

THE MATERIALS SCIENCE AND ENGINEERING DEPARTMENT  
FALL COLLOQUIUM SERIES PRESENTS:

# Pinshane Huang

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## *How stiff are 2D materials?*

### *Designing ultrasoft electronic materials using electron microscopy*

Because they are atomically thin, 2D materials offer a uniquely powerful platform for electron microscopy to extract the structure and properties of materials with single-atom or even picometer precision. This utility even reaches beyond 2D materials—graphene can also serve as ultra-low background substrates that enable new studies of organic crystals and soft-hard interfaces. In this talk, I will discuss how my group combines 2D materials and electron microscopy to provide a new window into questions ranging from how a single substitution impacts the lattice of a 2D material to how organic ligands guide the growth of anisotropic nanocrystals. After an overview of our work, the talk will focus on our work studying the bending stiffness of 2D materials and heterostructures, an area that is crucial for the development of next-generation electronics including deformable electronics, biosensors, and nanoelectromechanical systems. Here, we use aberration-corrected STEM to produce insight into both the bending stiffness and mechanisms of bending of 2D materials and heterostructures. Our results indicate that the bending stiffness of few-layer graphene can be orders of magnitude smaller than previously thought and provide a new lower limit for the fabrication of ultra-soft, high mobility electronic nanodevices based on 2D materials. This unusual behavior results from the atomic-scale bending mechanism in 2D multilayers, which is dominated by interlayer shear and slip. These findings have profound implications on 2D heterostructures, where we demonstrate that the bending stiffness can be controlled by tailoring the interfacial interactions between individual atomic layers of 2D materials.

**Pinshane Y. Huang** is an Assistant Professor in the Department of Materials Science and Engineering at the University of Illinois, Urbana-Champaign. Pinshane holds a Ph.D. and an M.S. in Applied and Engineering Physics from Cornell University, and B.A. in Physics from Carleton College. Her research is focused around transmission electron microscopy and spectroscopy of two-dimensional materials and soft-hard interfaces. Her awards include a Presidential Early Career Award for Scientists and Engineers (PECASE), a Packard Fellowship, a Sloan Fellowship, as well as Air Force Young Investigator and NSF CAREER awards. Her research has been featured in *Nova*, *National Geographic*, *BusinessWeek*, *CBS News*, *Discover Magazine*, and the *Guinness Book of World Records*.

**Tuesday, October 13 • 4 pm CT • Zoom**

[Registration is required. RSVP here.](#)

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