ME DEPARTMENTAL SEMINAR

Friday, March 26, 2004
1:30pm – 2:30pm
2233 GG BROWN

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"How Fishes Swim: Experimental Hydrodynamics and the Function of Flexible Propulsors"

Abstract:

There are 25,000 species of fishes, and a key feature of this evolutionary diversity is a great variety of propulsive systems used by fishes for maneuvering in the aquatic environment. Fishes have numerous control surfaces (fins) which act to transfer momentum to the surrounding fluid. Fishes are unstable and use several control surfaces simultaneously for propulsion and to maintain body position. Fish fins are flexible surfaces consisting of a thin membrane supported by numerous individual stiffening elements.

In this presentation I will discuss the results of recent experimental kinematic and hydrodynamic studies of fish fin function, and illustrate how fishes swim by transferring momentum to the surrounding fluid. Recent high-resolution video analyses of fish fin movements during locomotion show that fins undergo much greater deformations than previously suspected, and that fishes may actively adjust fin surface stiffness to modulate locomotor force. Fish fin motion results in the formation of vortex rings of various conformations, and quantification of vortex rings shed into the wake by freely-swimming fishes has proven to be useful for understanding the mechanisms of propulsion.

I will also provide several examples of research from my laboratory on novel methods of aquatic locomotion: basilisk lizards that run on the surface of the water, and a specialized locomotor mode used by fishes to save energy when swimming in a Karman vortex street.