Abstract Submitted
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Droplet swimmers in complex geometries: Autochemotaxis and trapping at pillars.[1] CORINNA MAASS, CHENYU JIN, CARSTEN KRUEGER, BABAK VAJDI HOKMABAD, Max Planck Institute for Dynamics and Self-Organization, Goettingen — Autochemotaxis is a key feature of communication between microorganisms, via their emission of a slowly diffusing chemoattractant or repellent. We present a well-controlled, tunable artificial model to study autochemotaxis in complex geometries, using microfluidic assays of self-propelling liquid crystal droplets in an aqueous surfactant solution. Droplets gain propulsion energy by micellar solubilisation, with filled micelles acting as a chemical repellent by diffusive phoretic gradient forces. We can tune the key parameters swimmer size, velocity and persistence length. If a swimming droplet approaches a wall, it will provide a boundary to both the hydrodynamic flow field and the spread of phoretic gradients, determining the interaction between swimmer and wall. Pillar arrays of variable sizes and shapes provide a convex wall interacting with the swimmer and in the case of attachment bending its trajectory and forcing it to revert to its own trail. We observe different behavior based on the interplay of wall curvature and negative auto-chemotaxis, i. e., no attachment for highly curved interfaces, stable trapping at large pillars, and a narrow transition region where negative autochemotaxis makes the swimmers detach after a single orbit.

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