

Quantitative Biology and Engineering Sciences (QBES) Laboratory



THE UNIVERSITY
of NORTH CAROLINA
at CHAPEL HILL

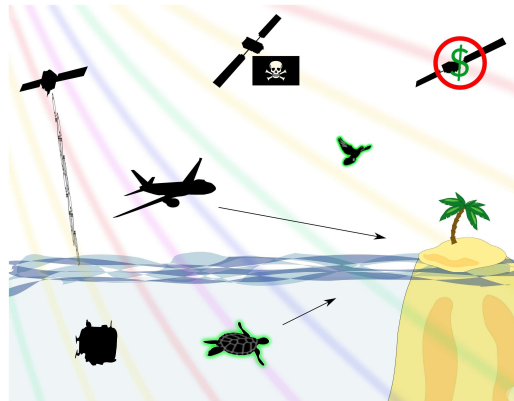
Purpose

Biology:

- Understand how animals use earth's **magnetic field** **with other sensor modes** to navigate

Engineering:

- Design systems that can **navigate without satellites**



Impacts

Addressing questions in **BIOLOGY**

- How do animals use the magnetic field to navigate?
- How do animals use multiple sensory modalities to navigate?
- How do navigation strategies deal with temporally changing environments?
- How do animals assimilate, process, and use information?

Learning concepts that can be applied in **ENGINEERING**

- Navigation without satellites (e.g., GPS)
- Improved intelligent and autonomous systems (e.g., drones)
- Enhanced ability to assimilate, process, and use disparate and distributed information (e.g., big data, autonomous systems)
- Novel sensors that are low in **Size, Weight, Power, and Cost** (SWAPC)

Technical/Scientific Approach

Blends **behavioral biology, sensory biology, robotics, various types of engineering, modeling and simulation, computational neuroscience**

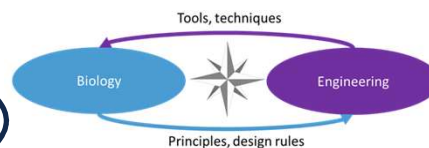
Behavioral Simulations

- Pure computer simulations
- Mobile and Tethered Robots
- Dynamical Systems Analysis

Sensing and Processing

- Various computational neuroscience models

Compare, contrast, and integrate bioinspired methods with engineering – based approaches



University Alignment

- Application to UNC departments and areas of study:
 - Quantitative Biology and Biology
 - Applied Mathematics
 - Applied Physical Sciences
 - Computer Science
 - Psychology and Neuroscience
- Application to current UNC initiatives and activities:
 - Institute for Convergent Science
 - Carolina Edge
 - Data @ Carolina
- Multidisciplinary Student Mentorship and Teaching
 - **Quantitative Biology** (3 undergraduates)
 - **Biology and Computer Science** (1 undergraduate)
 - **Biomedical Engineering** (2 undergraduates)