Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Dynamics of Geometrically Reconfigurable 1D and 2D Magneto-Elastic Lattices[1] MARSHALL SCHAEFFER, MASSIMO RUZZENE, Georgia Institute of Technology — Periodic structures are presented that exhibit multistability due to the nonlinearities of magneto-elastic interactions and structure geometry. The multistability of these structures affords them the ability to adapt their properties though geometric reconfiguration, bringing about changes in stiffness and Poisson's ratio, and introducing anisotropy. These changes in structural properties cause drastic changes in wave propagation, which is of interest for mechanical wave control. The dynamic transformation of one-dimensional (1D) and two-dimensional (2D) lattices between stable states are studied through nonlinear numerical simulations. The analysis is conducted using a lumped mass system of magnetic particles. The structures studied include hexagonal, re-entrant, and kagome lattices. Changes in plane wave propagation properties are predicted by applying Bloch theorem to lattice unit cells with linearized interactions. Results from Bloch analysis are then verified through direct numerical simulations. The propagation of plane waves in these lattices before and after topological changes is compared, and large differences are evident.

[1]This research is funded by the Air Force Office of Scientific Research.

Marshall Schaeffer
Georgia Institute of Technology

Date submitted: 15 Nov 2013 Electronic form version 1.4