Abstract Submitted
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A fully 3D experimental and theoretical study of flow patterns and Lagrangian trajectories generated by spinning bent rods in viscous fluids[1] LONGHUA ZHAO, ELIZABETH BOUZARTH, PAVEL CHTCHEPROV, ROBERTO CAMASSA, DAVID MARRON, RICHARD MCLAUGHLIN, PETER PETROCHENKO, LEANDRA VICCI, UNC RTG FLUIDS GROUP, JOINT FLUIDS LAB, CAROLINA CENTER FOR INTERDISCIPLINARY APPLIED MATHEMATICS TEAM — The fluid motion induced by spinning cilia is fundamental to many living organisms. Under some circumstances it is appropriate to approximate cilia as rigid bent rods. We study the effects of shape and orientation of these idealized cilia upon flow structures in a Stokes fluid. By utilizing slender body theory and image method, an asymptotic solution is constructed for a slender body attached to a no-slip flat plane and rotating about its base sweeping out a cone. Using 3D stereoscopic projection in a table-top experiment we explore the complex flow structures and present quantified comparisons with the theoretical predictions. Intriguing short, intermediate and long time phenomena of particle trajectories are documented, and the intricacies of their theoretical modeling reported.

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