

BME Seminar Series Presents

Composite Biomaterials: Enabling Microfluidic Fabrication and Engineering Human Tissues to Wearable Electronics and Beyond

by

Michael Daniele, Ph.D.Assistant Professor of Electrical and Computer Engineering and Bioengineering,
NC State University/UNC Biomedical Engineering

Abstract —The rising research and clinical interest in personalized and precision medicine promises to revolutionize both our understanding of human biology and traditional healthcare practices. An emerging ecosystem of smart, connected health monitors and biological manufacturing can potentially “close-the-loop” in healthcare, by offering unprecedented predictive power and ground-breaking regenerative solutions. In this discussion, I will illustrate the tremendous opportunity for the creation of new combinatorial materials and how this is the ultimate driver behind next-generation biomedical technologies. Specifically, I will describe my research group’s efforts to understand and control biological systems by engineering both human tissues and microscale biosensors. First, I will introduce how the capability to build functional composite biomaterials by exploiting simple, combinatorial chemistries enabled the synthesis of protein-polymer hydrogels for fabricating engineered tissue and in vitro organs. Then I will discuss, how we came to harness bio-synthesized nanomaterials for use in bioelectronics, enabling fully-integrated biosensors for multiplexed, wearable biochemical analysis. Each of these examples will be described in with respect to their material design, processing method, and the resultant properties which made them ideal for their targeted application.

Bio —Dr. Michael Daniele is an Assistant Professor in the Department of Electrical & Computer Engineering and Joint Department of Biomedical Engineering at UNC-Chapel Hill and NC State University, and he is a member of the NSF Nanosystems Engineering Research Center for Advanced Self-Powered Systems of Integrated Sensors and Technologies — ASSIST (assist.ncsu.edu). He joined academia in 2015 from the U.S. Naval Research Lab, where he was a Jerome and Isabella Karle Distinguished Scholar in Materials Engineering. Dr. Daniele’s primary area of interest is the broad application of soft nanomaterials to engineer devices which monitor, mimic or augment biological function. Specific topics of research include wearable and implantable biosensors, organ-on-a-chip models, and biological-machine interfaces.

Time & Date: 12:00 – 13:00 on May 26, 2017 (JST)

Venues in Japan: Tsurumai & Higashiyama Campuses, Nagoya University

■ **Tsurumai:** Meeting Room 1, 1st floor of Basic Medical Research Building

■ **Higashiyama:** Main Conference Room, 3rd floor of NIC Building