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Viscous constraints on squirmer microswimmers approaching suspended particles MEHDI JABBARZADEH, HENRY C. FU, University of Nevada, Reno — Microscopic self-propelled organisms often approach other particles to capture food, mate, or find new environments. The viscous Stokes flow around these small organisms push away particles, severely hindering approach. Previously, we investigated approach hydrodynamics by modeling a swimming organism as a sphere pushed by a constant force towards a force-free spherical target particle. We measured approach efficiency by examining how far the swimmer must travel before getting close to the target. For targets which are of bigger or comparable size to the swimmer, the swimmer travels less than 1.5 times the initial separation distance; for smaller targets the swimmer must travel farther, making approach infeasible. The constant force reliably models propulsion by a flagellum, but many microorganisms feed by using cilia-coated surfaces for propulsion or generation of feeding currents. Therefore, here we consider a force-free spherical squirmer model for the swimmer approaching a spherical force-free target particle. For squirmers, the "squirmer parameter" distinguishes whether the swimmer is a puller or pusher. We find that pullers can always approach any size target and a larger squirmer parameter will generate a stronger feeding current leading to less traveled distance. On the other hand, pushers approach targets only when the squirmer parameter is less than 1; for values larger than 1, the swimmer cannot get close to the target.

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