Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Tunable long range forces mediated by self-propelled colloidal hard spheres RAN NI, Univ of Amsterdam, MARTIEN COHEN STUART, Wageningen University, PETER BOLHUIS, Univ of Amsterdam — Most colloidal interactions can be tuned by changing properties of the medium. Here we show that activating colloidal particles with random self-propulsion can induce giant effective interactions between large objects immersed in such a suspension. Using Brownian dynamics simulations we find that the effective force between two hard walls in a 2D suspension of self-propelled (active) colloidal hard spheres can be tuned from a long range repulsion into a long range attraction by changing the active particle density. At relatively high densities, the active hard spheres can form a dynamic crystalline bridge, which induces a strong oscillating long range dynamic wetting repulsion between the walls. With decreasing density, the dynamic bridge gradually breaks, and an intriguing long range dynamic depletion attraction arises. A similar effect occurs in a quasi-2D suspension of self-propelled colloidal hard spheres by changing the height of the confinement. Our results open up new possibilities to manipulate the motion and assembly of microscopic objects by using active matter.

Ran Ni
Univ of Amsterdam

Date submitted: 05 Nov 2014 Electronic form version 1.4