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Performance of three different artificial swimmers in Newtonian and complex fluids F. GODINEZ, R. ZENIT, Universidad Nacional Autonoma de Mexico, E. LAUGA, University of California at San Diego — We present an experimental investigation of three simple swimming devices at low Reynolds number. Each swimmer is composed of a magnetic head attached to a propulsive tail. The robots are driven by an external magnetic field and three different kinds of tails are used: (i) a flexible filament periodically oscillated (the flexible oar mechanism); (ii) a rigid helical filament rotated by the external field (the corkscrew mechanism); (iii) a flexible filament that, when rotated by the field, acquires a conical helical shape (a hybrid case). Each swimmer is tested in two different fluids with the same shear viscosity, a Newtonian and a Boger fluid. Surprisingly, even though the tests were conducted with the same fluid, the results for the viscoelastic fluid are contrastingly different. The device based on flexible oar mechanism swims faster in the Boger fluid than in the Newtonian one; on the contrary, the hybrid device swims at lower speeds in the Boger fluid than in the Newtonian one. And unexpectedly, the device based on the corkscrew mechanism practically swims at the same velocity in both fluids. These results, suggest that the swimming performance of a biomimetic device strongly depends on the details of the swimming actuation. We can conclude that a general viscoelastic effect

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