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Ciliar fluid propulsion in a non-Newtonian liquid[1] MICHIEL BALTUSSEN, PATRIC ANDERSON, Technische Universiteit Eindhoven, JAAP DEN TOONDER, Philips Applied Technologies — Natural as well as artificial cilia are used to propel fluids, or propel an animal or object through a fluid. Although the fluid is often water, other more complex fluids such as saliva and mucus are also common. These fluids show a non-constant viscosity over a range of shear rates and are hence non-Newtonian. We model a single elastic cilium in a periodic domain in both a Newtonian as well as a non-Newtonian matrix fluid. The non-Newtonian fluid model is fitted on human saliva. A body force, which is asymmetric in time, is applied to the cilium. This causes a symmetric motion of the cilium for the Newtonian case, while the motion is asymmetric for the non-Newtonian case. Due to the asymmetric motion fluid is transported in the non-Newtonian case.

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