Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Direct Measurements of Forces inside a Three-Dimensional Emulsion[1] JING ZHOU, UMass Amherst, A. D. DINSMORE, UMass Amherst, S. LONG COLLABORATION, Q. WANG COLLABORATION, Y. LIN COLLABORATION, T. P. RUSSELL COLLABORATION — Disordered solids (*e.g.*, glass, gels and sand piles) differ tremendously in their microscopic detail, yet may exhibit similar response to applied forces. To test this idea in three dimensions, we measure positions, orientations and magnitudes of inter-particle forces inside dense emulsion piles under gravity and other external stresses. Confocal microscopy of monodisperse and polydisperse emulsions provides quantitative information in the interior of samples. CdSe-TOPO nano-particles and CMPV bio-particles are used to stabilize and label the interfaces of droplets. A method of image analysis was developed to find these flat contact regions and thus map forces in three dimensions. The contact area between neighboring droplets is quantitatively related to the force (f) between the droplets. We use Princens model to calculate forces, but also experimentally investigate the area-force relationship. We will present force autocorrelation functions and structure factors that quantify the spatial distribution of forces. This work is supported by NSF (DMR-0305395).

[1]This work is supported by NSF (DMR-0305395)

Jing Zhou
UMass Amherst

Date submitted: 01 Dec 2004 Electronic form version 1.4