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Effect of solid boundaries on a motile microorganism in a viscoelastic fluid[1] ALIREZA KARIMI, GAOJIN LI, University of Notre Dame, AREZOO ARDEKANI, Purdue University — Microorganisms swimming in viscoelastic fluids are ubiquitous in nature; this includes biofilms grown on surfaces, Helicobacter pylori colonizing in the mucus layer covering the stomach and spermatozoa swimming through cervical mucus inside the mammalian female reproductive tract. Previous studies have focused on the locomotion of microorganisms in an unbounded viscoelastic fluid. However in many situations, microorganisms interact with solid boundaries and their hydrodynamic interaction is poorly understood. In this work, we numerically study the effect of solid boundaries on the swimming behavior of an archetypal low-Reynolds number swimmer, called "squirmer," in a viscoelastic fluid. A Giesekus constitutive equation is used to model both viscoelasticity and shear-thinning behavior of the background fluid. We found that the time a neutral squirmer spends in the close proximity of the wall increases with polymer relaxation time and reaches a maximum at Weissenberg number of unity. A pusher is found to be trapped near the wall in a viscoelastic fluid, but the puller is less affected.

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