

The Department of Mechanical  
 Engineering  
 PRESENTS

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Friday, May 8, 2015  
 WCH Room 205/206  
 11:10-12:00PM

**Linking Length Scales: Investigating the Effect  
 of Microscale Strain Localization on Macroscopic Response**

**Abstract:**

The accurate measurement of deformation in response to thermo-mechanical loads is a fundamental requirement in the characterization of materials and structures. Of particular interest is the connection between the macroscopic and microscopic length scales, where strain localization at the grain or constituent level can play critical roles in overall material deformation and ultimate failure of the material. The identification of specific microstructural characteristics that lead to local damage accumulation and accelerated failure, and their mitigation, is key for the informed development and optimization of materials. This talk will present our recent work on exploring these connections using a combination of digital image correlation and scanning electron microscopy to measure deformation fields at small length scales, including a new use of functionalized nanoparticles for deformation tracking. These approaches enable us to glean critical insights into material behavior, including the impact of microstructure on damage accumulation in aerospace composites and the relationship between processing and performance in metallic alloys. Recent studies on shape memory alloys will be discussed as an illustrative example of these emerging experimental approaches and the meaningful analysis of their application.

**About the Speaker:**

Samantha Daly is an Associate Professor in the Department of Mechanical Engineering and in the Department of Materials Science and Engineering at the University of Michigan, Ann Arbor. Her research interests include the mechanical behavior of materials, fatigue, fracture, creep, composites, multi-functional materials, and advanced experimental techniques with a focus on novel approaches for small-scale characterization. She received her Ph.D. and M.S. degrees from the Division of Engineering and Applied Science at the Caltech in 2007 and 2002 respectively, and joined the faculty at the University of Michigan in 2008. She is a recipient of the NSF CAREER Award, the Journal of Strain Analysis Young Investigator Award, the 2014 International Journal of Solids and Structures Best Paper of the Year Award, the SEM M. Hetényi Award (for the best paper published in the journal *Experimental Mechanics* in 2011), the DOE Early Career Research Program Award, the AFOSR YIP Award, the ASME Orr Award for early career research excellence in fatigue, creep, and fracture, the Robert M. Caddell Research Award in Materials and Manufacturing, the U-M 1938E and departmental faculty excellence awards, and the Everhart and Charles D. Babcock Awards from Caltech.

