Weekly CEAFM Seminar: Fall 2017

JOHNS HOPKINS
Center for Environmental
& Applied Fluid Mechanics

Date: **Friday, November 3, 2017**

Time: 11:00 AM

Location: Hodson Hall # 210

Speaker: **Prof. George Lauder** (Harvard University)

Title: ***"Fish Robotics:***
Inspiration from Fishes for the Design of Mechanical Devices"

Abstract

There are over 35,000 species of fishes, and a key feature of this remarkable evolutionary diversity is the variety of propulsive systems used by fishes for swimming in the aquatic environment. Fishes have numerous control surfaces which act to transfer momentum to the surrounding fluid. In this presentation I will discuss the results of recent experimental kinematic and hydrodynamic studies of fish locomotor function, and the implications for construction of robotic models of fishes. Recent high-resolution video analyses of fish fin movements during locomotion show that fins undergo much greater deformations than previously suspected and fish fins possess an clever active surface control mechanism. Fish body and 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 analyses of propulsion in freely-swimming fishes have led to the development of a variety of self-propelling robotic models. Data from these devices will be presented and discussed in terms of the utility of using robotic models for understanding fish locomotor dynamics, and for studying the function of specialized fish surface structures like shark skin.

Bio

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. Since 1999 he has been Professor of Organismic and Evolutionary Biology at Harvard University. His research interests focus on the biomechanics and evolution of fishes, with a special focus on laboratory analyses of kinematics, muscle function, and hydrodynamics of freely-swimming fishes. Current work involves application of analyses of fish locomotor function to the design of fish-like robotic biorobotic test platforms.