PHYSICAL MATHEMATICS SEMINAR

HOW FISHES SWIM: EXPERIMENTS, MECHANICS, AND COMPUTATIONS

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ABSTRACT:

There are 28,000 species of fishes, and a key feature of this remarkable 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.

In this presentation, I will discuss the results of recent experimental kinematic and hydrodynamic studies of fish fin function. Recent high-resolution video analyses of fish fin movements during locomotion show that fins undergo much greater deformation than previously suspected. Experimental work on fin mechanics shows that fishes possess a mechanism for actively adjusting fin surface curvature 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.

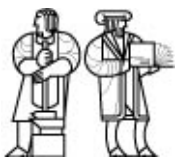
Experimental study of fish propulsion in combination with the design and testing of robotic fish fin platforms and computational fluid dynamic analysis is providing new insights into how swimming fishes generate and modulate locomotor force.

Brief Biography

George V. Lauder received the A.B. and Ph.D. degrees in biology from Harvard University in 1976 and 1979 respectively. From 1979 to 1981 he was a Junior Fellow in the Society of Fellows at Harvard and he then joined the faculty at the University of Chicago. Since 1999 he has been Alexander Agassiz Professor of Zoology, and Professor of Organismic and Evolutionary Biology at Harvard University. His research interests focus on the biomechanics and evolution of fishes with application of analyses of fish locomotor function to the design of biorobotic underwater vehicles.

TUESDAY, OCTOBER 24, 2006
2:30 PM
Building 4, Room 270

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



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