ECOLOGY AND EVOLUTIONARY BIOLOGY

The EBIO graduate program provides advanced training in a wide variety of biological disciplines ranging from biogeochemistry to community ecology to evolutionary genetics. The goal of the EBIO graduate program is to produce scientists, educators and citizens who are equipped with skills to build careers that advance knowledge about life on Earth. Graduates of the EBIO program are well-positioned to pursue a wide range of careers that include academia, science education, wildlife biology, conservation biology, resource management, environmental consulting and environmental law.

Our disciplinary strengths include behavior, ecology, genetics, morphology and systematics. Roughly half of the faculty focus on the adaptation and functioning of organisms in the context of environment, while the other half study higher levels of organization, including populations, communities and ecosystems. Our research programs have relevance for global change, conservation biology, and revealing fundamental mechanisms underlying the structural and functional adaptations of organisms.

Please contact ebiograd@colorado.edu for additional information.

Course code for this program is EBIO.

Master's Degree
- Ecology and Evolutionary Biology - Master of Arts (MA)
  (catalog.colorado.edu/graduate/colleges-schools/arts-sciences/programs-study/ecology-evolutionary-biology/ecology-evolutionary-biology-master-arts-ma/)

Doctoral Degree
- Ecology and Evolutionary Biology - Doctor of Philosophy (PhD)
  (catalog.colorado.edu/graduate/colleges-schools/arts-sciences/programs-study/ecology-evolutionary-biology/ecology-evolutionary-biology-doctor-philosophy-phd/)

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/0103612/)
  Professor; PhD, Australian National University

Armstrong, David M.
  Professor Emeritus

Barger, Nichole Nannette (https://experts.colorado.edu/display/0131398/)
  Associate Professor; PhD, Colorado State University

Basey, John M. (https://experts.colorado.edu/display/0105539/)
  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/0101746/)
  Professor, Chair; PhD, University of Massachusetts Amherst

Bowman, William D. (https://experts.colorado.edu/display/0105191/)
  Associate Chair, Professor; PhD, Duke University

Breed, Michael D. (https://experts.colorado.edu/display/0103631/)
  Professor; PhD, University of Kansas

Buchwald, Robert (https://experts.colorado.edu/display/0148439/)
  Instructor; PhD, University of Colorado Boulder

Carpenter, J. Harrison (https://experts.colorado.edu/display/fsid_1105915/)
  Senior Instructor; MS, Michigan Technological University

Clauset, Aaron (https://experts.colorado.edu/display/0147554/)
  Associate Professor; PhD, University of New Mexico

Corwin, Lisa A. (https://experts.colorado.edu/display/0157940/)
  Assistant Professor; PhD, University of California, Davis

Crumpacker, David W.
  Professor Emeritus

Cundiff, Milford F.
  Associate Professor Emeritus

Demmig-Adams, Barbara (https://experts.colorado.edu/display/fsid_0105649/)
  Professor; Dr habil, University of Wurzburg (Germany)

Emery, Nancy Christine (https://experts.colorado.edu/display/fsid_156291/)
  Assistant Professor; PhD, University of California, Davis

Evans, Luke M. (https://experts.colorado.edu/display/fsid_0156753/)
  Associate Professor; PhD, Northern Arizona University

Fierer, Noah (https://experts.colorado.edu/display/fsid_142240/)
  Associate Professor; PhD, University of California, Santa Barbara

Flaxman, Samuel M. (https://experts.colorado.edu/display/fsid_145598/)
  Associate Professor; PhD, Cornell University

Johnson, Pieter T.J. (https://experts.colorado.edu/display/fsid_143590/)
  Associate Professor; PhD, University of Wisconsin–Madison

Kane, Nolan Coburn (https://experts.colorado.edu/display/fsid_151238/)
  Assistant Professor; PhD, Indiana University Bloomington
Kociolek, John Patrick (https://experts.colorado.edu/display/fisid_154572/)
Professor; PhD, University of Michigan

Lewis, William M. Jr. (https://experts.colorado.edu/display/fisid_102314/)
Professor; PhD, Indiana University Bloomington

Li, Jingchun (https://experts.colorado.edu/display/fisid_157561/)
Assistant Professor; PhD, University of Michigan

Linhart, Yan B.
Professor Emeritus

Martin, Andrew (https://experts.colorado.edu/display/fisid_113238/)
Professor; PhD, University of Hawaii at Manoa

Mayer, Stephanie Susan (https://experts.colorado.edu/display/fisid_114948/)
Senior Instructor; PhD, University of California, Berkeley

McCain, Christy (https://experts.colorado.edu/display/fisid_145010/)
Associate Professor; PhD, University of Kansas

McKenzie, Valerie J. (https://experts.colorado.edu/display/fisid_142951/)
Assistant Professor; PhD, University of California, Santa Barbara

Medeiros, Daniel Meulemans (https://experts.colorado.edu/display/fisid_145697/)
Associate Professor; PhD, California Institute of Technology

Melbourne, Brett Andrew (https://experts.colorado.edu/display/fisid_144966/)
Associate Professor; PhD, Australian National University

Mitton, Jeffry B. (https://experts.colorado.edu/display/fisid_101058/)
Professor; PhD, SUNY at Stony Brook

Monson, Russell K.
Professor Emeritus

Nichols, Harvey
Professor Emeritus

Quandt, Catherine Alisha (https://experts.colorado.edu/display/fisid_159414/)
Assistant Professor; PhD, Oregon State University

Resasco, Julian (https://experts.colorado.edu/display/fisid_153799/)
Assistant Professor; PhD, University of Florida

Safran, Rebecca J. (https://experts.colorado.edu/display/fisid_145518/)
Associate Professor; PhD, Cornell University

Schmidt, Steve (https://experts.colorado.edu/display/fisid_103713/)
Professor; PhD, Cornell University

Seastedt, Timothy
Professor, Associate Chair; PhD, University of Georgia

Smith, Stacey Dewitt (https://experts.colorado.edu/display/fisid_153407/)
Assistant Professor; PhD, University of Wisconsin–Madison

Stock, David W. (https://experts.colorado.edu/display/fisid_113762/)
Associate Professor; PhD, University of Illinois at Urbana–Champaign

Suding, Katharine Nash (https://experts.colorado.edu/display/fisid_116718/)
Professor; PhD, University of Michigan Ann Arbor

Taylor, Scott (https://experts.colorado.edu/display/fisid_156318/)
Assistant Professor; PhD, Queen's University (Canada)

Tripp, Erin Anne (https://experts.colorado.edu/display/fisid_152313/)
Associate Professor; PhD, Duke University

Wessman, Carol A. (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 5000 (1) EBIO Colloquia**
All first year EBIO graduate students are required to attend the EBIO Colloquia Series. Speakers from around the world and within the department cover topics in all areas of biology. **Repeatable:** Repeatable for up to 2.00 total credit hours.

**EBIO 5030 (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 4030 **Requisites:** Restricted to graduate students only.

**EBIO 5060 (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 4060 **Requisites:** Restricted to graduate students only.

**EBIO 5080 (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 4080 **Requisites:** Restricted to graduate students only.
EBIO 5100 (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 4100
Repeatable: Repeatable for up to 6.00 total credit hours. Allows multiple enrollment in term.
Requisites: Restricted to graduate students only.

EBIO 5120 (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 4120
Repeatable: Repeatable for up to 7.00 total credit hours. Allows multiple enrollment in term.

EBIO 5150 (1-2) Techniques in Ecology
Emphasizes application of modern ecological techniques, such as stream biology, aquatic biology, environmental measurement and control, and techniques in geoeocology.
Equivalent - Duplicate Degree Credit Not Granted: EBIO 4150
Repeatable: Repeatable for up to 7.00 total credit hours. Allows multiple enrollment in term.

EBIO 5190 (1) Diversity and Inclusion
Topics have included: implicit bias, privilege, inclusive pedagogy, inclusive hiring practices, inclusive mentoring, barriers facing undergraduate students, barriers facing graduate students, fairness of the GRE.
Repeatable: Repeatable for up to 8.00 total credit hours.
Requisites: Restricted to graduate students only.

EBIO 5240 (3) Advanced Topics in Animal Behavior
Covers special areas of ethology such as sociobiology, animal communication, cognitive ethology, human ethology, moral and ethical issues.
Recommended: Prerequisite EBIO 3240.

EBIO 5270 (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 4270
Grading Basis: Letter Grade

EBIO 5290 (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 4290
Requisites: Restricted to graduate students only.
Grading Basis: Letter Grade

EBIO 5320 (3) Current Topics in Evolutionary Biology
Examines six major themes on contemporary evolutionary research: population genetics, natural selection and adaptation, molecular evolution, evolution and development, phylogenetic systematics, and macroevolution. Emphasizes recent primary literature and sophisticated mastery.
Requisites: Restricted to graduate students only.

EBIO 5340 (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 4340 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

EBIO 5410 (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 4410
Requisites: Restricted to graduate students only.

EBIO 5420 (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 4420
Grading Basis: Letter Grade

EBIO 5440 (4) Animal Developmental Diversity
Surveys development in a range of vertebrate and invertebrate systems to reconstruct the common bilatarian 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 4440 and MCDB 4441 and MCDB 5441
Requisites: Restricted to graduate students only.

EBIO 5460 (1-5) Special Topics
Familiarizes students with specialized areas of biology.
Equivalent - Duplicate Degree Credit Not Granted: EBIO 4460
Repeatable: Repeatable for up to 9.00 total credit hours. Allows multiple enrollment in term.
Requisites: Restricted to graduate students only.

EBIO 5500 (4) Plant Biodiversity and Evolution
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.
Equivalent - Duplicate Degree Credit Not Granted: EBIO 4500
EBIO 5520 (4) Plant Systematics
Explores principles and techniques in modern plant systematics from lichens and non-vascular plants to lycophytes, ferns, gymnosperms and angiosperms. Framework is evolutionary and ecological, with emphasis on taxonomy of major lineages and families of plants. No prerequisites, but coursework in evolutionary biology, genetics, phylogenetics and/or other botany classes is strongly encouraged.
Equivalent - Duplicate Degree Credit Not Granted: EBIO 4520
Requisites: Restricted to graduate students only.
Grading Basis: Letter Grade

EBIO 5560 (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 4560
Requisites: Restricted to graduate students only.

EBIO 5600 (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 4600
Grading Basis: Letter Grade

EBIO 5660 (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 4660
Requisites: Restricted to graduate students only.

EBIO 5700 (3) Quantitative Genetics
The study of genetics explores how the differences at the DNA level impact variability within and among individuals, and how that variation is shaped by interactions with environments. Quantitative genetics covers a range of topics, but in this course we will focus on the methods and approaches to investigate complex traits, those influenced by many genes and environmental factors, emphasizing the evolutionary forces that shape variation. We will analyze real genetic data (human, plant, mouse, etc.), and prepare our findings as written manuscripts or oral presentations. Some familiarity with basic genetic principles is assumed. Previously offered as a special topics course.
Equivalent - Duplicate Degree Credit Not Granted: EBIO 4700
Requisites: Restricted to graduate students only.

EBIO 5740 (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 4740

EBIO 5750 (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 4750

EBIO 5760 (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 4760 and MUSM 5760
Requisites: Restricted to graduate students only.

EBIO 5800 (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 4800
Repeatable: Repeatable for up to 12.00 total credit hours. Allows multiple enrollment in term.
Requisites: Restricted to graduate students only.
Recommended: Prerequisite minimum of 14 hours of EBIO course work.

EBIO 5820 (1) Graduate Writing Seminar
Enhances writing proficiency, using graduate writing projects to implement the course concepts. Offers understanding of conventions and strategies used in scientific writing to prepare students for academic and professional communication. Department enforced requisite, basic proficiency in English as a written language.
Requisites: Restricted to graduate students only.

EBIO 5840 (1-6) Independent Study (Master's Level)
Instructor consent required.
Repeatable: Repeatable for up to 6.00 total credit hours. Allows multiple enrollment in term.
Requisites: Restricted to graduate students only.

EBIO 6000 (1) Seminar: Introduction to Biological Research
Discusses areas of biological research represented in EBIO. Required of all first-year graduate students in EBIO.
Requisites: Restricted to graduate students only.

EBIO 6100 (1-3) Seminar in Environmental Biology
Instructor consent required.
Equivalent - Duplicate Degree Credit Not Granted: EBIO 6120
Repeatable: Repeatable for up to 7.00 total credit hours. Allows multiple enrollment in term.
Requisites: Restricted to graduate students only.

EBIO 6120 (1-3) Seminar in Environmental Biology
Instructor consent required.
Equivalent - Duplicate Degree Credit Not Granted: EBIO 6100
Repeatable: Repeatable for up to 7.00 total credit hours. Allows multiple enrollment in term.

EBIO 6200 (1-3) Seminar in Population Biology
Equivalent - Duplicate Degree Credit Not Granted: EBIO 6210
Repeatable: Repeatable for up to 7.00 total credit hours. Allows multiple enrollment in term.
Requisites: Restricted to graduate students only.
EBIO 6210 (1-3) Seminar in Population Biology
Equivalent - Duplicate Degree Credit Not Granted: EBIO 6200
Repeatable: Repeatable for up to 7.00 total credit hours. Allows multiple enrollment in term.

EBIO 6300 (1-3) Seminar in Organismic Biology
Repeatable: Repeatable for up to 7.00 total credit hours. Allows multiple enrollment in term.
Requisites: Restricted to graduate students only.

EBIO 6840 (1-7) Independent Research (Master's Level)
Instructor consent required.
Repeatable: Repeatable for up to 7.00 total credit hours. Allows multiple enrollment in term.
Requisites: Restricted to graduate students only.

EBIO 6940 (1) Master's Candidate for Degree
Instructor consent required.
Requisites: Restricted to graduate students only.
Grading Basis: Pass/Fail

EBIO 6950 (1-6) Master's Thesis
Instructor consent required.
Repeatable: Repeatable for up to 7.00 total credit hours. Allows multiple enrollment in term.
Requisites: Restricted to graduate students only.

EBIO 7840 (1-6) Independent Study (Doctoral Level)
Repeatable: Repeatable for up to 6.00 total credit hours. Allows multiple enrollment in term.
Requisites: Restricted to graduate students only.

EBIO 8840 (1-6) Independent Research (Doctoral Level)
Repeatable: Repeatable for up to 6.00 total credit hours. Allows multiple enrollment in term.
Requisites: Restricted to graduate students only.

EBIO 8990 (1-10) Doctoral Dissertation
Instructor consent required.
Repeatable: Repeatable for up to 30.00 total credit hours.
Requisites: Restricted to graduate students only.