



MSEN 681 Seminar Series

4:10 PM, Monday, October 13, 2014 • 104 Jack E. Brown

Actuating and Patterning Soft Materials

Dr. Michael Dickey

North Carolina State University

This talk will describe efforts in our research group to control the shape and function of soft materials (liquid metals, polymers and hydrogels) for applications that include stretchable electronics, soft robots, and self-folding polymer sheets. The research harnesses interfacial phenomena, micro fabrication, patterning, and thin films. The talk will discuss the underlying fundamental science motivating active areas of research in our group, which include:

- Ultra-stretchable wires, sensors, antennas, and microelectrodes composed of liquid metal alloys based on gallium. The metal is a liquid at room-temperature with low-viscosity (water-like) and can be micromolded due to a thin, oxide skin that forms rapidly on its surface. The metal can be patterned in a number of ways including injection into microchannels or by direct-write 3D printing. The properties of the metal will be discussed as well as methods to control and reconfigure the shape of the metal to form ultra-stretchable electronic components.
- Self-folding polymers sheets that change shape in response to light. These sheets are a form of shape memory polymers that are compatible with 2D patterning techniques including lithography, inkjet printing, and roll to roll processing. The appeal of this work is converting 2D patterns into 3D shapes in a hands free manner.
- New methods for patterning ions in hydrogels. This reversible process can imprint topography in the hydrogel using modest voltages, tune its local mechanical properties to create physically-reinforcing exoskeletons, and generate stresses sufficient to actuate or fold hydrogels over large distances within seconds.

abstract