

**Center for Fluid Mechanics, Division of Applied Mathematics  
Fluids, Thermal and Chemical Processes Group, School of Engineering  
Joint Seminar Series**

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Department of Mechanical Engineering  
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Santa Barbara, CA**

**New Approaches for Microscopic Fluctuating Hydrodynamics for the Study of  
Complex Fluids, Soft Materials, and Microfluidic Devices.**

Traditional approaches to fluid mechanics must be extended at sufficiently small length and time scales to account for spontaneous thermal fluctuations. This presents a variety of challenges both in formulating appropriate physical models and in their computational simulation. In the context of complex fluids and soft materials additional challenges arise from the often subtle interplay between elastic mechanics, hydrodynamic coupling, and thermal fluctuations. We present a set of new approaches which address central mathematical, physical, and computational issues in how to incorporate in the description of such fluid-structure interactions thermal fluctuations. We also address important numerical issues in the approximation of the resulting stochastic partial differential equations. We discuss specific applications including studies of polymeric fluids, vesicles, gels, and lipid bilayer membranes. We also discuss how these approaches are being used in an experimental collaboration investigating electrokinetic phenomena in microscale/nanoscale devices developed by colleagues Sumita Pennathur and Andrew Cleland.

**TUESDAY - FEBRUARY 15, 2011**

**4:00 PM**

**Barus & Holley, Room 190**