Biology

Bachelor of Science degree
with a major in Biology —
with concentrations in:
Cellular/Molecular Biology
Ecology
General Biology
Marine Biology
Microbiology
Science Education

Minor in Biology
Science Teaching Credential
Master of Science degree in Biology

Department Chair
Amy Sprowles, Ph.D.

Department of Biological Sciences
Science Complex B 221
707-826-3245
humboldt.edu/biosci

The Program

Students completing this program will have demonstrated the ability to:

- apply the scientific method to questions in biology by formulating testable hypotheses, gathering data that address these hypotheses, and analyzing those data to assess the degree to which their scientific work supports their hypotheses
- present scientific hypotheses and data both orally and in writing in the formats that are used by practicing scientists
- access the primary literature, identify relevant works for a particular topic, and evaluate the scientific content of these works
- apply fundamental mathematical tools (statistics, calculus) and physical principles (physics, chemistry) to the analysis of relevant biological situations
- identify the major groups of organisms and be able to classify them within a phylogenetic framework. Students will be able to compare and contrast the characteristics of organisms that differentiate the various domains and kingdoms from one another
- use the evidence of comparative biology to explain how the theory of evolution offers the only scientific explanation for the unity and diversity of life on earth. They will be able to use specific examples to explain how descent with modification has shaped organismal morphology, physiology, life history, and behavior

- explain how organisms function at the level of the gene, genome, cell, tissue, organ and organ-system. Drawing upon this knowledge, they will be able to give specific examples of the physiological adaptations, development, reproduction and behavior of different forms of life
- explicate the ecological interconnectedness of life on earth by tracing energy and nutrient flows through the environment. They will be able to relate the physical features of the environment to the structure of populations, communities, and ecosystems
- demonstrate proficiency in the experimental methods and methods of analysis appropriate for their area of specialization within biology.

Humboldt’s program emphasizes hands-on learning. Our diverse facilities include the largest greenhouse in the California State University system, a vertebrate museum containing mammals, reptiles, and amphibians from around the world, and a vascular plant herbarium with almost 100,000 specimens. Near the campus are many parks, forests, and undisturbed habitats for studying plants and animals in their natural surroundings.

Humboldt’s marine laboratory, located on the coast in the nearby town of Trinidad, gives students outstanding opportunities for marine biology projects. The research vessel, the Coral Sea, is used for seagoing field trips. Several smaller boats are used in nearshore waters, coastal lagoons, and Humboldt Bay.

Our well-equipped biotechnology laboratory, cell culture facility, and College Core facility allow modern work in molecular and cellular biology. Scanning and transmission electron microscopes are also available for student use.

Humboldt biology graduates have many job opportunities: teacher, field biologist, marine biologist, museum curator, science librarian, clinical lab technologist, laboratory technician, environmental consultant, microbiologist, and biotechnology research technician. Graduates may also pursue advanced study in biology or a professional degree.

Preparation

In high school take biology, chemistry, and physics (with labs, if possible); beginning and intermediate algebra; geometry; and trigonometry.

REQUIREMENTS FOR THE MAJOR

For a description of degree requirements to be fulfilled in addition to those listed below for the major, please see “The Bachelor’s Degree” section of the catalog, pp. 67-82.

Unit Requirements

Core units: 41-42
Concentration units: 23-46
Total units in the major: 64-87
Total units required for the degree: 120

Special Grade Requirement

Students who receive a grade below a C- in any prerequisite course will require instructor approval for enrollment.

Core Courses (41-42 units)

The following core courses are required for all biology majors. Take all lower division courses before beginning upper division work.

Lower Division

BIOL 105 (4) Principles of Biology
BOT 105 (4) General Botany
CHEM 109 (5) General Chemistry I
CHEM 110 (5) General Chemistry II
MATH 105 (3) Calculus for the Biological Sciences & Natural Resources, or
MATH 109 (4) Calculus I
PHYX 106 (4) College Physics: Mechanics & Heat
STAT 109 (4) Introductory Biostatistics
ZOOL 110 (4) Introductory Zoology

Upper Division

BIOL 307 (4) Evolution
BIOL 340 (4) Genetics

Concentrations (23-46 units)

Complete one of the following concentrations to fulfill the requirements of the major:

Cellular/Molecular Biology Concentration (26-35 units)

See biology core courses.

Lower Division

PHYX 107 (4) College Physics: Electromagnetism & Modern Physics, or
PHYX 118 (1) College Physics: Biological Applications
CHEM 228 (4) Brief Organic Chemistry, or the two-semester series:
CHEM 324 (3) Organic Chemistry I, and
<table>
<thead>
<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>BIOL 255</td>
<td>Marine Biology</td>
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<tr>
<td>CHEM 228</td>
<td>Brief Organic Chemistry</td>
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<tr>
<td>OCN 109/109L</td>
<td>Oceanography/Lab</td>
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<td>PHYX 107</td>
<td>College Physics: Electromagnetism &amp; Modern Physics, or</td>
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<td>PHYX 118</td>
<td>College Physics: Biological Applications</td>
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**Complete one upper division statistics course (e.g., STAT 333, STAT 406)**

**Upper Division Electives**

Complete three additional upper division courses (totaling at least 7 units) chosen with your advisor and focused on developing your skills as an ecologist.

**General Biology Concentration (28-38 units)**

*See core courses.*

**Lower Division**

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<tr>
<td>BIOL 250</td>
<td>(3) Cell Biology</td>
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<tr>
<td>BOT 310</td>
<td>(4) General Plant Physiology</td>
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<td>ZOOL 310</td>
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<td>ZOOL 312</td>
<td>(4) Human Physiology</td>
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Complete either:

**Chem 228** (4) Brief Organic Chemistry
**or the two-semester series:**

**Chem 324** (3) Organic Chemistry I
**Chem 324L** (2) Organic Chemistry I Lab
**Chem 325** (3) Organic Chemistry II
**Chem 325L** (2) Organic Chemistry II Lab

Complete at least 12 additional units of upper division courses in biological sciences, chosen in consultation with an academic advisor.

**Marine Biology Concentration (40-48 units)**

*See core courses.*

**Lower Division**

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<tr>
<td>BIOL 330</td>
<td>(4) Principles of Ecology</td>
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<tr>
<td>BIOL 344</td>
<td>(4) Population &amp; Community Ecology</td>
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Complete one course from the following:

**BIOL 350** (3) Cell Biology
**BOT 310** (4) General Plant Physiology
**ZOOL 310** (4) Animal Physiology
**ZOOL 312** (4) Human Physiology

Complete either:

**Chem 228** (4) Brief Organic Chemistry
**or the two-semester series:**

**Chem 324** (3) Organic Chemistry I
**Chem 324L** (2) Organic Chemistry I Lab
**Chem 325** (3) Organic Chemistry II
**Chem 325L** (2) Organic Chemistry II Lab

Complete at least 12 additional units of upper division courses in biological sciences, chosen in consultation with an academic advisor.

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**Ecology Concentration (30-37 units)**

*See core courses.*

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<td>PHYX 118</td>
<td>(1) College Physics: Biological Applications</td>
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**Complete one of the following:**

**GEOG 106** (3) Physical Geography
**GEOG 109** (4) General Geology
**OCN 109/109L** (3/1) General Oceanography/Lab

**SOIL 260** (3) Intro to Soil Science
**FISH 320** (3) Limnology

**Upper Division**

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<td>BIOL 330</td>
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<tr>
<td>BIOL 412</td>
<td>(4) General Microbiology, or</td>
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<td>BIOL 433</td>
<td>(3) Microbial Ecology and</td>
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<td>BIOL 433D</td>
<td>(1) Microbial Ecology Discussion</td>
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Complete 4-5 units from the following:

**BIOL 350** (3) Cell Biology and [either **BIOL 440** (2) Molecular Genetics Lab or **BIOL 450** (2) Cell Biology Lab]
**BIOL 412** (4) General Microbiology, or
**BOT 310** (4) General Plant Physiology, or
**ZOOL 310** (4) Animal Physiology

Complete at least 3 units of additional courses from the following:

**BIOL 412** (4) General Microbiology
**BOT 350** (4) Plant Taxonomy
**BOT 354** (4) Agrostology
**BOT 355** (4) Lichens and Bryophytes
**BOT 356** (4) Physiology
**BOT 358** (2) Biology of Microfungi
**BOT 359** (2) Biology of Ascomycetes and Basidiomycetes

**FISH 310** (4) Ichthyology
**WDLF 365** (3) Ornithology I
**ZOOL 314** (5) Invertebrate Zoology
**ZOOL 316** (3) Freshwater Aquatic Invertebrates
**ZOOL 354** (5) Herpetology
**ZOOL 356** (3) Mammalogy
**ZOOL 358** (4) General Entomology
**ZOOL 556** (4) Marine Mammalogy

Complete one upper division statistics course (e.g., STAT 333, STAT 406)

**Upper Division Electives**

Complete three additional upper division courses (totaling at least 7 units) chosen with your advisor and focused on developing your skills as an ecologist.

**General Biology Concentration (28-38 units)**

*See core courses.*

**Lower Division**

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Complete one of the following:

**BIOL 350** (3) Cell Biology
**BOT 310** (4) General Plant Physiology
**ZOOL 310** (4) Animal Physiology
**ZOOL 312** (4) Human Physiology

Complete either:

**Chem 228** (4) Brief Organic Chemistry
**or the two-semester series:**

**Chem 324** (3) Organic Chemistry I
**Chem 324L** (2) Organic Chemistry I Lab
**Chem 325** (3) Organic Chemistry II
**Chem 325L** (2) Organic Chemistry II Lab

Complete at least 12 additional units of upper division courses in biological sciences, chosen in consultation with an academic advisor.
Microbiology Concentration

(23-34 units)

See core courses.

Lower Division

PHYX 107  [4] College Physics: Electromagnetism & Modern Physics, or
PHYX 118  [1] College Physics: Biological Applications

Complete either:

CHEM 228  [4] Brief Organic Chemistry, or the two-semester series:

Take all lower division courses before beginning upper division work.

Upper Division

BIOL 350  [3] Cell Biology
BIOL 448  [3] Biogeography
BIOL 499  [1] Directed Study
BOT 350  [4] Plant Taxonomy
ZOOL 312  [4] Human Physiology

Before applying to the secondary education credential program, students must meet the prerequisite of 45 hours early field experience or enroll in SED 210/SED 410.

Requirements for the Minor

Total units required for the minor: 23-24

Lower Division

BIOL 105  [4] Principles of Biology
ZOOL 110  [4] Introductory Zoology

Upper Division

Complete one of the following courses.

BIOL 350  [3] Cell Biology
ZOOL 312  [4] Human Physiology

Upper Division Electives

Complete an additional 8 units of upper division courses (approved by minor advisor) in at least two of these three areas: biology (BIOL), botany (BOT) and zoology (ZOOL). Of these 8 units, a minimum of 5 units must be core courses NOT used to satisfy major requirements.

Note: BIOL 307 Evolution is the only upper division GE Area B course that can be used to satisfy requirements for the Biology minor.

Science Education Concentration

(31 units)

See core courses.

Lower Division


BIOL 105  [4] Principles of Biology
BIOL 350  [3] Cell Biology
BIOL 448  [3] Biogeography
BIOL 499  [1] Directed Study
BOT 350  [4] Plant Taxonomy
ZOOL 312  [4] Human Physiology

Take all lower division courses before beginning upper division work.

Upper Division

BIOL 350  [3] Cell Biology
ZOOL 312  [4] Human Physiology

Upper Division Electives

Complete an additional 8 units of upper division courses (approved by minor advisor) in at least two of these three areas: biology (BIOL), botany (BOT) and zoology (ZOOL). Of these 8 units, a minimum of 5 units must be courses NOT used to satisfy major requirements.

Note: BIOL 307 Evolution is the only upper division GE Area B course that can be used to satisfy requirements for the Biology minor.

MASTER OF SCIENCE DEGREE IN BIOLOGY

The Program

Graduate students will:

* apply a rich body of relevant biological sciences knowledge and information to solve complex scientific problems and challenges
* present a proposal for biological research or project of their own design
* conduct a unique and independent biological investigation or an independent project according to the rigors and conventions of the field

* communicate the results of their scientific investigation or project in writing according to conventions of the discipline

Program Admission Requirements

Bachelor’s degree in biology, botany, zoology, or a related subject area approved by the Department of Biological Sciences.

Undergraduate GPA at least 2.50 overall or 3.00 for the last 60 semester units of credit.

Submitted results of the aptitude portion of the Graduate Record Examination (GRE).

Requirements for the Master of Science Degree in Biology

For a description of degree requirements to be fulfilled in addition to those listed below, please see “The Master's Degree” on page B3.

Total units required for the degree: 30

Core Courses

BIOL 683  [1] Introduction to Graduate Studies
BIOL 684  [1] Introduction to Graduate Research
BIOL 685  [1] Seminar in Biology [take two seminars]

Complete upper division or graduate units in biological sciences or supporting courses approved by the graduate committee to bring total to 30 units. A minimum of 18 units must be at the graduate level.

BIOL 597 Methods in Laboratory Instruction, can be used to fulfill 2 of the 30 units required for the degree, but cannot be used to fulfill any of the 18 graduate-level units.

While in residence, enrollment in a minimum of 2 units* per semester of:
BIOL 690  [1-4] Thesis or

* Combined total of not less than 4 nor more than 8 units of BIOL 690 and/or BIOL 699 (with a maximum of 6 units in BIOL 690) and a thesis or project approved by the graduate committee.

Culminating Experience

Oral presentation of the thesis or project work and defense of the thesis or project before the graduate committee.