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Locomotion of a Reciprocal Swimmer by Fluid Elasticity NATHAN C. KEIM, MIKE GARCIA, PAULO E. ARRATIA, Dept. of Mechanical Engineering and Applied Mechanics, University of Pennsylvania — When fluid response is entirely viscous, a swimmer performing a reciprocal motion achieves no net displacement. This form of time-reversal symmetry is commonly broken by a non-reciprocal swimming stroke, but it may also break down if the fluidic environment has a nonlinear viscoelastic response, as found in many natural media such as mucus. In this talk, we present experiments on a rigid dimer that is "wiggled" in a reciprocal motion by a magnetic field, in the vicinity of a wall. When the dimer is immersed in a viscoelastic fluid, its motion produces a net translation. Surprisingly, the dimer can swim in a direction that is primarily parallel to the wall. No net translation is seen in a viscous Newtonian fluid under the same conditions. We report the effect's dependence on Deborah number, swimming stroke, and geometric parameters. The underlying mechanism is examined with particle tracking measurements.

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