Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Contact processes in crowded environments SHILIYANG XU, Physics Department, Syracuse University, B. CHAKRABARTI, Physics Department, Rutgers University, J.M. SCHWARZ, Physics Department, Syracuse University — Periodically sheared colloids at low densities demonstrate a dynamical phase transition from an inactive to active phase as the strain amplitude is increased. To begin to answer the question of what happens to this system at higher densities, we investigate a conserved-particle-number contact process with a three-body interaction as opposed to the usual two-body interaction. In particular, one active (diffusing) particle collides with two inactive (non-diffusing) particles such that they can become active. In mean-field, this system exhibits a continuous absorbing phase transition belonging to conserved directed percolation universality class. Simulations on 2D lattices support our result. In contrast, the three-body interaction with two active particles colliding and activating one inactive particle exhibits a first-order transition. Inspired by kinetically-constrained models of the glass transition, we investigate the "caging effect" at even higher particle densities to look for a second dynamical phase transition back to an inactive phase. While mean-field calculations demonstrate a continuous transition, 2D lattice simulations show a hint of a first-order transition, suggesting a possible fluctuation-driven transition due to the highly localized geometric constraint.

Shiliyang Xu
Physics Department, Syracuse University

Date submitted: 09 Dec 2011 Electronic form version 1.4