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Manipulating low-Reynolds-number flow by a watermill[1] LAILAI ZHU, HOWARD STONE, Department of Mechanical and Aerospace Engineering, Princeton University — Cilia and filaments have evolved in nature to achieve swimming, mixing and pumping at low Reynolds number. Their unique capacity has inspired a variety of biomimetic strategies employing artificial slender structures to manipulate flows in microfluidic devices. Most of them have to rely on an external field, such as magnetic or electric fields to actuate the slender structures actively. In this talk, we will present a new approach of utilizing the underlying flow alone to drive these structures passively. We investigate theoretically and numerically a watermill composing several rigid slender rods in simple flows. Slender body theory with and without considering hydrodynamic interactions is adopted. The theoretical predictions agree qualitatively with the numerical results and quantitatively in certain configurations.

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