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Flow generated by an oscillated elastic filament in viscous fluids
MOUMITA DASGUPTA, ARSHAD KUDROLLI, Clark University — We discuss with experiments the interplay of periodic driving, elasticity, and damping of a cilium in a viscous fluid and the resulting fluid flow. In particular, we oscillate an elastic filament made of PDMS in a viscous Newtonian fluid and observe the generated flow using PIV techniques. The competition between viscous drag and elasticity of the filament is observed to lead to symmetry breaking, resulting in a net flow. The length of the filament is varied to find an optimum length at which maximum net flow is obtained for a given elastic constant of the material and oscillating frequency. We discuss the related coupled oscillator system, and the rich dynamics observed in the context of fluid flow generated by elastic flagella and cilia.

Moumita Dasgupta
Clark University

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