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Probing transition pathways of self-assembled colloidal clusters[1]
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— Clusters of colloidal particles bound by weak interactions explore rich energy landscapes characterized by a few minima and many higher-energy, non-rigid configurations. To investigate how such systems transit through their energy landscapes, we designed a two-dimensional system that lends itself to simple observations with brightfield video microscopy. In our aqueous system, a short-range depletion interaction strongly confines the diffusion of the spherical polystyrene colloids to a shallow volume close to a glass cover slip. The same depletion interaction provides reversible bonds between the spheres. Analyzing time series of clusters of 3, 4, and 6 spheres allows us to compare the free energy of rigid configurations to that of the transition states and to measure the kinetics of the transitions. Combining experimental measurements of the kinetics with a recent theory using a geometrical approach for calculating energy landscapes leads to a new understanding of how hydrodynamics effect transitions rates between energy minima.

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