

Abstract Submitted
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Scaling laws for drag of a compliant body in an incompressible viscous flow LUODING ZHU, Indiana Univ-Purdue Univ Indianapolis — Motivated by an important discovery on the drag scaling law (the four-thirds power law) of a flexible fiber in a flowing soap film by Alben, Shelley and Zhang (*Nature* **420**, 479 (2002)) at high Reynolds numbers ($2,000 < Re < 40,000$), we investigate drag scaling laws at moderate Re for a compliant fiber tethered at the midpoint submerged in an incompressible viscous flow using the Immersed Boundary (IB) method. Our work shows that the scalings of drag with respect to oncoming flow speed vary with Re and the range of a dimensionless parameter η that measures the relative importance of fluid kinetic energy and body elastic potential energy. In particular, the exponents of the power laws gradually decrease from approximately two to approximately four-thirds as Re decreases from 10 to 800 for η in a certain range.

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