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Assembly and manipulation of planar ordered magnetic microbead clusters M. PRIKOCKIS, A. CHEN, T. BYVANK, G. VIEIRA, R. SOORYAKUMAR, The Ohio State University — The driving forces for many complex systems in nature often rely on the competition and cooperation between interacting simple components. These natural systems yield a framework to develop artificial phenomena and devices. In this vein we have investigated interacting micrometer sized beads containing superparamagnetic particles where competing deterministic and stochastic forces are tuned to create ordered clusters that are then maneuvered in a cooperative manner. Ferromagnetic microwires patterned on a silicon surface are utilized to regulate the magnetic interactions by confining the fluid-borne beads to a planar surface. Oriented weak external magnetic fields yield repulsive inter-particle forces that compete with local forces directed toward trap sites whose locations are determined by the underlying magnetic microwire pattern. The self-assembled ordered "clusters" of interacting dipolar beads are also subject to observable Brownian fluctuations. The geometrical order and inter-bead spacing within individual clusters are magnetically tuned, while entire clusters can be transported to nearby traps and reform into predictable shapes upon arrival. These features offer the potential for interesting engineering and biophysics studies.

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