

**MSE Seminar**  
**Modality: In-Person**  
**Friday, Sept. 3, 2021**  
Goodwin Hall 155  
**10:10 AM – 11:00 AM**

**Prof. Michael D. Bartlett**

**Mechanical Engineering**  
**Virginia Tech**

## **“Multifunctional Soft Materials for Electronics, Robots, and Adhesives”**

Multifunctional soft materials and interfaces create intriguing new opportunities to enhance performance through programmable and adaptable properties. I will discuss: 1) Novel material architectures of solid-liquid soft composites, and 2) Switchable adhesives through programmable structures and stiffness. For soft composites, I will show how liquid metal droplets incorporated into elastomers enables exceptional combinations of soft elasticity and electrical and thermal properties with extreme toughness, autonomously self-healing circuits, and damage detection. For switchable adhesives, I will present a framework for designing adhesives through kirigami, the Japanese art of paper cutting, and pneumatically controlled soft membranes. By incorporating kirigami at interfaces, we can enhance adhesive force while tuning anisotropy for high capacity yet easy release interfaces. Through pneumatically controlled shape and rigidity tuning we rapidly switch adhesion ( $\approx 0.1$  s) with measured switching ratios as high as 1300x. These approaches provide model systems to study fundamental material properties while enabling soft matter technologies.



Michael Bartlett is an Assistant Professor of Mechanical Engineering at Virginia Tech. His research focuses on soft multifunctional materials for deformable electronics and soft robotics, adaptive materials, and ‘smart’ adhesives. He received his BSE in Materials Science and Engineering from Michigan in 2008 and Ph.D. in Polymer Science and Engineering from UMass Amherst in 2013. After obtaining his Ph.D. he worked as a Senior Research Engineer in the Corporate Research Laboratory at 3M, as a Postdoctoral Fellow at Carnegie Mellon University, and was an Assistant Professor at Iowa State University before joining Virginia Tech in 2020. His research has resulted in publications, patents, media coverage, and awards including a DARPA Young Faculty Award and Director’s Fellowship, ONR Young Investigator (YIP) Award, the Early Career Scientist Award from the Adhesion Society, a 3M Non-Tenured Faculty Award, a ICTAS Junior Faculty

Award, and an Outstanding Faculty Award (student nominated). More at: [www.bartlett.me.vt.edu](http://www.bartlett.me.vt.edu)