BIOLOGY MAJOR

ADMISSION TO THE MAJOR

Students are encouraged to begin their major in the first year so that they can take maximum advantage of upper-level biology courses and research opportunities in later years. However, the major can certainly be successfully completed if begun during sophomore year, and many students are able to combine the biology major with a semester abroad.

A prospective biology major begins with a series of two core introductory courses. Students should begin the core series with BIOL181 and its associated laboratory course, BIOL191, which are offered in the fall semester. BIOL181 is offered in a number of small sections rather than a single large lecture class. These small sections allow for problem-based learning at a more individualized pace as students master the first semester of university-level biology. Students should enroll separately for the lab course, BIOL191. These courses do not have prerequisites or co-requisites, but it is useful to have some chemistry background or to take chemistry concurrently. In the spring semester, the prospective major should take BIOL182 and its laboratory course, BIOL192. An optional spring course, BIOL194, is offered to students of BIOL182 who wish a challenging reading and discussion experience in addition to the lectures.

MAJOR REQUIREMENTS

The biology majors program of study consists of the following.

- The two introductory courses, BIOL181-BIOL182, with their labs, BIOL191-BIOL192.
- At least six elective biology courses at the 200 and 300 levels, including one mid-level cell/molecular course (either M&B/B208, BIOL210, BIOL212, or BIOL218) and one mid-level organismic/population course (either NS&B/BIOL213/BIOL214, BIOL215, BIOL215 (https://iasext.wesleyan.edu/regprod/wesmaps_page.html?crse=011364&term=1179) or BIOL216).
- **Note:** No more than three of these mid-level courses (listed above) may be counted towards the six advanced elective requirement.
- Two semesters of general chemistry (CHEM141-CHEM142 or CHEM143-CHEM144).
- Any three additional semesters of related courses from at least two different departments: physics (PHYS111, PHYS112, PHYS113, or PHYS116), organic chemistry (CHEM251 or CHEM252), mathematics (MATH117 or higher), statistics (MATH132, BIOL320/BIOL520, or QAC201), computer science (COMP112, COMP211, or higher) or earth and environmental sciences (E&ES280).
- **Note:** A strong chemistry background is especially recommended for students planning to enter graduate or medical school. Most medical and other health-related graduate schools require two years of college-level chemistry, including laboratory components, as well as a course in biochemistry.

Electives may be chosen from among the following courses at the 200, 300, or 500 levels. See WesMaps for current course offerings. The courses are grouped thematically for your convenience only.

### CELL AND DEVELOPMENT BIOLOGY

- **BIOL212** Principles and Mechanisms of Cell Biology
- **BIOL218** Developmental Biology
- **M&B/B232** Immunology
- **M&B/B237** Signal Transduction
- **BIOL245** Cellular Neurophysiology
- **BIOL334** Shaping the Organism
- **BIOL325** Stem Cells: Basic Biology to Clinical Application
- **BIOL340/540** Issues in Development and Evolution
- **BIOL343/543** Muscle and Nerve Development
- **BIOL/NS&B345** Developmental Neurobiology

### EVOLUTION, ECOLOGY, AND CONSERVATION BIOLOGY

- **BIOL214** Evolution
- **BIOL215** Evolution in Human-Altered Environments
- **BIOL216** Ecology
- **BIOL220** Conservation Biology
- **BIOL235** Comparative Vertebrate Anatomy
- **BIOL254** Comparative Animal Behavior
- **BIOL290** Plant Form and Diversity
- **BIOL310** Genomics Analysis
- **BIOL316/516** Plant-Animal Interactions
- **BIOL318/518** Nature and Nurture: The Interplay of Genes and Environment
- **BIOL327/527** Evolutionary and Ecological Bioinformatics
- **BIOL340/540** Issues in Development and Evolution
- **BIOL346** The Forest Ecosystem

### GENETICS, GENOMICS, AND BIOINFORMATICS

- **M&B/B208** Molecular Biology
- **BIOL210** Genomics: Modern Genetics, Bioinformatics, and the Human Genome Project
- **BIOL/MB&B265/COMP113/CIS265** Bioinformatics Programming
- **BIOL327/527** Evolutionary and Ecological Bioinformatics
- **M&B/B231** Microbiology
- **BIOL310** Genomics Analysis
- **BIOL327/527** Evolutionary and Ecological Bioinformatics
- **M&B/B333/533** Gene Regulation
- **M&B/B394** Advanced Laboratory in Molecular Biology and Genetics
- **E&ES280** Introduction to GIS
- **M&B/B306** Epigenetics

### PHYSIOLOGY, NEUROBIOLOGY, AND BEHAVIOR

- **NS&B/BIOL213** Behavioral Neurobiology
- **BIOL/NS&B224** Hormones, Brain, and Behavior
- **BIOL235** Comparative Vertebrate Anatomy
- **BIOL/NS&B239** Functional Anatomy of the Human Brain
- **NS&B/BIOL243** Neurohistology
- **BIOL/NS&B245** Cellular Neurophysiology
COURSES FOR NON-MAJORS

The following courses do not have prerequisites and, as such, are appropriate for non-majors.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BIOL106</td>
<td>The Biology of Sex</td>
<td>1</td>
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<tr>
<td>BIOL137</td>
<td>Writing About Evolution</td>
<td>1</td>
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<tr>
<td>BIOL140</td>
<td>Classic Studies in Animal Behavior</td>
<td>1</td>
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<tr>
<td>BIOL145</td>
<td>Primate Behavior: The Real Monkey Business</td>
<td>1</td>
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<tr>
<td>BIOL148</td>
<td>Biology of Women</td>
<td>1</td>
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<tr>
<td>BIOL149</td>
<td>Neuroethology: Sensory Basis of Animal</td>
<td>1</td>
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<td></td>
<td>Orientation and Navigation</td>
<td></td>
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<tr>
<td>BIOL173</td>
<td>Global Change and Infectious Disease</td>
<td>1</td>
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<tr>
<td>BIOL181</td>
<td>Principles of Biology I: Cell Biology and</td>
<td>1</td>
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<td></td>
<td>Molecular Basis of Heredity</td>
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<td>BIOL182</td>
<td>Principles of Biology II</td>
<td>1</td>
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<tr>
<td>BIOL186</td>
<td>Introduction to the Biology of Nutrition</td>
<td>1</td>
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<td></td>
<td>and Impact on Human Health</td>
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<tr>
<td>BIOL202</td>
<td>Laboratory in Neurophysiology</td>
<td>1</td>
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<tr>
<td>BIOL254</td>
<td>Comparative Animal Behavior</td>
<td>1</td>
</tr>
<tr>
<td>BIOL290</td>
<td>Plant Form and Diversity</td>
<td>1</td>
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<tr>
<td>BIOL299</td>
<td>Waves, Brains, and Music</td>
<td>1</td>
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<tr>
<td>NS&amp;B/BIOL328</td>
<td>Chemical Senses</td>
<td>1</td>
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<tr>
<td>BIOL/NS&amp;B345</td>
<td>Developmental Neurobiology</td>
<td>1</td>
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<tr>
<td>BIOL/NS&amp;B351</td>
<td>Neurobiology of Learning and Memory</td>
<td>1</td>
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<tr>
<td>NS&amp;B/BIOL353</td>
<td>Neurobiology of Neurological Disorders</td>
<td>1</td>
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<tr>
<td>NS&amp;B/BIOL360</td>
<td>Neuroplasticity: How Experience Changes the</td>
<td>1</td>
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<tr>
<td></td>
<td>Brain</td>
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FULFILLING THE BIOLOGY MAJOR

Cross-listed courses that are included on the list above are automatically credited to the biology major. At least two elective courses (200-level and above) that are counted toward the biology major must be used to fulfill only the biology major and cannot be simultaneously used to fulfill another major.

Depending on the student’s specific program, and with prior permission of the chair, up to two biology courses from outside the department may be counted toward the major. Two Wesleyan courses that fall into this category are ANTH202 and ANTH349.

Additional courses that may be credited to the major: BIOL320, E&ES234, MB&B228 and M&B&B383, and ECON300. MB&B228 may be counted as long as neither M&B&B208 nor M&B&B383 is counted toward the major.

Biology majors are allowed to apply at most one elective course taken credit/unsatisfactory toward fulfilling the major requirements; however, this is discouraged because good performance in major courses is an important aspect of a student’s transcript.

Courses in the BIOL 400 series (such as research tutorials) contribute toward graduation but do not count toward the major.

STUDENT LEARNING GOALS

The Biology Department expects its majors to develop a broad and integrative understanding of the theory and practice of biology across a range of disciplines and levels of biological organization. The curricular requirements of the major are designed to provide enough flexibility for each student to choose a disciplinary emphasis of most interest and fulfill the additional expectation of achieving some depth of knowledge in a particular area through a relatively intensive classroom or laboratory experience. In this context, we want our students to develop skills in critical and quantitative thinking, creative problem solving, and intuition for the process of scientific reasoning. We also encourage our students to engage in ethical thinking about biological research and the role of biology in society and sustainability. A complete program of study in biology entails the application of these skills to designing or conducting original research (including scholarly research via scientific databases), writing about and orally communicating scientific concepts, as well as the comprehension and critical interpretation of primary scientific literature. Our ultimate goal is, therefore, to train students to use their biological knowledge and skills to become effective, scientifically informed citizens and professionals.

METHOD OF EVALUATION

We will evaluate how well students attain the above goals through standardized questionnaires, group discussions as part of a senior colloquium, and one-on-one advising. The standardized questionnaires will provide both quantitative and qualitative information from the written and oral responses of senior majors. After each student has independently responded to these questions, we will discuss these questions, and any other issues regarding the major, in small groups of faculty and students. This discussion will take place during one of the meetings of the senior colloquium. In addition, at one-on-one advising meetings professor and student will informally discuss the student’s progress toward meeting the learning goals and use this information to plan the student’s program of study.

STRUCTURE OF THE STANDARDIZED QUESTIONNAIRES

Quantitative information. We will use information derived from the Senior Survey. All students are asked to rate the gains they have made in a wide range of abilities. We will focus primarily on the following subset:

- Think analytically and logically
- Formulate/create original ideas and solutions
- Use quantitative tools (e.g. statistics, graphs)
- Gain in-depth knowledge of a field
- Understand the process of science and experimentation

In addition, we will examine how well our students perceive their gains in the following areas:

- Write effectively
- Communicate well orally
- Acquire new skills and knowledge on my own
- Identify moral and ethical issues
- Evaluate the role of science and technology in society

Qualitative information. We will ask each student to respond orally and in writing to the following statements during the spring semester of their senior year:
In what specific ways have biology courses and experiences...

- Helped you improve your skills in critical and quantitative thinking?
- Helped you develop skill in original thinking and creative problem solving?
- Increased your depth of knowledge in a particular area?
- Taught you how to design and conduct original research?
- Increased your awareness of the role of biology in society?

What were your most intellectually exciting experiences in the major?

HOW THE DEPARTMENT USES ASSESSMENT INFORMATION

Each year a subcommittee of the Biology Department will prepare an assessment report summarizing the quantitative data, the qualitative responses to the above questions, and highlights of the students’ discussion, and bring it to the biology faculty for consideration. We will use the quantitative (Senior Survey) data to compare the information from biology majors to that from students in other majors at the University to identify the strengths and weaknesses of the biology program. We will also analyze the information from biology majors longitudinally, to identify changes over time. The qualitative feedback, and the ensuing discussions, will provide the nuance and detail lacking in the quantitative data.

The most recent assessment report will guide the decisions of the Biology Department and of individual faculty members in the following areas:

- Curriculum
- Advising
- Course content
- Departmental activities
- Major requirements
- Teaching approaches

ADVANCED PLACEMENT

Students who have received a grade of 4 or 5 on the AP exam may receive one university credit toward graduation.

If you earned a 4 or 5 on the AP biology exam, you are eligible to take a placement exam during freshman Orientation. If you pass this exam, you may choose to place out of MB&B181/BIOL181 and go directly into BIOL182 in the spring.

Students interested in placing out of MB&B181/BIOL181 in the fall semester should contact Professor Michelle Murolo (mmurolo@wesleyan.edu) regarding the placement exam.

Students must consult a Health Profession advisor (http://wesleyan.edu/careercenter/students/health) after placing out of a course. The Health Professions advisor will draft a letter to be included with the student’s official transcript.

However, we recommend against this for almost all students, especially those who may be interested in the biology major. Although some of the MB&B181/BIOL181 material will be familiar from a high school AP course, the depth and rigor of MB&B181/BIOL181 provide a strong foundation as you move forward to more advanced courses. Alternatively, students with AP 4 or 5 may consult individually with the BIOL182 faculty regarding placing out of this second-semester introductory course. However, both courses are considered essential background for our upper-level courses; students are highly encouraged to enroll in both semesters.

PRIZES

Dr. Neil Clendeninn Prize. Established in 1991 by George Thornton, Class of 1991, and David Derryck, Class of 1993, for the African American student who has achieved academic excellence in biology and/or molecular biology and biochemistry. This student must have completed his or her sophomore year and in that time have exemplified those qualities of character, leadership, and concern for the Wesleyan community as shown by Dr. Neil Clendeninn, Class of 1971.

The Peirce Prize. Awarded in successive years for excellence in biology, chemistry, and geology.

TRANSFER CREDIT

Up to two outside credits for biology courses may also be applied from another institution (during a study-abroad program, for example). Prior permission must be obtained from the departmental liaison (Professor David Bodznick (dbodznick@wesleyan.edu)) to ensure credibility of specific courses from other institutions.

RELATED PROGRAMS OR CERTIFICATES

Environmental Studies Certificate. The Environmental Studies (ENVS) program is interdisciplinary and offers both a certificate and a linked major. The ENVS linked major is a secondary major and requires a student to also have a primary major in another department, program, or college. ENVS majors write a senior thesis or essay in environmental studies that is mentored by a professor in another department, program, or college (e.g., biology). There is also an opportunity to earn an ENVS certificate, which does not require a senior thesis or essay. See: wesleyan.edu/coe/academics/ (https://wesleyan.edu/coe/academics).

Informatics and Modeling Certificate. The Integrative Genomic Science pathway within this certificate will be of particular interest for life science majors. See wesleyan.edu/imcp/igs.html (https://wesleyan.edu/imcp/igs.html).

Neuroscience and Behavior Program. Several faculty members in the Biology and Psychology departments also participate in the Neuroscience and Behavior Program that, at the undergraduate level, constitutes a separate major. Information about that program can be found at wesleyan.edu/nsb (https://wesleyan.edu/nsb).

The graduate program is an integral part of the Biology Department’s offerings. Not only are graduate students active participants in the undergraduate courses, but, also, upper-level undergraduates are encouraged to take graduate-level courses and seminars (500 series). Research opportunities are also available for undergraduates, and, frequently, these involve close interaction with graduate students.

BA/MA PROGRAM

[wesleyan.edu/grad/degree-programs/ba-ma.html (https://wesleyan.edu/grad/degree-programs/ba-ma.html)]

This program provides an attractive option for life science majors to substantially enrich their research and course background and to earn an advanced degree
Biology Major

while at Wesleyan. Students are advised to begin research by their junior year if they intend to pursue the BA/MA in biology. Seniors can apply by December 1 and will be notified of their status by the end of January. Admission is competitive and based on GPA, faculty recommendations, and research experience.

ADDITIONAL INFORMATION

The seminar series features distinguished scientists from other institutions who present lectures on their research findings. One objective of these seminars is to relate material studied in courses, tutorials, and research to current scientific activity. These seminars are usually held on Thursdays at noon and are open to all members of the University community. Undergraduates are especially welcome.

HONORS

To be considered for departmental honors, a student must

• Be a biology major and be recommended to the department by a faculty member. It is expected that the student will have at least a B average (grade point average 85) in courses credited to the major.
• Submit a thesis based on laboratory research, computational research, or mathematical modeling. The thesis is carried out under the supervision of a faculty member of the department.

CAPSTONE EXPERIENCE

As a capstone experience, senior biology majors are encouraged to participate in one of the following opportunities for intensive scientific engagement: a hands-on laboratory or field course, participation in lab research (typically begun prior to senior year), or enrollment in an advanced (300-level) seminar or class. A series of faculty-student dinners during fall and spring of senior year provide further opportunities to discuss emergent scientific issues and approaches and their relation to students' career goals.