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Emergent order in ensembles of active spinners BENJAMIN C. VAN ZUIDEN, JAYSON PAULOSE, Lorentz Institute, Leiden University, WILLIAM T. M. IRVINE, James Franck Institute, University of Chicago, DENIS BARTOLO, Ecole Normale Suprieure de Lyon, VINCENZO VITELLI, Lorentz Institute, Leiden University — Interacting self-propelled particles is proxy to model many living systems from cytoskeletal motors to bird flocks, while also providing a framework to investigate fundamental questions in non equilibrium statistical mechanics. A surge of recent studies have shown that self-propulsion significantly modifies the phase behavior of particles interacting via potential interactions. A prototypical example is the so-called Motility Induced Phase Separation occurring in ensembles of self-propelled hard spheres. In stark contrast, our understanding of active spinning, as opposed to self-propulsion, remains very scarce. Here, we study a system of self-spinning dimers, interacting via soft repulsive forces. Upon varying the density and activity, we observe a range of emergent phases characterized by different degrees of spatiotemporal order in the position and orientation of the dimers. Changes in bulk properties, including crystallization, melting, and freezing, are reflected in the collective motion of the particles. We rationalize our numerical findings theoretically and demonstrate some of these concepts in a active granular experiment.

Benjamin C. van Zuiden
Lorentz Institute

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