Department of
Biomedical Engineering
UNIVERSITY OF WISCONSIN-MADISON

Spring 2018 Seminar Series

Nanofabricated Sensors for Recording & Imaging of Neural Activity— Towards Direct, Brain-Wide Readouts

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There is currently a concerted effort to develop the necessary technologies to record neural activity from the entire volume of the brain. Recent engineering advancements have propelled electrode-based devices and optical probes, achieving nanometer scale spatial resolution and impressive signal-to-noise ratio and temporal response; however, these sensors usually require a tethered connection and sample from relatively small areas in the nervous system. Developing sensing modalities for whole-brain direct recording of neural signals, will allow neuroscientists and neurologists to study the brain network directly and as a whole — an achievement that will surely elevate neuroscience, neurology and medicine to new heights. I will describe the development of nanofabricated sensors based on neuron-device interfacing for multi-site electrode recording of neuronal intracellular signals, as well as unprecedented, large volume in-vivo measurements of neurotransmitter dynamics in the brains of live animals, using a specialized MRI sensor. These strategies enable us for the first time to perform functional studies of neural activity across wide brain regions with molecular and electrophysiological specificity, and pave the way towards developing novel sensors for minimally-invasive whole brain recording of neural activity.

ABOUT the SPEAKER

Dr. Aviad Hai is a neuroengineer with extensive expertise and scientific contributions in the fields of biosensors for electrophysiology and neuroimaging. In his research at the Massachusetts Institute of Technology, he has been developing electromagnetic neural interfaces based on his work on nanofabricated devices for on-chip multi-site recording of neuronal intracellular signals (e.g. Hai et al., 2010, Nat Methods; for review, see: Spira & Hai, 2013, Nat Nanotechnology). Together with his research on molecular probes for neurotransmitter imaging (Hai et al., 2016, Neuron), he shapes his scientific strategy towards developing and applying novel electronic and magnetic neuro-sensors, and guiding future researchers in cutting-edge technologies for the detection and study of neural signals.

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12 PM in Tong Auditorium (1003 Engineering Centers)