NSF DISTINGUISHED LECTURE SERIES BIOECONOMY COORDINATING COMMITTEE

2022

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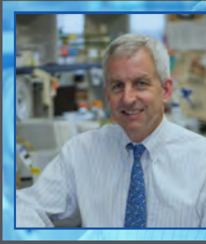
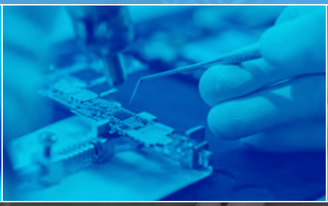
EAVESDROPPING ON AND MANIPULATING BIOLOGY'S MOLECULAR DIALOGUE

DATE
May 19th

TIME
11:00am - 12:00pm

VIEW ON
YouTube

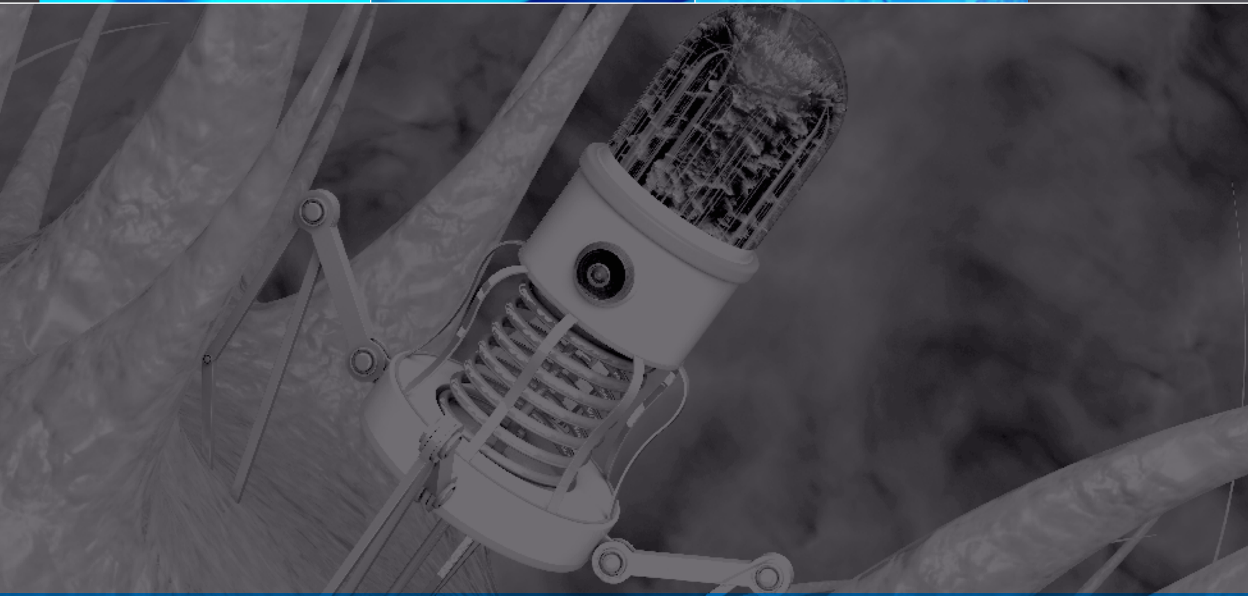




Bill Bentley, PhD

ROBERT E. FISCHELL DISTINGUISHED CHAIR OF ENGINEERING

INAUGURAL DIRECTOR OF THE ROBERT E. FISCHELL INSTITUTE FOR BIOMEDICAL DEVICES



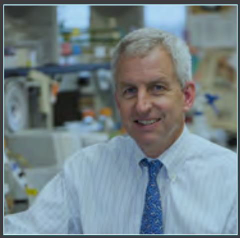
National Science Foundation

EAVESDROPPING ON AND MANIPULATING BIOLOGY'S MOLECULAR DIALOGUE

Microelectronics has transformed our lives. It has changed the way we collect, process, and transmit information. The intersection between microelectronics and biology has also been transformative – ionic currents that control cardiovascular and neural systems are detected and even corrected using electronics (e.g., EKG & defibrillators). Yet, the microelectronics world has barely "sampled" the vast repertoire of chemical information in our biological world. Take for example the human immune, endocrine, and gastrointestinal systems – they are largely opaque to the methods of electrical sensing and communication. In biology, information is often contained in the structure of its molecules – molecules that move from place to place and based on their structure, convey information and provoke a response.

We envision new processes and deployable products that open the dialogue between biology and microelectronics – that eavesdrop on and manipulate biological systems within their own settings and in ways that speed corrective actions. We view biofabrication and synthetic biology as integral technologies for achieving this vision. Synthetic biology, often visualized as an innovative means for "green" product synthesis through the genetic rearrangement of cells, can also provide a means to connect biological systems with microelectronic devices. Cells can be reprogrammed to close the communication gap that exists between the electrons and photons of devices and the molecules and ions of biology. This is enabled, in part, through redox mediators – biological carriers of electrons that transfer "packets" information to and from electronics. Biofabrication, the assembly of biological components using biological means or mimics thereof, offers a means to close the fabrication gap – a gap that stems from the disparity between biological systems, assembled of labile components using built-in error correction, and devices, built of potentially toxic materials using error prevention and byproduct exclusion. Here, innovative materials, electronics, biomolecular and cellular engineering strategies can be developed to mediate "molecular" communication - information transfer to microelectronic systems and back. New systems and devices are continually emerging that integrate abiotic and biological components (e.g, animal-on-a-chip devices, chip-based manufacturing systems, etc.) at a hierarchy of length scales. New systems may emerge that eavesdrop on and electronically guide cellular consortia, vastly expanding our synthetic biology repertoire while utilizing increasingly complex raw materials.

We suggest that a great many of our society's grand challenges in sustainability, food, energy, and medicine may be addressed by developing tools that open lines of communication between the biological and electronics worlds.



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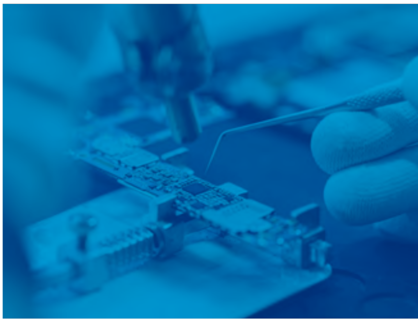
ABOUT THE SPEAKER

William E. Bentley is the Robert E. Fischell Distinguished Chair of Engineering and the Inaugural Director of the Robert E. Fischell Institute for Biomedical Devices. He is also appointed to the Department of Chemical and Biomolecular Engineering at the University of Maryland, College Park and the Institute for Bioscience and Biotechnology Research. 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.

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 over 40 PhDs and 25 postdocs, many now in leadership roles within industry (24), federal agencies (5) and academia (26). He co-founded a protein manufacturing company, Chesapeake PERL, baased on insect larvae as mini bioreactors.



UPCOMING

LECTURES | 2022

THURSDAY, JUNE 16, 2022

11:00 a.m. – 12:00 p.m. (Cosponsored by the Bioeconomy Coordinating Committee, BIO, and CISE)

Domitilla Del Vecchio, PhD

Professor of Mechanical Engineering

Massachusetts Institute of Technology (MIT)

NSF Bioeconomy Coordinating Committee Distinguished Lecture Series

NSF invests in fundamental research to support biotechnology and advance the U.S. bioeconomy across all fields of science and engineering. Presented by NSF's Bioeconomy Coordinating Committee and NSF Directorates, this distinguished lecture series will bring in individual speakers and panels representing the science and technology funded by a Directorate every month. Speakers will present on research and broader impacts in areas associated with biotechnology and the bioeconomy that are of interest broadly across the foundation.

All sessions will be conducted virtually.

For more information, refer to the NSF Bioeconomy Distinguished Lecture Series website or contact **Jared Dashoff at** jdashoff@nsf.gov.

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www.nsf.gov

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