

Chemical & Biomolecular Seminar Series



Robert L. Pigford Memorial Lecture

Jonathan Dordick

Vice President for Research
Howard P. Isermann Professor
of Chemical and Biological
Engineering

Office of Research

Rensselaer Polytechnic Institute

Friday, October 21, 2016

10:00—11:00 a.m.

102 Colburn Lab

Jonathan S. Dordick is the Howard P. Isermann Professor of Chemical and Biological Engineering at Rensselaer Polytechnic Institute where he is also the Vice President for Research. He received his B.A. degree in Biochemistry and Chemistry from Brandeis University and his Ph.D. in Biochemical Engineering from the Massachusetts Institute of Technology. He has held chemical engineering faculty appointments at the University of Iowa, where he also served as the Associate Director of the Center for Biocatalysis and Bioprocessing, and Rensselaer Polytechnic Institute where he also holds joint appointments in the Biomedical Engineering, Materials Science and Engineering, and Biology. His research group includes chemical engineers, bioengineers, materials scientists, biologists, chemists and microbiologists all focused on gaining a quantitative understanding of biological principles and applying them to advance bioengineering and biomanufacturing, drug discovery, nanoscale hierarchical assemblies. He has published over 350 papers and 40 patents, founded three companies, and has received numerous awards, including the ACS Marvin J. Johnson Award, the AIChE Food, Pharmaceutical and Bioengineering Award, the International Enzyme Engineering Award, among others.

Exploiting the Interface of Biomolecular Engineering and Materials Science to Generate New Therapeutic Outcomes

Nature is unparalleled in its structural and functional diversity. In many cases, nature has provided us with a blueprint to overcome gaps in our therapeutic arsenal. We have taken cues from nature to design materials with unique structural and functional properties, along with new process technologies with the ability to produce a wide range of biomimetic structures. In this talk I will highlight our recent efforts to exploit the interface of biology with materials science to address clinical applications. In particular, we have identified and engineered cell-lytic enzymes, and generated hybrid enzyme-containing surfaces with tailored activity against hospital-acquired infections (e.g., MRSA), food-borne illnesses (e.g., *Listeria*), and bacillus spores. Such activity provides a safe and potentially broadly applicable route to eliminating toxic compounds and pathogenic microorganisms from common surfaces. We have also developed a genetically encoded protein-based nanoparticle-generating system for remote regulation of gene expression by low-frequency radio waves (RFs) or a magnetic field. In mice with stem cell or viral expression of these genetically encoded components, remote stimulation of insulin transgene expression with RF or a magnet lowers blood glucose. We have also demonstrated a similar RF/magnetic field platform that can inhibit hypothalamic glucose-sensing neurons to regulate metabolism and behavior in mice. This robust, repeatable method for remote regulation *in vivo* may ultimately have applications in basic science, technology and therapeutics.