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Flows and transverse forces of self propelled micro-swimmers
JOHN KESSLER, Physics Dept, University of Arizona, RICARDO CORTEZ, Math Dept, Tulane University — We employ the properties of Stokes flows, using simple model "organisms" possessing the features needed, nothing more. At Reynolds numbers<<1 self propelled swimmers exert equal forward and backward forces on the fluid. Fore/aft asymmetry => locomotion. For spheres of unequal radii R, connected by an elongating *Gedanken*-rod, V(1)R(1)=V(2)R(2). Similarly other geometries, since drag is linear in velocity V. Time independence implies that an entire flow field develops "instantaneously": Calculating flows around an "organism" during an instant of self propulsion maps the entire field, while avoiding details of return strokes, or propulsion by a bundle of helices. Using the method of regularized Stokeslets, we find flows and interactions for various geometries. Transverse return flows toward the midsection of a swimmer, due to incompressibility, are associated with attraction of swimmers, to each other and boundaries, just as found in experiments with *Bacillus subtilis.* This work partially funded by NSF grants DMS0094179 and DEB0075296.

John Kessler
Physics Dept, University of Arizona

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