Swimming and pumping of helical structures in viscous fluids

LEI LI, SAVERIO SPAGNOLIE, UW-Madison — Many flagellated microorganisms including E. coli swim by rotating slender helical flagella, while ciliated organisms like Paramecia swim by passing helical waves along their surfaces. We will discuss a framework for studying such problems where the Stokes equations describing viscous flow are written in helical coordinates. Analytical predictions match well with full numerical simulations, and suggest optimal geometries. This work may also aid designs in microfluidic manipulation, microswimmer engineering, and the mixing of viscous fluids.

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