

Example FAQ: Lehigh University Biological Sciences Research

FAQ on Biological Sciences Research at Lehigh University

What are the main areas of research in the Biological Sciences Department?

The Biological Sciences Department at Lehigh University has a diverse research portfolio, with faculty expertise spanning a wide range of areas including:

- **Cell and Molecular Biology:** Researchers in this area study the fundamental processes of life at the cellular level, including DNA replication, chromosome organization, and cell signaling pathways. (Examples: Bob Skibbens, Linda Lowe-Krentz, Matthias Falk)
- **Neuroscience:** Faculty in neuroscience investigate the intricate workings of the nervous system, from the molecular mechanisms of neuronal communication to the complex circuits that underlie behavior and cognition. (Examples: Julie Haas, Julie Miwa, Nathan Urban, R. Michael Burger, Shawn Burton)
- **Evolutionary Biology and Genetics:** This field explores the processes that drive the diversity of life, including the genetic basis of adaptation, speciation, and the evolution of complex traits. (Examples: Dylan Shropshire, Gregory Lang, Johanna Kowalko, Wynn Meyer, Vassie Ware)
- **Biochemistry:** Researchers in biochemistry study the chemical processes that occur within living organisms, including the structure and function of biomolecules such as proteins, nucleic acids, and carbohydrates. (Examples: Dylan Shropshire, Linda Lowe-Krentz)
- **Immunology:** This area focuses on the biological mechanisms that protect organisms from disease, including the function of the immune system and the development of immune responses. (Examples: Bob Skibbens)

What are some specific research questions being addressed by faculty in the department?

- **How are sister chromatids held together during DNA replication and what are the implications for genome stability?** (Bob Skibbens)
- **What is the role of telomerase RNA in maintaining telomere length and how is telomerase activity regulated?** (David Zappulla)
- **How do bacterial endosymbionts manipulate the reproduction of their insect hosts and what is the genetic basis of this phenomenon?** (Dylan Shropshire)
- **What are the evolutionary dynamics of genetic conflict between selfish genetic elements and their hosts?** (Gregory Lang)
- **How do electrical synapses contribute to neuronal circuit function and plasticity, particularly in the thalamus?** (Julie Haas)
- **How does the cholinergic system regulate complex neurobiological processes such as learning, plasticity, and anxiety?** (Julie Miwa)
- **What are the genetic and developmental mechanisms underlying the evolution of exaggerated fins in zebrafish?** (Kathy Iovine)

- **What is the role of a heparin receptor in regulating vascular cell function and angiogenesis?** (Linda Lowe-Krentz)
- **How is the structure and function of gap junction membrane channels regulated, and what are the implications for cell-to-cell communication?** (Matthias Falk)
- **What are the physiological and circuit mechanisms that contribute to the computational properties of neuronal networks in the olfactory system?** (Nathan Urban)
- **How do hormonal pathways regulate aggressive behavior in different animal models?** (Neal Simon)
- **How does the auditory system process and encode information about sound location and other acoustic features?** (R. Michael Burger)
- **How does the olfactory bulb circuit architecture and synaptic interactions contribute to the encoding and discrimination of odorants?** (Shawn Burton)
- **How do ribosomes with different compositions contribute to the regulation of translation during spermatogenesis in *Drosophila*?** (Vassie Ware)
- **What are the genetic and evolutionary mechanisms underlying dietary specialization in mammals, particularly the transition to herbivory?** (Wynn Meyer)

What model organisms are used in research in the Biological Sciences Department?

Faculty in the department utilize a variety of model organisms to address their research questions, including:

- **Yeast:** *Saccharomyces cerevisiae* is a single-celled eukaryotic organism that is widely used for studying fundamental cellular processes such as DNA replication, gene expression, and cell signaling. (Examples: Bob Skibbens, David Zappulla, Gregory Lang)
- **Fruit flies:** *Drosophila melanogaster* is a powerful genetic model organism that has been instrumental in understanding the principles of genetics and development. (Examples: Dylan Shropshire, Vassie Ware)
- **Zebrafish:** *Danio rerio* is a vertebrate model organism that is transparent during early development, making it ideal for studying developmental processes. (Examples: Kathy Iovine, Matthias Falk)
- **Mice:** *Mus musculus* is the most widely used mammalian model organism for studying a wide range of biological processes, including neuroscience, immunology, and disease. (Examples: Julie Miwa, Nathan Urban, Shawn Burton)
- **Other organisms:** Some faculty also study non-model organisms, such as marine mammals, to investigate specific evolutionary questions. (Examples: Wynn Meyer)

What techniques are used in research in the Biological Sciences Department?

Researchers in the department employ a diverse set of experimental and computational techniques, including:

- **Molecular biology techniques:** DNA cloning, PCR, sequencing, gene expression analysis
- **Cell culture and microscopy:** Cell imaging, immunofluorescence, live-cell imaging
- **Biochemistry techniques:** protein purification, enzyme assays, western blotting
- **Electrophysiology:** intracellular and extracellular recordings, patch clamping
- **Behavioral assays:** animal behavior analysis, learning and memory paradigms

- **Computational modeling:** bioinformatics, statistical analysis, mathematical modeling

How is research in the Biological Sciences Department funded?

Research in the department is primarily funded by grants from external sources, including:

- **Federal agencies:** National Institutes of Health (NIH), National Science Foundation (NSF)
- **Private foundations:** Susan G. Komen for the Cure, Howard Hughes Medical Institute
- **State agencies:** State of Pennsylvania Health Research Initiative

What are the opportunities for undergraduate students to participate in research in the Biological Sciences Department?

The department strongly encourages undergraduate research involvement and offers various opportunities for students to engage in research:

- **BIOS 391: Undergraduate Research:** This course allows students to conduct research under the guidance of a faculty mentor.
- **Independent study projects:** Students can work with faculty on research projects outside of formal coursework.
- **Summer research programs:** The department hosts summer research programs for undergraduate students.
- **Volunteer positions:** Students can volunteer in research labs to gain experience.

What are the career paths for students with a degree in Biological Sciences from Lehigh University?

Graduates from the Biological Sciences program at Lehigh are well-prepared for a variety of career paths, including:

- **Research:** Graduate studies leading to careers in academia, industry, or government research laboratories.
- **Healthcare:** Medical school, dental school, veterinary school, or other allied health professions.
- **Biotechnology and pharmaceutical industries:** Research and development, quality control, regulatory affairs.
- **Education:** Teaching at the secondary or post-secondary level.
- **Science communication and policy:** Science writing, journalism, government agencies.

How can I learn more about specific research projects or faculty members in the Biological Sciences Department?

You can find more information about faculty research and lab websites on the department's website: <https://www.bios.lehigh.edu/>.