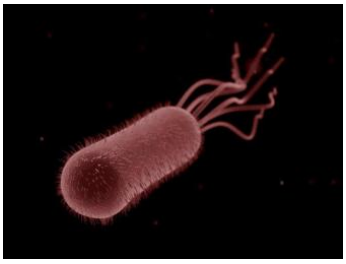
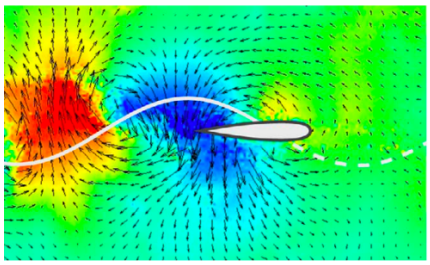
ME 491-004: Fluid Dynamics of Swimming and Flying

University of Hawai'i at Mānoa, Spring 2023

Instructor: Assistant Prof. William Uspal (uspal@hawaii.edu)





Description: This course will provide an introduction to animal locomotion in a fluid medium. We will explore the Stokesian and inviscid limits that distinguish microscopic and macroscopic swimmers. Aspects of flapping and soaring flight will be covered. Schooling, drag reduction, and other collective phenomena will be examined. Particular emphasis will be given to exploration with computational fluid dynamics. Articles from the recent literature will be discussed.

Lecture period: Tuesdays & Thursdays, 12:00– 1:15 pm, Holmes 211.

References: No textbook will be required. We will draw from the following sources, among others:

Life in Moving Fluids: The Physical Biology of Flow. S. Vogel.
The Fluid Dynamics of Cell Motility, Eric Lauga.
Mechanics of Swimming and Flying, Childress (in digestible pieces)
The Biokinetics of Swimming and Flying, A. Azuma.
Review papers in *The Annual Review of Fluid Mechanics.*

Prerequisites: ME 322, or consent of instructor.

Grade: Homework 25%, Midterm 20%, Course project or term paper 30%, Final exam 25%.