

Abstract Submitted
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Swimming Speeds of Filaments in Viscous Fluids with Resistance

NGUYENHO HO, SARAH OLSON, Worcester Polytechnic Institute — Spermatozoa and bacteria can utilize lateral and spiral bending waves to propagate in a fluid. Often, they encounter different fluid environments filled with mucus, cells, hormones, and other large proteins. These extra materials act as friction, possibly preventing or enhancing forward progression of swimmers. To understand these effects, we employ Taylor's techniques to calculate the asymptotic swimming speeds of a cylinder of infinite extent in a viscous fluid with resistance known as a Brinkman fluid. We find that, up to the second order expansion, the swimming speeds are enhanced as resistance increases. The Stokes limit can also be also recovered from this result as resistance goes to zero. In addition, we show numerical results for a Lagrangian algorithm of a rod waving in a porous medium and compare numerical results to asymptotic swimming speeds.

Nguyenho Ho
Worcester Polytechnic Institute

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