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Fluid flows created by swimming bacteria drive self-organization in confined suspensions ENKELEIDA LUSHI, Brown University, HUGO WIOLAND, Institut Jacques Monod, Paris 7 Diderot , RAYMOND GOLDSTEIN, DAMTP, University of Cambridge — Concentrated suspensions of micro-swimmers can display intricate self-organized spatiotemporal patterns on scales larger than those of the individual motile units. The collective dynamics of swimming microorganisms exhibits a complex interplay with the surrounding fluid: the motile cells stir the fluid, which in turn can reorient and advect them. This feedback loop can result in long-range interactions between the cells. We present a computational model that takes into account these cell-fluid interactions and cell-cell forces and that predicts counterintuitive cellular order driven by long-range flows. The predictions are confirmed by new experiments with *Bacillus Subtilis* bacteria. Simulations and experiments show that if the micro-swimmers are confined inside thin cylindrical chambers the suspension self-organizes into a stable swirling vortex. If the micro-swimmers are confined in thin racetracks, a persistent unidirectional stream can emerge. Both these phenomena emerge as a result of the complex interplay between the swimmers, the specific confining boundaries and the fluid flow.

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