

Abstract Submitted  
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**Flow field around *Vorticella*: Mixing with a reciprocal stroke**

RACHEL E. PEPPER, Harvard University, MARCUS ROPER, University of California Berkeley, HOWARD A. STONE, Harvard University — *Vorticella* is a stalked protozoan. It has an extremely fast biological spring, whose contraction is among the fastest biological motions relative to size. Though the *Vorticella* body is typically only  $30\ \mu\text{m}$  across, the contracting spring accelerates it up to speeds of centimeters per second. *Vorticella* live in an aqueous environment attached to a solid substrate and use their spring to retract their body towards the substrate. The function of the rapid retraction is not known. Many hypothesize that it stirs the surrounding liquid and exposes the *Vorticella* to fresh nutrients. We evaluate this hypothesis by modeling the *Vorticella* as a sphere moving normal to a wall, with a stroke that moves towards the wall at high Reynolds number, and away from the wall at low Reynolds number. We approximate the flow during contraction as potential flow, while the flow during re-extension is considered Stokes flow. The analytical results are compared to the flow field obtained with a finite element (Comsol Multiphysics) simulation of the full Navier-Stokes equations.

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