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Swimming sheet in a Newtonian fluid confined by a Brinkman medium SEYED AMIR MIRBAGHERI, HENRY FU, University of Nevada (Reno) — Many microorganisms swim through complex materials such as viscoelastic mucus in their natural habitats. As microorganisms move through complex materials, they may induce spatial heterogeneity in the medium, which can affect swimming properties. For example, the rotating flagella of bacteria may deplete polymer concentration near the flagella, while H pylori can turn nearby mucin gel into sol by elevating the pH. Here we examine a simple model of swimming in such scenarios, by investigating Taylor's two-dimensional swimming sheet swimming in a layer of Newtonian fluid. The Newtonian fluid is bounded above by a Brinkman medium, which represents the complex material that has been locally depleted or dissolved near the swimmer. We analytically derive the velocity for a small amplitude wave of an infinite sheet using a perturbation series to second order in the wave amplitude. For a fixed swimmer geometry, we explore the dependence of the velocity on the thickness of the Newtonian fluid and the permeability and porosity of the Brinkman medium.

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