



Department of  
Biomedical Engineering  
UNIVERSITY OF WISCONSIN-MADISON

## Fall 2018 Seminar Series

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# Redox-based Synthetic Biology—Towards Electrogenetics

**William E. Bentley, Ph.D.**  
**Robert E. Fischell Distinguished Chair  
of Engineering, Fischell Department of  
Bioengineering, University of Maryland**

We are developing tools of “electrofabrication” that enable facile assembly of biological components within devices, including microelectronic 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 that enable bi-directional “electron” flow. 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. That is, using simple reconstructions, one can apply voltage on an electrode and directly actuate genetic responses and associated phenotypes. 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.



*William E. Bentley is the Robert E. Fischell Distinguished Chair in the Fischell Department of Bioengineering. At Maryland since 1989, Dr. Bentley has focused his research on the development of molecular tools that facilitate the expression of biologically active proteins, having authored over 300 related archival publications. Recent interests are on new strategies for opening ‘communication’ between devices and biological systems. He has mentored over 40 PhDs and 21 postdocs, many now in leadership roles within industry, federal agencies, and academia. He is co-PI of Maryland’s Center of Excellence in Regulatory Science and Innovation (CERSI), a comprehensive joint initiative with the FDA and Maryland’s Baltimore campus. He is also co-PI of the National Capital Consortium for Pediatric Device Innovation, joint with Children’s National Medical Center. Dr. Bentley is also a Fellow of the ACS, AAAS, and AIMBE and is an elected member of the American Academy of Microbiology.*



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**Monday, December 3, 2018**  
**12 PM in Tong Auditorium (1003 Engineering Centers)**