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Bacterial Rheotaxis MARCOS MARCOS, Nanyang Technological University, HENRY FU, University of Nevada, Reno, THOMAS POWERS, Brown University, ROMAN STOCKER, Massachusetts Institute of Technology — Rheotaxis is the directed movement of an organism resulting from fluid velocity gradients, long studied in fish, aquatic invertebrates and spermatozoa. Here we show that rheotaxis also occurs in bacteria. Using controlled microfluidic shear flows, we demonstrate and quantify rheotaxis in *Bacillus subtilis*. A mathematical model of a bacterium swimming in a shear flow is in good agreement with observations and reveals that bacterial rheotaxis results from a subtle interplay between velocity gradients and the helical shape of flagella, which together generate a torque that reorients the cell, altering its swimming direction. The magnitude of the observed rheotactic velocity is comparable to typical chemotactic velocities, suggesting that rheotaxis can interfere with bacterial processes based on directed motility, such as foraging and infection.

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