Abstract Submitted
for the DFD07 Meeting of
The American Physical Society

Theory of swimming filaments in viscoelastic media HENRY FU, THOMAS POWERS, Brown University, CHARLES WOLGEMUTH, University of Connecticut Health Center — Motivated by the swimming of sperm in the non-Newtonian fluids of the female mammalian reproductive tract, we examine the swimming of filaments in the nonlinear viscoelastic Upper Convected Maxwell model. We obtain the swimming velocity and hydrodynamic force exerted on an infinitely long cylinder with prescribed beating pattern. We use these results to examine the swimming of a simplified sliding-filament model for a sperm flagellum. Viscoelasticity tends to decrease swimming speed, and changes in the beating patterns due to viscoelasticity can reverse swimming direction.

Henry Fu
Brown University

Date submitted: 25 Jul 2007 Electronic form version 1.4