EVOLUTIONARY BIOLOGY OF THE HUMAN SPECIES

Departmental Office: Schermerhorn Extension, 10th floor; 212-854-9987
http://e3b.columbia.edu/

Director of Undergraduate Studies: Dr. Matthew Palmer, 1010 Schermerhorn; 212-854-4767; mp2434@columbia.edu

Evolutionary Biology of the Human Species Adviser: Dr. Jill Shapiro, 1011 Schermerhorn Extension; 212-854-5819; jss19@columbia.edu

Director, Administration and Finance: Kyle Bukhari, 1014B Schermerhorn Extension; 212-854-8665; kb2337@columbia.edu (lg2019@columbia.edu)

The Department of Ecology, Evolution & Environmental Biology (E3B) at Columbia University was established in 2001. Although we are a relatively new department, we have grown rapidly in the past decade. We now have an internationally diverse student body and a broad network of supporters at Columbia and throughout New York City. Our affiliated faculty members come from departments at Columbia as well as from the American Museum of Natural History, the New York Botanical Garden, the Wildlife Conservation Society, and the EcoHealth Alliance. Together, we provide an unparalleled breadth and depth of research opportunities for our students.

In creating E3B, Columbia University recognized that the fields of ecology, evolutionary biology, and environmental biology constitute a distinct subdivision of the biological sciences with its own set of intellectual foci, theoretical foundations, scales of analysis, and methodologies.

E3B’s mission is to educate a new generation of scientists and practitioners in the theory and methods of ecology, evolution, and environmental biology. Our educational programs emphasize a multi-disciplinary perspective to understand life on Earth from the level of organisms to global processes that sustain humanity and all life.

To achieve this multi-disciplinary perspective, the department maintains close ties to over 70 faculty members beyond its central core. Thus, many faculty members who teach, advise, and train students in research are based in other departments on the Columbia campus or at the partner institutions. Through this collaboration, the department is able to tap into a broad array of scientific and intellectual resources in the greater New York City area. The academic staff covers the areas of plant and animal systematics; evolutionary and population genetics; ecosystem science; demography and population biology; behavioral and community ecology; and related fields of epidemiology, ethnobiology, public health, and environmental policy. Harnessing the expertise of this diverse faculty and the institutions of which they are a part, E3B covers a vast area of inquiry into the evolutionary, genetic, and ecological relationships among all living things.

Facilities and Collaborative Institutions

The Department of Ecology, Evolution, and Environmental Biology (E3B)

In addition to the off-campus facilities detailed below, the Columbia community offers academic excellence in a range of natural and social science disciplines that are directly related to biodiversity conservation including: evolution, systematics, genetics, behavioral ecology, public health, business, economics, political science, anthropology, and public and international policy. These disciplines are embodied in world-class departments, schools, and facilities at Columbia. The divisions that bring their resources to bear on issues most relevant to E3B’s mission are: the Lamont-Doherty Earth Observatory, the School of International and Public Affairs, the Goddard Institute for Space Studies, the International Research Institute for Climate Predication, the Black Rock Forest Reserve in New York State, the Rosenthal Center for Alternative/Complementary Medicine, the Division of Environmental Health Sciences at the School of Public Health, and the Center for International Earth Science Information Network (CIESIN). Several of these units of the University are networked through the Earth Institute at Columbia, a division of the University that acts as an intramural network of environmental programs and supplies logistical support for constituent programs, through planning, research, seminars, and conferences. All of the above schools, centers, and institutes contribute to finding solutions for the world’s environmental challenges.

The Earth Institute Center for Environmental Sustainability (EICES)

The Earth Institute Center for Environmental Sustainability (EICES), formerly known as the Center for Environmental Research and Conservation (CERC), is actively involved in protecting biodiversity and ecosystems. The Earth Institute Center for Environmental Sustainability is dedicated to the development of a rich, robust, and vibrant world within which we can secure a sustainable future. Through a diverse array of strategic partners in science, education, and outreach, the center builds unique programs that promote human well-being through the preservation, restoration, and management of biodiversity, and the services our ecosystems provide.

The Center for Environmental Research and Conservation (CERC), a leading provider of cutting-edge environmental research, education, and training, since its inception in 1994, has grown into two institutions—an Earth Institute center and a Secretariat for a major environmental consortium. The center’s new name is the Earth Institute Center for Environmental Sustainability (EICES, pronounced “i-sees”). EICES also continues, however, as the Secretariat for the Consortium for Environmental Research and Conservation, continuing 15 years of collaborations between the Earth Institute, the American Museum of Natural History, the New York Botanical Garden, The Wildlife Conservation Society, and EcoHealth Alliance on biodiversity conservation.

American Museum of Natural History

The American Museum of Natural History is one of the world’s preeminent scientific, educational, and cultural institutions. Since its founding in 1869, the Museum has advanced its global mission to discover, interpret, and disseminate information about human cultures, the natural world, and the universe through a wide-reaching program of scientific research, education, and exhibitions. The institution comprises 45 permanent exhibition halls, state-of-the-art research laboratories, one of the largest natural history libraries in the Western Hemisphere, and a permanent collection of 32 million specimens and cultural artifacts. With a scientific staff of more than 200, the Museum supports research divisions in anthropology, paleontology, invertebrate and vertebrate zoology, and the physical sciences. The Museum’s scientific staff pursues a broad agenda of advanced scientific research, investigating the origins and evolution of life on Earth, the world’s myriad species, the rich variety of human culture, and the complex processes that have formed and continue to shape planet Earth and the universe beyond.

The Museum’s Center for Biodiversity and Conservation (CBC) was created in June 1993 to advance the use of scientific data to mitigate threats to biodiversity. CBC programs integrate research, education, and
outreach so that people, a key force in the rapid loss of biodiversity, will become participants in its conservation. The CBC works with partners throughout the world to build professional and institutional capacities for biodiversity conservation and heightens public understanding and stewardship of biodiversity. CBC projects are under way in the Bahamas, Bolivia, Madagascar, Mexico, Vietnam, and the Metropolitan New York region.

The Museum’s scientific facilities include: two molecular systematics laboratories equipped with modern high-throughput technology; the interdepartmental laboratories, which include a state-of-the-art imaging facility that provides analytical microscopy, energy dispersive spectrometry, science visualization, and image analysis to support the Museum’s scientific activities; a powerful parallel-computing facility, including a cluster of the world’s fastest computers, positioned to make significant contributions to bioinformatics; and a frozen tissue facility with the capacity to store one million DNA samples.

New York Botanical Garden
The New York Botanical Garden (NYBG), with its 7 million specimen herbarium, the largest in the Western Hemisphere, and its LuEsther T. Mertz Library, the largest botanical and horticultural reference collection on a single site in the Americas, comprises one of the very best locations in the world to study plant science. NYBG’s systematic botanists discover, decipher, and describe the world’s plant and fungal diversity; and its economic botanists study the varied links between plants and people. The Enid A. Haupt Conservatory, the largest Victorian glasshouse in the United States, features some 6,000 species in a newly installed “Plants of the World” exhibit. The new International Plant Science Center stores the Garden collection under state-of-the-art environmental conditions and has nine study rooms for visiting scholars. All specimens are available for on-site study or loan.

In recent years, NYBG has endeavored to grow and expand its research efforts, supporting international field projects in some two dozen different countries, ranging from Brazil to Indonesia. In 1994, AMNH and NYBG established the Lewis and Dorothy Cullman Program for Molecular Systematics Studies to promote the use of molecular techniques in phylogenetic studies of plant groups. This program offers many opportunities for research in conservation genetics. NYBG operates both the Institute for Economic Botany (IEB) and the Institute of Systematic Botany (ISB). The ISB builds on the Garden’s long tradition of intensive and distinguished research in systematic botany—the study of the kinds and diversity of plants and their relationships—to develop the knowledge and means for responding effectively to the biodiversity crisis.

The Garden has also established a molecular and anatomical laboratory program, which includes light and electron microscopes, and has made enormous advances in digitizing its collection. There is currently a searchable on-line library catalog and specimen database collection with some half million unique records. Field sites around the world provide numerous opportunities for work in important ecosystems of unique biodiversity.

Wildlife Conservation Society
The Wildlife Conservation Society (WCS), founded in 1895 as the New York Zoological Society, works to save wildlife and wild lands throughout the world. In addition to supporting the nation’s largest system of zoological facilities—the Bronx Zoo; the New York Aquarium; the Wildlife Centers in Central Park, Prospect Park, and Flushing Meadow Park; and the Wildlife Survival Center on St. Catherine’s Island, Georgia—WCS maintains a commitment to field-based conservation science.

With 60 staff scientists and more than 100 research fellows, WCS has the largest professional field staff of any U.S.-based international conservation organization. Currently, WCS conducts nearly 300 field projects throughout the Americas, Asia, and Africa. The field program is supported by a staff of conservation scientists based in New York who also conduct their own research.

WCS’s field-based programs complement the organization’s expertise in veterinary medicine, captive breeding, animal care, genetics, and landscape ecology, most of which are based at the Bronx Zoo headquarters. WCS’s Conservation Genetics program places an emphasis on a rigorous, logical foundation for the scientific paradigms used in conservation biology and is linked to a joint Conservation Genetics program with the American Museum of Natural History. The Wildlife Health Sciences division is responsible for the health care of more than 17,000 wild animals in the five New York parks and wildlife centers. The departments of Clinical Care, Pathology, Nutrition, and Field Veterinary Programs provide the highest quality of care to wildlife.

EcoHealth Alliance
EcoHealth Alliance is an international organization of scientists dedicated to the conservation of biodiversity. For more than 40 years, EcoHealth Alliance has focused its efforts on conservation. Today, they are known for innovative research on the intricate relationships between wildlife, ecosystems, and human health.

EcoHealth Alliance’s work spans the U.S. and more than 20 countries in Central and South America, the Caribbean, Africa, and Asia to research ways for people and wildlife to share bioscapes for their mutual survival. Their strength is built on innovations in research, education, and training and accessibility to international conservation partners.

Internationally, EHA programs support conservationists in over a dozen countries at the local level to save endangered species and their habitats, and to protect delicate ecosystems for the benefit of wildlife and humans.

Academic Programs
The Department of Ecology, Evolution, and Environmental Biology runs two undergraduate majors/concentrations. The primary major is in environmental biology and the second is evolutionary biology of the human species. The foci and requirements vary substantially and are intended for students with different academic interests.

The environmental biology major emphasizes those areas of biology and other disciplines essential for students who intend to pursue careers in the conservation of Earth’s living resources. It is designed to prepare students for graduate study in ecology and evolutionary biology, conservation biology, environmental policy and related areas, or for direct entry into conservation-related or science teaching careers.

Interdisciplinary knowledge is paramount to solving environmental biology issues, and a wide breadth of courses is thus essential, as is exposure to current work. Conservation internships are available through partner institutions and serve as research experience leading to the development of the required senior thesis.

Declaration of the environmental biology major must be approved by the director of undergraduate studies and filed in the departmental office located on the 10th floor of Schermerhorn Extension.

The major in evolutionary biology of the human species provides students with a foundation in the interrelated spheres of behavior, ecology, genetics, evolution, morphology, patterns of growth, adaptation,
and forensics. Using the framework of evolution and with attention to the interplay between biology and culture, research in these areas is applied to our own species and to our closest relatives to understand who we are and where we came from. This integrated biological study is also known as biological anthropology. As an interdisciplinary major, students are also encouraged to draw on courses in related fields including biology, anthropology, geology, and psychology as part of their studies.

**Professors**

Steve Cohen (International and Public Affairs)
Marina Cords (also Anthropology)
Ruth DeFries
Kevin Griffin (also Earth and Environmental Sciences)
Paul Hertz (Barnard)
Ralph Holloway (Anthropology)
Darcy Kelley (Biological Sciences)
Don Melnick (also Anthropology and Biological Sciences)
Brian Morton (Barnard)
Shahid Naeem
Paul Olsen (Earth and Environmental Sciences)
Robert Pollack (Biological Sciences)
Maria Uriarte
Paige West

**Associate Professors**

Hilary Callahan (Barnard)
Maria Diuk-Wasser
Duncan Menge
Dustin Rubenstein
Duncan Menge

**Assistant Professors**

Andres Bendesky
Deren Eaton

**Lecturers**

Sara Kross
Matthew Palmer
Jill Shapiro

**Adjunct Faculty/Research Scientists**

**Columbia University**

Simon Anthony (CUMC)
Hilary Callahan (Barnard Biology)
Steven Cohen (SIPA)
Steven Davis
Adela Gondek (SIPA)
Paul Hertz (Barnard)
Ralph Holloway
Darcy Kelley
Brian Morton (Barnard)
Robert Pollack
Marya Pollack
Paige West
Natalie Boelman (Lamont-Doherty)

**American Museum of Natural History**

George Amato
Mary Blair
Frank Burbrink
Joel Cracraft
Steven David
Dave Grimaldi
Christopher Raxworthy
Robert Rockwell
Nancy Simmons
Brian Smith
Eleanor Sterling

**The New York Botanical Garden**

Michael Balick
Dennis Stevenson

**Wildlife Conservation Society**

Howard Rosenbaum
Scott Silver
Patrick R. Thomas

**EcoHealth Alliance**

Peter Daszak
Kevin Olival
Melinda Rostal

**Cary Institute of Ecosystem Studies**

Joshua Ginsberg

**NYC Audubon**

Susan Elbin

**Woods Hole**

Michael T. Coe

**Guidelines for all Ecology, Evolution, and Environmental Biology Majors and Concentrators**

The grade of D is not accepted for any course offered in fulfillment of the requirements toward the majors or concentrations.

**Major in Environmental Biology**

The major in environmental biology requires 50 points, distributed as follows:

**Lower Division Courses**

Two terms of introductory or environmental biology such as the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>EEEB UN2001</td>
<td>Environmental Biology I: Elements to Organisms and Environmental Biology II: Organisms to the Biosphere</td>
</tr>
</tbody>
</table>

Two terms of environmental science such as the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>EESC UN2100</td>
<td>Earth’s Environmental Systems: The Climate System</td>
</tr>
<tr>
<td>EESC UN2200</td>
<td>EARTH’S ENVIRONMENTAL SYSTEMS: THE SOLID EARTH</td>
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</tbody>
</table>
Lower Division Courses

requires 50 points, distributed as follows:

The ecology and evolution track within the environmental biology major

Environmental Biology Major

Ecology and Evolution Track within the

genetics.

Students planning on continuing into graduate studies in environmental

semesters of the seminar, starting in the spring of the junior year, is

a research internship (generally in the summer before the senior year)

Students must also complete a senior thesis, which involves completing

Students must also complete a senior thesis, which involves completing a research internship (generally in the summer before the senior year) and completing at least one semester of the thesis research seminar, EEEB UN3991-EEEB UN3992 Senior Seminar. Enrollment in both semesters of the seminar, starting in the spring of the junior year, is recommended.

Students planning on continuing into graduate studies in environmental biology or related fields are encouraged to take organic chemistry and genetics.

Ecology and Evolution Track within the Environmental Biology Major

The ecology and evolution track within the environmental biology major requires 50 points, distributed as follows:

Lower Division Courses

Two terms of introductory or environmental biology such as the following:

Two terms of chemistry such as the following:

CHEM UN1403 GENERAL CHEMISTRY I-LECTURES
- CHEM UN1404 and GENERAL CHEMISTRY II-LECTURES

One term of physics such as the following:

PHYS UN1201 General Physics I

One term of statistics such as the following:

EEEB UN3005 Introduction to Statistics for Ecology and Evolutionary Biology

Biological basis of life such as the following:

PHYS UN1201 General Physics I

One term of calculus such as the following:

MATH UN1101 CALCULUS I

MATH UN1102 CALCULUS II

MATH UN1201 Calculus III

MATH UN1202 Calculus IV

Upper Division Courses

Students must complete five advanced elective courses (generally 3000- level or above) satisfying the following distribution. At least one of these courses must include a laboratory component. For more information and a list of appropriate courses, contact the director of undergraduate studies.

1. Ecology, behavior, or conservation biology;
2. Evolution or genetics;
3. Morphology, physiology, or diversity;
4. Policy or economics;
5. One additional course from the preceding four groups.

Students must also complete a senior thesis, which involves completing a research internship (generally in the summer before the senior year) and completing at least one semester of the thesis research seminar, EEEB UN3991-EEEB UN3992 Senior Seminar. Enrollment in both semesters of the seminar, starting in the spring of the junior year, is recommended.

Students planning on continuing into graduate studies in ecology or evolutionary biology are encouraged to take organic chemistry.

Major in Evolutionary Biology of the Human Species

The major in evolutionary biology of the human species requires 36 points, distributed as described below.

Students must take a minimum of 20 points from approved biological anthropology courses. The additional courses may be taken in other departments with adviser approval. These include up to 6 points of introductory biology/chemistry or calculus (in any combination). Please speak with the major adviser about the extended list of courses from related areas including Biology, Psychology, Archaeology, Anthropology, Earth and Environmental Science, and Statistics that count toward this program.

For example, students interested in focusing on paleoanthropology would complement the requirements with additional courses in human evolution and morphology, evolutionary biology and theory, archaeology, genetics, and statistics. Those interested in primate behavior would supplement the requirements with classes in behavioral biology, ecology, and statistics.

Two terms of chemistry such as the following:

CHEM UN1403 GENERAL CHEMISTRY I-LECTURES
- CHEM UN1404 and GENERAL CHEMISTRY II-LECTURES

Chemistry laboratory such as the following:

CHEM UN1500 GENERAL CHEMISTRY LABORATORY

Two terms of physics such as the following:

PHYS UN1201 General Physics I

PHYS UN1202 General Physics II

One term of statistics such as the following:

EEEB UN3005 Introduction to Statistics for Ecology and Evolutionary Biology

Biological basis of life such as the following:

PHYS UN1201 General Physics I

One term of calculus such as the following:

MATH UN1101 CALCULUS I

MATH UN1102 CALCULUS II

MATH UN1201 Calculus III

MATH UN1202 Calculus IV

Upper Division Courses

Students must complete five advanced elective courses (generally 3000- level or above) satisfying the following distribution. At least one of these courses must include a laboratory component. For more information and a list of appropriate courses, contact the director of undergraduate studies.

1. Three courses in ecology, evolution, conservation biology, or behavior;
2. One course in genetics. BIOL UN3031 GENETICS or BIOL BC2100 Molecular and Mendelian Genetics is recommended;
3. One course in morphology, physiology, or diversity.

Students must also complete a senior thesis, which involves completing a research internship (generally in the summer before the senior year) and completing at least one semester of the thesis research seminar, EEEB UN3991-EEEB UN3992 Senior Seminar. Enrollment in both semesters of the seminar, starting in the spring of the junior year, is recommended.

Students planning on continuing into graduate studies in ecology or evolutionary biology are encouraged to take organic chemistry.
Required Courses

EEEB UN1010  Human Origins and Evolution
EEEB UN1011  Behavioral Biology of the Living Primates

**Alternate options may be possible for all courses other than EEEB UN1010 Human Origins and Evolution and EEEB UN1011 Behavioral Biology of the Living Primates. These will be considered on an individual basis in consultation with the major/concentration adviser.

Conservation Course

EEEB UN3240  Challenges and Strategies of Primate Conservation (This is the recommended conservation course but this requirement can be fulfilled with other classes such as Conservation Biology, Zoo Conservation, Ecology, Behavior and Conservation of Mammals, SEE-U in Jordan or Brazil, or other relevant offerings.)

Theoretical Foundation from Archaeology

Select one course of the following: Nearly all archaeology courses (save for Rise of Civilization) can fulfill this requirement. Check with the advisor.

Archaeology

ANTH UN1007  The Origins of Human Society
ANTH UN2028  Think Like an Archaeologist: Introduction to Method & Theory
ANTH UN3064  Death and the Body
ANTH UN3823  Archaeology Engaged: The Past in the Public Eye

Breadth Requirement

Select a minimum of one course from each of the three sections (may overlap seminar requirement for majors):

Genetics/Human Variation

BIOL BC2100  Molecular and Mendelian Genetics
BIOL UN3031  GENETICS
BIOL GU4560  Evolution in the age of genomics
ANTH UN3970  Biological Basis of Human Variation
EEEB GU4340  HUMAN ADAPTATION
EEEB GU4700  Race: The Tangled History of a Biological Concept

Primate Behavioral Biology and Ecology

EEEB UN3940  Current Controversies in Primate Behavior and Ecology
BIOL BC2272  Ecology
BIOL BC2280  Animal Behavior
PSYC UN2420  Animal Behavior
PSYC BC1119  Systems and Behavioral Neuroscience
PSYC UN2450  Behavioral Neuroscience
PSYC BC3372  Comparative Cognition
PSYC UN3450  Evolution of Intelligence, Animal Communication, # Language
PSYC UN3460  Evolution of Behavior (Seminar)
PSYC UN3470  Brain Evolution: Becoming Human (Seminar)
EEEB GU4010  The Evolutionary Basis of Human Behavior
EEEB GU4134  Behavioral Ecology

EEEB GU4201  Ecology, Behavior, and Conservation of Mammals (can count for either breadth requirement or conservation requirement, but not both)

Human Evolution/Morphology

EEEB UN3208  Explorations in Primate Anatomy
EEEB UN3215  Forensic Osteology
EEEB UN3220  The Evolution of Human Growth and Development
ANTH GU4147  Human Skeletal Biology I
ANTH GU4148  The Human Skeletal Biology II
EEEB UN3204  Dynamics of Human Evolution
EEEB UN3910  THE NEANDERTALS
ANTH GU4002  Controversial Topics in Human Evolution
ANTH GU4200  Fossil Evidence of Human Evolution
BIOL BC2278  Evolution
BIOL UN3208  Introduction to Evolutionary Biology
EEEB UN3030  The Biology, Systematics, and Evolutionary History of the 'Apes'
BIOL BC2262  Vertebrate Biology
BIOL UN3006  PHYSIOLOGY
BIOL BC3360  Physiology
EEEB GU4200  Introduction to Mammalogy

Seminar

Selection at least one of the following seminars. May also count toward the breadth requirement.

EEEB UN3204  Dynamics of Human Evolution
EEEB UN3910  THE NEANDERTALS
EEEB UN3940  Current Controversies in Primate Behavior and Ecology
ANTH UN3970  Biological Basis of Human Variation
EEEB UN3993 - EEEB UN3994  EBHS Senior Seminar and EBHS SENIOR THESIS SEMINAR
EEEB GU4321  Human Nature: DNA, Race & Identity
ANTH GU4002  Controversial Topics in Human Evolution (Fulfills the seminar requirement for the major)

Additional courses in the student’s area of focus to complete the required 36 points overall including a minimum of 20 points of approved biological anthropology courses.

Students intending to pursue graduate study in this field should broaden their foundation by taking an introductory biology course (optimally either EEEB UN2001 Environmental Biology I: Elements to Organisms or EEEB UN2002 Environmental Biology II: Organisms to the Biosphere) or an advanced evolution course, a genetics course, and a statistics course. We recommend that those interested in either biological anthropology or bioarchaeology take a foundation cultural anthropology course such as ANTH UN1002 The Interpretation of Culture, ANTH UN2004 INTRO TO SOC # CULTURAL THEORY, ANTH UN2005 THE ETHNOGRAPHIC IMAGINATION, or ANTH UN3040 Anthropological Theory I. Students interested in forensic anthropology should take chemistry in lieu of biology (though the latter is recommended as a foundation course for all students). The adviser makes additional recommendations dependent on the student’s area of focus.
Approved Biological Anthropology Courses

Paleoanthropology and Morphology

EEEB UN1010 Human Origins and Evolution
EEEB UN3204 Dynamics of Human Evolution
EEEB UN3208 Explorations in Primate Anatomy
EEEB UN3215 Forensic Osteology
EEEB UN3220 The Evolution of Human Growth and Development
EEEB UN3910 THE NEANDERTALS
ANTH GU4147 Human Skeletal Biology I
- ANTH GU4148 and The Human Skeletal Biology II
ANTH GU4200 Fossil Evidence of Human Evolution taught intermittently

Primate Behavioral Ecology and Evolution

EEEB UN1011 Behavioral Biology of the Living Primates
EEEB UN3030 The Biology, Systematics, and Evolutionary History of the 'Apes'
EEEB UN3940 Current Controversies in Primate Behavior and Ecology
EEEB GU4010 The Evolutionary Basis of Human Behavior

Human Variation

ANTH UN3970 Biological Basis of Human Variation
EEEB GU4340 HUMAN ADAPTATION
EEEB GU4700 Race: The Tangled History of a Biological Concept

Additional Courses

EEEB UN3240 Challenges and Strategies of Primate Conservation
EEEB UN3993 - EEEB UN3994 EBHS Senior Seminar
- EBHS SENIOR THESIS SEMINAR

Concentration in Environmental Biology

The concentration in environmental biology differs from the major in omitting calculus and physics from the lower division, requiring three advanced electives rather than five, and omitting the senior seminar with thesis project. It requires 36 points, distributed as follows:

Lower Division Courses

Two terms of introductory or environmental biology such as the following:

EEEB UN2001 - EEEB UN2002 Environmental Biology I: Elements to Organisms and Environmental Biology II: Organisms to the Biosphere (or equivalents)

Two terms of environmental science such as the following:

EEESC UN2100 Earth's Environmental Systems: The Climate System
EEESC UN2200 EARTH'S ENVIRONMENTAL SYSTEMS: THE SOLID EARTH

Two terms of chemistry such as the following:

CHEM UN1403 - CHEM UN1404 GENERAL CHEMISTRY I-LECTURES and GENERAL CHEMISTRY II-LECTURES

One term of statistics. Select one of the following:

EEEB UN3005 Introduction to Statistics for Ecology and Evolutionary Biology
BIOL BC2286 Statistics and Research Design

Upper Division Courses

EEEB UN3087 Conservation Biology
Two other 3000- or 4000-level courses from the advanced environmental biology courses listed for the major.

Concentration in Evolutionary Biology of the Human Species

The concentration in evolutionary biology of the human species requires 20 points including the required introductory courses EEEB UN1010 Human Origins and Evolution, EEEB UN1011 Behavioral Biology of the Living Primates, an approved conservation course (optimally Primate Conservation), and three courses for the breadth distribution requirements as described for the major. Students must take a minimum of 15 points from approved biological anthropology courses as described for the major (the two introductory classes count toward that total). The additional courses may be taken in other departments with adviser approval.

Concentrators do not have to complete the theoretical foundation course from archaeology or a seminar.

Special Concentration in Environmental Science for Environmental Biology Majors

The special concentration in environmental science requires a minimum of 31.5 points, distributed as follows:

Introductory Environmental Science (13.5 points)

EEESC UN2100 Earth's Environmental Systems: The Climate System
EEESC UN2200 EARTH'S ENVIRONMENTAL SYSTEMS: THE SOLID EARTH
EEESC UN2300 Earth's Environmental Systems: The Life System (equivalent to EEEB UN2002)

Introductory Science (6 points)

Two courses in chemistry, physics, mathematics, or environmental biology from the supporting mathematics and science list for the environmental science major.

Advanced Environmental Science (12 points)

Select four of the following:

EEESC UN3015 The Earth's Carbon Cycle
EEESC BC3017 Environmental Data Analysis
EEESC BC3025 Hydrology
EEESC GU4008 Introduction to Atmospheric Science
EEESC GU4050 Global Assessment and Monitoring Using Remote Sensing
EEESC GU4223 SEDIMENTARY GEOLOGY
EEESC GU4550 Plant Ecophysiology
EEESC GU4835 Wetlands and Climate Change
EEESC GU4885 THE CHEMISTRY OF CONTINENTAL WATERS
EEESC GU4917 Earth/Human Interactions
EEESC GU4926 Principles of Chemical Oceanography
Advanced courses used to fulfill requirements in the environmental biology major cannot count toward requirements for the special concentration.

Special Concentration in Environmental Biology for Environmental Science Majors

The Department of Ecology, Evolution, and Environmental Biology sponsors a special concentration which must be done in conjunction with the environmental science major. Students should be aware that they must complete the environmental science major in order to receive credit for the special concentration.

The special concentration in environmental biology requires a minimum of 39 points, distributed as follows:

Introduction Environmental Biology and Environmental Science (17 points)

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<thead>
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<tr>
<td>EEEB UN2001</td>
<td>Environmental Biology I: Elements to Organisms</td>
</tr>
<tr>
<td>EEEB UN2002</td>
<td>Environmental Biology II: Organisms to the Biosphere (equivalent to EESC UN2300)</td>
</tr>
<tr>
<td>EESC UN2100</td>
<td>Earth’s Environmental Systems: The Climate System</td>
</tr>
<tr>
<td>EESC UN2200</td>
<td>EARTH’S ENVIRONMENTAL SYSTEMS: THE SOLID EARTH</td>
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</table>

Introductory Science (13 points)

Select one of the following chemistry sequences:

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<tbody>
<tr>
<td>CHEM UN1403</td>
<td>GENERAL CHEMISTRY I-LECTURES</td>
</tr>
<tr>
<td>- CHEM UN1404</td>
<td>and GENERAL CHEMISTRY II-LECTURES</td>
</tr>
<tr>
<td>CHEM UN1604</td>
<td>2ND TERM GEN CHEM (INTENSIVE) and intensive General Chemistry Laboratory</td>
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<tr>
<td>- CHEM UN2507</td>
<td></td>
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</tbody>
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One term of statistics such as the following:

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<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>EEEB UN3005</td>
<td>Introduction to Statistics for Ecology and Evolutionary Biology</td>
</tr>
<tr>
<td>BIOL BC2286</td>
<td>Statistics and Research Design</td>
</tr>
<tr>
<td>STAT UN1101</td>
<td>Introduction to Statistics</td>
</tr>
<tr>
<td>STAT UN1201</td>
<td>Calculus-Based Introduction to Statistics</td>
</tr>
<tr>
<td>EEEB UN3087</td>
<td>Conservation Biology</td>
</tr>
</tbody>
</table>

Advanced Environmental Biology (9 points)

Three additional advanced environmental biology courses (3000-level and above), each chosen from a different curricular area (evolution genetics, ecology behavior conservation, anatomy/physiology/diversity, biology laboratory courses).

Fall 2021

EEEB UN1010 Human Origins and Evolution. 3 points.
CC/GS: Partial Fulfillment of Science Requirement
Lab fee: $25. Taught every fall.

This is an introductory course in human evolution. Building on a foundation of evolutionary theory, students explore primate behavioral morphology and then trace the last 65 million years of primate evolution from the earliest Paleocene forms to the fossil remnants of earliest humans and human relatives. Along with Behavioral Biology of the Living Primates this serves as a core required class for the EBHS program.

EEEB UN2001 Environmental Biology I: Elements to Organisms. 3 points.
CC/GS: Partial Fulfillment of Science Requirement
Introductory biology course for majors in biology or environmental biology, emphasizing the ecological and evolutionary context of modern biology.

EEESC UN2330 SCIENCE FOR SUSTAINABLE DEVPT. 3 points.
CC/GS: Partial Fulfillment of Science Requirement
The course provides students with the natural science basis to appreciate co-dependencies of natural and human systems, which are central to understanding sustainable development. After completing the course, students should be able to incorporate scientific approaches into their research or policy decisions and be able to use scientific methods of data analysis. The semester will highlight the climate system and solutions from both physical and ecological perspectives; water resources; food production and the cycling of nutrients; and the role of biodiversity in sustainable development. The course emphasizes key scientific concepts such as uncertainty, experimental versus observational approaches, prediction and predictability, the use of models and other essential methodological aspects.
EEEB UN3005 Introduction to Statistics for Ecology and Evolutionary Biology. 3 points.
Prerequisites: some background in ecology, evolutionary biology, and/or statistics is recommended.
An introduction to the theoretical principles and practical application of statistical methods in ecology and evolutionary biology. The course will cover the conceptual basis for a range of statistical techniques through a series of lectures using examples from the primary literature. The application of these techniques will be taught through the use of statistical software in computer-based laboratory sessions.

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<tr>
<th>Course</th>
<th>Section/Call Number</th>
<th>Times/Location</th>
<th>Instructor</th>
<th>Points</th>
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<td>Pb-Faculty House</td>
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EEEB UN3015 INTRO-STAT-ECOLGY/EVOL BIO-LAB. 0.00 points.
Required Lab for EEEB UN3005. An introduction to the theoretical principles and practical application of statistical methods in ecology and evolutionary biology. The course will cover the conceptual basis for a range of statistical techniques through a series of lectures using examples from the primary literature. The application of these techniques will be taught through the use of statistical software in computer-based laboratory sessions.

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<th>Times/Location</th>
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EEEB UN3240 Challenges and Strategies of Primate Conservation. 3 points.
CC/GS: Partial Fulfillment of Science Requirement
Enrollment limited to 20. Priority given to EBHS students.
Prerequisites: EEEB UN1010 or EEEB UN1011 or the instructor’s permission.
Throughout their range, numerous primate species are on the brink of extinction. This course examines the central issues relating to conservation of wild primates and explores strategies and solutions for preserving these endangered populations. Through the analysis of the ecological and social traits linked to vulnerability and the direct and indirect threats from human activities, students will gain a practical understanding of how to develop successful, sustainable, and practical conservation strategies.

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<th>Course</th>
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</table>

BIOL UN3560 Evolution in the age of genomics. 4 points.
Prerequisites: Introductory Biology I and II, or the instructors permission.
This course introduces basic concepts in evolutionary biology, from speciation to natural selection. While the lectures incorporate a historical perspective, the main goal of the class is to familiarize students with topics and tools of evolutionary genetics as practiced today, in the era of genomics. Thus, the focus will be on evidence from molecular evolution and genetics and exercises will assume a basic background in genetics. Examples will be drawn from across the tree of life, but with a primary focus on humans.

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<th>Section/Call Number</th>
<th>Times/Location</th>
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<td>Guy Sella</td>
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<td>Peter</td>
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<td>800 Fairchild Life Sciences Bldg</td>
<td>Peter</td>
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</table>

EEEB UN3940 Current Controversies in Primate Behavior and Ecology. 4 points.
CC/GS: Partial Fulfillment of Science Requirement
Taught every two years. Enrollment limited to 15.
Prerequisites: EEEB UN1011 or the equivalent.
Critical in-depth evaluation of selected issues in primate socioecology, including adaptationism, sociality, sexual competition, communication, kinship, dominance, cognition, and politics. Emphasizes readings from original literature.

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<th>Times/Location</th>
<th>Instructor</th>
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EEEB UN3991 Senior Seminar. 3 points.
Open only to seniors.
Guided, independent, indepth research experience culminating in the senior essay. Weekly meetings are held to review work in progress, to share results through oral and written reports, and to consider career options for further work in this field.

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<th>Course</th>
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<td>530 Alsachul Hall</td>
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EEEB UN3993 EBHS Senior Seminar. 4 points.
Four points for the year-long course.
Prerequisites: the instructor’s permission and senior standing as a major in The Evolutionary Biology of the Human Species (EBHS).
Year-long seminar in which senior EBHS majors develop a research project and write a senior thesis. Regular meetings are held to discuss research and writing strategies, review work in progress, and share results through oral and written reports.
EEEB UN3997 Independent Study. 1-3 points.
CC/GS: Partial Fulfillment of Science Requirement

Students conduct research in environmental biology under supervision of a faculty mentor. The topic and scope of the research project must be approved before the student registers for the course.

Fall 2021: EEEB UN3997

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<td>Matthew Palmer</td>
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<td>EEEB 3997</td>
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<td>Jill Shapiro</td>
<td>1-3</td>
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EEEB GU4005 Conservation Policy. 3 points.
Prerequisites: Students should have completed at least one course in ecology, evolution or conservation biology.

The purpose of this course is to arm emerging scientists with an understanding of conservation policy at the city, state, federal and international levels. Our focus will be on understanding the science that informs conservation policy, evaluating the efficacy of conservation policies for achieving conservation goals, and learning about the role that scientists play in forming policy.

Fall 2021: EEEB GU4005

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EEEB GU4111 Ecosystem Ecology and Global Change. 3 points.
CC/GS: Partial Fulfillment of Science Requirement

This course will provide an introduction to ecosystem ecology. Topics include primary production carbon storage, nutrient cycling, and ecosystem feedbacks to climate change. By the end of the course, students will be well versed in the basics of ecosystem ecology and have exposure to some current areas of research. Topics covered will include some aspects that are well established and others that are hotly debated among scientists. Throughout the course, students will be encouraged to think independently and act like research scientists.

Fall 2021: EEEB GU4111

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<th>Course</th>
<th>Section/Call Number</th>
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EEEB GU4129 Zoo Conservation. 3 points.
CC/GS: Partial Fulfillment of Science Requirement

This course examines the role and function of the modern zoo in the context of the modern conservation movement. Students will learn about the evolution of the zoological park from an entertainment venue to a reservoir of rare or otherwise endangered species of animals, and as a catalyst for conservation of these species.

Fall 2021: EEEB GU4129

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EEEB GU4134 Behavioral Ecology. 4 points.
Not offered during 2021-22 academic year.

Prerequisites: graduate students: EEEB 6110 and the instructor’s permission. Undergraduate students: PSYCH W2420 or BIOL BC3280 and the instructor’s permission.

An examination of evolutionary and behavioral ecological theory. The course will focus on natural selection, kin selection, and sexual selection, as well as related topics including cooperation, conflict, cooperative breeding, signaling, sex allocation, reproductive skew, and alternative mating strategies among others. Emphasis will be placed on understanding the theoretical bases of these theories, as well as empirical tests of these concepts. The course is writing intensive and written assignments will encourage critical assessment of theory, experimental design, and data analysis.

Fall 2021: EEEB GU4134

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<th>Course</th>
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EEEB GU4160 Landscape Ecology. 5 points.
Prerequisites: Introductory background in ecology (EEEB UN2001, EEEB UN2002 or similar course, e.g. EEEB GU 4110, or BIOL BC2272) or permission from the instructor. Basic knowledge of R statistical software. Landscape ecology is a sub-discipline of ecology that examines the development, causes and attributes of spatial patterns of landscapes and their implications for ecological processes. By its nature, landscape ecology draws from many other areas within ecology. The course will consider ecological processes at the individual, population, community, and ecosystem level. The ecology of landscapes is also critical to the development of management and restoration schemes that take into account biodiversity conservation, provision of ecosystem services, and human land use. The course will cover the conceptual underpinnings of landscape ecology and will introduce students to some of the tools used to analyze the structure and dynamics of landscapes. Students will also examine consequences of landscape patterns and dynamics for organisms and for the management and sustainability of landscapes. These skills prepare students to ask questions from a landscape perspective. The weekly two-hour lab will provide students with skills and confidence in the use of mapping and analysis tools in landscape ecology.

Fall 2021: EEEB GU4160

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<th>Course</th>
<th>Section/Call Number</th>
<th>Times/Location</th>
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<td>Maria Uriarte</td>
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<td>EEEB 4160</td>
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<td>T Th 8:40am - 9:55am</td>
<td>Maria Uriarte</td>
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<td>1015 Ext Schermerhorn Hall</td>
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</table>
EEEB 4321 Human Nature: DNA, Race & Identity. 4 points.
The course focuses on human identity, beginning with the individual and progressing to communal and global viewpoints using a framework of perspectives from biology, genetics, medicine, psychiatry, religion and the law. Prerequisites: General biology or the instructor's permission. Given in alternate years.

Enrollment limited to 25. Priority given to undergraduate environmental biology majors.

EEEB GU4666 Insect Diversity. 4 points.
Introduction to phylogenetic relationships, evolution, and ecology of the major groups of arthropods, with emphasis on insects. Lab: identification of common families of spiders and insects of the northeastern United States.

EEEB GU4910 Field Botany and Plant Systematics. 4 points.
CC/GS: Partial Fulfillment of Science Requirement
Course fee: $50. Enrollment limited to 14. Priority given to E3B graduate students.

Prerequisites: introductory biology sequence, including organismal biology.
A survey of vascular plants with emphasis on features of greatest utility in identifying plants in the field to the family level. This will be coupled with a survey of the major plant communities of northeastern North America and the characteristic species found in each. The course will consist of one lecture and one laboratory per week with several lab sessions extended to accommodate field trips to local and regional natural areas.

### Spring 2021

**EEEB UN1005 First Year Seminar in Ecology, Evolution and Environmental Biology. 1 point.**
This course provides a brief introduction to ecology, evolution and environmental biology with an emphasis on key concepts, current research, and opportunities for undergraduates. The course is taught jointly by the faculty in the department of Ecology, Evolution and Environmental Biology (E3B), with each session covering a different aspect of research and/or teaching in the department. Students are expected to complete weekly readings and participate in discussion both in class and online.

**EEEB UN1011 Behavioral Biology of the Living Primates. 3 points.**
CC/GS: Partial Fulfillment of Science Requirement

Prerequisites: Corequisite EEBE UN1111
Study of non-human primate behavior from the perspective of phylogeny, adaptation, physiology and anatomy, and life history. Focuses on the four main problems primates face: finding appropriate food, avoiding being eaten themselves, reproducing in the face of competition, and dealing with social partners. Along with Human Origins & Evolution, this serves as a core required class for the EBHS program.
EWEBUN2002 Environmental Biology II: Organisms to the Biosphere. 4 points.
CC/GS: Partial Fulfillment of Science Requirement

Prerequisites: EWEBUN2001
Second semester of introductory biology sequence for majors in environmental biology and environmental science, emphasizing the ecological and evolutionary aspects of biology. Also intended for those interested in an introduction to the principles of ecology and evolutionary biology.

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<td>Matthew; Paul Olsen, Matthew, Sonya Dyhrman</td>
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EWEBUN2310 Earth’s Environmental Systems: The Life System Required Lab: Sections 001, 002, 003, 004,005. 0 points.
This three hour lab is required of all students who enroll in EWEBUN2300. There are currently five lab sections.

<table>
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<th>Course</th>
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EWEBUN3011 Behavioral Biology of the Living Primates. 3 points.
CC/GS: Partial Fulfillment of Science Requirement

Prerequisites: introductory biology course in organismal biology and the instructor’s permission. Corequisite EWEBUN3111
Survey of non-human primate behavior from the perspective of phylogeny, adaptation, physiology and anatomy, and life history. Focus on the four main problems primates face: finding appropriate food, avoid being eaten themselves, reproducing in the face of competition, and dealing with social partners.

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<th>Course</th>
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<td>Marina Cords</td>
<td>3</td>
<td>6/10</td>
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EWEBUN3220 The Evolution of Human Growth and Development. 3 points.
CC/GS: Partial Fulfillment of Science Requirement
Taught intermittently. Not offered during 2021-22 academic year.

Prerequisites: EWEBUN1010 or ANTHUN1007 or the instructor’s permission.
This course explores central issues in human growth and development from birth through senescence. Emphasis will be placed on the factors responsible for the variability in current human growth patterns as well as the evolutionary divergence of a uniquely human pattern from our closest living and fossil relatives.

EWEBUN3250 THEORY # METHOD IN BIOL ANTHRO. 4.00 points.
In this course, we examine the process of doing scientific research. Using topics selected from the three main foci of biological anthropology – paleoanthropology, primate behavioral biology, and human variation/adaptation – we will explore the process of developing research questions and the different methods used to investigate them. Through structured discussion and critical analysis of primary literature, you will move beyond learning the facts of biological anthropology to critically interpreting studies and actively developing research.

EWEBUN3992 Senior Seminar. 3 points.
Open only to seniors.
Guided, independent, indepth research experience culminating in the senior essay. Weekly meetings are held to review work in progress, to share results through oral and written reports, and to consider career options for further work in this field.

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<tr>
<th>Course</th>
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<td>Matthew; Palmer</td>
<td>3</td>
<td>13/20</td>
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EWEBUN3994 EBHS SENIOR THESIS SEMINAR. 1.00-3.00 points.
Prerequisites: the instructors permission and senior standing as a major in The Evolutionary Biology of the Human Species (EBHS). Year-long seminar in which senior EBHS majors develop a research project and write a senior thesis. Regular meetings are held to discuss research and writing strategies, review work in progress, and share results through oral and written reports.

EWEBUN3998 Independent Study. 1-3 points.
CC/GS: Partial Fulfillment of Science Requirement

Students conduct research in environmental biology under supervision of a faculty mentor. The topic and scope of the research project must be approved before the student registers for the course.

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<tr>
<td></td>
<td>002/12133</td>
<td>Th 4:10pm - 6:00pm 530 Altschul Hall</td>
<td>Jill Shapiro</td>
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EEEB GU4050 Programming and Data Science Skills for Biologists. 3 points.
Prerequisites: One year of introductory biology or permission from the instructor
Programming and Data Science Skills for Biologists will introduce students to computational tools and concepts that are fundamental to working with large biological datasets. This will include learning core principles of a common programming language (Python, R), in addition to tools for collaboration and version control (git, github), reproducible science (jupyter, rstudio), accessing large databases (HDF5, dask), and manipulating and visualizing data. Programmatic approaches are commonly used in biology but few biologists receive formal training in applying programming languages to these tasks. This course offers a deeper understanding of computational techniques and algorithms as they apply to real biological datasets, with particular attention to genomic, spatial, and network analyses.

EEEB GU4086 Ethnobotany: the Study of People and Plants. 3 points.
Priority given to students with backgrounds in ecology or plant systematics.
A survey of the relationships between people and plants in a variety of cultural settings. Sustainability of resource use, human nutrition, intellectual property rights, and field methodologies are investigated.

EEEB GU4150 Theoretical Ecology. 3 points.
Prerequisites: Calculus, Introductory Biology.
This course will provide an introduction to theoretical ecology. Topics will include population, community, ecosystem, disease, and evolutionary ecology. Lectures will cover classic and current concepts and mathematical approaches. The numerical analysis laboratory will cover computational tools for numerical and graphical analysis of the models we cover in lecture, using MATLAB. By the end of the course, students will be well versed in the basics of theoretical ecology and will be able to read theoretical ecology literature, analyze and simulate mathematical models, and construct and analyze their own simple models.

EEEB GU4192 INTRO TO LANDSCAPE ANALYSIS. 3.00 points.
CC/GS: Full Fulfillment of Science Requirement
Prerequisites: SDEV W3390 or EESC W4050 or the instructor’s permission.
Changes in land use and land cover underlie multiple environmental and sustainability concerns, including conservation of biodiversity, impacts of climate change, climate mitigation through terrestrial carbon storage, urbanization and watershed protection. This class provides basic theory in landscape analysis and training in methods for analyzing landscapes, focusing on interpretation of satellite images. The class covers approaches and definitions in landscape analysis, data sources, land cover classification, change detection, accuracy assessment, and techniques to interpret results of these analyses. Students will obtain hands-on experience working with data from a landscape related to his/her research or a landscape chosen by the instructors. The course will consist of one lecture a week and one lab session to implement the methods discussed in lecture. Students will become proficient in using Google Earth Engine as a platform for image analysis.

EEEB GU4195 Marine Conservation Ecology. 3 points.
CC/GS: Partial Fulfillment of Science Requirement
Prerequisites: EEEB GR6110, EEEB GR6112, or EEEB GR6990, basic statistics, or the instructor’s permission.
This course provides an overview of marine ecology, introducing processes and systems from which the marine environment is formed and the issues and challenges which surround its future conservation. Coursework will be evaluated using debates, oral presentations and more traditional metrics. Topics to be covered include fisheries, invasive species, habitat alteration, climate change. While we will focus on general threats there will be special emphasis placed on coral reef ecosystems.

EEEB GU4210 Herpetology. 3 points.
Not offered during 2021-22 academic year.
Prerequisites: at least one course in Introductory Biology.
The course explores the science of herpetology in three parts: 1) the evolution and ecology of amphibians and reptiles; 2) their physiological adaptations; and 3) requirements for conservation, management, policy and monitoring.

EEEB GU4321 Human Nature: DNA, Race & Identity. 4 points.
The course focuses on human identity, beginning with the individual and progressing to communal and global viewpoints using a framework of perspectives from biology, genetics, medicine, psychiatry, religion and the law.

EEEB GU4210 Herpetology. 3 points.

Fall 2021: EEEB GU4321
Course Number  Section/Call Number  Times/Location  Instructor  Points  Enrollment
EEEB 4321  001/12622  W 2:10pm - 4:00pm  309 Hamilton Hall  Robert Pollack, 4  12/20

Spring 2022: EEEB GU4321
Course Number  Section/Call Number  Times/Location  Instructor  Points  Enrollment
EEEB 4321  001/12626  W 2:10pm - 4:00pm  309 Hamilton Hall  Marya Pollack, 4  15/20

EEEB GU4655 Biodiversity Conservation and Social Change. 3 points.
CC/GS: Partial Fulfillment of Science Requirement
Environmental programs worldwide are fraught with disputes between groups of people over natural resources. Such conflict can be highly complex, may undermine or deter environmental conservation efforts, and may even foster violence. These conflicts often involve disagreements between different human parties that are divided by culture, social values, and perceptions about the ethics and appropriateness of how resources should be allocated or used. Combining specific case studies, ecological and social theory, and a complex systems approach, this course will enhance the proficiency of participants to understand, study, and manage natural resource-based conflicts. The course is designed for conservation scientists, environmental policymakers, rural development specialists, political ecologists, and conflict/peace workers.
EEEB GU4670 Introduction to Geographical Information Systems. 3.00 points.

Geographic information systems (GIS) are powerful tools for analyzing fundamental geographic questions. GIS involves generating, linking, manipulating, and analyzing different sorts of spatial data; creating outputs commonly visualized as two- and sometimes three-dimensional maps. This course will cover major topics in GIS with applications for the broad field of biology and natural sciences, using QGIS and R. The goal of this course is to teach students a level of GIS proficiency such that they will be self-sufficient in their further learning and use of GIS.

EEEB GU4700 Race: The Tangled History of a Biological Concept. 4 points.

Enrollment limited to 15. Priority given to EBHS majors/concentrators. Not offered during 2021-22 academic year.

From Aristotle to the 2020 US census, this course examines the history of race as a biological concept. It explores the complex relationship between the scientific study of biological differences—real, imagined, or invented and the historical and cultural factors involved in the development and expression of "racial ideas." Scientific background not required. [Additional hour for film screenings weekly in second half of the semester—attendance at films is mandatory.] Please note that this course DOES NOT fulfillment the SC requirement at the College or GS.

Courses typically offered, but not in academic year 2020-2021

EEEB UN1001 Biodiversity. 3 points.
CC/GS: Partial Fulfillment of Science Requirement

In this course we will use genetics, evolutionary biology, and ecology to address three simple questions: What is biological diversity? Where can we find it? How can we conserve it? No previous knowledge of science or mathematics is assumed.

EEEB UN1005 First Year Seminar in Ecology, Evolution and Environmental Biology. 1 point.

This course provides a brief introduction to ecology, evolution and environmental biology with an emphasis on key concepts, current research, and opportunities for undergraduates. The course is taught jointly by the faculty in the department of Ecology, Evolution and Environmental Biology (E3B), with each session covering a different aspect of research and/or teaching in the department. Students are expected to complete weekly readings and participate in discussion both in class and online.

EEEB UN1011 Behavioral Biology of the Living Primates. 3 points.
CC/GS: Partial Fulfillment of Science Requirement

Prerequisites: Corequisite EEEB UN1111

Study of non-human primate behavior from the perspective of phylogeny, adaptation, physiology and anatomy, and life history. Focuses on the four main problems primates face: finding appropriate food, avoiding being eaten themselves, reproducing in the face of competition, and dealing with social partners. Along with Human Origins & Evolution, this serves as a core required class for the EBHS program.

EEEB UN2002 Environmental Biology II: Organisms to the Biosphere. 4 points.
CC/GS: Partial Fulfillment of Science Requirement

Prerequisites: EEEB UN2001

Second semester of introductory biology sequence for majors in environmental biology and environmental science, emphasizing the ecological and evolutionary aspects of biology. Also intended for those interested in an introduction to the principles of ecology and evolutionary biology.

EEEB UN3001 The Saga of Life. 4 points.

E3B's mission is to educate a new generation of scientists and practitioners in the theory and methods of ecology, evolution, and environmental biology. Our educational programs emphasize a multidisciplinary perspective to understand life on Earth from the level of organisms to global processes that sustain humanity and all life.

EEEB UN3001 Behavioral Biology of the Living Primates. 3 points.
CC/GS: Partial Fulfillment of Science Requirement

Prerequisites: introductory biology course in organismal biology and the instructor's permission. Corequisite EEEB UN3111

Survey of non-human primate behavior from the perspective of phylogeny, adaptation, physiology and anatomy, and life history. Focus on the four main problems primates face: finding appropriate food, avoid being eaten themselves, reproducing in the face of competition, and dealing with social partners.
EEEB 3087 Conservation Biology. 3 points.
CC/GS: Partial Fulfillment of Science Requirement

Prerequisites: introductory organismal biology course, ideally EEEB UN2002.

Applications of biological principles to the conservation of biodiversity. Because conservation biology is a cross-disciplinary field, some of the social, philosophical, and economic dimensions of biological conservation are also addressed.

Spring 2022: EEEB 3087
Course Number Section/Call Number Times/Location Instructor Points Enrollment
EEEB 3087 001/11974 M 4:10pm - 6:00pm 1015 Ext Schermerhorn Hall Dustin Partridge 3 18/26

EEEB UN3204 Dynamics of Human Evolution. 4 points.
CC/GS: Partial Fulfillment of Science Requirement

Enrollment limited to 13. Priority is given to EBHS majors/concentrators.

Prerequisites: EEEB UN1010 Human Species/HO&E, ANTH UN1007 Origins of Human Society, or the equivalent.

Seminar focusing on recent advances in the study of human evolution. Topics include changing views of human evolution with respect to early hominin behavior, morphology, culture and evolution. [Either Dynamics of Human Evolution or Neandertals is taught every other year.]

EEEB UN3208 Explorations in Primate Anatomy. 3 points.
CC/GS: Partial Fulfillment of Science Requirement

Taught every other year. Enrollment limited to 14 Not offered during 2021-22 academic year.

Prerequisites: EEEB UN1010 or EEEB UN1011 or the instructor’s permission.

Introductory laboratory course in primate skeletal anatomy. From tarsiers to talapoin, guenons to gibbons, through hands-on expertise students explore the amazing range and diversity of the living members of this order.

EEEB UN3215 Forensic Osteology. 3 points.
CC/GS: Partial Fulfillment of Science Requirement

Taught every other year. Enrollment limited to 15. Priority given at first class session to EBHS majors/concentrators.

Prerequisites: no prior experience with skeletal anatomy required. Not appropriate for students who have already taken either EEEB GU4147 or EEEB GU4148.

An exploration of the hidden clues in your skeleton. Students learn the techniques of aging, sexing, assessing ancestry, and the effects of disease, trauma and culture on human bone.

Spring 2022: EEEB UN3215
Course Number Section/Call Number Times/Location Instructor Points Enrollment
EEEB 3215 001/11978 M W 4:10pm - 6:00pm 506 Schermerhorn Hall Jill Shapiro 3 15/16

EEEB UN3220 The Evolution of Human Growth and Development. 3 points.
CC/GS: Partial Fulfillment of Science Requirement

Taught intermittently. Not offered during 2021-22 academic year.

Prerequisites: EEEB UN1010 or ANTH UN1007 or the instructor’s permission.

This course explores central issues in human growth and development from birth through senescence. Emphasis will be placed on the factors responsible for the variability in current human growth patterns as well as the evolutionary divergence of a uniquely human pattern from our closest living and fossil relatives.

EEEB UN3240 Challenges and Strategies of Primate Conservation. 3 points.
CC/GS: Partial Fulfillment of Science Requirement

Enrollment limited to 20. Priority given to EBHS students.

Prerequisites: EEEB UN1010 or EEEB UN1011 or the instructor’s permission.

Throughout their range, numerous primate species are on the brink of extinction. This course examines the central issues relating to conservation of wild primates and explores strategies and solutions for preserving these endangered populations. Through the analysis of the ecological and social traits linked to vulnerability and the direct and indirect threats from human activities, students will gain a practical understanding of how to develop successful, sustainable, and practical conservation strategies.

EEEB UN3087 Conservation Biology. 3 points.
CC/GS: Partial Fulfillment of Science Requirement

Taught intermittently. Not offered during 2021-22 academic year.

Prerequisites: EEEB UN1010 or EEEB UN1011 or the instructor’s permission.

This course focuses on our closest relatives, the extant apes of Africa and Asia. We will explore the nature and extent of the morphological, genetic, and behavioral variability within and among these forms. Using this framework, we will then analyze questions of systematics and trace the evolutionary development of the hominoids during the Miocene, the epoch that saw the last common ancestor of today’s gibbons, orang utans, gorillas, chimpanzees and humans. Timing note: The course meets for 2 hours twice a week. Films are screened during the last 30 minutes of each class and students must be able to stay for the entire time if they want to take the class.
EEEB 3910 THE NEANDERTALS. 4.00 points.
CC/GS: Partial Fulfillment of Science Requirement
Offered every other year/rotating with Dynamics of Human Evolution.
Enrollment limited to 13. Priority given at first class session to EBHS majors/concentrators. Not offered during 2021-22 academic year.

Prerequisites: EEEB UN1010 Human Species or ANTH UN1007.
Nearly two hundred after discovery, Neandertals remain one of most enigmatic hominin taxa. What do we understand today about their biology, subsistence, culture, cognitive abilities, and eventual fate? Are they simply extinct relatives or do their genes continue in many of us today? In this seminar we will examine the primary research in an attempt to find answers to some of these questions.

Spring 2022: EEEB UN3910
Course Section/CALL Times/Location Instructor Points Enrollment
EEEB 3910 001/11984 Th 4:10pm - 6:00pm Jill Shapiro 4.00 11/12

EEEB UN3919 Trading Nature: A Conservation Biology Perspective. 4 points.
This course explores the scientific and theoretical conceptualization of nature as a market commodity, through the lens of conservation biology. Students will engage in critical analysis of the ‘traditional’ forms in which biodiversity has been appropriated as inputs into markets such as fisheries, resource extraction, bushmeat and medicine, as well as new market environmentalism.

EEEB OC3920 Biology of African Animals and Ecosystems. 4 points.
Course consists of 6 separate modules, offered in rotation of four, each worth 4 points. Not offered during 2021-22 academic year.

Prerequisites: EEEB W2001 and EEEB W2002 Environmental Biology I and II, or the instructor’s permission.
This course offers a small group of students the unique opportunity to study the ecology, evolution, and behavior of African animals and ecosystems in one of the world’s most biologically spectacular settings, the wildlife-rich savannas of Kenya. In addition to gaining sophisticated training in fieldwork, hypothesis-driven biological research, statistics, and scientific writing and presentation, the course gives participants many opportunities to observe and study a diversity of plants, animals and their interactions. Lectures include core topics in ecology and evolution with emphasis on the African animals and ecosystems that students will see in Kenya. This course is part of a semester abroad program in Tropical Biology and Sustainability based in Kenya and cannot be taken separately on campus.

Spring 2022: EEEB OC3920
Course Section/CALL Times/Location Instructor Points Enrollment
EEEB 3920 001/11985 Dustin Rubenstein 4 8/20

EEEB OC3921 Agriculture and the Environment. 4 points.
Course consists of 6 separate modules, offered in rotation of four, each worth 4 points.

Prerequisites: EEEB W2001 and EEEB W2002 Environmental Biology I and II, or the instructor’s permission.
Students will compare productivity, diversity, and ecological processes in the diverse farming systems of Kenya which include highland and lowland, large and small-scale systems, monoculture cereal crops, mixed farming with crops and livestock, pastoral systems, diverse tree crop systems from plantations to multispecies agroforests, and intensive horticulture. Students spend their time in Kenya learning state of the art techniques for characterizing soils, agricultural landscapes, and ecosystem services. They will use these methods across the range of farming systems to develop projects comparing various aspects of these systems, and explore sustainability issues from the ecological, agricultural, and livelihood disciplines. This course is part of a semester abroad program in Tropical Biology and Sustainability based in Kenya and cannot be taken separately on campus.

EEEB OC3922 Water, Energy and Ecosystems. 4 points.
Course consists of 6 separate modules, offered in rotation of four, each worth 4 points. Not offered during 2021-22 academic year.

Prerequisites: EEEB W2001 and EEEB W2002 Environmental Biology I and II, or the instructor’s permission.
The course will provide an introduction to the principles of hydrological sciences and their application to ecological sciences, with a focus on instrumentation methods for characterizing surface, subsurface, and biological hydrological dynamics in field settings. Lectures and field activities will address the theories of operation, design, and implementation of methods used to quantify hydrological patterns and processes with particular emphasis on characterizing the biological signature and ecological impact of landscape hydrological dynamics. Emphasis will be placed on applications of hydrological science to issues of sustainable landscape use, water resource conservation, and prevention/reversal of land degradation in dryland ecosystems. This course is part of a semester abroad program in Tropical Biology and Sustainability based in Kenya and cannot be taken separately on campus.

EEEB OC3923 Savanna Ecology and Conservation. 4 points.
Course consists of 6 separate modules, offered in rotation of four, each worth 4 points.

Prerequisites: EEEB W2001 and EEEB W2002 Environmental Biology I and II, or the instructor’s permission.
Only six percent of Africa’s land is protected, and these areas are rarely large enough to sustain wildlife populations. Mostly, wildlife must share land with people who also face survival challenges. This course will explore how wildlife and people interact in Kenya, where new approaches to conservation are being developed and implemented. Lectures will cover the ecology of tropical grasslands and first principles underlying conservation and management of these landscapes. Field trips and projects will examine the dynamics between human actions and biodiversity conservation. This course is part of the study abroad program in Kenya on Tropical Biology and Sustainability and cannot be taken separately on campus.
EEEB OC3924 Natural History of African Mammals. 4 points.
Course consists of 6 separate modules, offered in rotation of four, each worth 4 points.
Prerequisites: EEEB W2001 and EEEB W2002 Environmental Biology I and II, or the instructor’s permission.
Introduction to concepts, methods, and material of comparative natural history, with African mammals as focal organisms. Perspectives include morphology, identification, evolution, ecology, behavior and conservation.
Observations and experiments on a variety of species in different habitats and at a range of scales will provide insights into the adaptive value and underlying mechanistic function of mammalian adaptations. This course is based in Laikipia, but may travel to other sites across Kenya, which might include other conservancies and pastoral group ranches.
This course is part of a semester abroad program in Tropical Biology and Sustainability based in Kenya and cannot be taken separately on campus.

EEEB OC3925 Sustainable Development in Practice. 4 points.
Course consists of 6 separate modules, offered in rotation of four, each worth 4 points.
Prerequisites: EEEB W2001 and EEEB W2002 Environmental Biology I and II, or the instructor’s permission.
Students will study the theory and practical application of sustainable development, touching on urban and rural issues in Kenya and other diverse agro-ecological zones in East Africa. They will begin at the Columbia Global Centers/Africa in Nairobi by learning about the administrative and socio-political structures that govern Kenya and East Africa followed by an emersion in the history of the United Nation’s Millennium Development Goals (MDGs). Students will then spend time studying agriculture, education, infrastructure, water, and health issues in other urban and rural areas in Kenya and East Africa to understand the need for an integrated approach to sustainable development. Discussions with communities, field work, practical problem solving, GIS tools, e-tools, modeling, and understanding of the local constraints will form the foundation for this course. This course is part of a semester abroad program in Tropical Biology and Sustainability based in Kenya and cannot be taken separately on campus.

EEEB OC3928 Terrestrial Paleoeology. 4 points.
Prerequisites: (EEEB UN2001) and EEEB UN2002) or permission from instructor
Terrestrial paleoecology is the study of vegetation and animals in ancient ecosystems. The paleoecology of eastern Africa is significant because it can shed light on the potential role that climate played in human evolution. This course aims to teach students the principles of paleoecology primarily through fieldwork, lab work, and research projects. In the first half of the course, students will be introduced to basic methods in the modern Mpala ecosystem. In the second, they will explore the rich record of human evolution in the Turkana Basin. Students will study bones, teeth, plants, or soils to reconstruct modern and ancient ecosystems.

EEEB UN3940 Current Controversies in Primate Behavior and Ecology. 4 points.
CC/GS: Partial Fulfillment of Science Requirement
Taught every two years. Enrollment limited to 15.
Prerequisites: EEEB UN1011 or the equivalent.
Critical in-depth evaluation of selected issues in primate socioecology, including adaptationism, sociality, sexual selection, communication, kinship, dominance, cognition, and politics. Emphasizes readings from original literature.

EEEB UN3994 EBHS SENIOR THESIS SEMINAR. 1.00-3.00 points.
Prerequisites: the instructors permission and senior standing as a major in The Evolutionary Biology of the Human Species (EBHS). Year-long seminar in which senior EBHS majors develop a research project and write a senior thesis. Regular meetings are held to discuss research and writing strategies, review work in progress, and share results through oral and written reports.

EEEB UN3998 Independent Study. 1-3 points.
CC/GS: Partial Fulfillment of Science Requirement
Students conduct research in environmental biology under supervision of a faculty mentor. The topic and scope of the research project must be approved before the student registers for the course.

EEEB GU4001 Society and Nature in the Amazon. 4 points.
The Amazon Basin is one of the largest equatorial forests on earth. Far from being an untouched biome the Amazon has a rich and instigating sociobiodiversity that can be apprehended in its uniqueness since pre-colombian times. History, culture, politics correlated with hydrology, climate and ecology are elements for the understanding of contemporary dynamics in the Amazon. The course aims towards an interdisciplinary approach of the Amazon as a unique ecosystem in Latin America which reflects a myriad of questions crucial for the understanding not only of South America but of nature and society in modern times.

EEEB GU4010 The Evolutionary Basis of Human Behavior. 3 points.
CC/GS: Partial Fulfillment of Science Requirement
Offered intermittently.
Prerequisites: introductory course in evolutionary biology, e.g., EEEB UN1010, EEEB UN1011 or EEEB UN2001, or the instructor’s permission.
This course addresses the role of evolution in contemporary human social behavior, including such topics as kin selection, sexual selection, parenting, altruism, and conflict. Populations explored will include both industrialized and traditional societies, with an emphasis on the interaction between evolutionarily-influenced behavior and the local ecological context.
EEEB GU4110 Coastal and Estuarine Ecology. 4 points.
CC/GS: Partial Fulfillment of Science Requirement

Prerequisites: Environmental Biology I or the equivalent.
Environments close to shore are hugely ecologically important, not least in terms of their contributions to biodiversity, primary and secondary productivity. Coastal and Estuarine Ecology introduces students to a range of nearshore habitats and biota, the processes that operate in these environments, and potential threats through, for example, habitat destruction and alteration, overfishing, and climate change. Field research makes up a large component of the course and its assessment, with students given the opportunity to build proficiency in field observation and enquiry through either several short field trips or a week-long trip to a dedicated marine station. The specific structure of the trip(s) will be determined during the fall, with more details and regular updates listed on the Courseworks site. Please note: occasional field trips on Fridays and Saturdays are required for this course.

EEEB GU4115 Historical Ecology. 3 points.
Not offered during 2021-22 academic year.

Prerequisites: EEEB GU4110.
This will be an interdisciplinary course that seeks to understand how modern ecosystems have been altered over the recent past. Drawing on tools from history, archaeology, anthropology, paleontology, oceanography and ecology this class will focus on equipping students with the skills to adequately assess the factors which have influenced the present distribution and assembly of biodiversity in a particular area. We will apply these skills to understanding the historical ecology of the New York City region and beyond.

EEEB GU4126 Introduction to Conservation Genetics. 3 points.
Not offered during 2021-22 academic year.

In this course, we will use evolutionary genetic principles and population genetic models to describe the extent and distribution of genetic variation in populations and species, and determine ways to conserve it. A basic knowledge of genetics and mathematics is assumed.

Spring 2022: EEEB GU4126

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EEEB GU4150 Theoretical Ecology. 3 points.
Prerequisites: Calculus, Introductory Biology.
This course will provide an introduction to theoretical ecology.
Topics will include population, community, ecosystem, disease, and evolutionary ecology. Lectures will cover classic and current concepts and mathematical approaches. The numerical analysis laboratory will cover computational tools for numerical and graphical analysis of the models we cover in lecture, using MATLAB. By the end of the course, students will be well versed in the basics of theoretical ecology and will be able to read theoretical ecology literature, analyze and simulate mathematical models, and construct and analyze their own simple models.

EEEB GU4210 Herpetology. 3 points.
Not offered during 2021-22 academic year.

Prerequisites: at least one course in Introductory Biology.
The course explores the science of herpetology in three parts: 1) the evolution and ecology of amphibians and reptiles; 2) their physiological adaptations; and 3) requirements for conservation, management, policy and monitoring.

EEEB GU4645 CULTURAL & BIOLOGICAL DIVERSITY. 3 points.
Enrollment limited to 20.
Prerequisites: the instructor’s permission.
Many areas of the world with high biological diversity also have high levels of linguistic diversity (a proxy for cultural diversity). These places are generally in parts of the world that have been, until quite recently, at the frontiers of resource extraction, human migration and resettlement, and capital expansion. Cultural, linguistic, and biological diversity are now imperiled by the same threats (including resource extraction, human migration and resettlement, and capital expansion). This course will explore how different fields have sought to understand and sustain the reciprocal, mutually influencing relationships between human societies and their environments. The term “biocultural diversity” – which denotes the truism that human societies influence and are influenced by the environments of which they are a part – is relatively new (although increasingly in use). Students will be able to differentiate how different scholars and academic traditions define and apply biocultural diversity and will explore its application in biodiversity conservation and cultural revitalization through case studies.

EEEB GU4700 Race: The Tangled History of a Biological Concept. 4 points.
Enrollment limited to 15. Priority given to EBHS majors/concentrators.
Not offered during 2021-22 academic year.

From Aristotle to the 2020 US census, this course examines the history of race as a biological concept. It explores the complex relationship between the scientific study of biological differences-real, imagined, or invented and the historical and cultural factors involved in the development and expression of “racial ideas.” Scientific background not required. [Additional hour for film screenings weekly in second half of the semester-attendance at films is mandatory.] Please note that this course DOES NOT fulfill the SC requirement at the College or GS.

Of Related Interest

Economics
ECON GU4625 Economics of the Environment

Earth and Environmental Sciences
EESC UN2330 SCIENCE FOR SUSTAINABLE DEVPT
EESC GU4050 Global Assessment and Monitoring Using Remote Sensing
EESC GU4550 Plant Ecophysiology
EESC GU4835 Wetlands and Climate Change

Political Science
POLS GU4730 Game Theory and Political Theory