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Swimming invariant manifolds and the motion of bacteria in a fluid flow[1] HELENA YOEST, Bucknell University, KEVIN MITCHELL, UC-Merced, TOM SOLOMON, Bucknell University — We present experiments on the motion of both wild-type and smooth-swimming bacillus subtilis in a hyperbolic, microfluidic fluid flow. Passive invariant manifolds crossing the fixed point in the flow act as barriers that block inert tracers in the flow. Self-propelled tracers can cross these passive manifolds, but are blocked by and attracted to swimming invariant manifolds (SWIMs) that split from the passive manifolds with larger and larger non-dimensional swimming speed $v_0 \equiv V_0/U$, where V_0 is the swimming speed in the absence of a flow and U is a characteristic flos speed. We present the theory that predicts these SWIMs for smooth-swimming tracers, along with experiments that we are conducting to test these theories. We also discuss potential effects of rheotaxis and chemotaxis on the phenomena.

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