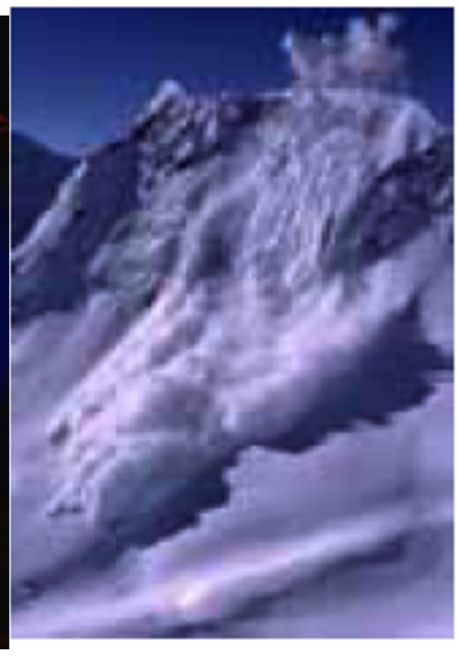
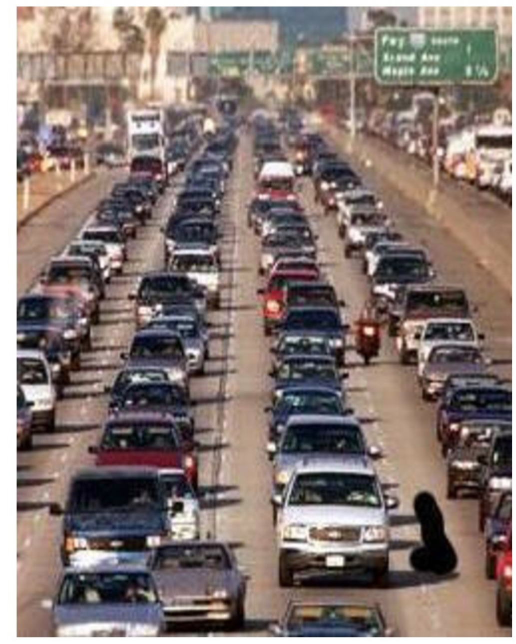
Boston University **Physics Colloquium**





Jamming

All around us things seem to get jammed. Before breakfast, coffee grounds and cereal jam as they refuse to flow into our filters and bowls. On the way to work, we are caught in traffic jams. In factories, powders jam as they clog in the conduits that were designed to have them flow smoothly from one side of the factory floor to the other. Our recourse in all these situations is to pound on our containers, dashboards and conduits until the jam miraculously disappears. We are usually so irritated by the jam that we do not notice that the properties of the jammed state, in all of these situations, have similar behaviors that are quite different from those of crystalline solids.

I will argue that many similarities seen in the jammed state can be understood in terms of a singular point--the jamming transition of frictionless soft spheres. This transition coincides with the threshold of mechanical stability, lending the marginally-jammed solid special properties, including a vanishing ratio of the shear to bulk modulus and a diverging length scale characterizing the minimum size of a cluster that is mechanically rigid. This diverging length gives rise to qualitatively new physics by interfering with the usual plane-wave behavior of low-frequency sound modes. Even the lowest frequency sound modes have wavelengths shorter than the divergent length scale at the jamming transition. As a result, the disorder can never be averaged away and a new class of modes appears, swamping out plane wave behavior all the way down to zero frequency. In this sense, the marginally-jammed solid can be considered the epitome of disorder--the opposite limit from the perfect crystal.

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April 2, 2013 (Tuesday) at 3:30pm (Refreshments at 3:00pm)
SCI 109, Metcalf Science Center, Boston University

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Hosts: Rama Bansil, Ophelia Tsui