MAR16-2015-004175

Abstract for an Invited Paper
for the MAR16 Meeting of
the American Physical Society

Topological mechanics of gyroscopic meta-materials

WILLIAM IRVINE, University of Chicago

Topological mechanical meta-materials are artificial structures whose unusual properties are protected very much like their electronic and optical counterparts. I will present an experimental and theoretical study[1] of a new kind of active meta-material comprised of coupled gyroscopes on a lattice that breaks time-reversal symmetry. The vibrational spectrum displays a sonic gap populated by topologically protected edge modes which propagate in only one direction and are unaffected by disorder. We observe these edge modes in experiment and verify their robustness to disorder and the insertion of obstacles. Controlled distortions of the underlying lattice can induce a topological phase transition that switches the edge mode chirality. This effect allows the direction of the edge current to be determined on demand.

[1]Topological mechanics of gyroscopic meta-materials, Lisa M. Nash, Dustin Kleckner, Alismari Read, Vincenzo Vitelli, Ari M. Turner and William T.M. Irvine, PNAS (In press).