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Dynamics of artificial bacterial flagella YI MAN, ERIC LAUGA, Department of Mechanical and Aerospace Engineering, University of California, San Diego — Artificial bacterial flagella (ABF) are small-scale rigid helices actuated by an external rotating magnetic field and therefore able to propel in a viscous fluid. In experiments, ABF are observed to display wobbling motion at low frequencies and a transition to directed swimming at higher frequencies. We use here a combination of numerics and asymptotics to provide a theoretical explanation for this dynamics. In particular we show that the wobbling angle - the angle between the direction of propulsion and the axis of the helix - is inversely proportional to the Mason number, a dimensionless number given by the ratio of the magnitudes of viscous torque to magnetic torque. Our theoretical predictions agree well with experimental results.

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