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Invariant manifolds as barriers to the motion of bacteria in vortex flows[1] KATIE LILIENTHAL, DOAN MINH, TOM SOLOMON, Bucknell University — We present experiments that study the motion of swimming bacteria (bacillus subtilis) in a time-independent vortex flow. The flow is a pair of vortices generated in a microfluidic cell composed of either a cross or an H-shaped channel. Experiments are done with both wild-type and a genetically-mutated "smooth swimming" [2] bacillus subtilis. We analyze the trajectories of these bacteria in terms of invisible barriers, based on a theory of "burning invariant manifolds" [3] that act as one-way barriers that impede the motion of reaction fronts in a fluid flow. We explore whether similar one-way barriers impede the motion of bacteria.

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[2]R. Rusconi, J.S. Guasto and R. Stocker, Nature Physics **10**, 212 (2014).
[3]J. Mahoney, D. Bargteil, M. Kingsbury, K. Mitchell and T. Solomon, Europhys. Lett. **98**, 44005 (2012).

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