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Collective motion of microswimmers in viscoelastic fluids[1] GAOJIN LI, AREZOO ARDEKANI, Purdue University — The dynamics of suspension of self-propelled microorganisms show fascinating hydrodynamic phenomena, such as, large scale swarming motion, locally correlated motion, enhanced particle diffusion, and enhanced fluid mixing. Even though many studies have been conducted in a Newtonian fluid, the collective motion of microorganisms in non-Newtonian fluids is less understood. The non-Newtonian fluid rheological properties, such as viscoelasticity and shear-dependent viscosity in saliva, mucus and biofilm, significantly affect the swimming properties and hydrodynamic interaction of microorganisms. In this work, we use direct numerical simulation to investigate the collective motion of rod-like swimmers in viscoelastic fluids. Two swimming types, pusher and puller, are investigated. The background viscoelastic fluid is modeled using an Oldroyd-B constitutive equation.

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Arezoo Ardekani
Purdue Univ

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