Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

**Low-$Re$ swimming across viscosity gradients, I: Experiments** ROBERTO ZENIT, Brown University, JORGE GONZALEZ-GUTIERREZ, Universidad Autonoma de Chiapas, CHRISTIAN ESPARZA-LOPEZ, ERIC LAUGA, University of Cambridge — The environment of many microorganisms consists of fluids with non-homogeneous viscosity distribution, in particular in a biological setting. Some swimmers are able to modify their motion in response to changes in the viscosity, and thus to display so-called viscotaxis. A particular example of a viscotactic bacterium is *H. pylori*, which is able to swim across the mucus layer that protects the stomach and successfully colonise it. In this work we use a synthetic swimmer to study the process in a controlled manner. A magnetically driven helical swimmer is made to swim across a two-layer fluid with contrasting viscosities. The speed of the swimmer, which maintains the same rotational speed, is measured during the penetration process. Tests were conducted for swimmers with the head-first (pushers) and tail-first (pullers), and in the direction of the viscosity gradient and against it. The results reveal widely dynamics, depending on these factors. In general, pushers experience a decrease in swimmer speed during the crossing while pullers experience the opposite effect.

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Date submitted: 31 Jul 2020 Electronic form version 1.4