

abstract

MATHEMATICAL PHYSICS SEMINAR

Topic:

Speaker:

Affiliation:

Date:

Time/Room:

We have proposed that the glass transition is one example of a broader class of jamming transitions, where systems can develop extremely long stress relaxation times in disordered states as temperature is lowered, an applied shear stress is lowered, or particle density is raised. We suggested that the state of the system might be represented by a "jamming phase diagram" as a function of temperature, shear stress and density. However, such a diagram is unconventional from the point of view of equilibrium phase diagrams because the glass transition and other jamming transitions are not sharp; for example, the glass transition temperature depends on how long one is willing to wait in order to measure the stress relaxation time. I will first discuss recent numerical simulations of soft particle packings that suggest that there is a special point in the jamming phase diagram where the onset of jamming is sharp with increasing particle density at zero temperature. This point (Point J) occurs at zero temperature and zero shear stress at random close-packing density, and has special properties: the transition is of mixed first/second-order character, with a discontinuity in the number of overlapping neighbors per particle and a diverging length scale. I will then introduce an analogy between the particle packings at Point J and a correlated percolation, k-core percolation. The latter model can be solved exactly on the Bethe lattice and yields exponents in excellent agreement with the simulations.