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Collective motion of vibrated polar granular disks[1] OLIVIER DAUCHOT, DESEIGNE JULIEN, CEA-Saclay / SPEC, HUGUES CHATE, CEA-Saclay / Chate, DYCOACT COLLABORATION — In many interesting situations, the interactions among self-propelled agents lead to the spontaneous emergence of self-organized collective motion. The ubiquity of the phenomenon at all scales raises the question of the existence of some underlying universal mechanisms. Recent numerical and analytical studies have confirmed the existence of a transition from a disordered state at large noise to a state with various collective properties reflecting the local symmetry of the particles and their interactions. Though, there are still very few experimental situations where the onset of collective motion can be attributed to spontaneous symmetry breaking. Here, we report on experiments conducted with both polar self propelled and a-polar Brownian disks and by comparing the dynamics of both systems in the same experimental conditions, we demonstrate without ambiguity that collective motion emerges from the interplay of self-propulsion and hard-core repulsion only [1]. Interestingly the alignment, which has no nematic origin, is effectively induced during the collisions because of the self propulsion.

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