Compliant, Wireless Optoelectronic Systems as Neural Interfaces

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Advanced optoelectronic systems that can intimately integrate with the brain and the peripheral nervous system have the potential to accelerate progress in neuroscience research and to enable new approaches in treating neurological disorders. Specifically, capabilities for injecting electronics, light sources, photodetectors, multiplexed sensors, programmable microfluidic networks and other components into precise locations of the deep brain and for softly laminating them onto targeted regions of the surfaces of the brain or the peripheral nerves will open up unique and important opportunities in stimulation, inhibition and real-time monitoring of neural circuits. In this talk, we will describe foundational concepts in materials science and assembly processes for these types of technologies, in 1D, 2D and 3D architectures. Examples in system level demonstrations include ‘cellular-scale’, injectable optofluidic neural probes for behavioral research on animal models, 3D mesoscale networks for study of neural signal propagation in cortical spheroids, and closed-loop, wireless systems for optogenetic control of organ function.

ABOUT the SPEAKER

Professor John A. Rogers obtained BA and BS degrees in chemistry and in physics from the University of Texas, Austin, in 1989. From MIT, he received SM degrees in physics and in chemistry in 1992 and the PhD degree in physical chemistry in 1995. From 1995 to 1997, Rogers was a Junior Fellow in the Harvard University Society of Fellows. He joined Bell Laboratories as a Member of Technical Staff in the Condensed Matter Physics Research Department in 1997, and served as Director of this department from the end of 2000 to 2002. He then spent thirteen years on the faculty at University of Illinois, most recently as the Swanlund Chair Professor and Director of the Seitz Materials Research Laboratory. In the Fall of 2016, he joined Northwestern University as the Louis Simpson and Kimberly Querrey Professor of Materials Science and Engineering, Biomedical Engineering and Medicine, with affiliate appointments in Mechanical Engineering, Electrical and Computer Engineering and Chemistry, where he is also Director of the recently endowed Querrey-Simpson Institute for Bioelectronics.

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