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Locomotive consequences of non-axisymmetric flagellar configurations HENRY FU, University of Nevada, Reno, MARCOS MARCOS, Nanyang Technological University, YUNKYONG HYON, University of Nevada, Reno, THOMAS POWERS, Brown University, ROMAN STOCKER, Massachusetts Institute of Technology — Although peritrichous bacteria can form flagellar bundles at many attachment points and directions relative to the cell body, locomotion of these bacteria is often modeled as arising from a polar bundle oriented along the cell body axis. We discuss the consequences of non-axisymmetric flagellar configurations for bacterial locomotion and implications for bacterial behavior using a boundary element method (BEM) based on the method of regularized Stokeslets. We validate our BEM by comparing to analytic results for spheres and ellipsoids, as well as results in the literature for axisymmetric flagella with spherical and ellipsoidal heads obtained from other boundary element methods and slender body theory. Non-axisymmetric flagellar configurations generically lead to wobbling cell bodies and wiggling helical cell trajectories, both of which have been observed experimentally. We compare experimental and numerically calculated wiggling trajectories to deduce information about flagellar geometries of swimming B. subtilis. We discuss the implications of off-axis flagellar geometries for bacterial rheotaxis and chemotaxis.

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