Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

**The Influence of Topology on Signal Propagation in Granular Force Networks**[1] DANIELLE BASSETT, University of California Santa Barbara, ELI OWENS, KAREN DANIELS, North Carolina State University, MASON PORTER, Oxford University — Granular materials exhibit numerous rich and complex behaviours, which have been investigated from both continuum and particulate perspectives. In particular, sound propagation through granular materials is both heterogeneous and complicated, and understanding its features is important not only from the perspective of fundamental physics but also for practical applications such as the characterization and non-destructive testing of such materials. Unfortunately, continuum models of sound propagation have been unable to explain the full range of observed behaviours. Here we represent granular materials as spatially-embedded networks composed of nodes (particles) and weighted edges (contact forces between particles) located in Euclidean space, and we use network science to provide fundamental insights into how sound propagates. Using photoelastic particles, we quantitatively characterise the internal force structure and show that its meso-scale network structure plays a crucial role in sound propagation. These results might help to explain the failure of previous physical models, and illustrate that contact topology alone is insufficient to understand signal propagation in granular materials.

[1]Supported in part by the David and Lucile Packard Foundation, Public Health Service Grant NS44393, the Institute for Collaborative Biotechnologies through Contract W911NF-09-D-0001 from the US Army Research Office.

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Date submitted: 21 Oct 2011 Electronic form version 1.4