

DOCTOR OF PHILOSOPHY IN BIOLOGY

The Biology Department offers a broad range of courses that emphasize scientific inquiry and current experimental approaches. These research areas provide essential information as we address the urgent challenges of biodiversity conservation, global climate change, epidemiology, and human health and well-being. Students consider real-world issues at the heart of how we understand ourselves as human beings in relation to other living things.

Students pursuing the Doctor of Philosophy in Biology are expected to study related biological fields through an individual program of courses, seminars, and readings, primarily emphasizing an intensive research experience culminating in a thesis. Graduate students design their own program of courses to complement and strengthen their previous background knowledge. The low student-faculty ratio ensures close collaboration between students and their dissertation advisors. Faculty and invited outside speakers offer regular research seminars, and graduate students present their work as it progresses at a biweekly departmental colloquium. All students are required to participate in one of the journal clubs, which meet weekly to discuss Ecology/Evolution, Cell/Development/Genetics, Neuroscience/Behavior, or Environmental Biology. Additional courses and lectures of interest offered by other departments are also available to biology students.

All PhD students must teach for three semesters (two in the introductory series), under faculty training and supervision. Teaching assistants are involved in preparing materials for and assisting in laboratory courses and in evaluating student work. Some classroom teaching opportunities may be offered in the later years of the PhD program.

COURSES

The PhD is a research degree demanding rigorous scholarly training and creativity; the result is an original contribution to the candidate's field. The student and the Pre-Candidacy Committee will work out a program of study for the first two years at the time of matriculation. This program will take into account the student's proposed field of interest and prior background in biology and related sciences. No specific courses are required, but, rather, a subject-matter requirement is used to ensure a broad background. Before taking the qualifying examination, all students must have at least one substantive course above the introductory level (at Wesleyan or elsewhere) in each of five subject areas:

- Genetics/Genomics/Bioinformatics
- Evolution/Ecology
- Physiology/Neurobiology/Behavior
- Cell biology/Developmental Biology
- Biochemistry/Molecular Biology

The adequacy of courses that have been taken at other institutions will be evaluated by the Pre-Candidacy Committee through its meeting with the student. Students whose focus is bioinformatics may substitute two upper-level courses in computer science for one of these five areas.

All PhD students must take a minimum of two 1 credit advanced (**300** or **500**) lecture, lab, or seminar course approved by the First Year Advisory committee. At least one of these should be taken during the student's first year. Departmental and interdepartmental seminars and journal clubs are included in the program,

and additional individual reading in particular areas may also be required. First-year students are exposed to research in the department through usually two, occasionally three, one-semester lab rotations or research practica. Toward the end of each semester of the first two years, each student will meet with the Pre-Candidacy Committee to review progress and to discuss any modification of the proposed program.

All degree-seeking graduate students are required to register for at least one credit in each semester that they are enrolled in the university.

Working with the Pre-Candidacy Committee, graduate students design their own program of courses to complement and strengthen their previous background knowledge. All students are required to participate in one of the journal clubs, during which recent journal articles are presented and discussed. Four journal clubs meet once a week:

- Ecology/Evolution
- Cell/Development/Genetics
- Neuroscience/Behavior
- Environmental Biology

PROGRESS AND QUALIFYING EXAMS

A PhD student's career in the Department of Biology at Wesleyan University is divided into three phases:

1. Preparation, rotations, and qualifier exam

Students are required to spend a one-semester rotation in two research laboratories during their first year. A third rotation is occasionally appropriate. After settling into a lab, a qualifying examination will be taken at the end of the second year no later than June 30. The examination is designed to test the student's knowledge of biology and ability to think critically. It includes a written research proposal, followed by an oral examination to discuss the proposal and evaluate the student's breadth in biology. The examination will be administered by four faculty members of the department (or associated departments and including the advisor), chosen by the student and his or her research advisor. The examining committee will include the research advisor and one member whose research field is clearly outside the student's area of special interest.

2. Active PhD thesis research

Within a year of passing the qualifier examination the student should meet with a thesis committee selected in consultation with his/her advisor to discuss research progress and proposed research. The student should submit to the committee an updated thesis proposal. The thesis committee will include the thesis advisor and three additional members; at least two of the latter three must be a member of the biology department faculty. The third member may be from another Wesleyan department or another institution if appropriate. The committee will meet with the student twice a year thereafter, or more frequently if it is appropriate.

3. Preparation of the PhD thesis and defense

The thesis committee determines when sufficient experimental work has been completed and must approve the final written document. After the committee's determination, a public thesis defense will be scheduled.

TEACHING

A minimum of three semesters as a teaching assistant is required.

RESEARCH

PhD students start their research experience with two or more semester-long practica in laboratories. These are designed to provide complementing experiences to prepare students for their thesis research. Research projects are available in the following areas:

- **Aaron Lab**—epilepsy, the hippocampus, and the cortex
- **Chernoff Lab**—conservation, evolution, and genetics of fish
- **Cohan Lab**—evolutionary genetics and speciation of bacteria
- **Coolon Lab**—ecological and evolutionary functional genomics
- **Feng Lab**—behavioral neurobiology of hibernation, with thirteen-lined ground squirrels as a model
- **Johnson Lab**—regulation of cell movement during development
- **Melón Lab**—Neurobiological mechanism that drive sex differences in the development of disorders associated with alcohol exposure
- **Mitchel Lab**—emergent phenomena in biological systems, mechanobiology, epithelial cell biology
- **O'Neil Lab** (*Biology Dept. Affiliate*)—protein aggregation in neurodegenerative disease
- **Singer Lab**—evolution and ecology of plant-animal interactions
- **Sultan Lab**—evolutionary ecology of phenotypic plasticity in plants
- **Tezak Lab**—Incubation environment influence of cell fate decisions and organ development; gonadal sex determination in reptiles
- **Weir Lab**—molecular genetics; bioinformatics

All PhD students present their research in bi-monthly seminars (BIOL557) attended by all members of the department, to encourage students to become fluent and comfortable with their presentation skills.

DISSERTATION AND DEFENSE

The most important requirement is a PhD thesis, an original contribution to biology that merits publication. The candidate will receive advice and guidance from the thesis director but must demonstrate both originality and scientific competence. Normally, the candidate will choose a thesis topic during the second year of graduate work in consultation with appropriate faculty. The thesis committee determines when sufficient experimental work has been completed and must approve the final written document. At this point a public defense will be scheduled after which the documents will be signed if the candidate has fulfilled all the requirements.

ADDITIONAL INFORMATION

BA/MA PROGRAM

This program provides an attractive option for life science majors to substantially enrich their research and course background and to earn an advanced degree while at Wesleyan. Students are encouraged to begin research by their sophomore year if they intend to pursue the BA/MA in biology. Admission is competitive and based on GPA, faculty recommendations, and research

experience. For information about the BA/MA program: [wesleyan.edu/grad/degree-programs/bama.html](http://www.wesleyan.edu/grad/degree-programs/bama.html) (<http://www.wesleyan.edu/grad/degree-programs/bama.html>)

All degree-seeking graduate students are required to register for at least one credit in each semester that they are enrolled in the University.

For additional information, please visit wesleyan.edu/bio/graduate (<https://wesleyan.edu/bio/graduate/>).