

# ECOLOGY AND EVOLUTIONARY BIOLOGY

Ecology seeks to understand the processes that control the abundance and distribution of organisms and how they interact with one another in a changing environment. Evolutionary biology provides a unifying conceptual framework for all of biology, including the characteristics of organisms and biological diversity. Taken together, ecology and evolutionary biology form a fundamental, broad, diverse and interdisciplinary area of scientific inquiry. Study in both areas is necessary for understanding the complex biological issues of today, including fighting diseases, understanding of the responses of life and humankind to Earth's changing environment and learning how species develop, thrive and decline. Also, ecology and evolutionary biology are working toward solving some of the world's most demanding problems, including sustainability and the future of life on earth, human health and welfare and wise stewardship of our planet. Students majoring in Ecology and Evolutionary Biology (EBIO) apply scientific approaches to issues in ecology and evolution, with an emphasis on critical evaluation of the literature, generating and testing hypotheses, designing and carrying out experiments to test predictions and articulating, in oral or written form, the results of investigations.

In light of the broad importance of ecology and evolution for fundamental understanding of living systems, the undergraduate EBIO degree emphasizes knowledge and problem-solving in areas of:

- the ecology of organisms, populations and communities
- the distribution and function of terrestrial, freshwater and marine ecosystems
- principles and patterns of evolution, including natural selection and the history of life on Earth
- comparative, systematic, evolutionary and environmental aspects of botany, microbiology and zoology
- adaptation of organisms to the physical and biotic environment
- animal behavior and emotion
- molecular evolution and population genetics
- developmental biology and the evolution of development
- conservation biology and management of ecosystems
- the relevance of mathematics, chemistry and physics to biology
- the development of biological thought
- infectious disease ecology
- landscape and ecosystem ecology
- sustainability and human-nature systems
- energy and biofuels
- Darwinian medicine
- health and population genetics
- genetically engineered organisms

EBIO majors include students who:

- have strong and compelling interests in the natural world and who are interested in making a difference
- are interested in pursuing advanced graduate degrees in science, especially biology

- want careers in the areas of natural resources management, environmental consulting, environmental law, environmental science, science teaching and scientific journalism, among other professions
- are passionate about making a difference in the lives of others by improving their physical and mental health
- are interested in many different areas of biology, from the molecular to ecosystem levels
- are fascinated with the complexity and diversity of nature

A bachelor of arts (BA) degree in EBIO provides excellent training, education and experience, preparing students for many successful careers and for admission to and success in graduate study or medical school and other health professions:

- because ecology and evolution are subjects of central importance for understanding the ways all organisms live, grow and survive—everything from microbes to humans
- because the department and its classes provide students a broad learning experience in the biological sciences
- because the department's faculty provide EBIO majors with excellent classes and research opportunities

**Course code for this program is EBIO.**

## Bachelor's Degree

- Ecology and Evolutionary Biology - Bachelor of Arts (BA) ([catalog.colorado.edu/undergraduate/colleges-schools/arts-sciences/programs-study/ecology-evolutionary-biology/ecology-evolutionary-biology-bachelor-arts-ba](http://catalog.colorado.edu/undergraduate/colleges-schools/arts-sciences/programs-study/ecology-evolutionary-biology/ecology-evolutionary-biology-bachelor-arts-ba))

## Minor

- Ecology and Evolutionary Biology - Minor ([catalog.colorado.edu/undergraduate/colleges-schools/arts-sciences/programs-study/ecology-evolutionary-biology/ecology-evolutionary-biology-minor](http://catalog.colorado.edu/undergraduate/colleges-schools/arts-sciences/programs-study/ecology-evolutionary-biology/ecology-evolutionary-biology-minor))

## Faculty

While many faculty teach both undergraduate and graduate students, some instruct students at the undergraduate level only. For more information, contact the faculty member's home department.

Adams, William ([https://experts.colorado.edu/display/fisid\\_103612](https://experts.colorado.edu/display/fisid_103612))  
Professor; PhD, Australian National University

Armstrong, David M.  
Professor Emeritus

Barger, Nichole Nannette ([https://experts.colorado.edu/display/fisid\\_131398](https://experts.colorado.edu/display/fisid_131398))  
Associate Professor; PhD, Colorado State University

Basey, John M. ([https://experts.colorado.edu/display/fisid\\_105539](https://experts.colorado.edu/display/fisid_105539))  
Senior Instructor; PhD, University of Nevada, Reno

Bekoff, Marc  
Professor Emeritus

Bock, Carl L.E.  
Professor Emeritus

Bock, Jane H.  
Professor Emerita

Bonde, Erik K.  
Professor Emeritus

Bowers, M. Deane ([https://experts.colorado.edu/display/fisid\\_101746](https://experts.colorado.edu/display/fisid_101746))  
Professor, Chair; PhD, University of Massachusetts Amherst

Bowman, William D. ([https://experts.colorado.edu/display/fisid\\_105191](https://experts.colorado.edu/display/fisid_105191))  
Associate Chair, Professor; PhD, Duke University

Breed, Michael D. ([https://experts.colorado.edu/display/fisid\\_103631](https://experts.colorado.edu/display/fisid_103631))  
Professor; PhD, University of Kansas

Carpenter, J Harrison ([https://experts.colorado.edu/display/fisid\\_115915](https://experts.colorado.edu/display/fisid_115915))  
Senior Instructor; MS, Michigan Technological University

Clauset, Aaron ([https://experts.colorado.edu/display/fisid\\_147554](https://experts.colorado.edu/display/fisid_147554))  
Associate Professor; PhD, University of New Mexico

Crumpacker, David W.  
Professor Emeritus

Cundiff, Milford F.  
Associate Professor Emeritus

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Demmig-Adams, Barbara ([https://experts.colorado.edu/display/fisid\\_105649](https://experts.colorado.edu/display/fisid_105649))  
Professor; Dr habil, Univ of Wurzburg (Germany)

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Assistant Professor; PhD, University of California, Davis

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Lewis, William M. Jr. ([https://experts.colorado.edu/display/fisid\\_102314](https://experts.colorado.edu/display/fisid_102314))  
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Melbourne, Brett Andrew ([https://experts.colorado.edu/display/fisid\\_144966](https://experts.colorado.edu/display/fisid_144966))  
Associate Professor; PhD, Australian National University

Mitton, Jeffrey B. ([https://experts.colorado.edu/display/fisid\\_101058](https://experts.colorado.edu/display/fisid_101058))  
Professor; PhD, SUNY at Stony Brook

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Nichols, Harvey  
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Seastedt, Timothy ([https://experts.colorado.edu/display/fisid\\_103519](https://experts.colorado.edu/display/fisid_103519))  
Professor, Associate Chair; PhD, University of Georgia

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Assistant Professor; PhD, University of Wisconsin–Madison

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Wessman, Carol A. ([https://experts.colorado.edu/display/fisid\\_100909](https://experts.colorado.edu/display/fisid_100909))  
Professor; PhD, University of Wisconsin–Madison

Windell, John T.  
Professor Emeritus

Winston, Paul W.  
Professor Emeritus

## Courses

### EBIO 1010 (3) Introduction to Quantitative Thinking for Biologists

Focuses on the collection, visualization and analysis of data that are relevant for advancing critical thinking, student-directed learning, and the development of quantitative analysis skills, with an emphasis on using R and examples from ecology and evolutionary biology.

**Grading Basis:** Letter Grade

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

### EBIO 1040 (3) Biology: A Human Approach 2

Lect. Continues EBIO 1030, focusing on the function of the human body, and maintenance of dynamic equilibrium in the internal environment in the face of a continually changing external environment. Discusses factors influencing these homeostatic conditions and how and why they change. Recommended for nonscience majors.

**Recommended:** Prerequisite EBIO 1030 (minimum grade C-).

**Additional Information:** Arts Sci Core Curr: Natural Science Sequence

Arts Sci Gen Ed: Distribution-Natural Sciences

### EBIO 1100 (3) Biology and Society

Lect. Studies the dynamic relationships between the biological sciences and society. Areas of inquiry include interconnections between ecological and evolutionary theory and concepts and emergent questions being raised on a societal level. Students will explore topics such as human populations and sexual reproduction; biological factors affecting sociability and social patterns; environmental change with a focus on global biodiversity and the services to people; natural resource management; and public health. Recommended for majors and non-majors.

**Requisites:** Requires corequisite course of EBIO 1110.

### EBIO 1110 (1) Biology and Society Laboratory

One two-hour lab per week. Provides experiments and exercises relating to concepts presented in EBIO 1100. Recommended for majors and non-majors. When taken with EBIO 1100, meets the MAPS requirement for natural science: lab.

**Requisites:** Requires corequisite course of EBIO 1100.

### EBIO 1210 (3) General Biology 1

Lect. Provides a concentrated introduction to molecular, cellular, genetic, and evolutionary biology. Emphasizes fundamental principles, concepts, facts, and questions. Intended for science majors.

**Additional Information:** GT Pathways: GT-SC2 -Natural Physical Sci:Lec Crse w/o Req Lab

Arts Sci Core Curr: Natural Science Sequence

Arts Sci Gen Ed: Distribution-Natural Sciences

MAPS Course: Natural Science

### EBIO 1220 (3) General Biology 2

Provides a concentrated introduction to organisms, homeostasis, development, behavior, and ecology. Emphasizes fundamental principles, concepts, facts, and questions. Intended for science majors.

**Recommended:** Prerequisite EBIO 1210 (minimum grade C-).

**Additional Information:** GT Pathways: GT-SC2 -Natural Physical Sci:Lec Crse w/o Req Lab

Arts Sci Core Curr: Natural Science Sequence

Arts Sci Gen Ed: Distribution-Natural Sciences

### EBIO 1230 (1) General Biology Laboratory 1

One 3-hour lab per week. Consists of experiments and exercises to provide an extension of basic concepts and scientific approaches presented in General Biology 1. Intended for science majors.

**Recommended:** Prerequisite or corequisite EBIO 1210 (minimum grade C-).

**Additional Information:** GT Pathways: GT-SC1 - Natural Physical Sci:Lec Crse w/ Req Lab

Arts Sci Core Curr: Natural Science Lab

Arts Sci Gen Ed: Distribution-Natural Sci Lab

Arts Sci Gen Ed: Distribution-Natural Sciences

MAPS Course: Natural Science

MAPS Course: Natural Science Lab or Lab/Lec

### EBIO 1240 (1) General Biology Laboratory 2

One 3-hour lab per week. Consists of experiments and exercises to provide an extension of basic concepts and scientific approaches presented in General Biology 2. Intended for science majors.

**Recommended:** Prerequisite or corequisite EBIO 1220 (minimum grade C-).

**Additional Information:** GT Pathways: GT-SC1 - Natural Physical Sci:Lec Crse w/ Req Lab

Arts Sci Core Curr: Natural Science Lab

Arts Sci Gen Ed: Distribution-Natural Sciences

Arts Sci Gen Ed: Distribution-Natural Sci Lab

### EBIO 1250 (4) Introduction to Ecology and Evolutionary Biology Research

Introduces students to research in ecology and evolutionary biology topics in the context of investigations about Boulder's local historic apple trees. Students will learn about the genetics, physiology, and urban ecology of the trees, learn techniques for how to do research in these areas, and engage in a research project that addresses one of these topics. Results from research on Boulder's Apples will be reported back to the Boulder community.

**Grading Basis:** Letter Grade

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

### EBIO 1300 (1-3) Topics in Biological Sciences

Covers special topics in biology for freshmen or nonmajors. Introduces scientific methods and principles in biology, as well as issues of current interest in biology. Does not count toward the major in EBIO.

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

### EBIO 1940 (3) Introduction to Scientific Writing

Introduces first year students to college writing, focusing on developing academic research and writing skills of particular interest to science students. Emphasizes habits of mind in topic invention, drafting, revision and writing style, as well as critical thinking and information literacy.

**Requisites:** Restricted to students with 0-56 credits (Freshmen or Sophomore) only.

**Grading Basis:** Letter Grade

**Additional Information:** Arts Sci Core Curr: Written Communication

Arts Sci Gen Ed: Written Communication-Lower

### EBIO 2010 (1-3) Environmental Issues and Biology

Lect. Describes how the natural environment is currently stressed by a variety of human actions. Examines the nature of these environmental problems and their impact on living organisms, both human and nonhuman species.

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 2040 (4) Principles of Ecology**

Lecture and laboratory. Introduces principles of ecology, emphasizing patterns and processes at various levels of biological organization. Scope global, but examples often from local environment. Laboratory emphasizes techniques of field biology. Uses animals and/or animal tissues.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 2640 and ENVS 2000

**Recommended:** Prerequisites EBIO 1030 and EBIO 1040 and EBIO 1050 or EBIO 1210 and EBIO 1220 and EBIO 1230 and EBIO 1240 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences  
Arts Sci Gen Ed: Distribution-Natural Sci Lab

**EBIO 2070 (4) Genetics: Molecules to Populations**

Lect. and rec. Covers principles of genetics and developmental biology at levels of molecules, cellular organelles, individuals and populations; asexual and sexual life cycles; heredity. Recitations allow discussion of genetics problems and implications of genetic principles and provide demonstrations and simulations of genetic processes. Intended for sophomore majors in EBIO.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 2640

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 and EBIO 1230 and EBIO 1240 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences  
Arts Sci Gen Ed: Distribution-Natural Sci Lab

**EBIO 2090 (3) Tropical Island and Marine Ecology**

Examines fundamental concepts of marine ecology, emphasizing organismal diversity, species interactions, dispersal, colonization, physiology and adaptations. Includes study of beach and coral formation, island organisms and their population dynamics. Students may also register for an optional 1 credit, one week, tropical island and coral reef trip that complements the lecture portion of the class but has an additional cost.

**Recommended:** Prerequisite EBIO 1220 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 2091 (3) Field Studies in Marine and Island Ecology and Oceanography**

Investigates tropical island and marine ecology as well as all four disciplines of oceanography. A three-credit course focused on a tropical island ecology and oceanography field trip that complements the lecture portion of EBIO 2090 and ATOC 3070 with an additional cost. Examines fundamental concepts of marine ecology, emphasizing organismal diversity, species interactions, study of beach and coral formation, island formation, organisms and their population dynamics. The course consists of a one-week field trip to the Keys Marine Laboratory in the Florida Keys and once-weekly class room meeting (of variable duration from 1-4 hours) throughout the semester.

**Requisites:** Requires a corequisite course of EBIO 2090 or ATOC 3070 or GEOL 3070.

**Grading Basis:** Letter Grade

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences  
Arts Sci Gen Ed: Distribution-Natural Sci Lab

**EBIO 2640 (5) Honors Principles of Ecology**

Lect., lab, and rec. Introduces principles of ecology, emphasizing patterns and processes at various levels of biological organization. Scope global, but examples often from local environment. Laboratory emphasizes techniques of field biology. Uses animals and/or animal tissues.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 2040 and ENVS 2000

**Recommended:** Prerequisites EBIO 1030 and EBIO 1040 and EBIO 1050 or EBIO 1210 and EBIO 1220 and EBIO 1230 and EBIO 1240 (minimum grade C-).

**Additional Information:** Arts Sciences Honors Course

Arts Sci Gen Ed: Distribution-Natural Sciences

Arts Sci Gen Ed: Distribution-Natural Sci Lab

**EBIO 2840 (1-6) Independent Study: Lower Division**

**Repeatable:** Repeatable for up to 6.00 total credit hours. Allows multiple enrollment in term.

**EBIO 3010 (1-2) Teaching Biology**

Provides an opportunity to assist in teaching of specific lecture or laboratory section in EBIO under direct faculty supervision. Students must first make arrangements with the appropriate faculty member and turn in a form to the EBIO office.

**Repeatable:** Repeatable for up to 3.00 total credit hours. Allows multiple enrollment in term.

**EBIO 3040 (4) Conservation Biology**

Applies principles of population ecology, population genetics, biogeography, animal behavior, and paleobiology to the maintenance of biodiversity and natural systems. The resulting theory is then applied to conservation policy and management techniques.

**Equivalent - Duplicate Degree Credit Not Granted:** ENVS 3040

**Recommended:** Prerequisite EBIO 2040 or EBIO 2640 or ENVS 2000 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 3080 (4) Evolutionary Biology**

Lect. and lab. Emphasizes the fundamental evolutionary concepts that provide explanations for the diversification of life on Earth. Specific topics include the evidence for evolution, adaptation by natural selection, speciation, systematics, molecular and genome evolution, and macroevolutionary patterns and processes. Recitations allow students to explore specific topics in more depth and smaller groups.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 3680

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

Arts Sci Gen Ed: Distribution-Natural Sci Lab

**EBIO 3110 (3) Population and Community Ecology**

Presents principles of ecology that relate to the niche, population growth, metapopulations, population interactions (within and between trophic levels), community structure and development, landscape ecology and species diversity.

**Recommended:** Prerequisite EBIO 1240 or EBIO 2640 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 3170 (3) Mountain Ecology and Conservation**

Focuses on the ecology of mountain environments around the world, including climatic gradients, plant and animal diversity and distributions, habitat zonation, evolutionary processes, and various aspects of montane conservation from habitat change to climate change.

**Requisites:** Restricted to students with 27-180 credits (Sophomores, Juniors or Seniors) only.

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 and EBIO 2040 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 3180 (3) Global Ecology**

Lect. Involves study of ecological principles and problems at the biosphere level. Presents a worldwide approach to populations, biotic resources, ecologic interactions, land use, deforestation, desertification, species extinctions, pollution, environmental quality, global change, and environmental ethics.

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 (minimum grade C-).

**Additional Information:** Arts Sci Core Curr: Natural Science Non-Sequence  
Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 3190 (3) Tropical Marine Ecology**

Lect. Examines the biology and ecology of marine ecosystems, emphasizing those occurring in tropical regions such as coral reefs. Studies how these ecosystems are changing and the future impact of human stress on the marine environment.

**Requisites:** Restricted to students with 27-180 credits (Sophomores, Juniors or Seniors) only.

**Recommended:** Prerequisite any two-semester introductory biology course.

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 3240 (4) Animal Behavior**

Lect. and lab. Topics include basic concepts and history, methods of study, ethical issues, neurobiology, behavior, the development of behavior, predator-prey relationships, communication, aggression and dominance, mating systems, cognitive ethology, and parental care. When possible, life-history strategies, the evolution of behavior, and behavioral ecology are stressed. Uses animals and animal tissues.

**Requisites:** Restricted to students with 27-180 credits (Sophomores, Juniors or Seniors) only.

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 and EBIO 1230 and EBIO 1240 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences  
Arts Sci Gen Ed: Distribution-Natural Sci Lab

**EBIO 3400 (3) Microbiology**

Surveys distinguishing characteristics of microorganisms based on structural-functional relationships, taxonomy, growth and physical-chemical agents of control including antibiotics, metabolism and genetics. Introduces applied microbiology emphasizing infectious diseases, basic concepts of immunology and microbial ecology. Uses animals and/or animal tissues.

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 and EBIO 1230 and EBIO 1240 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences  
Arts Sci Gen Ed: Distribution-Natural Sci Lab

**EBIO 3410 (1) Microbiology Lab**

Accompanies EBIO 3400.

**Requisites:** Requires a prerequisite or corequisite course of EBIO 3400 (minimum grade D-).

**Grading Basis:** Letter Grade

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences  
Arts Sci Gen Ed: Distribution-Natural Sci Lab

**EBIO 3523 (3) The Art and Strategy of Science Communication: Branding Climate Change**

Integrating the science of climate change and science communication with the research, strategy and execution practices of strategic communication (e.g., advertising and public relations).

**Equivalent - Duplicate Degree Credit Not Granted:** APRD 3523

**Grading Basis:** Letter Grade

**EBIO 3590 (4) Plants and Society**

A writing intensive course for majors and non-majors which acquaints students with the history of plant use in our society. Topics center on the evolving relationship between humans and plants as food sources, medicines, fuel, and other products, such as fibers and dyes.

**Grading Basis:** Letter Grade

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences  
Arts Sci Gen Ed: Distribution-Natural Sci Lab

**EBIO 3630 (4) Parasitology**

Lect. and lab. Surveys animal parasites, including life histories; emphasizes parasites of humans. Uses animals and/or animal tissues.

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 and EBIO 1230 and EBIO 1240 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences  
Arts Sci Gen Ed: Distribution-Natural Sci Lab

**EBIO 3680 (5) Honors Evolutionary Biology**

Lect., rec., and co-sem. Emphasizes the fundamental evolutionary concepts that provide explanation for the diversification of life on Earth. Specific topics include the evidence for evolution, adaptation by natural selection speciation, systematics, molecular and genome evolution, and macroevolutionary patterns and process. Recitations allow students to explore specific topics in more depth and smaller groups.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 3080

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 and EBIO 1230 and EBIO 1240 and EBIO 2070 (minimum grade C-).

**Additional Information:** Arts Sciences Honors Course  
Arts Sci Gen Ed: Distribution-Natural Sciences  
Arts Sci Gen Ed: Distribution-Natural Sci Lab

**EBIO 3850 (4) Animal Diversity: Invertebrates**

Lect. and lab. Offers a broad study of the biology of the most diverse group of organisms on Earth. Areas include ecology, physiology, evolution and morphology of aquatic and terrestrial forms. Uses animals and/or animal tissues.

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 and EBIO 1230 and EBIO 1240 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences  
Arts Sci Gen Ed: Distribution-Natural Sci Lab

**EBIO 3930 (1-6) Internship**

Provides an academically supervised opportunity for upper-division students to work in public or private organizations. Projects are usually related to students' career goals. Each project has both academic and work components. Pass/fail only.

**Repeatable:** Repeatable for up to 6.00 total credit hours. Allows multiple enrollment in term.

**Grading Basis:** Pass/Fail

**EBIO 3940 (3) Written Communication in the Sciences**

Focuses upon communication commonly practiced by scientists, with special emphasis on writing. Directs attention to scientists' strategic use of written arguments, statistical data and visual representations. Prepares students for communication tasks within advanced study and professional work.

**Requisites:** Restricted to students with 57-180 credits (Juniors or Seniors).

**Additional Information:** Arts Sci Core Curr: Written Communication  
Arts Sci Gen Ed: Written Communication-Upper

**EBIO 3980 (2) Seminar: Introduction to EBIO Honors**

Offers an opportunity for students who are either exploring the option of writing an Honors thesis, or are in the process of conducting Honors research, to receive guidance on the process of thesis writing, evaluation and presentation of research results and thesis defense. Thesis requirements and the role of the A&S Honors Council will be discussed. Also offers the opportunity to hear practice defense talks from the graduating Honors candidates.

**Requisites:** Restricted to students with 57-180 credits (Juniors or Seniors).

**Additional Information:** Arts Sciences Honors Course

**EBIO 3990 (1-3) EBIO Honors Thesis Research**

Provides an introduction to the departmental Honors program. Consists of individual library research on a potential Honors thesis topic under the guidance of a faculty mentor.

**Requisites:** Restricted to Ecology and Evolutionary Biology (EBIO) majors only.

**Recommended:** Prerequisites minimum 3.2 GPA and approval by departmental honors committee.

**EBIO 4030 (3) Limnology**

Examines the ecology of inland waters, including a detailed consideration of physical, chemical and biological properties of freshwater ecosystems: origins and major characteristics of lakes and streams, survey of chemical and nutrient cycles in freshwater habitats and survey of biotic composition of freshwater environments. Important themes in modern freshwater ecology are considered, including energy flow, trophic structure, eutrophication and management of freshwater ecosystems.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5030

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4060 (3) Landscape Ecology**

Studies distributional patterns of communities and ecosystems, ecological processes that affect those patterns, and changes in pattern and process over time. Consideration of spatial and temporal scales in ecological analyses is required to understand and predict response to broad-scale environmental change.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5060

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 and EBIO 1230 and EBIO 1240 and EBIO 2040 or EBIO 2640 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4070 (3) DNA Methods in Ecology and Conservation Biology**

Acquiring skill with molecular methods in ecology and conservation biology is most quickly accomplished with hands-on experience. Combines classroom lectures with collecting in the field and laboratory exercises to provide experience extracting DNA, amplifying DNA with the Polymerase Chain Reaction (PCR), designing PCR primers, sequencing DNA and editing and aligning sequences with the Sequencher software.

**Requisites:** Requires prerequisite course of EBIO 2070 (minimum grade C).

**Grading Basis:** Letter Grade

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences  
Arts Sci Gen Ed: Distribution-Natural Sci Lab

**EBIO 4080 (4) Freshwater Phycology**

Algae are a non-monophyletic group of organisms that play critical roles in ecosystem structure and function. They have a long history of being used in a variety of ways by the human species, but are increasingly being applied to modern issues of understanding water quality and climate change, engineering at the nano scale and in the production of renewable biofuels.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5080

**Requisites:** Restricted to students with 57-180 credits (Juniors or Seniors).

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 and EBIO 1230 and EBIO 1240 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences  
Arts Sci Gen Ed: Distribution-Natural Sci Lab

**EBIO 4090 (3) Coral Reef Ecology**

Combines classroom-based instruction in the Fall semester with an international, field-based SCUBA diving expedition to learn about the incredible coral reef ecosystems of the Caribbean (in early January). Students learn about and observe a variety of organisms that make the reef their home. The course covers threats to coral reefs worldwide as well as ongoing efforts aimed at conservation. Scuba certification required.

**Requisites:** Restricted to students with 27-180 credits (Sophomores, Juniors or Seniors) only.

**Recommended:** Prerequisite any ecology course is a highly recommended.

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sci Lab  
Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4100 (3) Advanced Ecology**

Emphasizes specific aspects of ecology based on specialties of faculty. One or more courses are offered most semesters. Topics have included dynamics of mountain ecosystems, tundra ecology, ethnoecology, population dynamics, tropical and insular biology, ecology of fishes, quantitative plant ecology, and arctic and alpine environments. May use animals and/or animal tissues.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5100

**Repeatable:** Repeatable for up to 6.00 total credit hours. Allows multiple enrollment in term.

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 and EBIO 1230 and EBIO 1240 and EBIO 2040 or EBIO 2640 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4120 (2-4) Advanced Ecology**

Emphasizes specific aspects of ecology based on specialties of faculty. One or more courses are offered most semesters. Topics have included dynamics of mountain ecosystems, tundra ecology, ethnoecology, population dynamics, tropical and insular biology, ecology of fishes, quantitative plant ecology and arctic and alpine environments. May use animals and/or animal tissues.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5120

**Repeatable:** Repeatable for up to 7.00 total credit hours. Allows multiple enrollment in term.

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 and EBIO 1230 and EBIO 1240 and EBIO 2040 or EBIO 2640 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4140 (3) Plant Ecology**

Examines the relationships between plants and their physical and biological environments, encompassing physiology, competition, plant-soil and plant-animal interactions, population dynamics, diversity, and influence on ecosystem function.

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 and EBIO 1230 and EBIO 1240 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4145 (4) Restoration Ecology**

Examines ecological theories that inform the practice of ecological restoration, with particular emphasis on grassland ecosystems near Boulder and linkages with social, political and economic factors. In conjunction with local partner organizations, students work on a current management challenge, generate novel data using accepted field techniques, and formulate a professional restoration management plan.

**Requisites:** Requires prerequisite EBIO 2040 or ENVS 3434 or CVEN 3434 (all minimum grade C-).

**Grading Basis:** Letter Grade

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4150 (1-2) Techniques in Ecology**

Emphasizes application of modern ecological techniques, such as stream biology, aquatic biology, environmental measurement and control, and techniques in geoecology.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5150

**Repeatable:** Repeatable for up to 7.00 total credit hours. Allows multiple enrollment in term.

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 and EBIO 1230 and EBIO 1240 and EBIO 2040 or EBIO 2640 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4155 (3) Ecosystem Ecology**

Integrates information from physics (energetics), chemistry (element properties) and biology (evolutionary traits, photosynthetic pathways) to understand the structure and functioning of ecosystems. Provides an analysis of biotic community responses and feedbacks to environmental change drivers. Strong focus on water, nutrient cycling and carbon dynamics of diverse terrestrial and aquatic landscapes. Formerly EBIO 3270.

**Recommended:** Prerequisites general biology, EBIO 2040 or equivalent.

**Grading Basis:** Letter Grade

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4160 (3) Introduction to Biogeochemistry**

Covers fundamentals of biogeochemical cycling, emphasizing water, carbon and nutrient dynamics in terrestrial ecosystems; chemical interactions of atmosphere, biosphere, lithosphere and hydrosphere; natural and human-managed environments.

**Equivalent - Duplicate Degree Credit Not Granted:** ENVS 4160 and GEOL 4160

**Recommended:** Prerequisites GEOL 3320 or EBIO 3270 and CHEM 1011 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4175 (3) The Scientific Basis for Ecosystem Management of Public Lands**

An advanced field ecology course emphasizing measurements, statistical procedures and biotic data information management relevant to land management issues. Develops concepts of adaptive ecosystem management using ongoing field studies on public land in the Colorado Front Range.

**Recommended:** Prerequisites EBIO 3270 and EBIO 4500 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4270 (4) Population Genetics**

Provides an in-depth applied introduction to population genetics. Lectures, discussions and labs will focus on exploring how evolutionary processes shape genetic variation through time and space and how population-level evolutionary processes can be inferred from patterns of genetic variation. While learning basic population genetic theory we will investigate current topics in the field and work with simulated and real data.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5270

**Requisites:** Requires prerequisite courses of EBIO 2070 and EBIO 3080 (all minimum grade C-).

**Grading Basis:** Letter Grade

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4290 (4) Phylogenetics and Comparative Biology**

Reviews the principles and methodology of phylogenetic inference using molecular data. Emphasizes the application of comparative approaches to hypothesis testing in evolution, ecology and medicine and provides a broad foundation in both theory and practice of phylogenetics.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5290

**Recommended:** Prerequisite EBIO 3080 (minimum grade C-) or instructor consent required.

**Grading Basis:** Letter Grade

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4340 (4) Conservation Biology and Practice in Brazil's Atlantic Forest**

Field Studies. Examines the application of conservation principles in the Atlantic Forest of Brazil, a 'biodiversity-in-crisis' setting. Explores successful conservation strategies integrated with efforts to alleviate socioeconomic issues. Three-week Maymester, Study Abroad Global Seminar.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5340 and ENVS 4340 and ENVS 5340

**Recommended:** Prerequisite EBIO 2040 or ENVS 2000 or 2000/higher-level course in ANTH, EBIO, ENVS, EVEN, GEOG, IAFS or other discipline related to ecology or sustainability.

**Grading Basis:** Letter Grade

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences  
Arts Sci Gen Ed: Distribution-Natural Sci Lab

**EBIO 4410 (4) Biological Statistics**

Lect. and lab. Offers a demanding, problems-oriented methods course in statistical inference procedures, assumptions, limitations, and applications emphasizing techniques appropriate to realistic biological problems. Includes data file management using interactive computing techniques.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5410

**Requisites:** Restricted to students with 57-180 credits (Juniors or Seniors).

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 and EBIO 1230 and EBIO 1240 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4420 (3) Computational Biology**

Covers a wide range of techniques for simulating biological systems, developing computer programs and scripts to interact with data and making research shareable and reproducible.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5420

**Grading Basis:** Letter Grade

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4440 (4) Animal Developmental Diversity**

Surveys development in a range of vertebrate and invertebrate systems to reconstruct the common bilaterian ancestor, and elucidate the developmental genetic changes underlying animal diversification. Lab focuses on vertebrate embryos and explores key methods in evolutionary developmental biology including in situ hybridization, embryo microinjection, and transgenesis.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5440 and MCDB 4441 and MCDB 5441

**Recommended:** Prerequisites MCDB 1150 or EBIO 1210 and MCDB 2150 or EBIO 2070 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences  
Arts Sci Gen Ed: Distribution-Natural Sci Lab

**EBIO 4460 (1-5) Special Topics**

Familiarizes students with specialized areas of biology.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5460

**Repeatable:** Repeatable for up to 15.00 total credit hours. Allows multiple enrollment in term.

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 and EBIO 1230 and EBIO 1240 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4500 (4) Plant Biodiversity and Evolution**

Lect. and lab. Surveys plant types emphasizing diagnostic features of plants in general and major taxa in particular. Focuses on identity, morphology, anatomy, reproduction, ecology, geography, evolution, fossil record, and economic use of taxa.

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 and EBIO 1230 and EBIO 1240 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences  
Arts Sci Gen Ed: Distribution-Natural Sci Lab

**EBIO 4510 (4) Plant Anatomy and Development**

Lect. and lab. Introduces structures of seed plants, especially angiosperms, and developmental history of these structures. Studies cell types, and their location and function in plant tissues and organs. The laboratory provides an opportunity to examine plant tissues and to prepare tissues for examination by the light microscope. Stresses role of plant structures in the living plant.

**Recommended:** Prerequisites, EBIO 1210 and EBIO 1220 and EBIO 1230 and EBIO 1240 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences  
Arts Sci Gen Ed: Distribution-Natural Sci Lab

**EBIO 4520 (4) Plant Systematics**

Lect. and lab. Studies the principles and techniques of modern systematics of organisms, illustrated with examples from the plant kingdom, usually the angiosperms. Framework of course is evolutionary and ecological, as well as taxonomic.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5520

**Requisites:** Restricted to students with 27-180 credits (Sophomores, Juniors or Seniors) only.

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences  
Arts Sci Gen Ed: Distribution-Natural Sci Lab

**EBIO 4530 (4) Functional Plant Biology**

Lect. and lab. Explores mechanisms of plant functioning and how such functioning relates to the performance of the plant under different environmental conditions. Phenomena include water relations, growth and development, and metabolic processes including photosynthesis, respiration, and responses to stress.

**Requisites:** Restricted to students with 27-180 credits (Sophomores, Juniors or Seniors) only.

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 and EBIO 1230 and EBIO 1240 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences  
Arts Sci Gen Ed: Distribution-Natural Sci Lab

**EBIO 4550 (4) Plant Eco-Evo-Devo**

Explores the fundamental principles of plant form from the perspectives of ecological function, evolutionary origin, and developmental dynamics. Students are presented with conceptual and analytical tools to interpret the vast diversity of growth form-function relationships that exist among plants. Laboratory sessions apply concepts presented in lecture and students will engage in original research using light and scanning electron microscopy.

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 and EBIO 1230 and EBIO 1240 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences  
Arts Sci Gen Ed: Distribution-Natural Sci Lab

**EBIO 4560 (4) The Lichen Biome**

Focuses on lichens as biologically diverse hubs of interactions, and will cover numerous dimensions of diversity within the symbiosis (algae, bacteria, and ecological and evolutionary relationships therein) and beyond it (diversity of lichen symbioses in nature, their functions, and conservation).

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5560

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences  
Arts Sci Gen Ed: Distribution-Natural Sci Lab

**EBIO 4600 (4) Evolutionary Ecology**

Evaluates how interactions within species, among species and between species and the environment evolve over time. Emphasizes the development of scientific skills, including ecological, genetic and statistical tools for testing hypotheses in evolutionary ecology. Lab activities include research projects that quantify natural selection, gene flow and phenotypic plasticity in natural systems, and a semester-long class experiment examining plant dispersal.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5600

**Requisites:** Requires prerequisite courses of EBIO 2040 and EBIO 3080 (all minimum grade C-).

**Grading Basis:** Letter Grade

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences  
Arts Sci Gen Ed: Distribution-Natural Sci Lab



**EBIO 4640 (3) Plant Field Studies**

Includes field-oriented courses offered at irregular intervals during the academic year or during summer sessions.

**Repeatable:** Repeatable for up to 7.00 total credit hours. Allows multiple enrollment in term.

**Requisites:** Requires prerequisite courses of EBIO 2040 or EBIO 2640 or ENVS 2000 (all minimum grade C-).

**Recommended:** Prerequisites EBIO 2040 and EBIO 2640 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sci Lab  
Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4660 (4) Insect Biology**

Lect. and lab. Introduction to evolution, ecology, physiology, and behavior of insects. Emphasizes how insects have solved problems, such as maintaining water balance or finding food, that are shared by all animals but for which there may be unique solutions among the insects. Agricultural and human health problems relative to entomology are discussed. Uses animals and/or animal tissues.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5660

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 and EBIO 1230 and EBIO 1240 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences  
Arts Sci Gen Ed: Distribution-Natural Sci Lab

**EBIO 4740 (3) Biology of Amphibians and Reptiles**

Comparative morphology, taxonomy, ecology, behavior and geographic distribution of amphibians and reptiles. Uses animals and animal tissue.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5740

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 and EBIO 1230 and EBIO 1240 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4750 (4) Ornithology**

Lect., lab, and field trips. Presents origin, evolution, ecology, physical and behavioral characteristics and taxonomy of orders and families of birds of North America; field work with local species emphasizing avian ecology. Uses animals and/or animal tissues.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5750

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 and EBIO 1230 and EBIO 1240 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences  
Arts Sci Gen Ed: Distribution-Natural Sci Lab

**EBIO 4760 (4) Mammalogy**

Lect., lab, and field studies. Discusses origin, evolution and adaptation, geographic distribution, ecology and taxonomy of mammals; field and laboratory study of Coloradan species. Uses animals and/or animal tissues.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5760 and MUSM 5760

**Recommended:** Prerequisites EBIO 1210 and EBIO 1220 and EBIO 2040 and EBIO 2640 (minimum grade C-).

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences  
Arts Sci Gen Ed: Distribution-Natural Sci Lab

**EBIO 4800 (3) Critical Thinking in Biology**

Lect. and discussion. Explores controversial issues, historical themes, or emerging developments in biology. Consult the EBIO Undergraduate Advising Center for current listings.

**Equivalent - Duplicate Degree Credit Not Granted:** EBIO 5800

**Repeatable:** Repeatable for up to 15.00 total credit hours. Allows multiple enrollment in term.

**Requisites:** Restricted to students with 27-180 credits (Sophomores, Juniors or Seniors) only.

**Recommended:** Prerequisite minimum of 14 hours of EBIO course work.

**Additional Information:** Arts Sci Gen Ed: Distribution-Natural Sciences

**EBIO 4840 (1-6) Independent Study: Upper Division**

**Repeatable:** Repeatable for up to 6.00 total credit hours. Allows multiple enrollment in term.

**EBIO 4860 (1-2) Critical Thinking in Biology - Lab****EBIO 4870 (1-6) Independent Research: Upper Division**

**Repeatable:** Repeatable for up to 6.00 total credit hours. Allows multiple enrollment in term.

**EBIO 4980 (2) Seminar: EBIO Honors Thesis**

Offers guidance to graduating Honors students during the process of thesis writing, evaluation and presentation of their research results and thesis defense. Thesis requirements and the role of the A&S Honors Council will be discussed. All graduating candidates will present a practice defense talk for peer feedback and will be expected to offer feedback to their peers.

**Recommended:** Prerequisites minimum 3.3 GPA and a declared EBIO major and approval by departmental honors committee.

**Additional Information:** Arts Sciences Honors Course

**EBIO 4990 (1-3) EBIO Honors Thesis Research**

To be taken during the final academic year prior to graduation. Consists of the final phase of honors research and thesis preparation under the guidance of a faculty mentor.

**Requisites:** Restricted to Ecology and Evolutionary Biology (EBIO) majors only.

**Recommended:** Prerequisites minimum 3.3 GPA and a declared EBIO major and approval by departmental Honors program.

**Additional Information:** Arts Sciences Honors Course