The Office of Naval Research (ONR) biorobotics program focuses on bioinspired autonomous undersea vehicles with additional work in micro air vehicles and humanoid robots to support human-robot interaction research.

Accomplishments include:

Neuroscience research into neuromotor control circuits controlling movement patterns led to an analog nonlinear neural controller to produce precise adaptive synchronization of a 6-foil underwater vehicle.

Analysis of the fluid dynamics of fly wings and fish fins led to new principles for high-lift propulsion due to dynamic stall mechanisms. High-lift pitching and heaving foils developed at NUWC have been able to capture this efficient propulsion on prototype underwater vehicles. These vehicles are quiet, highly maneuverable and capable of long mission duration.

Research into biosonar, electrosense and lateral line sensors is leading to new search and identification capabilities.

Research Challenges and Opportunities

- Extracting principles and implementing efficient bio-propulsion and control surfaces
- Developing adaptive controllers for high-degree-of-freedom bio-inspired locomotion
- Integrating biosensing, bionavigation, locomotion and closed-loop control to enable agile vehicles operating in complex environments
- Developing muscle-like actuators
- Developing vehicles that can support high-level human autonomous system interaction, including within shared spaces
- Developing the capabilities for micro air vehicles to perch and grasp