Real-space condensation in mass transport models: statics, dynamics, and large deviations

Abstract: The formation of traffic jams on highways, the clustering of particles in shaken granular gases, and the emergence of macroscopically-linked hubs in complex networks are all examples of real-space condensation. This phase transition, in which a finite fraction of the “mass” in a macroscopic system is concentrated in a microscopic fraction of its volume, is rather ubiquitous in nonequilibrium systems. In this talk, I shall present some of the insights into these phenomena garnered from the study of prototypical toy models. After reviewing static properties of the condensation transition, I shall focus on two unexpected features recently discovered: (1) Spatial correlations, which generically exist in driven systems, may give rise to a collective motion of the condensate through the system. The mechanism behind this motion is explained using simplified models, and shown to be rather generic. (2) When the current flowing through a system is conditioned to have highly atypical values, condensates may form in systems that otherwise do not condense. I will present microscopic and macroscopic approaches to analyze this novel scenario of condensation.

Host: Jim Sethna, 412 PSB, 255-5132, jps6@cornell.edu