University of Connecticut

ME Spring 2017 Seminar Series
MECHANICAL ENGINEERING

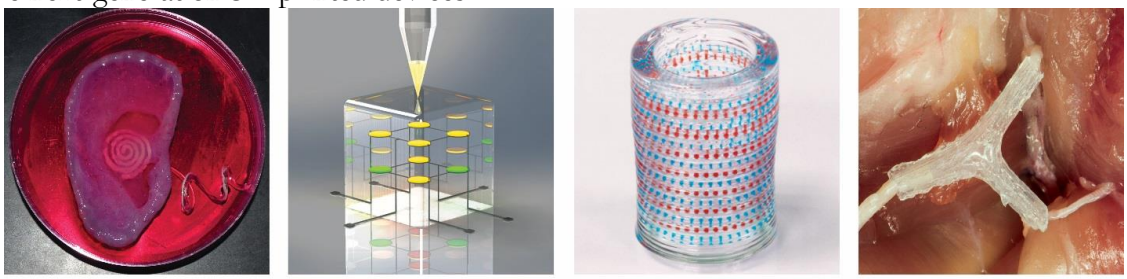
www.engr.uconn.edu

Friday, March 24 • 2:30 PM – BPB, Rm. 130

3D Printing Functional Materials & Devices

Michael C. McAlpine
Benjamin Mayhugh Associate Professor
Department of Mechanical Engineering, University of Minnesota

Abstract: The development of methods for interfacing high performance functional devices with biology could impact regenerative medicine, smart prosthetics, and human-machine interfaces. Indeed, the ability to three-dimensionally interweave biological and functional materials could enable the creation of devices possessing unique geometries, properties, and functionalities. Yet, most high quality functional materials are two dimensional, hard and brittle, and require high crystallization temperatures for maximal performance. These properties render the corresponding devices incompatible with biology, which is three-dimensional, soft, stretchable, and temperature sensitive. We overcome these dichotomies by: 1) using 3D printing and scanning for customized, interwoven, anatomically accurate device architectures; 2) employing nanotechnology as an enabling route for overcoming mechanical discrepancies while retaining high performance; and 3) 3D printing a range of soft and nanoscale materials to enable the integration of a diverse palette of high quality functional nanomaterials with biology. 3D printing is a multi-scale platform, allowing for the incorporation of functional nanoscale inks, the printing of microscale features, and ultimately the creation of macroscale devices. This three-dimensional blending of functional materials and 'living' platforms may enable next-generation 3D printed devices.



Cells & Tissue | 3D Electronics | Dynamic Control | Biomedical Devices

Biographical Sketch: Michael C. McAlpine is the Benjamin Mayhugh Associate Professor of Mechanical Engineering at the University of Minnesota. Previously, he was an Assistant Professor of Mechanical and Aerospace Engineering at Princeton University (2008-2015). He received a B.S. in Chemistry with honors from Brown University (2000) and a Ph.D. in Chemistry from Harvard University (2006). His research is focused on 3D printing functional materials & devices, including the three-dimensional interweaving of biological and electronic materials using 3D printing. He has received a number of awards, including the Presidential Early Career Award for Scientists and Engineers (PECASE), NIH Director's New Innovator Award, a TR35 Young Innovator Award, an Air Force Young Investigator Award, the Intelligence Community Young Investigator Award, a DuPont Young Investigator Award, a National Academy of Sciences Frontiers Fellow, a DARPA Young Faculty Award, an American Asthma Foundation Early Excellence Award, a Graduate Student Mentoring Award, the Extreme Mechanics Letters Young Lecturer, and an invitation to the National Academy of Engineering Frontiers in Engineering.

For additional information, please contact Prof. Ying Li at (860) 486-7110, yingli@engr.uconn.edu or
Laurie Hockla at (860) 486-2189, hockla@engr.uconn.edu