Understanding and harnessing the coupling between lubrication pressure and elasticity provides materials design strategies for applications such as adhesives, coatings, microsensors, and biomaterials. This presentation will discuss our efforts to 1) understand the dynamic (and thermodynamics) of attachment of particles to fluid interface, and 2) the analogies between drops and soft materials in terms of their adhesion and deformation in viscous environments. First we will describe microfluidic measurements aimed at characterizing the transport and attachment of particles to a fluid interface. We will highlight the importance of flow on the attachment of particles to droplets, and show that the trajectories of particles past a fluid interface are very different from the trajectories past solid spheres. We will then compare and contrast the adsorption of particles to fluid interfaces to the case of adsorption of surfactants. In the second part of the presentation measurements of hydrodynamic interactions between soft surfaces will be discussed. We will show how elastic films deform due to viscous forces and how these deformations are similar to those observed with fluid droplets. We will discuss implications for adhesion and soft lubrication. In particular, our experiments highlight important length scales for hydrodynamic drainage of past soft or structured surfaces and the importance of elastic deformation during the approach of compliant surfaces.
Short Bio:

Joelle Frechette received her PhD from Princeton University in Chemical Engineering and Materials Science in 2005 studying adhesion in electrochemical environment. After post-doctoral work at UC Berkeley where she investigated unwanted adhesion in microelectromechanical systems, she joined the Hopkins Faculty in 2006. Joelle Frechette was awarded the NSF CAREER award in 2008 and the ONR Young Investigator Award in 2011. Her research interests are in the area of interfacial science, adhesion, wetting, and colloids.