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Can unicells increase their nutrient uptake by swimming? VINCENT LANGLOIS, ANDERS ANDERSEN, TOMAS BOHR, Department of Physics and Center for Fluid Dynamics, Technical University of Denmark, 2800 Kgs. Lyngby, Denmark, ANDRÉ VISSER, THOMAS KIØRBOE, National Institute for Aquatic Resources, Technical University of Denmark, Kavalergården 6, 2920 Charlottenlund, Denmark — We introduce two simple models for the flow generated by a self-propelled flagellate: a sphere propelled by a cylindrical flagellum and one propelled by an external point force. We use these models to examine the role of advection in enhancing feeding rates in 3 situations: (i) osmotroph feeding on dissolved molecules, (ii) interception feeding flagellates feeding on non-motile prey particles, and (iii) interception feeders feeding on motile prey (such as bacteria). We show that the Sherwood number is close to unity for osmotrophic flagellates, as suggested by most previous models. However, a more correct representation of the flow field than that predicted by a naive sinking sphere model leads to substantially higher clearance rates for interception feeding flagellates. We finally demonstrate that prey motility significantly enhances prey encounter rates in interception feeding flagellates and in fact often is much more important for food acquisition than the feeding current.

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