WELDON SCHOOL OF BIOMEDICAL ENGINEERING

PURDUE ENGINEERING

Weldon School of Biomedical Engineering
Distinguished Lecture Series

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9:30-10:20am
MJIS 1001

Implantable Biomedical Microelectromechanical Systems

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Abstract: The tremendous technological convergence of microfabrication technology, wireless communication technology, and low-power circuitry has opened the possibility of widespread use of microfabricated implantable wireless microsystems as interfaces to the body for monitoring of physiological parameters. The application of this technology convergence will be discussed in three contexts. The first is a (now FDA-cleared) wireless endovascular pressure sensor implant for chronic monitoring of patients with congestive heart failure, allowing titration of medication and ultimately reducing heart-failure hospitalizations of this patient population. The second is based on the use of extracellular matrix (ECM) protein materials in the fabrication of MEMS, which offer the possibility of MEMS-based devices that are more easily integrated with the body, are better tolerated by the immune system, and/or which have mechanical properties that are well-matched to potential biological applications. Advances in MEMS enable the fabrication of complex devices from these delicate materials. As an example, a collagen-based cortical neural electrode, which has demonstrated reduced inflammation and superior persistence of functionality in *in vivo* models when compared to conventional electrodes, will be discussed. Finally, approaches to implantable biodegradable power sources that are activated by body fluid but are relatively insensitive to the electrochemical environment in which they are immersed will be discussed.

Biography: Mark G. Allen received the B.A. degree in chemistry, the B.S.E. degree in chemical engineering, and the B.S.E. degree in electrical engineering from the University of Pennsylvania, Philadelphia, and the S.M. and Ph.D. degrees from Massachusetts Institute of Technology, Cambridge. In 1989 he joined the faculty of the School of Electrical and Computer Engineering, Georgia Institute of Technology, Atlanta, ultimately holding the rank of Regents' Professor and the J.M. Pettit Professorship in Microelectronics, as well as a joint appointment in the School of Chemical and Biomolecular Engineering. In 2013 he left Georgia Tech to become the Alfred Fitler Moore Professor of Electrical and Systems Engineering and Scientific Director of the Singh Nanotechnology Center at the University of Pennsylvania. His research interests are in the development and the application of new micro- and nanofabrication technologies, as well as MEMS. Dr. Allen has held the posts of Editor-in-Chief of the Journal of Micromechanics and Microengineering, co-chair of the 1996 IEEE MEMS Conference, co-chair of the 2012 Power MEMS conference, chair of the 2016 Solid State Sensors Conference ('Hilton Head'), and will chair the 2020 PwrSoC conference. He is co-founder of multiple MEMS companies, including Cardiomems, Axion Biosystems, and EnaChip. Professor Allen received the IEEE 2016 Daniel P. Noble Award for contributions to research and development, clinical translation, and commercialization of biomedical microsystems. He is a Fellow of the IEEE, and a member of the National Academy of Inventors.

~BME Faculty Host: Hyowon "Hugh" Lee~
****Coffee and juice will be provided at West Lafayette****