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On the interactions between two undulatory swimmers and between a swimmer and a boundary JINZHOU YUAN, HAIM BAU, University of Pennsylvania — We study numerically and experimentally the interactions between a low-Reynolds number, undulatory swimmer, such as C. elegans, and a non-slip wall and the interactions between two swimmers in an unbounded domain. The Stokes equation with collision avoidance potential was solved using finite elements to obtain the translational and rotational drag coefficients of the swimmers. The swimmers' instantaneous linear and angular velocities were determined by requiring the swimmers to be subject to zero net forces and torques and using the method of superposition. A swimmer proximate to a wall is attracted to the wall and eventually assumes a trajectory that is parallel to the wall and a speed that is twice that of a comparable swimmer distal from the wall. The theoretical predictions are in qualitative agreement with experimental observations. Under certain circumstances, two swimmers in an unbounded domain attract one another and eventually achieve an equilibrium distance between their centers of mass and an equilibrium phase difference. The equilibrium distance between the swimmers and the phase difference between their gaits are functions of the swimmers' initial positions and orientations.

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