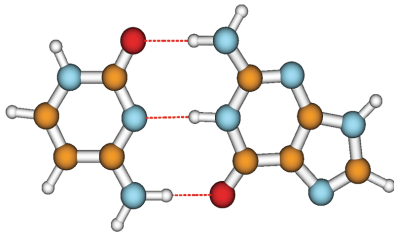
DISTINGUISHED LECTURER SERIES

VCU
MECHANICAL ENGINEERING

Biomolecular Networks as Smart Material Systems



Professor, Donald J. Leo
Virginia Tech

15 September 2008
Social Hour: 11:30-12:00 noon
Seminar: 12:00–1:00 pm
Room E2214
Engineering East Hall

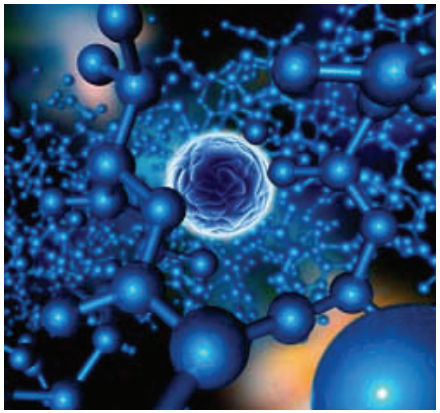
ABSTRACT

The discipline of smart materials has long been concerned with the development of new technologies for sensing, actuation, power, and control. Traditional applications have included noise and vibration control, nondestructive evaluation, and energy harvesting. Our recent work in this field has concentrated on the development of smart material systems that utilize biomolecules as the transducing element. Biomolecules such as proteins have a fascinating array of transduction properties due to an incredible diversity of functionality. With the modern tools of genetic engineering, we can envision the development of biomolecules that enable improved or radically new functionalities for engineering systems. This work has application in the development of novel bio-sensing systems, power sources that convert biological energy to electrical energy, and more fundamental studies of protein systems for engineering and medical technologies.

The model system we are developing is based on a recently developed technique for creating protein scaffolds using aqueous droplets immersed in organic solvents with dissolved lipids. Self-assembly of the lipid molecules results in the formation of a lipid monolayer around the water droplets. Physically connecting two droplets together produces a bilayer at the interface, which enables the electrochemical study of proteins that incorporate into the interfacial bilayer. Our recent work has focused on the development of two-dimensional networks of droplets that enable the design of biomolecular networks. Feedback control is used to control the electrochemical transport in the network, which produced a diverse range of functionalities into the biomolecular network.

Bio

Don Leo is currently the Associate Dean for Research and Graduate Studies at Virginia Tech and also the Special Assistant to the Vice President for Energy Initiatives. He also holds an appointment as a Professor of Mechanical Engineering. His research interests are the synthesis, modeling, and control of active material systems, with particular interest in the field of electroactive polymers. Don is the author of the textbook *Engineering Analysis of Smart Material Systems*, published by John Wiley and Sons in 2007. He has been a faculty member at Virginia Tech since 1998, before which time he held appointments on the faculty of the University of Toledo (1997–1998) and as a Project Engineer at CSA Engineering, Inc. (1995–1997) in Palo Alto, CA. From 2005 to 2007, Don was a program manager in the Defense Advanced Research Project Agency (DARPA). He is the author of over 130 papers, 60 of which have been published in archival publications. Don is a member of ASME and is currently the Vice Chair for the ASME Adaptive Structures and Material Systems Technical Committee.



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