

**Dr. Jonathan T. Reeder**

Postdoctoral Fellow

Materials Science and Engineering Department  
Northwestern University

**Monday, January 13, 2020, 9:15-10:15 am**  
**Armstrong Hall of Engineering, Room 1103**

**Materials and Designs for Soft Bio-Integrated Fluidic and Thermal Microsystems**

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Dr. Jonathan T. Reeder is a postdoctoral fellow in the Materials Science and Engineering Department at Northwestern University in the John Rogers Research Lab. His research focuses on materials and designs for soft microfluidic systems for applications in health monitoring, diagnostics, and therapeutics. His research interests include stimuli responsive polymers, advanced microfabrication, 3D micro/mesoscale structures, and biosensors. From 2012-2016 he was an NSF Graduate Research Fellow in the Materials Science and Engineering Department at the University of Texas at Dallas where he researched physiologically responsive

shape memory polymers. He spent one year at the University of Tokyo as a visiting graduate researcher where he developed mechanically compliant organic electronics for neural interfaces and electronic skins. During his PhD he served as a cofounder and research director of Pascalor Inc, a startup that worked to commercialize flexible temperature and pressure sensors developed during his PhD.

**Abstract:** <sup>1</sup>Department of Materials Science and Engineering, McCormick School of Engineering, Northwestern University, Evanston, IL 60208, USA.

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The intimate physical coupling of soft sensors and actuators with biological tissue represents a powerful avenue for providing physiological insights and altering biological function. This talk will describe soft multifunctional materials and designs which enable mechanically compliant microfluidic and mesoscale systems which modulate, measure, and exploit thermal and fluidic functions in soft tissue for applications in health monitoring, diagnostics, and therapeutics. This work spans the investigation of structure-property relationships of shape memory and bioresorbable polymers, the development of mesoscale 3D assembly techniques, and processing schemes for integration of heterogeneous materials. These advances in materials engineering form the basis for soft, bio-integrated microsystems for 1) *in situ biochemical analysis of sweat* via skin-mounted devices comprising soft microfluidic valves, pumps, collection chambers, and water barrier schemes, 2) *targeted, on-demand blocking of peripheral nerve activity* via a soft microfluidic cooler comprising bioresorbable materials, and 3) *3D, thermoresponsive structures* which soften and mechanically deploy into preprogrammed states upon implantation or via external stimuli. Efforts in the development of materials and designs for medicine have the potential to define new pathways for next generation healthcare.