CBST Seminar

Center for Biomanufacturing Science & Technology

UNIVERSITY OF DELAWARE

DATE:

April 11, 2017

TIME:

1:00 p.m.

LOCATION:

366 Colburn Lab

Dr. William Bentley

Fischell Department of Bioengineering

University of Maryland, College Park

William E. Bentley is the Robert E. Fischell Distinguished Professor of Engineering and founding Director of the Fischell Institute for Biomedical Devices located in the A. James Clark School of Engineering at the University of Maryland. He received a B.S. and M.E. in chemical engineering from Cornell University, and a Ph.D. in chemical engineering from the University of Colorado at Boulder. Dr. Bentley has focused his research on the development of molecular tools that facilitate the expression of biologically active proteins, having authored over 270 related archival publications. He is a fellow of AAAS, ACS, AIMBE, and the American Academy of Microbiology. He has served on advisory committees for the NIH, NSF, DOD, DOE, FDA, USDA, and several state agencies and has mentored more than 30 PhDs and 15 postdocs, many now in leadership roles within industry (18), federal agencies (4) and academia (22). He co-founded a protein manufacturing company, Chesapeake PERL, based on insect larvae as mini bioreactors.

"Communicating with and Controlling Biology Via Electronics"

The ability to interconvert information between electronic and biologic systems has already transformed our ability to record and actuate biological function (e.g., EEG, EKG, defibrillators). In parallel, we have begun to demand biological connectivity from electronic consumer products (fitbit, cell phones, etc.). There are significant gaps, however, that must be overcome before biological information can be seamlessly conveyed and before biological function can be electronically "programmed". A communication gap exists whereby the common vectors for information flow in biology are ions and molecules; they are electrons and photons in electronics. Since there are essentially no "free" electrons in biological systems, there is essentially no direct "translator" of electrons to molecules and vice versa. Gaining access to molecular communication is essential as molecules are the primary vector that drives biological function. There is also a fabrication gap to overcome. It is difficult to construct microelectronic devices that include labile biological components. We are developing tools of "biofabrication" that enable facile assembly of biological components within devices that preserve their native biological function. By recognizing that biological redox active molecules are a biological equivalent of an electron-carrying wire, we have developed biological surrogates for electronic devices, including a biological redox capacitor. We have also turned to synthetic biology to provide a means to sample, interpret and report on biological information contained in molecular communications circuitry. Finally, we have developed synthetic genetic circuits that enable electronic actuation of gene expression. This presentation will introduce the concepts of molecular communication that are enabled by integrating relatively simple concepts in synthetic biology with biofabrication. Our presentation will show how engineered cells represent a versatile means for mediating the molecular "signatures" commonly found in complex environments, or in other words, they are conveyors of molecular communication.