Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

From Crystals to Point J: how changing the order affects disordered systems CARL GOODRICH, ANDREA LIU, University of Pennsylvania, SIDNEY NAGEL, University of Chicago — The theory of crystalline solids is well established as the basis for our understanding of periodically ordered materials. While less developed, much progress has been made in understanding solids that lack periodic order. Specifically, the jamming transition of idealized soft spheres is a critical point that corresponds to the opposite limit of the fully disordered solid–the epitome of disorder. We seek to bridge the gap between these two extreme limits–the completely disordered solid and the perfect crystal–to understand how partially ordered systems behave. Can they always be considered as perturbations away from these two limits, or are they fundamentally different? We find that systems with intermediate bond orientational order exist but that most systems display either very high or very low order. We study mechanically stable configurations that are very ordered but whose contact number is not far from the marginal value. Despite their ordered structure, these states show the same excess low-frequency modes, elastic properties and scalings typically associated with systems near the jamming transition. This suggests that the signatures of the jamming transition are more robust than previously thought and sheds light on the physical mechanism that makes jamming unique.

Carl Goodrich
University of Pennsylvania

Date submitted: 09 Nov 2012 Electronic form version 1.4