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A numerical study of the effects of fluid rheology and stroke kinematics on flagellar swimming in complex fluids CHUANBIN LI, ROBERT GUY, BECCA THOMASES, UC Davis — It is observed in experiments that as the fluid rheology is changed, Chlamydomonas reinhardtii exhibits changes in both flagellar kinematics and the swimming speed. To understand this phenomenon, we develop a computational model of the swimmer, using flagellar strokes fit from experimental data. We conduct numerical simulations by changing strokes and fluid rheology independently to dissect the effects of these two factors. We discover that stroke patterns extracted from viscoelastic fluids generate much lower stress and have higher efficiency at the cost of lower swimming speed. We also discover that higher fluid elasticity hinders swimming for a fixed stroke pattern.

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