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Rigid and Soft Minima of DNA-colloid Clusters
JESSE COLLINS, ZORANA ZERAVCIC, Harvard SEAS, VINOTHAN MANOHARAN, Harvard SEAS and Physics, MICHAEL BRENNER, Harvard SEAS — What are the limits of self-assembly via short-ranged, isotropic potentials? We investigate how carefully tuning the interaction matrix–breaking the permutation symmetry–of a small number of particles leads to unique ground states and novel energy landscape features, including soft local and global minima. We coat microspheres with highly specific and thermodynamically optimized DNA-sequences, and observe a few of these at a time organize in wells and droplets. DIC and other imaging techniques reveal 3D cluster structure, and fluorescence reveals the identity of each bead in the cluster. Although our experiments equilibrate timely over only a small temperature window, they elucidate how discrete sphere packing geometry governs both the statistical equilibrium and theoretical "zero T" cluster probabilities. Finally, I'll describe how relaxing some constraints can shift equilibria and flatten maxima on the energy landscapes of these specific spheres.

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