 3
3:30 pm, 216 EES

Research Seminar: *Neuronal Interfacing - Controlling Cellular Function and Monitoring Activity*

The nervous system, a three-dimensional network of interconnected neurons and glia, both maintains physiological homeostasis and enables communication with the external world by responding to stimuli, processing information, and mediating proper reactions. One of the most influential hypotheses in modern neuroscience states that the functions of these neuronal networks arise from the formation and modulation of the synaptic connections among the network's constituent neurons. To map a network's spatiotemporal connectivity and correlating it to that network's function, we need tools that can perturb and record neuronal activity in a cell-specific fashion. Toward this end, we have generated vertically-grown silicon nanowire arrays to introduce biologically important molecules into cells with minimized cytotoxicity and high delivery efficiency and, using patterned arrays, showed site-specific control of cellular functions, such as specific ion-channel knock-down and controlled glial cell proliferation (gliosis). In conjunction, we have been developing planar patch-clamp arrays to monitor individual cellular activity in a mid-size neuronal network (up to one hundred neurons). Thus far, our prototypical devices have successfully made whole-cell patch clamp recordings from rat hippocampal neurons, suggesting the viability of our design for network-scale measurements. In the near future, we envision that the combination of both tools will serve as a spatially resolvable means of controlling and probing complicated neurobiological phenomena and, thus, of getting closer to cracking the neuronal code.