Abstract Submitted
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Swimming of wavy sheets in weakly viscoelastic fluids[1] ALEXANDER MOROZOV, University of Edinburgh — Many natural habitats of biological microswimmers include complex fluids whose mechanical response is strongly non-Newtonian. Recent attempts to understand swimming in such fluids produced a series of seemingly contradictory results. Especially, it is currently not understood whether swimming in dilute polymer solutions would be faster or slower than in Newtonian fluids like water. One of the classical models to study swimming is a 2D infinite periodic waving sheet model introduced by G. I. Taylor. For small-amplitude swimming it was shown previously that viscoelasticity of the suspending fluid reduces the propulsion speed, while simulations of a finite-size version of the same model predicted an increase of the propulsion speed followed by a decrease as the fluid becomes progressively more elastic. Here we present a mechanism for the reduction of the propulsion speed and devise a new swimmer that can go faster in viscoelastic fluids than in their Newtownian counterparts. We perform analytical and exact numerical calculations of large-amplitude swimming of both models to confirm our mechanism.

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