Abstract Submitted
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Helicoidal microswimmers in a flow: Generalized Jeffery orbits[1]

KENTA ISHIMOTO, Kyoto Univ — We theoretically study the dynamics of a helicoidal microswimmer with arbitrary shape in a linear background flow and derive a generalized version of the Jeffery equations for the angular dynamics of the object. A helicoidal object, which is defined by a rotational symmetry, is a larger symmetry class that includes a body of rotation. The helicoidal Jeffery equations include a new constant from the chirality of the object, derived from the inhomogeneous chirality distribution along the axis of the rotational symmetry, whereas the overall chirality of the object contributes to the drift velocity. Further investigations are made for an object in a simple shear flow, and the dynamics with different parameter values are clarified. A bacterial swimmer is considered as an example of a helicoidal object, and we calculate the values of the constants in the generalized Jeffery equations for a typical morphology of Escherichia coli, being consistent with recent experimental and theoretical results. [Ref] K. Ishimoto, J. Fluid Mech. 892 (2020) A11.

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