Title: Hydrodynamics of shape changing underwater bodies

Description: Many biological systems are highly maneuverable underwater due to their flexible body structure that can change shape. Recent work has shown that when a body shrinks underwater, it can recover kinetic energy from surrounding moving fluid to provide a boost of acceleration. Based on fundamental fluid mechanics, we have developed a mathematical model for representing the forces on a body undergoing a rapid change in shape that could be used as a basis for implementing shape changing actuators on underwater vehicles. In this project, the SURFO student will utilize previously developed numerical modeling tools to investigate how the rate of shape change function alters the added mass and kinetic energy transfer from the fluid to the body. This work will be incorporated with future efforts to develop a control system and physical actuator for an underwater vehicle.

Project Location: Preferably in-residence, but portions of the project could be conducted remotely.

Student Preparation: Project will require extensive use of Matlab, so Matlab experience is required. Project will also include running simulations using a software developed in Processing (wrapper for Java), so experience with object-oriented programming is good. An interest in fluid mechanics and hydrodynamics is good as well.

Additional Mentors: Megan Gimple (MS student), Matt Colavita (NUWC), Stephanie Steele (remote scientist), Jensen McTighe (MS Student)

Contact: Yes, prospective students can contact me if they have questions about the project.