



JOHNS HOPKINS
Center for Environmental
& Applied Fluid Mechanics

Friday, April 26, 2019
3:00 PM, 132 Gilman Hall

***"Engineering Animals: Bio-inspiration from
Charismatic Marine Megafauna"***

**Presented by Prof. Frank E. Fish
Department of Biology
West Chester University**

The ability to control the flow of water around the body dictates the performance of marine animals and technologies in the aquatic environment. Animals have existed in the oceans for millions of years and evolved suites of morphological and physiological adaptations to perform maximally in a viscous fluid environment where Archimedes Principle dominates. Therefore, marine organisms can serve as the foundation for engineering new bio-inspired technologies. Dolphins, sea lions and mantas are able to swim with high efficiency and maneuverability by use of oscillating propulsive wing-like surfaces. The propulsive and control surfaces possessed by these animals make them ideal platforms to emulate in designing bio-inspired autonomous underwater vehicles (AUV) with superior performance capabilities beyond the present AUVs. As an alternative to active propulsion, passive flow control for improved aero/hydrodynamic performance is displayed in the wing-like flippers of humpback whales. The novel design of the high aspect ratio flippers includes prominent leading edge tubercles. These structures induce a flow field of separated vortices alternating with regions of accelerated flow over the flipper. The coupled flow regions maintain areas of attached flow and delay stall at high angles of attack for maneuverability. Both active and passive flow control by large marine organisms can be utilized in the bio-inspired design of engineered structures and commercial products for enhanced performance in fluid environments.