Biology

Chair

- Jodie M. Plumert

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

Biology 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:1060 Big Ideas: Origins of the Universe, Earth, and Life; BIOL:1140 Human Biology: Nonmajors; BIOL:1141 Human Biology: Health Professions; BIOL:1251 How the Brain Works (and Why it Doesn't); BIOL:1260 Plants and Human Affairs; BIOL:1261 Introduction to Botany; BIOL:1370 Understanding Evolution; and BIOL:2211 Genes, Genomes, and the Human Condition.

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 non-science majors. Recommendations: first-year or sophomore standing. GE: Natural Sciences without Lab. Same as ASTR:1060, EES:1060.

BIOL:1140 Human Biology: Nonmajors 4 s.h.
Overview of molecular and cellular basis of human life; structure, function of human tissues, organs, organ systems; evolution, reproduction, genetics, impact of molecular biology and genetic engineering; integration of humans and the biosphere; lecture, laboratory. GE: Natural Sciences with Lab.
BIOL:1141 Human Biology: Health Professions 4 s.h.
Molecular and cellular basis of human life; structure, function of human tissues, organs, organ systems; evolution, reproduction, genetics, impact of molecular biology and genetic engineering; integration of humans and the biosphere; lecture, laboratory. 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 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.
Biological plant life; emphasis on structure, function, reproduction, inheritance, diversity, evolution. Requirements: one year of high school chemistry. GE: Natural Sciences without Lab.

BIOL:1295 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: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.
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: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.

BIOL:2512 Fundamental Genetics 4 s.h.
Nature, function of genetic material: classical, molecular, developmental aspects. Prerequisites: BIOL:1411 with a minimum grade of C- and (BIOL:1412 with a minimum grade of C- or PSY:2701 with a minimum grade of C-) and CHEM:1110. Recommendations: CHEM:2210.

BIOL:2663 Plant Response to the Environment 3 s.h.
Mechanisms of plant responses to environmental factors (biotic and abiotic) at organismal and molecular levels. Prerequisites: BIOL:1411 and BIOL:1412.

BIOL: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 ENV:2673.

BIOL: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.

BIOL: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.
BIOL:3713 Molecular Genetics  4 s.h.
Mechanism, regulation of RNA, DNA, protein biosynthesis,
with emphasis on methods of genetic analysis; application
of modern recombinant DNA techniques to basic problems.
Prerequisites: BIOL:2512 or BMB:3120 or BMB:3110.

BIOL:3716 Genetics and Biotechnology Lab  4 s.h.
Expansion of genetic concepts introduced in BIOL:2512;
introduction to genetic/molecular techniques currently used in
genetic analysis and biotechnology. Prerequisites: BIOL:1411.
Corequisites: BIOL:2512 or BIOL:2211, if not taken as a
prerequisite. Recommendations: grade of C or higher in
BIOL:2512.

BIOL:3736 Developmental Biology Lab  4 s.h.
Experimental manipulation of embryos to examine
mechanisms of early development, including gametogenesis
and fertilization, cleavage, gastrulation, pattern formation and
organogenesis; in vivo imaging of development, methods to
visualize gene expression and independent research; model
organisms including sea urchin, fish, frog, chick, mouse.
Prerequisites: BIOL:3233.

BIOL:3994 Introduction to Research  2-3 s.h.
Independent scientific research related to the field of biology.

BIOL:3999 Independent Research in Neuroscience  2-3 s.h.
Independent scientific research related to the field of
neuroscience. Same as PSY:3999.

BIOL:4213 Bioinformatics  2,4 s.h.
Overview of bioinformatics topics, including access to
sequence data, pairwise and multiple sequence alignment
algorithms, molecular phylogeny, microarray data analysis,
protein analysis, proteomics and protein structure analysis;
emphasis on each topic includes biological motivation,
computational approach (practical and theoretical), and
interpretation of output. Prerequisites: BMB:3120 or
MICR:3170 or BIOL:2512 or BMB:3110. Recommendations:
grade of B+ or higher in BIOL:2512 or BIOC:3120, or graduate
standing. Same as GENE:4213, IGPI:4213.

BIOL:4314 Introduction to Synthetic Biology in the Lab  4 s.h.
Introduction to theory and practice of large-scale design
goals of synthetic biology in which various types of DNA
instructions, known from decades of research and discovery
on specific biological systems, are taken out of context and
used to execute various novel tasks designed to solve real
world problems; basic laboratory instruction in standardized
construction techniques for stringing together off-the-shelf
DNA components that are then introduced into organisms
capable of executing the instructional set; controlled
experiments to investigate the degree of variability exhibited
by engineered genetic constructs. Prerequisites: BIOL:1411.
Same as BME:4314.

BIOL:4316 Summer Practicum in Genomics  2 s.h.
Major areas of genomics, including sequence similarity
searching, whole genome comparisons, phylogenetic
analysis, and regulatory informatics; computer workshop
experience in application of bioinformatics tools.
Prerequisites: BIOL:4213 or BIOL:3314.

BIOL:4333 Genes and Development  3 s.h.
Mechanisms by which genes control development of
multicellular animals; methodology of scientific research
applied to developmental genetics. Prerequisites: BIOL:2512
with a minimum grade of C-. Recommendations: BIOL:3233.

BIOL:4353 Neurophysiology: Cells and Systems  3-4 s.h.
Physiological properties of nerve cells, nervous systems;
axonal conduction, synaptic transmission, sensory
transduction, integrative processes, higher functions.
Prerequisites: (BIOL:2753 or BIOL:3253) and (MATH:1460 or
MATH:1380 or MATH:1550 or MATH:1850) and ((PHYS:1511
and PHYS:1512) or (PHYS:1611 and PHYS:1612)). Same as
NSCI:4353.

BIOL:4373 Molecular Evolution: Genes, Genomes, and Organisms
Theory underlying phylogenetic analysis with application
of these methods to molecular data sets; analysis of
multigene data, organelar, and nuclear genome sequences to
reconstruct the history of cells. Prerequisites: BIOL:3172 with
a minimum grade of C-. Same as IGPI:4373.

BIOL:4386 Introduction to Scientific Computing for Biologists
In modern biological research, computational tools are no
longer a luxury but a necessity; introduction to a set of
computational tools and best practices in data analysis to
prepare for data-intensive research in the field of biomedical
sciences; topics include reproducibility in computational
projects, version control, command-line interface, remote
computing, and general and statistical programming.
Prerequisites: BIOL:2512 or BMB:3110 or BMB:3120 or

BIOL:4806 Service Learning in Biology  arr.
Credit for community outreach and/or service; service learning
projects involve more than just volunteering; preparation of
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  1-3 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 and leading lab 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 non-scientist
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  arr.
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. Requirements: honors standing.

BIOL:4999 Honors Research in Biology arr.
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:5110 Practicum: College Teaching for Biology Teaching Assistants 2 s.h.
Practical pedagogical concerns including how to structure a course, devise learning outcomes, development of syllabus and calendar of assignments, evaluation of student work, and creation of a student-centered classroom with collaborative learning experiences; for biology TAs teaching in introductory courses BIOL:1411 and BIOL:1412.

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 arr.

BIOL:5211 Genes, Genomes, and the Human Condition Graduate Lecture 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. Recommendations: BIOL:1411 highly recommended. Same as IGPI:5211.

BIOL:5218 Microscopy for Biomedical Research arr.
Basic microscopy methods for research including optics, preparation, and analysis of biomedical specimens; light, fluorescence, confocal, transmitting electron, scanning electron, atomic force microscopes, elemental analysis; immunohistochemistry and stereology techniques; individualized laboratory instruction. Prerequisites: BIOL:2723. Same as ACB:5218, MICR:5218.

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

BIOL:5512 Readings in Genetics 2 s.h.
Critical evaluation of classic genetics papers. Requirements: biology graduate standing.

BIOL:5653 Fundamental Neurobiology I 3 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; focus on systems and developmental neurobiology; first in a two-semester sequence. Same as NSCI:5653, PSY:5203.

BIOL:5654 Fundamental Neurobiology II 3 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; focus on molecular/cellular neurobiology and neurophysiology; second in a two-semester sequence. Prerequisites: BIOL:5653 or NSCI:5653 or PSY:5203. Same as NSCI:5654, PSY:5205.

BIOL:5658 Fundamental Neurobiology I Discussion 2 s.h.
Discussion of selected papers, including classics from neurobiology literature; coordinated with BIOL:5653 lecture material. Same as NSCI:5658, PSY:5204.

BIOL:5659 Fundamental Neurobiology II Discussion 2 s.h.
Discussion of selected papers, including classics from neurobiology literature; coordinated with BIOL:5654 lecture material. Same as NSCI:5659, PSY:5206.

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

BIOL:6199 Research: Biology arr.

BIOL:6265 Neuroscience Seminar 0-1 s.h.
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 arr.

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.