Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

**Quantifying Stress Fields of Defects in 3D Colloidal Crystals** MATTHEW BIERBAUM, NEIL Y.C. LIN, Cornell University, PETER SCHALL, University of Amsterdam, JAMES P. SETHNA, ITAI COHEN, Cornell University — We introduce the "Stress Assessment from Local Structural Anisotropy" (SALSA) method and use it to directly measure the local stress fields of defects including vacancies, dislocations, and polycrystals in 3D colloidal suspensions. In this technique, we extract a time-series of particle positions from confocal images from which we determine stresses on the particle scale. In the case of the vacancy, we find a nonlinear pressure ring which is well described by linear elastic theory with a geometric nonlinearity. We next measure the stress fields in a polycrystal before and after cyclic shear. We find that the normal stresses in the grain boundaries are about 10%-20% lower than in the grains. This provides a more detailed, particle level measurement of polycrystalline stresses that is consistent with analogous X-ray experiments as well as previous simulations.

Matthew Bierbaum
Cornell University

Date submitted: 14 Nov 2014 Electronic form version 1.4