Weekly CEAFM Seminar: Fall 2016

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Date: **Friday, Dec 2, 2016**

Time: 11:00 AM

Location: Gilman Hall # 50

Speaker: **Prof. James T. Swan** (Massachusetts Institute of Technology)

Title: ***"The Hydrodynamics of Colloidal Gelation"***

Abstract

Colloidal gels are formed during arrested phase separation. Sub-micron, mutually attractive particles aggregate to form a system-spanning network with high interfacial area, far from equilibrium. Models for microstructural evolution during colloidal gelation have often struggled to match experimental results with long standing questions regarding the role of hydrodynamic interactions. In the present work, we demonstrate simulations of gelation with and without hydrodynamic interactions between the suspended particles. The disparities between these simulations are striking and mirror the experimental-theoretical mismatch in the literature. The hydrodynamic simulations agree with experimental observations, however. We explore a simple model of the competing transport processes in gelation that anticipates these disparities, and conclude that hydrodynamic forces are essential. We show through detailed simulations and analytical theory how competing transport processes are affected by hydrodynamic interactions between colloids and extend the simulations beyond the quasi-static limit to study the breakdown of gels under flow. Our simple model is capable of reproducing the results from a variety of flow scattering experiments, and suggest a pathway to understanding the co-evolution of structure and stress in flowing, attractive dispersions.