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Observation of Spontaneous Circulation in a Confined Bacterial Suspension HUGO WIOLAND, RAYMOND GOLDSTEIN, DAMTP, University of Cambridge — The individual swimming behavior of many microorganisms is often well described by a run-and-tumble model. However steric and fluid interactions with other cells and boundaries can strongly affect this behavior. At high concentrations, rod-like bacteria are known to exhibit self-organization reminiscent of nematic liquid crytal ordering, except with polar alignment. Depending on the experimental conditions different large scale patterns can arise such as vortices, jets, plumes and swarms. We use the model organism *Bacillus subtilis* to study the effect of a quasi-2D confinement on their large scale organization. Bacteria are concentrated in flattened drops surrounded by oil. Using fluorescent microsphere tracers and particle image velocimetry, we measure the flow of the cells and of the suspending fluid inside and outside of the drop. For drop diameters ranging from 10 to 100 μm and 20 μm in height, the suspension displays spontaneous circulation in the form of a single vortex, which, for the largest drops, significantly exceeds the size of swirls in the unconfined system. Moreover we observe a striking backward flow close to the boundary. We compare these results with a theoretical analysis to gain insights into the assembly and stability of such patterns.

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