

Carnegie Mellon University

Materials Science & Engineering

presents

Bottom-up synthesis and assembly of nanodevices for tissue and cells interrogation

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Abstract - The interface between nanoscale electronic devices and biological systems enables interactions at length-scales natural to biology, maximizing communication between these two diverse yet complementary systems. Nanostructures and nanostructured substrates show enhanced coupling to artificial membranes, cells, and tissue. Such nano-bio interfaces offer better sensitivity and spatial resolution as compared to conventional planar structures. I will present the electrical properties of silicon nanowires (SiNWs) interfaced with embryonic chicken hearts and cultured cardiomyocytes. Utilizing the bottom-up approach enabled subcellular electrical recordings using the smallest reported device ever and thus exceeded the spatial and temporal resolution limits of other electrical recording techniques. I will discuss the synthetic breakthrough and novel fabrication required to realize the first new electronic measurement tool for intracellular measurements since patch-clamp of the 1970s – a truly three-dimensional nanoscale transistor. The exceptional synthetic control and flexible assembly of nanomaterials provides powerful tools for fundamental studies and applications in life science, and opens up the potential of merging active transistors with cells such that the distinction between nonliving and living systems is blurred.

Bio - Tzahi Cohen-Karni is an assistant professor at the department of biomedical engineering in Carnegie Mellon University, Pittsburgh PA USA. He received both his B.Sc. degree in Materials Engineering and the B.A. degree in Chemistry from the Technion Israel Institute of Technology, Haifa, Israel, in 2004. His M.Sc. degree in Chemistry from Weizmann Institute of Science, Rehovot, Israel, in 2006 and his Ph.D. in Applied Physics from the School of Engineering and Applied Sciences, Harvard University, Cambridge MA, USA, in 2011. He was a Juvenile Diabetes Research Foundation (JDRF) Postdoctoral Fellow at the Massachusetts Institute of Technology and Boston Children's Hospital at the labs of Robert Langer and Daniel S. Kohane from 2011 to 2013. Dr. Cohen-Karni received the Gold Graduate Student Award from the Materials Research Society in 2009, was awarded the third place in the National Collegiate Inventors Competition in 2010 and received the 2012 International Union of Pure and Applied Chemistry Young Chemist Award. In 2014 He was awarded the Charles E. Kaufman Foundation Young Investigator Research Award.

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