Active hard spheres: glass transition, crystallisation and emergent forces

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Abstract: Active matter consists of a collection of objects that are able to continuously convert stored biological or chemical energy to drive their motion. The interest in studying the dynamics of active matter originates from the aim to understand the intriguing self-organization phenomena in nature, including bird flocks, bacteria colonies, tissue repair, and cell cytoskeleton. Very recently, breakthroughs in particle synthesis have enabled fabrications of artificial colloidal microswimmers, which not only show strikingly new phenomena and physics but also offer new possibilities and insights in touching some classic yet unsolved problems in condensed matter physics. In this talk, I will present our recent work on systems of active hard spheres, and focus on the non-equilibrium glass transition [1] and crystallisation [2] as well as the tunable emergent long range forces induced by active (self-propelled) colloidal hard spheres [3].

[1] R. Ni et al., Nature Communications, 4, 2704 (2013)
[2] R. Ni et al., Soft Matter, 10 (35), 6609 (2014)
[3] R. Ni et al., arXiv:1403.1533 (2014)