

Abstract Submitted
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Ferromagnetic rollers in a harmonic confinement ANDREAS KAISER, ALEXEY SNEZHKO, IGOR S. ARANSON, Argonne National Laboratory — We present the emergence of flocking and global rotation in a system of rolling ferromagnetic microparticles energized by a vertical alternating magnetic field confined in a harmonic potential. By combing experiments and discrete particle simulations, we have identified primary physical mechanisms leading to the emergence of large-scale collective motion: spontaneous symmetry breaking of the clock / counterclockwise particle rotation, collisional alignment of particle velocities, and random particle re-orientations due to shape imperfections. We also emphasize a subtle role of rotational noise: While the low-frequency flocking appears to be noise-insensitive, the reentrant flocking happens to be noise-activated. Moreover, we uncover a new relation between collective motion and synchronisation.

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