THE FLUIDS, THERMAL AND CHEMICAL PROCESSES GROUP OF THE DIVISION OF ENGINEERING ,
THE CENTER FOR FLUID MECHANICS AND THE DEPT. OF ECOLOGY AND EVOLUTIONARY BIOLOGY
SEMINAR SERIES

MOVEMENT AND SENSING AT CLOSE QUARTERS

Malcolm A. MacIver
Dept. Biomedical Engineering
Dept. Mechanical Engineering
Dept. of Neurobiology and Physiology
Northwestern University

Like miners wearing headlamps, active sensory systems—such as the echolocating bat and weakly electric fish—have the advantage of not relying on extrinsic energy sources for sensory stimulation. Such systems, however, are under a basic biophysical constraint: spherical r^2 spreading losses on the outbound leg of the signal, and the same on the return, join to form fourth-power fall off with distance. To double the range that an object is detected at, this relationship implies a 2^4 or 16-fold increase in emission power is needed. Perhaps related to this observation, at standard hunting velocities both the bat and weakly electric fish sense prey with less than half a second to spare before collision in the absence of a course correction. Reflecting this "just-in-time" sensory system, both animals exhibit remarkable maneuverability. In this talk, I'll discuss some of the unique sensory and mechanical abilities of weakly electric fish, how these abilities are closely intertwined in short-range systems, and some robotics work we have done on artificial electrosense and propulsion systems inspired by the fish.

TUESDAY - MAY 5, 2009 - Barus & Holley, Room 190 - 4:00pm