

Biology

Degrees Offered

- Master of Science
- Doctor of Philosophy

Nature of the Program

The Department of Biology's graduate program is dedicated to scholarship in academics and research. The objectives of the program are to empower students through the following:

1. Recognize important biological problems
2. Design, execute, and analyze experiments aimed at solving important problems
3. Communicate their findings in oral and written form
4. Foster an awareness of the social and political issues of the day related to biology
5. Create a desire to continue independent study after graduation

The Department of Biology offers graduate courses and research that lead to M.S. and Ph.D. degrees in biology. The focal areas of research in the graduate program are: plant sciences, biochemistry and molecular biology, bioinformatics, genetics, genomics and evolutionary biology, biology education, cell and developmental biology, ecology, forensic biology, neuroanatomy and neurophysiology and behavioral neurobiology.

FACULTY

CHAIRPERSON

- Richard B. Thomas - Ph.D. (Clemson University)

ASSOCIATE CHAIR

- Jennifer Hawkins - Ph.D. (Iowa State University)
Associate Chair for Graduate Studies
- Stephanie Young - Ph.D. (West Virginia University)
Associate Chair for Undergraduate Studies

PROFESSORS

- Ashok Bidwai - Ph.D. (Utah State University)
Biochemical and Molecular Genetic Analysis of Protein Kinases
- Jonathan R. Cumming - Ph.D. (Cornell University)
Plant Physiology, Rhizosphere Ecology
- Kevin C. Daly - Ph.D. (University of Arizona)
Sensory motor integration and behavior
- Stephen DiFazio - Ph.D. (Oregon State University)
Plant Genomics, Ecological Genetics
- James B. McGraw - Ph.D. (Duke University)
Plant Ecology, Plant Population Biology, Conservation Biology
- William Peterjohn - Ph.D. (Duke University)
Biogeochemistry, Ecosystem Ecology
- Rita V.M. Rio - Ph.D. (Yale University)
Symbioses
- Richard B. Thomas - Ph.D. (Clemson University)
Physiological Plant Ecology, Global Environmental Change

ASSOCIATE PROFESSOR

- Clifton P. Bishop - Ph.D. (University of Virginia)
Developmental and Molecular Biology of *Drosophila*
- Andrew M. Dacks - Ph.D. (University of Arizona)
Neural Basis of Behavior States, Nervous System Evolution
- Sarah M. Farris - Ph.D. (University of Illinois)

Nervous System Evolution and Development, Entomology

- Jennifer Hawkins - Ph.D. (University of Iowa)
Plant comparative genomics, Molecular evolution.

ASSISTANT PROFESSOR

- Craig Barrett - PhD The Ohio State University
Plant evolutionary Biology
- Sadie Bergeron - Ph.D. (University of Massachusetts - Amherst)
Developmental Neuroscience
- Edward Brzostek - Ph.D. (Boston University)
Forest ecology, ecosystem modeling
- Timothy Driscoll - Ph.D. (Virginia Tech)
Bioinformatics, microbial metagenomics
- Jennifer Gallagher - Ph.D. (Yale University)
Molecular Mechanisms of Genetic Variation
- Gary Marsat - Ph.D. (McGill University)
Sensory Processing of Communication Signals; Systems Neuroscience and Computational Neuroscience

CLINICAL ASSOCIATE PROFESSOR

- Donna Ford-Werntz - Ph.D. (Washington University, St. Louis)
Plant Systematics

CLINICAL ASSISTANT PROFESSOR

- Zachariah Fowler - Ph.D (West Virginia University)
Forest ecology

Admissions

MASTER OF SCIENCE

Applicants for the MS in Biology should have earned a bachelor's degree with a cumulative GPA of 3.0 or higher, and should possess an adequate background in science and mathematics. A fortieth percentile ranking or higher for the verbal, quantitative, and analytical sections of the GRE is expected. Applicants should submit a thoughtful essay that demonstrates their strong interest in scientific research, and addresses the match between their research interests and those of the faculty. Application materials should include three supportive letters of recommendation from people (typically faculty) who are familiar with the applicant's abilities. International students should have a TOEFL score greater than 250 for the computer-based exam, greater than 600-603 on the paper-based test or greater than 100 for the internet-based test.

DOCTOR OF PHILOSOPHY

The program for the degree of doctor of philosophy reflects a flexible, research-oriented approach geared to develop the interests, capabilities, and potentials of mature students. Applicants must have met all the entrance requirements listed above for the master of science program, but a fiftieth percentile ranking or higher in the verbal quantitative and analytical section of the Graduate Record Examination is expected.

Acceptance into the Ph.D. or the M.S. program is by vote of the Graduate Committee of the Department of Biology. This committee ensures that all entrance requirements are met or that provisions have been made to remedy the deficiencies, and that facilities and personnel are adequate to support the program to a successful conclusion. If after reviewing all the application materials there is no faculty member willing to serve as the applicant's academic advisor, then the potential student will not be accepted into the program.

Master of Science

Degree Requirements

- **Credit Hours:** Students are required to complete a minimum of 33 graduate credit hours in Biology at the 400 level or above. Only 12 credit of coursework at the 400 level may be used.
- **Grade Point Average:** Students must earn a minimum overall GPA of a 2.75, and a minimum GPA of 3.00 in coursework applied to their graduate program.
- **Program of Study:** The Program of Study is a written document consisting of two parts: 1) an outline of past, present, and future course work for a student's graduate career; and 2) a written plan of a student's proposed research project. A written Program of Study must be approved by the student's Masters Advisory Committee.

- **Graduation Requirement:** Students must write and defend a Master's Thesis. A final oral defense is administered after an original, written thesis has been submitted to and approved by the Advisory Committee. For complete guidelines, please see the graduate student handbook at <http://biology.wvu.edu/students/graduate-students/forms-and-policies> (<http://biology.wvu.edu/students/graduate-students/forms-and-policies/>).
- **Progress toward completion:** Year 1: Formation of an Advisory Committee and complete the Program of Study. Year 2: submit written Thesis and perform an oral defense. At the beginning of each academic year, students are evaluated by the department to insure timely progress in their degree programs.
- **Additional Requirements:** Students must have a program of study formulated and approved by an Advisory Committee at the end of the second semester of entering the M.S. program. The program of study outlines the coursework to be taken in support of the proposed research. The advisory committee ensures that all of the Department of Biology, Eberly College of Arts and Sciences, and University requirements are met during the course of the student's program of study.

Curriculum Requirements

Minimum GPA of 3.0 is required.

Biology Coursework at the 400 level or above. *	18
Research	6
BIOL 797 Research (Repeated)	
Graduate Professional Development Seminars	6
BIOL 796 Graduate Seminar (Repeated each Fall)	
BMS 700 Scientific Integrity	
Professional development courses (2 cr. min) selected with the graduate adviser.	
Departmental Seminars	3
BIOL 794 Seminar (Departmental Colloquium)	
Total Hours	33

* Excludes BIOL 486, BIOL 490, BIOL 796, BIOL 797, BIOL 799

Doctor of Philosophy

Degree Requirements

- **Credit Hours:** Students are required to complete a minimum of 37 graduate credit hours in Biology and/or related areas at the 400 level or above.
- **Grade Point Average:** Students must earn a minimum cumulative GPA of 2.75 , and a GPA of 3.00 in all coursework applied to their graduate program.
- **Program of Study:** The Program of Study is a written document consisting of two parts: 1) an outline of past, present, and future course work for a student's graduate career; and 2) a written plan of a student's proposed research project. A written Program of Study must be approved by a Ph.D. student's Advisory Committee.
- **Comprehensive Examination:** The Comprehensive or Preliminary Exam has two parts, the written and an oral. The Written Examination determines whether students understand various biological processes and abstractions covered in the readings provided by the student's committee members, and is able to solve problems based on these concepts. The Oral Qualifying Examination tests students' understanding of classic papers and fundamental concepts in their area of research emphasis. Mastery of this basic knowledge indicates a readiness to proceed with original research.
- **Proposal Exam:** The Proposal Exam has a written and oral component and is used to determine whether students can formulate a coherent, convincing research plan.
- **Dissertation:** The dissertation must demonstrate an ability to carry out independent research. Chapters of the dissertation should meet the standards required for publications in a reputable biological journal. Ph.D. Candidates must present a formal Departmental seminar on their research topic as part of their graduation requirements.
- **Progress toward completion:** At the beginning of each academic year, students are evaluated by the department to insure timely progress in their degree programs. Students must adhere to the following timeline:
 - Year 1: Form a committee and present the program of study.
 - Year 2: Complete the Comprehensive and Proposal exams.

- Year 3: Conduct dissertation research.
- Year 4: Submit Written Dissertation and present Oral Dissertation Defense.

- **Additional Requirements:**

- A minimum of 2 semesters of Teaching Practicum
- All Ph.D. students must register for, and attend, the graduate seminar (BIOL 796) every Fall semester while they are in residence. A maximum of 3 hours of BIOL 796 can be counted towards the 37-hour coursework requirement.
- All Ph.D. students are required to register for and attend BMS 700 Scientific Integrity (1 credit hour) or like course and a minimum of 2 additional credit hours of professional development
- Graduate students are expected to attend Departmental Seminars (BIOL 794 Seminar) in order to become acquainted with research being conducted within and outside the department. All Ph.D. students are required to register for and attend the Departmental Seminars given during at least five (5) semesters of their degree program.

For complete guidelines, please see the graduate student handbook at <https://biology.wvu.edu/students/graduate-students/forms-and-policies> (<https://biology.wvu.edu/students/graduate-students/forms-and-policies/>).

Curriculum Requirements

Minimum GPA of 3.0 is required.

Biology Coursework at the 400 level or above *	18
Research	6
BIOL 797 Research (Repeated)	
Graduate Professional Development Seminars	6
BIOL 796 Graduate Seminar (Repeated each Fall)	
BMS 700 Scientific Integrity	
Professional development courses (2 cr. min) selected with the graduate advisor	
Departmental Seminars	5
BIOL 794 Seminar	
Teaching Practicum	2
BIOL 790 Teaching Practicum	
Total Hours	37

* Excludes BIOL 481, BIOL 486, BIOL 490, BIOL 796, BIOL 797, BIOL 799

Degree Progress

MASTER'S BENCHMARKS

- **Progress toward completion:** Year 1: Formation of an Advisory Committee and complete the Program of Study. Year 2: submit written Thesis and perform an oral defense. At the beginning of each academic year, students are evaluated by the department to insure timely progress in their degree programs.
- **Additional Requirements:** Students must have a program of study formulated and approved by an Advisory Committee at the end of the second semester of entering the M.S. program. The program of study outlines the coursework to be taken in support of the proposed research. The advisory committee ensures that all of the Department of Biology, Eberly College of Arts and Sciences, and University requirements are met during the course of the student's program of study.

DOCTORAL BENCHMARKS

At the beginning of each academic year, students are evaluated by the department to insure timely progress in their degree programs. Students must adhere to the following timeline:

- Year 1: Form a committee and present the program of study.
- Year 2: Complete the Comprehensive and Proposal exams.
- Year 3: Conduct dissertation research.
- Year 4: Submit Written Dissertation and present Oral Dissertation Defense.

Major Learning Outcomes

BIOLOGY

The graduate programs in the Department of Biology provide rigorous training in several fields of biology. The central mission of our graduate program is to train the next generation of Biologists for careers in the field, laboratory and several other professional settings that rely on deep expertise in the biological sciences.

Students earning a M.S. or Ph.D. in Biology will be able to:

- Explain general biological principles as well as those specific to their research sub-discipline.
- Comprehend and critically evaluate literature published within their field.
- Independently design and execute experiments and provide quality data, analysis and interpretation, critical to progress in their research area.
- Effectively communicate their research in oral and written formats, including the ability to author manuscripts suitable for publication in peer reviewed scientific journals.
- Understand the role of ethics in personal and professional behavior.
- Learn and apply best laboratory practices (i.e. proper laboratory safety procedures and experimental protocols).