Abstract Submitted
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Teaching Stokesian Dynamics to Swim JAMES SWAN, JOHN BRADY, California Institute of Technology — We develop a generic framework for modeling the hydrodynamic self-propulsion (i.e. swimming) of bodies (e.g. microorganisms) at low Reynolds number via Stokesian Dynamics simulations. In this framework, the swimming body is composed of many spherical particles constrained to form an assembly. We map the resistance tensor describing the hydrodynamic interactions among the particles onto that for the assembly. Specifying a particular swimming gate and imposing the condition that the swimming body is force- and torque-free determines the propulsive speed. This methodology projects directly onto the classical theory for the swimming of arbitrary bodies at low Reynolds number. We illustrate the generality of the method through simulations of a wide array of swimming bodies: Taylor's helical swimmer, Purcell's three-link swimmer, the Taylor/Purcell swimming toroid, pushers and pullers, flagellates, ciliates and amoeba-like bodies undergoing large-scale deformation. We also make available an open source code with which the swimming of a body of arbitrary geometry and with arbitrary swimming gate may be simulated.

James Swan
California Institute of Technology

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