Biology

Chair

- Diane C. Slusarski

Undergraduate major: biology (B.A., B.S.)
Undergraduate minor: biology
Graduate degrees: M.S. in integrated biology; Ph.D. in integrated biology
Faculty: https://biology.uiowa.edu/people/faculty
Website: https://biology.uiowa.edu/

The Department of Biology offers undergraduate and graduate programs that prepare students for careers in a wide variety of fields such as health science or biological research, technology, and education. It also offers several courses that undergraduate students in all majors may use to satisfy the GE CLAS Core Natural Sciences requirement and other courses on topics of general interest for undergraduate non-biology majors, including a First-Year Seminar course, BIOL:1000 First-Year Seminar, designed for entering students. The department also administers the interdisciplinary biomedical sciences major and the neuroscience major, both leading to a Bachelor of Science degree.

Programs

Undergraduate Programs of Study

Majors

- Major in Biology (Bachelor of Arts)
- Major in Biology (Bachelor of Science)

Minor

- Minor in Biology

Graduate Programs of Study

Majors

- Master of Science in Integrated Biology
- Doctor of Philosophy in Integrated Biology

Facilities

The department is housed in two contiguous buildings, with modern facilities and equipment for state-of-the-art research. Facilities include the W.M. Keck Dynamic Image Analysis Facility, which couples sophisticated state-of-the-art microscopy and computerized motion analysis to permit three-dimensional real-time analysis of cell movement in vitro and in situ. The Roy J. Carver Center for Genomics houses the department's DNA sequencing, oligo synthesis, quantitative PCR, functional genomics facilities, and informatics facilities. The Roy J. Carver Center for Imaging is a microscopy and imaging facility; its confocal microscopes are available for teaching and research.

A large greenhouse is used in plant research and education. The department also houses animal-care facilities suitable for mice, rats, rabbits, Xenopus laevis, and zebra fish. These facilities are managed by the University's animal care unit, which is accredited by the Association for Assessment and Accreditation of Laboratory Animal Care. A central University facility provides assistance in the preparation of transgenic mice.

The department is home to the Developmental Studies Hybridoma Bank, which is affiliated with the National Institutes of Health. The hybridoma bank collects and distributes monoclonal antibodies that originate in laboratories all over the world. Its collection now contains more than 3,500 monoclonal antibodies that are distributed to users internationally for a modest fee.

In addition to department facilities, the University offers a genomic sequencing service, a DNA oligonucleotide synthesis and enzyme lab, oligopeptide synthesis and sequencing equipment, and mass- and NMR spectroscopy facilities. The Center for Biocatalysis and Bioprocessing is available for growing large amounts of microorganisms (e.g., 100 liters) for use in protein isolation.

Iowa Lakeside Laboratory

The Iowa Lakeside Laboratory is a field station run cooperatively by the University of Iowa, Iowa State University, and the University of Northern Iowa. Located on West Lake Okoboji, in northwestern Iowa, the laboratory affords excellent conditions for summer study in field biology, limnology, phycology, aquatic ecology, pollination biology, and plant taxonomy. It offers a wide variety of summer courses at the undergraduate and graduate levels. Students should check with their advisors to determine whether specific courses may be counted toward requirements for graduation. See Iowa Lakeside Laboratory (University College) in the Catalog or visit the Lakeside Laboratory website.

Courses

Many courses include laboratory, discussion, and/or field components.

The following courses are not open to graduate students and do not provide credit toward a biology major:

- BIOL:1000 First-Year Seminar
- BIOL:1060 Big Ideas: Origins of the Universe, Earth, and Life
- BIOL:1061 Big Ideas: Evolution of Life on Earth and the Search for Life in the Universe
- BIOL:1140 Human Biology
- BIOL:1141 Introductory Animal Biology
- BIOL:1251 How the Brain Works (and Why it Doesn't)
- BIOL:1260 Plants and Human Affairs
- BIOL:1261 Introduction to Botany
- BIOL:1311 Human Genetics in the Twenty-First Century
- BIOL:1370 Understanding Evolution
- BIOL:2211 Genes, Genomes, and the Human Condition

Biology Courses

BIOL:1000 First-Year Seminar 1 s.h.
Small discussion class taught by a faculty member; topics chosen by instructor; may include outside activities (e.g., films, lectures, performances, readings, visits to research facilities, field trips). Requirements: first- or second-semester standing.

BIOL:1060 Big Ideas: Origins of the Universe, Earth, and Life 3 s.h.
Origin of the universe, the biochemistry of life, and the origin of life on Earth; for nonscience majors. Recommendations: first-year or sophomore standing. GE: Natural Sciences without Lab. Same as ASTR:1060, EES:1060.
BIOL:1061 Big Ideas: Evolution of Life on Earth and the Search for Life in the Universe  
4 s.h.  
Evolution of life on Earth, origins of plants and animals, origins of humans and humanity, and the search for life in the universe; for nonscience majors. GE: Natural Sciences with Lab. Same as ANTH:1061, ASTR:1061, EES:1061.

BIOL:1140 Human Biology  
4 s.h.  
Molecular and cellular basis of human life; integration of humans and the biosphere through photosynthesis, respiration; structure, function of human tissues, organs, organ systems; reproduction, genetics, impact of molecular biology and genetic engineering; lecture, laboratory. GE: Natural Sciences with Lab.

BIOL:1141 Introductory Animal Biology  
4 s.h.  
Fundamental principles: cells and macromolecules, energy metabolism, organismic physiology, genetics, development, ecology, and evolution. Requirements: one year of high school chemistry. Recommendations: CHEM:1070. GE: Natural Sciences with Lab.

BIOL:1251 How the Brain Works (and Why it Doesn't)  
3-4 s.h.  
Introductory survey of neuroscience; structure and function of the brain; nature of consciousness: brain function in mental illness and degenerative disorders; genes and the mind; perception, sensation, memory, and emotions. Requirements: non-biology major. GE: Natural Sciences without Lab.

BIOL:1260 Plants and Human Affairs  
2-3 s.h.  
How plants are useful to people: food, clothing, shelter, medicines, psychoactive agents; plants' social, economic, ecological significance. GE: Natural Sciences without Lab.

BIOL:1261 Introduction to Botany  
4 s.h.  
Biology of plant life; emphasis on structure, function, reproduction, inheritance, diversity, evolution. Requirements: one year of high school chemistry. GE: Natural Sciences with Lab.

BIOL:1265 Career Preparation and Life Design for Biology Majors  
1 s.h.  
Exploration of career paths, employers, graduate programs; preparation for life after college; development of practical skills in job searching, writing, interviewing, and networking; for students who are unsure what they can do after graduation with a bachelor's degree in biology. Requirements: junior or senior standing.

BIOL:1311 Human Genetics in the Twenty-First Century  
3 s.h.  
Organization and inheritance of human genes and genomes; genetic basis of simple and complex traits; genetic aspects of cancer; paleogenomics and tracing human migrations with DNA. GE: Natural Sciences without Lab. Same as ANTH:1310.

BIOL:1370 Understanding Evolution  
3 s.h.  
Evolution and diversity of living things, their patterns on Earth, their organization in ecological systems; dynamics of evolutionary processes. GE: Natural Sciences without Lab.

BIOL:1411 Foundations of Biology  
4 s.h.  
Unifying concepts of living systems; emphasis on common properties and processes; chemical and cellular basis of life, genetics, and evolution. Prerequisites: CHEM:1110 with a minimum grade of C- or CHEM:1070 with a minimum grade of A-. GE: Natural Sciences with Lab.

BIOL:1412 Diversity of Form and Function  
4 s.h.  
Underlying unifying concepts of life; emphasis on diversity of living systems; the tree of life, cellular evolution, prokaryotic and eukaryotic diversity, plant and animal form and function; interactions among diverse forms of life and their environment. Prerequisites: BIOL:1411 with a minimum grade of C-. GE: Natural Sciences with Lab.

BIOL:1808 Ways of Knowing Science  
1 s.h.  
Science as a powerful way of knowing based on experimentation and observation of natural world; introduction to subdisciplines of scientific research; scope and methods of scientific research; questions that scientific research seek answers for; methods that scientists use to obtain answers to their questions; how science affects us personally and how it affects the rest of society; research seminars, discussion, and exploration.

BIOL:2120 Good Genes Gone Bad: Genetic Disorders of Notable Celebrities  
3 s.h.  
Introduction to a wide range of genetic disorders affecting notable celebrities; relevant genetic pathways in easy-to-understand language; exploration of mechanisms of disease and treatments. GE: Natural Sciences without Lab.

BIOL:2211 Genes, Genomes, and the Human Condition  
3 s.h.  
Organization, expression, and evolution of genes in context of genomes; focus on human genome; distribution and transmission of variation in human population. Prerequisites: BIOL:1411. Recommendations: BIOL:1412.

BIOL:2246 Entomology Lab  
4 s.h.  
Insects are the most species-rich and diverse of all animals; introduction to insect biology; emphasis on evolution, diversity, ecology, and morphology with some additional focus on physiology and behavior; students work in lab and field settings; memorization of entomological terms required; hands-on learning including how to employ various tools, techniques, and approaches used by professional entomologists, insect collecting and preservation, DNA extraction and sequencing, and analysis of evolutionary and ecological data. Prerequisites: BIOL:1412.

BIOL:2254 Endocrinology  
3 s.h.  
Production and effect of hormonal chemical messengers of secretory glands; emphasis on cell signaling in vertebrate systems; actions of hormones in regulating growth, physiology, and reproduction; organ to molecular levels. Prerequisites: BIOL:1411 and (BIOL:1412 or HHP:3500 or PSY:2701). Recommendations: CHEM:2210.

BIOL:2346 Vertebrate Zoology  
4 s.h.  
Vertebrate diversity, success in relation to evolutionary history, and adaptive radiation of fish, amphibians, reptiles, birds, mammals; physiological, morphological, behavioral, life history adaptations; vertebrate zoogeography, systematic, patterns of reproduction, social systems. Prerequisites: BIOL:1411 and BIOL:1412.

BIOL:2374 Biogeography  
3 s.h.  
Introduction to processes that lead to the patterns of plant and animal distributions we see across the globe; processes of focus include plate tectonics, climate, and human-ecological interactions; species management and conservation in relationship to climate and change in human patterns of environment. Prerequisites: BIOL:1141 or BIOL:1370 or BIOL:1261 or GEOG:1020 or BIOL:1412. Same as GEOG:2374.
BIOC:3120 or BIOC:3110. Same as IGPI:3314.

Applying bioinformatics tools. Prerequisites: BIOL:2512 or BIOL:2723 or BIOL:3716 or (PHYS:1611 and PHYS:1612) with a minimum grade of C- or HHP:3500 with a minimum grade of C- and CHEM:1110. Recommendations: CHEM:2210.

BIOC:2603 Mechanisms of Aging
3 s.h.

Evolutionary theories of aging, cellular and genetic basis of aging and repair, disruption of homeostasis in aging; focus on studies of biological and environmental causes of age-related diseases. Prerequisites: BIOL:1411 and (BIOL:1412 or HHP:3500 or PSY:2701).

BIOC:2673 Ecology
3 s.h.

Adaptations of organisms to their physical and biological environments; organism-environment interactions; population biology; interactions between species; ecology of communities, ecosystems; human impact on ecosystems. Prerequisites: BIOL:1411 and BIOL:1412. Recommendations: a basic statistics or calculus course. Same as ENVS:2673.

BIOC:2723 Cell Biology
3 s.h.

Structures of cells and organelles in relation to their functions at molecular, cellular levels; emphasis on higher eukaryotic cells. Prerequisites: BIOL:1411 and (BIOL:1412 or HHP:3500 or PSY:2701) and CHEM:1120.

BIOC:2753 Introduction to Neurobiology
3 s.h.

Techniques of molecular biology, genomics, neuropharmacology, and functional brain imaging applied to understanding how the brain works. Prerequisites: (BIOL:1412 or HHP:3500) and BIOL:1411.

BIOC:3172 Evolution
4 s.h.

Nature, evidence, analysis, implications, molecular/genetic basis; historical record, phylogeny, speciation, adaptation, investigative methods. Prerequisites: BIOL:2512 with a minimum grade of C- and (STAT:2010 or STAT:3510 or MATH:1550 or MATH:1850 or MATH:1460).

BIOC:3223 Introduction to Developmental Biology
3 s.h.

Fundamental mechanisms in differentiation, organogenesis, morphogenesis; and pattern formation; mechanistic approach at molecular, cellular, tissue levels of organisms. Prerequisites: BIOL:1411 and CHEM:1120 and (BIOL:1412 with a minimum grade of C- or HHP:3500 with a minimum grade of C-). Recommendations: BIOL:2512.

BIOC:3244 Animal Behavior
3.5 s.h.

Genetics, sensory physiology, migration, development of behavior, circadian rhythms, foraging strategies, aggression, sexual and parental behavior, group selection, social behavior. Prerequisites: BIOL:1411 and (BIOL:1412 or PSY:2701).

BIOC:3253 Neurobiology
4 s.h.

Neurobiology from molecular/ cellular to systems levels including cell biology of the neuron; membrane electrophysiology; synaptic transmission and plasticity, functional neuroanatomy, sensory, motor and autonomic systems, emotion, memory, sleep, language, attention and cognition, neuronal development. Prerequisites: BIOL:1411 and (PSY:2701 or BIOL:2753). Recommendations: BIOL:2723 and BIOL:3110 and PHYS:1512.

BIOC:3314 Genomics
3 s.h.

Major areas of genomics, including DNA and protein sequence analysis, structural diversity of whole genomes, microarray applications, proteomics; computer workshop experience in applying bioinformatics tools. Prerequisites: BIOL:2512 or BIOL:3120 or BIOL:3110. Same as IGPI:3314.
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<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BIOL:3676</td>
<td>Evolution Lab</td>
<td>4 s.h.</td>
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<tr>
<td>BIOL:3713</td>
<td>Molecular Genetics</td>
<td>4 s.h.</td>
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<td>BIOL:3716</td>
<td>Genetics and Biotechnology Lab</td>
<td>4 s.h.</td>
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<td>BIOL:3736</td>
<td>Developmental Biology Lab</td>
<td>4 s.h.</td>
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<td>BIOL:3743</td>
<td>Basic Biology of Human Disease</td>
<td>2 s.h.</td>
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<tr>
<td>BIOL:3753</td>
<td>Developmental Neurobiology</td>
<td>3 s.h.</td>
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<tr>
<td>BIOL:3898</td>
<td>Teaching Internship in Biology</td>
<td>2 s.h.</td>
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<td>BIOL:4213</td>
<td>Bioinformatics</td>
<td>2.4 s.h.</td>
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<tr>
<td>BIOL:4314</td>
<td>Introduction to Synthetic Biology in the Lab</td>
<td>4 s.h.</td>
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<tr>
<td>BIOL:4316</td>
<td>Summer Practicum in Genomics</td>
<td>2 s.h.</td>
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<td>BIOL:4333</td>
<td>Genes and Development</td>
<td>3 s.h.</td>
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<td>BIOL:4353</td>
<td>Neurophysiology: Cells and Systems</td>
<td>3-4 s.h.</td>
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<tr>
<td>BIOL:4373</td>
<td>Molecular Evolution: Genes, Genomes, and Organisms</td>
<td>3 s.h.</td>
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<tr>
<td>BIOL:4386</td>
<td>Introduction to Scientific Computing for Biologists</td>
<td>3 s.h.</td>
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BIOL:4806 Service Learning in Biology  
Credit for community outreach and/or service; service learning projects involve more than just volunteering; preparation of a detailed plan summarizing project goals, activities, and audience; routine meetings with team members and faculty mentor; research and development of educational materials and/or activities focused on a biology topic; plan, promote, support, and assess an event that engages the targeted community.

BIOL:4897 Teaching Internship in Biology  2-3 s.h. 
Training and practical experiences in the teaching of biology; includes a weekly training session with a Ph.D. instructor or course supervisor, active assistance of the primary instructor in one or more class meetings each week, and/or providing constructive written feedback on laboratory or classroom exercises; additional experiences may include leading a training session, co-teaching or lead-teaching one or more lab or classroom exercises, and assisting with the development of classroom activities or resources; specific experiences will vary depending on the course and supervisor needs. Prerequisites: BIOL:1411 with a minimum grade of B and BIOL:1412 with a minimum grade of B. Requirements: third- or fourth-year standing and interview with instructor.

BIOL:4898 Communicating Research  1 s.h. 
Independent, investigative research experience; research process and communication—establishing goals and expectations with a mentor, developing and framing a research hypothesis or question, communicating results in written and oral form to scientist and nonscientist audiences; supportive learning environment to share research experiences and develop identities as scientists, learn skills to become effective independent researchers and science communicators. Corequisites: BIOL:3994 or BIOL:4999.

BIOL:4995 Honors Research in Neuroscience  
Independent scientific research related to the field of neuroscience. Requirements: honors standing in neuroscience, UI g.p.a. of at least 3.33, and neuroscience g.p.a. of at least 3.33. Same as PSY:4995.

BIOL:4998 Honors Seminar in Biology  2 s.h. 
Prerequisites: BIOL:1411 and BIOL:1412. Requirements: honors standing.

BIOL:4999 Honors Research in Biology  
Independent scientific research related to the field of biology. Requirements: honors standing in biology, UI g.p.a. of at least 3.33, and biology g.p.a. of at least 3.33.

BIOL:5117 Topics in Molecular Genetics  0-2 s.h. 
Prerequisites: BIOL:2512 with a minimum grade of B-.

BIOL:5199 Critical Readings in Biology  
Organization, expression, and evolution of genes in context of genomes; focus on human genome; distribution and transmission of variation in human population. Recommendations: BIOL:1411 highly recommended. Same as IGPI:5211.

BIOL:5211 Genes, Genomes, and the Human Condition Graduate Lecture  3 s.h. 
Basic microscopic methods for research including optics, preparation, and analysis of biomedical specimens; light, fluorescence, confocal, transmitting electron, scanning electron, atomic force microscopes, elemental analysis; immunochemistry and stereology techniques; individualized laboratory instruction. Prerequisites: BIOL:2723. Same as ACB:5218, MICR:5218.

BIOL:5268 Monoclonal Antibody Technologies  2 s.h. 
Provides knowledge of screening and characterizations methods for monoclonal antibodies, a powerful tool in molecular cytology, immunohistochemistry, and studies of gene regulation; methods include screening for monoclonal antibodies (mAbs), fluorescence-activated cell sorting (FACS) analysis, enzyme-linked immunosorbent assay (ELISA), Southern blot hybridization, cytchemistry, histochemistry, and induced polarization (IP).

BIOL:5320 Computational Genomics  3 s.h. 
Introduction to computational methods used in genome analysis and functional genomics; biological sequence analysis, sequence database search, microarray data analysis, biological network analysis; in-depth coverage of principal genome science challenges and recent solutions. Prerequisites: (BIOS:4120 or STAT:3510) and BME:5320 and (CS:5110 or ENGR:1300). Same as BME:5330, ECE:5220, GENE:5173, IGPI:5330.

BIOL:5412 Fundamental Genetics - Graduate Lecture  3 s.h. 

BIOL:5512 Fundamental Genetics - Graduate Discussion  1 s.h. 
Critical evaluation of classic genetics papers. Requirements: biology graduate standing.

BIOL:5653 Fundamental Neurobiology  3 s.h. 
Neurobiology from molecular/cellular to systems levels, including cell biology of the neuron; membrane electrophysiology; synaptic transmission and plasticity, functional neuroanatomy, peripheral and CNS sensory systems, peripheral and CNS motor systems, autonomic systems, emotion, memory, sleep, language, attention and cognition, neuronal development. Same as NSCI:5653, PSY:5203.

BIOL:5658 Fundamental Neurobiology Discussion  1 s.h. 
Discussion of selected papers, including classics from neurobiology literature; coordinated with BIOL:5653 lecture material. Same as NSCI:5658, PSY:5204.

BIOL:5753 Developmental Neuroscience  1 s.h. 
Neural induction and nervous system patterning: neurogenesis, axon, and dendrite outgrowth and targeting; synapse formation, specificity, refinement; mechanisms of neuronal cell death; myelination; neural stem cells; introduction to cellular, molecular, and genetic techniques in studies of neural development. Prerequisites: BIOL:5653.

BIOL:6188 Seminar: Writing in Natural Sciences  2 s.h. 
Writing and critiquing skills in the natural sciences.

BIOL:6199 Research: Biology  
Research presentations. Same as ACB:6265, MPB:6265, NSCI:6265, PSY:6265.

Analysis and presentation of primary research on central biological questions utilizing a full array of model and non-model organisms and analytical approaches; development of effective skills in public speaking, presentation, and scientific writing.

BIOL:6899 Independent Study in Biology  

BIOL:7270 Principles of Scholarly Integrity 1 s.h.
Training in responsible conduct of research; student/mentor responsibilities; authorship and reviewing; plagiarism/falsification/fabrication of data; intellectual property; conflict of interest; fiscal, institutional, societal; treatment of human and animal subjects; data handling. Requirements: enrollment in graduate psychology or biology program. Same as PSY:7270.

BIOL:7604 Principles of Scholarly Integrity 0 s.h.
Training in responsible conduct of research and scholarly activities; student/mentor responsibilities; authorship; plagiarism/falsification/fabrication of data; intellectual property; conflict of interest; fiscal, institutional, societal; treatment of human and animal subjects; data handling. Requirements: postdoctoral standing in psychology or biology. Same as PSY:7604.