ECOLOGY AND EVOLUTIONARY BIOLOGY

Osborn Memorial Laboratories, 203.432.3837
http://eeb.yale.edu
M.S., Ph.D.

Chair
Thomas Near

Director of Graduate Studies
Erika Edwards

Professors Richard Bribiescas (Anthropology), Nicholas Christakis (Sociology), Michael Donoghue, Casey Dunn, Erika Edwards, Vivian Irish (Molecular, Cellular, & Developmental Biology), Walter Jetz, Thomas Near, David Post, Jeffrey Powell, Richard Prum, Eric Sargis (Anthropology), Oswald Schmitz (School of the Environment), David Skelly (School of the Environment), Stephen Stearns, Jeffrey Townsend (Public Health), Paul Turner, J. Rimas Vaisnys (Electrical Engineering), Günter Wagner

Associate Professors Craig Brodersen (School of the Environment), Liza Comita (School of the Environment), Forrest Crawford (Public Health), James Noonan (Genetics), Carla Staver, Alison Sweeney, David Vasseur

Assistant Professors Martha Munoz, Alvaro Sanchez

Senior Lecturer Marta Martinez Wells

Lecturers Adalgisa Caccone, Linda Puth

FIELDS OF STUDY

The Department of Ecology and Evolutionary Biology (E&EB) offers training programs in organismal biology, ecology, and evolutionary biology including molecular evolution, phylogenetics, molecular population genetics, developmental evolution, and evolutionary theory.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

Each entering student, in consultation with the director of graduate studies (DGS), develops a specific program of courses, seminars, laboratory research, and independent reading tailored to the student’s interests, background, and goals. There are normally no foreign language requirements. All first-year students carry out two research rotations. Students have the option of a rotation over their first summer. Students must participate in (1) E&EB 500 and E&EB 501, Advanced Topics in Ecology and Evolutionary Biology; (2) E&EB 545, a course on the responsible conduct of research; (3) weekly E&EB seminars; and (4) symposia of faculty and graduate student research. In addition, during their first two years of study, graduate students must enroll in a minimum of three additional graduate-level courses (numbered 500 and above); a grade of Honors (H) must be earned in two of these. Teaching experience is regarded as an integral part of the graduate training program. All students are required to teach three courses, normally at the TF-20 level, typically during their first two years of study. Students who require additional support from the Graduate School must teach additional terms, if needed, after they have fulfilled the academic teaching requirement.

By the middle of the fourth term of study, each student organizes a formal preprospectus consultative meeting with the student’s advisory committee to discuss the planned dissertation research. Before the beginning of the fifth term, students present and defend their planned dissertation research at a prospectus meeting, at which the department determines the viability and appropriateness of the student’s Ph.D. proposal. A successful prospectus meeting and completion of course requirements results in admission to candidacy for the Ph.D. The remaining requirements include completion, presentation, and successful defense of the dissertation, and submission of copies of the dissertation to the Graduate School and to the Marx Science and Social Science Library.

In cases where the dissertation committee decides that preliminary field work during the summer after the fourth term is necessary prior to the prospectus, the prospectus meeting can be delayed by one term. A request for a delay must come from the dissertation committee adviser and must be approved by the DGS. In these exceptional cases, admission to candidacy may not be required for registration for the third year of graduate study.

HONORS REQUIREMENT

Students must meet the Graduate School’s requirement of Honors in two courses by the end of the fourth term of study. The E&EB department also requires an average grade of at least High Pass in course work during the first two years of study.

MASTER’S DEGREE

M.S. (en route to the Ph.D.) Students must pass eight graduate-level courses. Required courses are: E&EB 500 and E&EB 501, Advanced Topics in Ecology and Evolutionary Biology; E&EB 545, Responsible Conduct of Research; E&EB 901, Research Rotation I; and E&EB 902, Research Rotation II. These courses are taken Sat/Unsat. A minimum of three additional graduate-level, elective courses are required and must be taken for a grade. Students must earn Honors in at least two courses and maintain an overall average of High Pass.
Additional information on the department, faculty, courses, and facilities is available from Deanna Brunson, Office of the Director of Graduate Studies, Department of Ecology and Evolutionary Biology, Yale University, PO Box 208106, New Haven CT 06520-8106; e-mail, deanna.brunson@yale.edu; tel., 203.432.3837; fax, 203.432.2374; website, http://eeb.yale.edu.

COURSES

E&EB 500a and E&EB 501b, Advanced Topics in Ecology and Evolutionary Biology Erika Edwards
Topics to be announced. Graded Satisfactory/Unsatisfactory.

E&EB 510a / S&DS 510a, Introduction to Statistics: Life Sciences Walter Jetz and Jonathan Reuning-Scherer
Statistical and probabilistic analysis of biological problems, presented with a unified foundation in basic statistical theory. Problems are drawn from genetics, ecology, epidemiology, and bioinformatics.

E&EB 515a, Conservation Biology Linda Puth
An introduction to ecological and evolutionary principles underpinning efforts to conserve Earth’s biodiversity. Efforts to halt the rapid increase in disappearance of both plants and animals. Discussion of sociological and economic issues.

E&EB 520a, General Ecology David Post and David Vasseur
A broad consideration of the theory and practice of ecology, including the ecology of individuals, population dynamics and regulation, community structure, ecosystem function, and ecological interactions on broad spatial and temporal scales. Topics such as climate change, fisheries management, and infectious disease are placed in an ecological context.

E&EB 523Lb, Laboratory for Principles of Ecology, Evolutionary Biology, and the Tree of Life Marta Wells
Experimental approaches to organismal and population biology, including study of the diversity of life.

E&EB 525b, Evolutionary Biology Paul Turner
An overview of evolutionary biology as the discipline uniting all of the life sciences. Evolution explains the origin of life and Earth’s biodiversity, and how organisms acquire adaptations that improve survival and reproduction. This course uses reading and discussion of scientific papers to emphasize that evolutionary biology is a dynamic science, involving active research to better understand the mysteries of life. We discuss principles of population genetics, paleontology, and systematics; and application of evolutionary thinking in disciplines such as developmental biology, ecology, microbiology, molecular biology, and human medicine.

E&EB 545b, Responsible Conduct of Research Jeffrey Powell
This five-week discussion seminar considers issues related to the responsible conduct of research. Topics addressed include research misconduct, plagiarism, data acquisition and management, mentoring and collaboration, authorship and peer review, the use of animals and humans in scientific research, sexual harassment, diversity, and balancing professional and personal life. Graded Satisfactory/Unsatisfactory. 0 Course cr

E&EB 550a, Biology of Terrestrial Arthropods Marta Wells
Evolutionary history and diversity of terrestrial arthropods (body plan, phylogenetic relations, fossil record); physiology and functional morphology (water relations, thermo-regulation, energetics of flying and singing); reproduction (biology of reproduction, life cycles, metamorphosis, parental care); behavior (migration, communication, mating systems, evolution of sociality); ecology (parasitism, mutualism, predator-prey interactions, competition, plant-insect interactions).

E&EB 551La, Laboratory for Biology of Terrestrial Arthropods Marta Wells
Comparative anatomy, dissections, identification, and classifications of terrestrial arthropods; specimen collection; field trips.

E&EB 632a, Evolution and Medicine Stephen Stearns
Introduction to the ways in which evolutionary science informs medical research and clinical practice. Diseases of civilization and their relation to humans’ evolutionary past; the evolution of human defense mechanisms; antibiotic resistance and virulence in pathogens; cancer as an evolutionary process. Students view course lectures online; class time focuses on discussion of lecture topics and research papers. Prerequisites: BIOL 101–BIOL 104.

E&EB 636b / SOCY 636b, Biosocial Science Nicholas Christakis
This seminar (with limited enrollment, but open to anyone) covers topics at the intersection of the natural and social sciences, including behavior genetics, gene-environment interactions, social epigenetics, and diverse other topics.

E&EB 654a, Phylogenetic Biology Casey Dunn
Phylogenetic biology is the study of the evolutionary relationships between organisms, and the use of evolutionary relationships to understand other aspects of organism biology. This course surveys phylogenetic methods, providing a detailed picture of the statistical, mathematical, and computational tools for building phylogenies and using them to study evolution. We also examine the application of these tools to particular problems in the literature and emerging areas of study.

E&EB 672b, Ornithology Richard Prum
An overview of avian biology and evolution, including the structure, function, behavior, and diversity of birds. The evolutionary origin of birds, avian phylogeny, anatomy, physiology, neurobiology, breeding systems, and biogeography.

E&EB 673Lb, Laboratory for Ornithology Richard Prum
Laboratory and field studies of avian morphology, diversity, phylogeny, classification, identification, and behavior. Must be taken concurrently with E&EB 672. ½ Course cr
E&EB 678a, Mathematical Models and Quantitative Methods in Evolution and Ecology  Alvaro Sanchez
In this course, we focus on how quantitative approaches are used to allow scientific inference. We discuss general principles for generating hypotheses that are testable (i.e., quantifiable). The course also examines a variety of approaches used to model population-level processes in evolution and ecology, including an overview of population genetics, quantitative genetics, optimality models, game theory, and population dynamic equations. We also discuss experimental design, statistical analyses, inference, and other quantitative methods. The course assumes a basic background in algebra, calculus, probability theory, and statistics. Please address any questions regarding the course to alvaro.sanchez@yale.edu. Prerequisite: although mathematical refreshers are provided, a college-level calculus course (or equivalent) is necessary in order to follow the materials.

E&EB 680b, Life History Evolution  Stephen Stearns
Life history evolution studies how the phenotypic traits directly involved in reproductive success are shaped by evolution to solve ecological problems. The intimate interplay between evolution and ecology.

E&EB 821a, Advanced Topics in Philosophy of Biology  Casey Dunn and Gunter Wagner
This course focuses on epistemology—how we know what we know. We investigate the various scientific methods that biologists employ, and how these reconcile with approaches in other fields. We also address causality, measurement theory, and the challenges that arise when integrating heterogeneous categories of information that do not have shared ontologies. Prerequisite: E&EB 621 or permission of the instructor.

E&EB 842b / ANTH 835b, Primate Diversity and Evolution  Eric Sargis
The diversity and evolutionary history of living and extinct primates. Focus on major controversies in primate systematics and evolution, including the origins and relationships of several groups. Consideration of both morphological and molecular studies. Morphological diversity and adaptations explored through museum specimens and fossil casts.

E&EB 901a, Research Rotation I  Erika Edwards
E&EB 902b, Research Rotation II  Erika Edwards