

SPRING 2023

# MSE 690 SEMINAR SERIES

FRIDAY, MARCH 24TH | 3:30 REFRESHMENTS | 3:45PM SEMINAR

ARMS 1010



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## *“Elastocapillary Adhesion”*

**Abstract:** Establishing an adhesive contact between two materials requires both that the surface energies favor the creation of interfacial area and that it is possible to form contact area given the geometry and material properties. While elasticity has long been understood to be important in determining the relative “stickiness” between non-conformal surfaces, in recent years capillarity has also emerged as playing key roles in adhesion with highly compliant materials in multiple ways. For example, recent studies have demonstrated that solid surface tension can compete with or dominate over bulk elasticity in governing contact mechanics on small length scales, and mounting evidence suggests that the internal free fluid phase of compliant polymer gels also contributes significantly to mechanical response via both poroelasticity and classic capillary wetting. In this work, we investigate the adhesion between polydimethylsiloxane (PDMS) gel microspheres and rigid glass substrates. By varying the stiffness and size of the microspheres as well as the surface energy of the substrate and directly imaging the adhered microspheres, we observe a range of adhesive contact geometries from classic elastic to quantitatively wetting-like behavior, always mediated by a phase-separated fluid contact zone. We understand our data with a theoretical model that incorporates elasticity, capillarity, and phase separation to capture the complete range of adhesive contact behavior.

**Biography:** Prof. Katharine Jensen earned her A.B. in Physics at Princeton in 2004, then spent two years as a researcher at MIT Lincoln Laboratory. She completed her Ph.D. in Physics at Harvard in 2013 studying structures and defects in hard-sphere colloidal crystals and glasses. Her postdoctoral research investigating soft interface mechanics started at Yale in the Department of Mechanical Engineering and Materials Science and later moved to the Department of Materials at ETH Zürich. She has been an Assistant Professor of Physics at Williams College since 2017, where her work studying mechanics of soft and amorphous materials and interfaces has been recognized with research grants from both the National Science Foundation and the American Chemical Society.



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