Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Role of passive body dynamics in micro-organism swimming in complex fluids BECCA THOMASES, ROBERT GUY, University of California, Davis — We investigate the role of passive body dynamics in the kinematics of swimming micro-organisms in complex fluids. Asymptotic analysis and linear theory are used to predict shape changes that result as body elasticity and fluid elasticity are varied. The analysis is compared with a computational model of a finite length swimmer in a Stokes-Oldroyd-B fluid. Simulations and theory agree quantitatively for small amplitude motions with low fluid elasticity (Deborah number). This may not be surprising as the theory is expected hold in these two regimes. What is more remarkable is that the predicted shape changes match the computational shape changes quantitatively for large amplitudes, even for large Deborah numbers. Shape changes only tell part of the story. Swimming speed depends on other effects as well. We see that shape changes can predict swimming speed well when either the amplitude is small (including large Deborah number) or when the Deborah number is small (including large amplitudes). It is only in the large De AND large amplitude regime where the theory breaks down and swimming speed can no longer be inferred from shape changes alone.

becca thomases
University of California, Davis

Date submitted: 01 Aug 2016 Electronic form version 1.4