Biology-Inspired Robot Control: Fall 2016

ME 599 (3) *graduate level, Offered jointly with AA546 and EE546*

Instructor: Prof. Sawyer B. Fuller, `minster@uw.edu`
`http://faculty.washington.edu/minster/bio_inspired_robotics_2016/`
WF 3:30-4:50 pm in MEB234

Honeybees, mountain goats, and even human infants are just a few of the many animals that outperform current robotic systems. Watch a honeybee land on a flower buffeted by wind using a brain the size of a sesame seed, or a mountain goat navigate a sheer cliff, or even a 9-month old baby casually reach for a spoon on a table. The dynamic motions and robustness to uncertainty exhibited by these and other animals far exceeds what has been so far achieved by their robotic counterparts. This is despite decades of advancements in robotics.

This course will cover the latest findings about feedback control in animal locomotion and biology-inspired robotics. These have lead to an emerging, but by no means complete, picture about how to create engineered systems that will be able to transform sensory input to motor output to produce more animal-like abilities. In addition to preparing students to pose questions at the cutting edge of robotics, this course will cover analytical concepts, methods, and tools that can be used to answer them. Topics of emphasis will include:

- reflexive control architectures

- using "mechanical intelligence" to reduce the burden of feedback control

- control of small robots with limited computational ability

- biomechanics of animal motion

- tools for modeling biological and robotic systems

This course assumes an undergraduate training in electrical, mechanical, or aerospace engineering, including system dynamics (ME 373 and 374 or equivalent) and control theory (ME471 or equivalent). Topics will be developed through readings and presentations of current literature, problem sets, and a course project consisting of numerical simulations or experimental robotics.