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Ground States and Folding Dynamics of Colloidal Clusters ELLEN KLEIN, W. BENJAMIN ROGERS, VINOTHAN N. MANOHARAN, Harvard University — We experimentally study colloidal clusters consisting of $N<100$ spherical particles with short range, isotropic interactions. These clusters are a model system for understanding colloidal self-assembly and dynamics, since the positions and motion of the particles can be observed in real space. For $N \leq 10$ the ground states are degenerate; previous work[1] has shown that the probabilities of observing specific clusters depend primarily on their rotational entropy, which is determined by symmetry. Thus, less symmetric structures are more frequently observed. However, for large N the ground state should be a highly symmetric close-packed lattice. We seek to understand how this transition occurs as a function of N.To do this, we coat colloidal particles with complementary DNA strands that induce a short-range, temperature dependent interparticle attraction. We then assemble and anneal an ensemble of clusters with N $\geq$ 10. We characterize the number of apparent ground states, their symmetries, and their probabilities as a function of N. We also observe how these clusters fold into minimal-energy configurations by subjecting them to an electric field that we then relax.

[1] *The Free-Energy Landscape of Clusters of Attractive Hard Spheres*, G. Meng, et. al. Science **327** 563 (2010).

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