

Special PHYSICAL MATHEMATICS SEMINAR

SWIMMING, TOWING, TUMBLING IN VISCOUS FLUIDS.

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ABSTRACT:

I will present three topics related to fluid-structure interactions at low Reynolds number. First, motivated by numerical simulations of sedimenting rod suspensions, I will discuss experimental observations of the sedimentation of two identical but anisotropic particles. For a wide variety of body shapes, we find surprisingly stable "tumbling orbits" where the two bodies rotate in phase, alternately speeding up and slowing down as they fall. In the next study, motivated by the shape and locomotion of superhelically shaped spirochete bacteria, we consider instead single bodies of high geometric complexity. We consider the rotational dynamics of towed bodies whose shape is a superposition of two oppositely handed helices, finding that the direction and rate of body rotation is a result of competition between the two helices. Lastly, we investigate how swimming *C. elegans* nematodes respond to the systematic changes in their fluid environment. We find that stroke form and Strouhal number remain invariant over many orders of magnitude change in viscosity, and that the stroke form lies near that of peak mechanical efficiency. We also find a power-law relation between swimming power-output and viscosity. I will also discuss the swimming of *C. elegans* in confined geometries, and demonstrate that confining walls can markedly increase swimming speed.

TUESDAY, JANUARY 23, 2007

2:30 PM

Building 2, Room 105

*Reception at 3:30 PM in Building 2, Room 349
(Applied Math Common Room)*



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