Community Spotlight

Each Community Spotlight features an outstanding group, partner, resource, or member of our community.

Movement: Nature's Flying Machines

By Blake Cahill, Anna Monfils, and Debra Linton

Module Description:

This week's featured resource is a lab module in which students explore the physics of flight, the adaptations that make powered flight possible, and the evolution of powered flight in vertebrates and invertebrates.

Movement is a key function required for the survival and reproduction of organisms. Microorganisms, such as bacteria and unicellular protists, achieve movement via cellular structures such as cilia and flagellae. Plants and fungi are incapable of individual locomotion but can disperse their offspring via seeds and spores and can grow towards or away from environmental stimuli. Animals have evolved a multitude of methods for movement in terrestrial, aquatic, and aerial environments. One of the most successful types of animal locomotion is flight. Flight has evolved at least four separate times, in the insects, pterosaurs, birds, and bats. Flying animals have a diversity of body forms and aerial abilities. They can teach us a lot about form and function. In fact, scientists study animal flight to develop flying robots, airplanes, and rocket ships. In today's lab, you will investigate the forces involved in the form and function of flight in birds and insects.

Students completing this module will be able to:

- Explain the forces acting on flight.
- Describe how lift is created by wings.
- Compare how antagonistic muscles (flexors, extensors) power flight in animals with endoskeletons and exoskeletons.
- Discuss how wing morphology (form) relates to flight ability (function).
- Evaluate the impact of body mass and wing morphology on bird migration

distance.

In addition to the lab module itself, this resource includes a pre-lab activity and assessment questions. Answer keys and a PowerPoint presentation are also available to instructors upon instructor verification.

Teaching Setting:

This resource was designed for use in an introductory biology lab course for majors. However, the module consists of several data modeling and paper modeling activities that could easily be adapted for lecture courses and implemented across multiple class periods if needed.

Citation:

Cahill, B., Monfils, A., Linton, D. (2019). Movement: Nature's Flying Machines. Biodiversity Literacy in Undergraduate Education, QUBES Educational Resources. doi:10.25334/Q4P165

Visit Resource

Related Materials and Opportunities:

This module was created by Blake Cahill, a graduate student at Central Michigan University (CMU) in Earth and Atmospheric Science who developed this module while taking BIO 620: Student Centered Curriculum Design for the 21st Century Biology Classroom. This course was taught by Anna Monfils and Debra Linton, who are core members of the **Biodiversity Literacy in Undergraduate Education (BLUE)** (see the BLUE website and the BLUE group on QUBES) and developed the class in response to graduate student interest in a BLUE Faculty Mentoring Network (FMN). The product of this course was then implemented in BIO 212: Foundations of Form and Function at CMU. Learn more about BLUE and their FMNs below.

BLUE
Biodiversity Literacy in Undergraduate Education

BLUE is a network of biodiversity, data, and education specialists working collaboratively to identify core biodiversity data competencies for undergraduates, develop strategies for integrating these competencies into the introductory biology curriculum, and build capacity for sustained development and implementation of biodiversity and data literacy education. Materials developed or endorsed by BLUE support the training of diverse, competent, and engaged young biologists who are well prepared for a broad set of career paths generating and utilizing biodiversity data to address scientific issues of critical national and global importance. Check out more BLUE resources here, including one that was previously featured as the Resource of the Week.

AIM-UP!
Advancing Integration of Museums into Undergraduate Programs

iDigBio
Integrated Digitized Biocollections

This resource was one of the selected modules available for use or adaptation by participants in BLUE's Fall 2019 FMN, **Natural History Collections Data in the Classroom FMN**, which was done in partnership with QUBES, **Advancing Integration of Museums into Undergraduate Programs (AIM-UP!)** (see the AIM-UP! website and the AIM-UP! group on QUBES) and **Integrating Digitized Biocollections (iDigBio)** (see the iDigBio website and the iDigBio group on QUBES). FMNs are online professional development opportunities for faculty that provide support and guidance during implementation of course changes. BLUEs FMN was specifically designed for faculty interested in incorporating real natural history collections data into their lessons and data literacy skills into their curricula. If you'd like to stay in touch with BLUE, learn more about BLUE activities, or become active in their initiatives, please complete this Google Form or join the BLUE listserve: BLUE-L@LISTS.UFL.EDU. If you'd like to stay up to date on all of the latest QUBES FMN information, please subscribe to the QUBES Newsletter.

BioQUEST is a transformative, collaborative community empowering educators to drive innovation in STEM education for all students.

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