Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

A parity-breaking electronic nematic phase transition in the spin-orbit coupled correlated metal $Cd_2Re_2O_7$ J. W. HARTER, California Institute of Technology, Z. Y. ZHAO, J.-Q. YAN, D. G. MANDRUS, University of Tennessee, D. HSIEH, California Instititute of Technology — Strong interactions between electrons are known to drive metallic systems toward a variety of well-known symmetry-broken phases, including superconducting, electronic liquid crystalline, and charge- and spin-density wave ordered states. In contrast, the electronic instabilities of correlated metals with strong spin-orbit coupling have only recently begun to be explored. We uncover a novel multipolar nematic phase of matter in the metallic pyrochlore $Cd_2Re_2O_7$ using spatially-resolved second-harmonic optical anisotropy measurements. Like previously discovered electronic liquid crystalline phases, this multipolar nematic phase spontaneously breaks rotational symmetry while preserving translational invariance. However, it has the distinguishing property of being odd under spatial inversion, which is allowed only in the presence of spin-orbit coupling. By examining the critical behavior of the multipolar nematic order parameter, we show that it drives the thermal phase transition near 200 K in $Cd_2Re_2O_7$ and induces a parity-breaking lattice distortion as a secondary order parameter.

John Harter
Caltech

Date submitted: 08 Nov 2016 Electronic form version 1.4