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Amplitude transitions of swimmers and flexors in viscoelastic fluids ROBERT GUY, BECCA THOMASES, University of California Davis — In both theoretical and experimental studies of the effect of fluid elasticity on microorganism swimming, very different behavior has been observed for small and large amplitude strokes. We present simulations of an undulatory swimmer in an Oldroyd-B fluid and show that the resulting viscoelastic stresses are a nonlinear function of the amplitude. Specifically, there appears to be an amplitude dependent transition that is key to obtaining a speed-up over the Newtonian swimming speed. To understand the physical mechanism of the transition, we examine the stresses in a time-symmetric oscillatory bending beam, or flexor. We compare the flow in a neighborhood of the flexor tips with a large-amplitude oscillatory extensional flow, and we see similar amplitude dependent transitions. We relate these transitions to observed speed-ups in viscoelastic swimmers.

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