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Simulation of suspensions of hydrodynamically interacting self-propelled particles PATRICK UNDERHILL, JUAN HERNANDEZ-ORTIZ, MICHAEL GRAHAM, University of Wisconsin-Madison — Simulations of large populations of hydrodynamically interacting swimming particles are performed at low Reynolds number in periodic and confined geometries. Each swimmer is modeled as a rod containing beads with a propulsion force exerted on one bead (with an equal and opposite force exerted on the fluid) and excluded volume potentials at the beads. At small concentrations, the swimmers behave analogously to a dilute gas in which the hydrodynamic interactions perturb the ballistic trajectories into diffusive motion. Simple scaling arguments can explain the swimmer behavior as well as the behavior of passive tracer particles. As the concentration increases, the hydrodynamic interactions lead to large-scale collective motion.

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