THE MAJOR IN

ECOLOGY & EVOLUTIONARY BIOLOGY (E&EB)

IN YALE COLLEGE

2024-2025

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Introduction

Teaching and research in biology at Yale occurs in the three biology departments on Science Hill (Ecology & Evolutionary Biology, Molecular, Cellular, & Developmental Biology, and Molecular Biophysics & Biochemistry), in the Yale School of Medicine, and in the Yale School of Public Health. The depth and breadth of expertise in this community make Yale a leading center for students and scientists.

The Department of Ecology and Evolutionary Biology (E&EB) offers broad education in the biological sciences. By helping us to understand the beauty and complexity of life, it richly supports our curiosity about nature. The subject matter ranges from molecules through cells, organs, organisms, populations, and communities to ecosystems and the ecological and evolutionary processes that have produced and continue to shape them. Biology is currently experiencing an explosion of discovery with important implications for the analysis and treatment of human disease, for the development of biotechnology, and for our capacity to recognize, understand, and deal with human impacts on the environment, including extinctions and global change. The E&EB major delivers some of the major conceptual tools needed to understand these important issues.

The department offers a B.A. or B.S. degree. The B.A. program is appropriate for students who are interested in ecology, evolution and organismal diversity as part of a liberal education but do not intend to pursue graduate work in the discipline. The B.S. program is appropriate for students intending to attend medical or veterinary school or to pursue graduate study in ecology and evolutionary biology, other biological disciplines, or environmental sciences. The two programs share prerequisites but differ in core and senior requirements.

The prerequisites for the E&EB major provide basic scientific literacy. Beyond the prerequisites, either of two tracks will satisfy the E&EB major. The Biodiversity and the Environment track emphasizes courses appropriate for ecology, evolutionary biology, and environmental science careers; the Organismal Biology track emphasizes courses appropriate for pre-medical and pre-veterinary students. Pre-medical and pre-veterinary students in the Organismal Biology track may use courses required by medical schools, but not by the major, as electives.

College seminars do not count toward the requirements of the major.

The department offers a variety of courses without prerequisites for non-majors. These include all 100-level offerings and the 200-level courses that deal with organism groups (e.g., plants, fishes, mammals, birds, insects, and invertebrates).

Independent Research: E&EB majors can pursue independent research in both laboratory and field-based projects. With approval, independent research for credit can be conducted under the supervision of faculty members in any department at Yale.

Studying Abroad: Participation in study abroad programs is encouraged. Credit for courses taken abroad may apply to the major if approved in advance by the DUS, who will want to see a syllabus that describes content, workload, and methods of evaluating performance. You are strongly encouraged to consult with the DUS before studying abroad.

Credit/D/Fail: No course taken to fulfill distribution requirements, as a prerequisite of the E&EB major, or as a requirement of the E&EB major may be taken Credit/D/Fail. All such courses must be taken for a letter grade.

What can the E&EB Major do for me?

The E&EB major provides excellent preparation for a wide range of careers in health care, public health, science communication, teaching, conservation, resource management, climate change, and research. E&EB undergraduates enjoy a high rate of acceptance at medical and graduate schools. Four years after graduation, most of our majors are employed in secondary or higher education, medicine (including veterinary & sports), or the tech sector. You'll also find our former students in legal, financial, and community services; environmental, agricultural, and industrial consulting; and working at all levels of government.

As one of the smaller Life Sciences departments, we are positioned to support and guide our individual students from the time they declare the major until graduation. At your request, our Assistant DUS for Research can help to connect you with research labs which match your interests beginning as early as sophomore year. Our major is structured to give you a broad, interdisciplinary foundation on which to explore and develop your future research.

Starting in the E&EB Major

BIOL Introductory Courses

E&EB, MCDB and MB&B combine efforts to teach a yearlong Introductory Biology course consisting of four one-half credit modules. The completion of all these modules is a prerequisite for each of these majors and will probably also be necessary for any student contemplating a career in the health sciences regardless of the student's major.

BIOL 101, Biochemistry and Biophysics. Edgar Benavides, Lilian Kabeche, Michael Koelle, & Thomas Loreng**.** MW 11:35 – 12:50, 1/2 credit

Introduction to the study of life at the molecular level. Topics include the three-dimensional structures and function of large biological molecules, the human genome, and the design of antiviral drugs to treat HIV/AIDS. The first of four modules in a yearlong introductory biology sequence; meets for the first half of the term.

BIOL 102, Principles of Cell Biology and Membrane Physiology. Edgar Benavides, Amaleah Hartman, Valerie Horsley, & Thomas Loreng. MW 11:35 – 12:50, 1/2 credit

Introduction to the study of cell biology and membrane physiology. Topics include the organization and functional properties of biological membranes, membrane physiology and signaling, rough endoplasmic reticulum and synthesis of membrane/secretory membrane proteins, endocytosis, the cytoskeleton, and cell division. The second of four modules in a yearlong introductory biology sequence; meets for the second half of the term.

BIOL 103, Genes and Development. Edgar Benavides, Thomas Loreng, Vivian Irish, & Weimin Zhong, MW 11:35 – 12:50, 1/2 credit

Introduction to genes, genetics, and developmental biology. How genes control development and disease; Mendel's rules; examples of organ physiology. The third of four modules in a year-long introductory biology sequence; meets for the first half of the term.

BIOL 104, Principles of Ecology and Evolutionary Biology. Edgar Benavides, Thomas Loreng, Thomas Near, & Carla Staver. MW 11:35 – 12:50, 1/2 credit

Introduction to ecology, evolutionary biology, animal behavior, and the history of life. Evolutionary transitions and natural selection. Adaptation at genic, chromosomal, cellular, organismal, and supra-organismal levels. Distributional and social consequences of suites of organismal adaptations. The fourth of four modules in a year-long introductory biology sequence; meets for the second half of the term.

Placement Exam for BIOL Requirement

Students are required to take all four of the BIOL introductory modules as prerequisites for the E&EB, MB&B and MCDB majors. Students with score of 5 on the AP Biology Exam or a score of 7 on the IB Biology exam are eligible to take a Yale-developed placement exam in the biological sciences available to incoming first-years as an online exam beginning sometime in July. Based on performance on the placement exam, students may be exempted from some of the introductory

modules. ***The placement exam option is only allowed to incoming first-years. Students cannot take this exam later in their studies.***

The Department of Molecular Biophysics and Biochemistry (MB&B) has provided a guide to BIOL placement exams at https://mbb.yale.edu/academic-programs/undergraduate-education/biol-101-104-placement-exams.

Note that many courses will require one or more of the introductory modules as prerequisites. Please check each course description carefully.

Prerequisites for the E&EB Major

The prerequisites for the major are intended to provide core scientific literacy; they include courses in biology, chemistry, physics, and mathematics. Finishing these introductory courses early allows for a more flexible program in later years, but it is not necessary to complete them before declaring the major.

The introductory biology sequence (BIOL 101, 102, 103, and 104) is required. Also required are a two-term lecture sequence in General Chemistry, (CHEM 161 & 165 or CHEM 163 & 167) taken with associated laboratories (CHEM 134L and 136L); one term of mathematics (MATH 115, 116, or 120) or one term of statistics & data science (S&DS 100 or 230). Optionally, Organic Chemistry for First Year Students (CHEM 174 and 175) and the associated laboratories (CHEM 222L and 223L) satisfies the chemistry requirement. A different statistics course approved by the Director of Undergraduate Studies (DUS) may be substituted for the mathematics prerequisite.

Students must take four additional courses, *for a total of four credits*, from among the following options: MATH 115 or 116, MATH 118 or 120, MATH 222 or 225, MATH 230 or 231, MATH 235, 241, 242, 244, 246, 247, 250, 255, S&DS 100-106, 220, 230, 238, 240, CPSC 100, 112, 123, 201, CHEM 174 or 220, CHEM 175 or 221, CHEM 222L, 223L, PHYS 170 or 180, PHYS 171 or 181, EPS 110, 212, 220, 222, 232, 240, 255. No more than two of these four additional courses may originate in the same department. Further prerequisite options will be determined periodically; please consult Yale Course Search with the course attribute "YC E&EB: Prereq Option" for the most current list.

An online program, ONEXYS for Physics, is offered in the summer by the Mathematics and Physics departments and by the Poorvu Center for Teaching and Learning to review math skills needed in preparation for introductory physics courses.

Acceleration credit awarded in chemistry, mathematics, and physics, or completion of advanced courses in those departments, may be accepted in place of the corresponding prerequisites for the E&EB major. Students who have mathematics preparation equivalent to MATH 115 or higher are encouraged to take a statistics course (usually S&DS 101–106) and/or additional mathematics or statistics courses such as MATH 120, 121, 222, or 225 and S&DS 220 or 230. Because chemistry courses are prerequisite to several E&EB courses, students are strongly urged to take general chemistry in the first or second year.

Roadmap to the Major

Ecology and Evolutionary Biology

	B.S. Ecology and Evolutionary Biology *Concentrations:* *Biodiversity and the Environment,* ***or*** *Organismal Biology*	B.A. Ecology and Evolutionary Biology *Concentration:* *Biodiversity and the Environment*	B.A. Ecology and Evolutionary Biology *Concentration:* *Organismal Biology*
Degrees Offered			
Prerequisites for entering the major	**Intro Biology sequence** (BIOL 101, 102, 103, and 104)		
	2 term lecture sequence in General Chemistry (CHEM 161, 165 or CHEM 163, 167) with labs (CHEM 134L, 136L)		
	1 term mathematics or 1 term of statistics & data science MATH 115 or MATH 116 or MATH 120 or S&DS 100 or S&DS 230		
	4 total credits, no more than two term lecture coures in a departmental offering MATH 115 or 116 MATH 118 or 120 MATH 222 or 225 MATH 230 or 231 MATH 235 MATH 241 MATH 242 MATH 244 MATH 246 MATH 247 MATH 250 MATH 255 S&DS 100-106 S&DS 220 S&DS 230 S&DS 238 S&DS 240 CPSC 100 CPSC 112 CPSC 123 CPSC 201 CHEM 174 or 220 CHEM 175 or 221 CHEM 222L CHEM 223L PHYS 170 or 180 PHYS 171 or 181 EPS 110 EPS 212 EPS 220 EPS 222 EPS 232 EPS 240 EPS 255		
Requirements for each degree	**B. S. Degree** **5.5 course credits** (not incl prereqs or senior req)	**B.A. Degree** **3.5 course credits** (not incl prereqs or senior req)	**B.A. Degree** **3.5 course credits** (not incl prereqs or senior req)
	Same as B.A. degree requirements (either concentration).	E&EB 220	E&EB 290 & 291L
	Two electives, at least one elective must be a lecture or a seminar.	E&EB 225	E&EB 295 or BENG 350
		1 course from E&EB 246-272 or 280 with lab or E&EB 326 and 327L	MCDB 300 or MB&B 300
Senior Requirements	**2 terms original research** (E&EB 475, 476) **or** (E&EB 495, 496)	**1 term independent study** (E&EB 470) **or** **Senior Essay in a course**	**1 term independent study** (E&EB 470) **or** **Senior Essay in a course**

Research Opportunities

Students interested in research can work on a broad spectrum of subjects in E&EB, MCDB, MB&B, Earth & Planetary Studies (EPS), Anthropology (ANTH), and in the Schools of Medicine (YSM), Public Health (YSPH), and the Environment (YSE). Those subjects include molecular biology, biochemistry, genetics, cell biology, neurobiology, physiology, environmental sciences, plant science, ecology, evolution, and behavior. Students may work in laboratories for academic credit or experience, and financial support may be available, but students who are being directly paid may not receive course credit.

The choice of a research laboratory should be made in consultation with faculty members and the Director of Undergraduate Studies (DUS) or Assistant DUS (ADUS). Opportunities can be found on the following web sites: https://eeb.yale.edu/, https://biology.yale.edu/, https://undergradresearch.yale.edu/, and https://www.yura.yale.edu/ . Descriptions of research programs within E&EB can be found below in the section titled *Faculty and Research Interest.* Assistant DUS Marta Wells can also assist students in identifying prospective research advisors.

Research Courses

During the academic year, seniors with DUS or ADUS approval may take E&EB 475 & 476 or E&EB 495 & 496. These courses are designated for students who are doing independent research to fulfill the senior requirement for the Bachelor of Science degree. Students who wish to do research earlier in their course of study may take E&EB 469 or E&EB 474 *before* their senior year. These courses do not substitute for other major requirements, but all count towards the 36 credits required for the Yale College degree. For research courses, hours are typically arranged at the mutual convenience of the student and the faculty advisor. Students taking these courses are expected to devote an average of 10 hours per week to their research. Approval from the Yale College Committee on Honors and Academic Standing is required to exceed certain limits. A student must petition that committee for permission to enroll in more than one research course in any one term before the senior year or for more than 2 course credits in research in any one term during the senior year. Permission is also required for a student to enroll in more than three such course credits in the first six terms of enrollment. In the petition, sound academic reasons must be given for exceeding these limits.

Students taking E&EB 475 & 476 are expected to spend at least 10 hours per week in the laboratory of a faculty member over two terms in senior year. Students must re-register each term to be enrolled, and at the completion of *each* term, a paper must be submitted to their professor. ***Please note that taking E&EB 475/476 or E&EB 495/496 does not satisfy the lab requirement or the elective requirement.***

Summer Research

Yale students can also do full-time research with a faculty member over the summer. Summer research allows students to continue research begun during the previous academic year or to begin research that will be continued during the subsequent academic year. Some faculty members have grant funds that can support students during the summer. Other possibilities for financial support can be found at http://www.yale.edu/yser/fellowships.html . Interested students should consult a member of the Yale faculty or the DUS. Academic credit is not granted unless the student is registered in (and paying tuition to) the Yale summer school.

Summer research at other institutions is possible through several programs. Yale does not award academic credit for research done at other institutions, even if done in the context of a course.

Go to studentgrants.yale.edu to look for sources of research funding.

Go to YSE Career Development Office for internship opportunities.

USA Summer Programs in Field Stations (NOT an exhaustive list – feel free to search further!):

Biological Field Stations: http://www.obfs.org/

Duke University Marine Laboratory: http://www.nicholas.duke.edu/marinelab/

Cary Institute of Ecosystems Studies: https://www.caryinstitute.org/about

Marine Biological Laboratory – Woods Hole: http://www.mbl.edu

Mountain Lake Biological Station – University of Virginia http://mlbs.virginia.edu

Shoals Marine Laboratory: http://www.sml.cornell.edu

University of Michigan Biological Station: http://www.lsa.umich.edu/umbs/

University of Notre Dame Environmental Research Center: https://underc.nd.edu/education/

Studies Abroad

E&EB majors may participate in programs that include study abroad. Programs approved for a full semester of credit by the Yale College Studies Abroad program include the Organization for Tropical Studies (OTS) in Costa Rica and School for Field Studies in several localities. More detailed information can be found on the web site: http://www.yale.edu/yalecollege/international/

Application to both the programs and to the Studies Abroad Committee should be done early in the semester preceding the semester spent abroad. Summer programs also exist that may be used to fulfill some degree requirements, and in some cases credit can be transferred. How the credit in programs abroad might be applied to fulfilling the E&EB major requirements depends on the program chosen and should be discussed with the DUS early in planning in a conversation supported by the syllabus of the proposed course.

Here is some information on opportunities for study abroad in E&EB.

Organization for Tropical Studies – Costa Rica, South Africa
Semester and summer (Costa Rica only) programs available. Study either tropical biology and environmental science in Costa Rica or savanna ecology and conservation in South Africa.
https://tropicalstudies.org/

Tropical Biology Association – Uganda, Tanzania, Madagascar
Summer and four-month courses in tropical ecology and conservation. These courses highlight up-to-date concepts and techniques in tropical ecology and conservation.
http://www.tropical-biology.org

School for Field Studies (SFS) – Australia, Bhutan, Cambodia, Chile, Costa Rica, Kenya, Panama, Peru, Tanzania, and Turks and Caicos Islands. Semester and summer programs available. SFS teaches students field research skills through cooperative work with local communities, conservation organizations, and government agencies.
http://www.fieldstudies.org

Council on International Education Exchange – Africa, Australia, Latin America, Middle East
Semester, academic year, and summer programs available. CIEE offers programs at universities and field stations. Students can choose from a variety of arts and science courses including Biology, Ecology, and Environmental Studies.
http://www.ciee.org

AustraLearn – Australia, New Zealand
Semester, academic year, summer, and internship programs available. AustraLearn offers programs at universities in Australia and New Zealand. Students can choose from a variety of arts and science courses including Animal Science, Biology, Botany, Ecology, Environmental Science, Marine Biology, and Zoology.
http://www.australearn.org

Denmark International Study (DIS) – Copenhagen
Semester, academic year, and summer programs available. Students can select from one of the biology disciplines: Marine Biology and Ecology, or Environmental Biology, or Molecular Biology and Genetics, or Medical Practice and Policy. Students may also combine courses from the various disciplines. https://disabroad.org/

Institute for Study Abroad (IFSA)
Semester or academic year programs available. ISA offers programs at universities in 19 countries. Students can choose from a variety of arts and science courses including Anatomy, Biology, Ecology, Entomology, Environmental Science, Forestry, Genetics, and Zoology.
http://www.ifsa-butler.org/

Institute for Tropical Marine Ecology – West Indies
Semester and summer programs available. Academic programs in marine ecology, research, and conservation.
http://itme.org/

Institute for Tropical Ecology and Conservation ITEC – Panama
Tropical field courses include lectures, field exercises, and individual research.
http://www.itec-edu.org/

Where to get advice

The advising system for students majoring in E&EB provides clear information on programs of study through the students' four years at Yale. Each student has three formal advisors to guide academic choices but finding the right person for a specific issue can take student initiative.

The First Year…

Upon entering Yale, each student is assigned to one of the fourteen residential colleges on campus. With this initial assignment, the first-year student encounters a team of three important advisors who help to answer questions and direct the student's choice of classes.

First, each entering student is assigned a *first-year counselor (froco)*, who is a senior living with the first-year class. The froco gives the first-years a "student's eye view" of the curriculum, courses, and instructors. Valuable as this is, it should not substitute for the advice of a faculty advisor, which is particularly important for first-years who are considering a major in science. The second advisor, also a member of the student's residential college, is usually a faculty fellow of that student's college and sometimes a member of the E&EB department. The faculty advisor is responsible for advising the student about fulfilling distributional requirements in the first year. The third member of the first-year advising team is the student's residential dean. The dean has ultimate authority over the student's decisions for courses and programs of study. If the first-year faculty advisor is not a member of a science department in Yale College, the student is strongly advised to consult with the DUS in the field of the student's primary interest. Prospective science majors should arrange advising meetings before classes start in the fall.

The most important issue for prospective E&EB majors is taking Chemistry in the first year because many courses require two terms of chemistry, sometimes followed by biochemistry. Starting this sequence early is essential. If a first-year student takes a second science course, it should be the introductory Biology sequence (BIOL 101 – 104). One may postpone the laboratory for chemistry until the year after the course is taken, but this is not recommended. Math and other prerequisites can be taken later.

…and Beyond

After the first year, a student may continue with the faculty advisor assigned for the first year or can choose a new faculty advisor for the sophomore year. E&EB majors should find an advisor in the program as soon as they decide on the major. A list of E&EB faculty and their affiliated colleges can be found in the next section. The sophomore year advisor usually remains a student's advisor for the next two years, but students may switch if they prefer another individual. Students may consult with the E&EB DUS and ADUS to identify an appropriate faculty advisor. When you have identified a faculty advisor, please inform the E&EB Registrar.

The E&EB faculty advisor has four roles: (1) ensuring that the student fulfills the requirements for graduation; (2) ensuring that the student fulfills the requirements of the major; (3) giving guidance on the student's curriculum and future career plans; (4) writing letters of recommendation for the student when requested.

The regular faculty advisor can handle most routine issues. Certain matters need the attention of the DUS or ADUS. The E&EB DUS' names, phone numbers, and email addresses are on the inside cover of this booklet. They can also be reached through the E&EB Registrar.

Yale Ecology and Evolutionary Biology Undergraduate Group (YEEBUG)

YEEBUG is an undergraduate organization dedicated to building the E&EB community at Yale. YEEBUG provides a diverse network of other students majoring in E&EB, all of whom are eager to help out whether you are a declared major, thinking about declaring the E&EB major, or are interested in any small aspect of E&EB. YEEBUG holds social events, organizes topical panels and dinners with professors, leads field trips, and represents the group at bazaars and academic fairs. Students in the major hail from diverse backgrounds and are interested in a wide array of topics: they range from viral evolution to primate psychology, anthropology to conservation policy, fish phylogenetics to microbial ecology, agricultural entomology to biogeography and landscape ecology.

Prospective majors are welcome at all events! If you would like to subscribe to the newsletter, get in touch, or get involved please email yeebugboard@gmail.com. Check out our insta @yale.eeb.undergrads.

E&EB Faculty and Research Interests

Primary Faculty

Adalgisa Caccone
Lecturer in Ecology and Evolutionary Biology and Senior Research Scientist in Ecology and Evolutionary Biology, School of the Environment, and Epidemiology (Microbial Diseases)

21 Sachem St, ESC 140, New Haven, CT 06511
adalgisa.caccone@yale.edu Phone: 203-432-5259

Research Interests: Molecular evolution and conservation genetics.

Jennifer Coughlan
Assistant Professor of Ecology and Evolutionary Biology

21 Sachem St, ESC 358, New Haven, CT 06511
jennifer.coughlan@yale.edu

Research Interests: Evolutionary genetics, using a charismatic group of wildflowers (Mimulus) to understand the genetic basis and evolutionary drivers of adaptation and speciation in nature.

Martina Dal Bello

Assistant Professor of Ecology and Evolutionary Biology

840 West Campus Drive, West Haven, CT 06516
martina.dalbello@yale.edu

Research Interests: Community ecology, microbial ecology, marine ecology, climate change.

Mary Beth Decker
Research Scientist in Ecology and Evolutionary Biology; Lecturer in School of the Environment

165 Prospect St, OML 316B, New Haven, CT 06511
marybeth.decker@yale.edu Phone: 203-432-6293

Research Interests: Biological oceanography, jellyfish blooms in changing coastal and estuarine ecosystems.

Annise Dobson

Lecturer and Associate Research Scientist

165 Prospect St, OML 326A, New Haven, CT 06511

annise.dobson@yale.edu

Research interests: The role of soil fauna in community and nutrient dynamics of urban and managed forest ecosystems.

Casey Dunn

Professor of Ecology and Evolutionary Biology

165 Prospect St, OML 326A, New Haven, CT 06511
casey.dunn@yale.edu Phone: 203-432-3109

Research Interests: Comparative invertebrate zoology. We use phylogenetics to study evolution of genomes, genome function, morphology, and siphonophores.

Erika Edwards

Professor of Ecology and Evolutionary Biology; Curator of Botany Peabody Museum of Natural History; Director Marsh Botanical Gardens

165 Prospect St, OML 326B, New Haven, CT 06511
erika.edwards@yale.edu Phone: 203-432-3869

Research Interests: Evolution; phylogenetics; plant structure and function; ecological adaptation.

Vanessa Ezenwa
Professor of Ecology and Evolutionary Biology

165 Prospect St, OML 427, New Haven, CT 06511
vanessa.ezenwa@yale.edu Phone: 203-432-2614

[Pierson College Fellow]

Research Interests: Disease ecology, behavioral ecology, ecoimmunology, parasitology.

Walter Jetz
Professor of Ecology Evolutionary Biology; School of the Environment

165 Prospect St, OML 401, New Haven, CT 06511
walter.jetz@yale.edu Phone: 203-432-7540

Research Interests: Macroecology; community ecology; biogeography; global change biology; conservation; ecology and evolution of terrestrial vertebrates.

Joshua Moyer
Lecturer of Ecology and Evolutionary Biology

165 Prospect St, OML 103A, New Haven, CT 06511
joshua.moyer@yale.edu

[Saybrook College Fellow]

Research Interests: Functional anatomy & biodiversity of vertebrates, specializing in the ecological morphology & systematics of cartilaginous fishes (sharks and their relatives) using methods in kinematics, animal behavior, gross anatomy & dissection, histology, and biomedical imaging.

Martha M. Muñoz
Assistant Professor of Ecology and Evolutionary Biology

165 Prospect St, ESC 368, New Haven, CT 06511
martha.munoz@yale.edu Phone: 203-432-9861

[Jonathan Edwards College Fellow]

Research Interests: The Ecology and Evolution of life in motion by integrating physiology, biochemistry, and behavior. We focus on reptiles and amphibians as model systems.

Thomas Near
Professor of Ecology and Evolutionary Biology; Bingham Oceanographic Curator of Ichthyology, Peabody Museum of Natural History, Head of College-Saybrook College

21 Sachem St, ESC 364, New Haven, CT 06511-8934
thomas.near@yale.edu Phone: 203-432-3002

Research Interests: Evolutionary biology of fishes – retracing how species and lineages are treated to one another, primarily using DNA sequence data to reconstruct the evolutionary relationships of species represented through branching diagrams and phylogenies.

C. Brandon Ogbunu
Assistant Professor of Ecology and Evolutionary Biology; member of the Chemical Biology Institute, West Campus

165 Prospect St, OML 253A, New Haven, CT 06511
brandon.ogbunu@yale.edu Phone: 203-432-7805

[Saybrook College Fellow]

Research Interests: Systems biology, population genetics, epidemiology, disease ecology and evolution, science and society.

David M. Post
Professor of Ecology and Evolutionary Biology

165 Prospect St, OML 426B, New Haven, CT 06511
david.post@yale.edu Phone: 203-432-3005

Research Interests: Aquatic ecology; food-web structure and dynamics; eco-evolutionary interactions; environmental change.

Richard O. Prum
William Robertson Coe Professor of Ornithology of Ecology and Evolutionary Biology, Curator Vertebrate Zoology (Ornithology) Peabody Museum of Natural History

21 Sachem St, ESC 164, New Haven, CT 06511
richard.prum@yale.edu Phone: 203-432-9423

Research Interests: Evolutionary ornithology, including phylogenetics, behavior, feathers, structural color, evolution and development, sexual selection, and historical biogeography.

Linda Puth
Lecturer in Ecology and Evolutionary Biology

165 Prospect St, New Haven CT 06511
linda.puth@yale.edu Phone: 203-432-8099

[Timothy Dwight Fellow]

Research Interests: Community assembly and the consequences of diversity, primarily in freshwater algae.

Eric Slessarev
Assistant Professor of Ecology and Evolutionary Biology

165 Prospect St, New Haven CT 06511
eric.slessarev@yale.edu

[Pierson Fellow]

Research Interests: Soil science, terrestrial biogeochemistry, ecosystem-geosphere interactions, carbon and nutrient cycling.

Carla A. Staver
Associate Professor of Ecology and Evolutionary Biology; Associate Director of the Yale Institute for Biospheric Studies

165 Prospect St, OML 404, New Haven, CT 06511
carla.staver@yale.edu Phone: 203-436-9200

Research Interests: Landscape ecology of savannas and forest; fire and herbivore feedbacks; temporal and spatial variability as ecological driver; historical dependence in ecology.

Alison Sweeney
Associate Professor of Physics; Ecology and Evolutionary Biology

217 Prospect St, SCL 131, New Haven, CT 06511
alison.sweeney@yale.edu Phone: 203-432-3650

Research Interests: Molecular evolution of self-assembling protein photonic structures in mollusks and optical characterization of the sophisticated roles they play in camouflage and photosynthetic symbiosis.

Paul Turner
Rachel Carson Professor of Ecology and Evolutionary Biology; Microbiology Faculty, Yale School of Medicine

165 Prospect St, OML 327B, New Haven, CT 06511
paul.turner@yale.edu Phone: 203-432-5918

Research Interests: Virus evolutionary genetics and genomics, mostly in bacteriophages and arthropod-borne viruses. We use experimental evolution to test basic biology questions, and conduct applied research on virus-based therapies to treat disease.

David Vasseur
Professor and Chair of Ecology and Evolutionary Biology

165 Prospect St, OML 426A, New Haven, CT 06511
david.vasseur@yale.edu Phone: 203-432-2719

Research Interests: Theoretical ecology; biodiversity-ecosystem function; impacts of environmental variability on population, community, and ecosystem processes; spatial population synchrony.

Marta Lucia Martinez Wells
Senior Lecturer of Ecology and Evolutionary Biology

165 Prospect St, OML 103B, New Haven, CT 06511
marta.wells@yale.edu Phone: 860-428-4995

Research Interests: Insect behavior and evolution; mating signal and speciation in neuropteran insects.

Michelle Wong
Assistant Professor of Ecology and Evolutionary Biology

165 Prospect St, New Haven CT 06511
michelle.y.wong@yale.edu

[Grace Hopper Fellow)

Research Interests: Ecosystem ecology, biogeochemistry, plant-soil feedbacks, nutrient cycling.

Affiliated Faculty

Richard Bribiescas
Professor of Anthropology

10 Sachem St, Room 202, New Haven, CT 06511
richard.bribiescas@yale.edu Phone: 203-432-2049

Craig Brodersen
Associate Professor of School of the Environment

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Nicholas Christakis
Sol Goldman Family Professor of Social & Natural Science; Professor of Internal Medicine General

17 Hillhouse Ave, 17HLH, New Haven, CT 06511
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Liza Comita
Assistant Professor of School of the Environment

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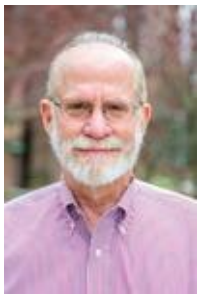
Forrest Crawford
Assistant Professor of School of Public Health

300 George St, New Haven, CT 06511
forrest.crawford@yale.edu Phone: 203-785-6125



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Recommendations for Premedical Students

Most medical schools require:

One year of Biology plus one year of laboratories (University of Texas medical schools require two years of biology)

Two years of Chemistry plus two years of laboratories

One year of Physics plus laboratories

At least one term of calculus; some require a full year of mathematics

Biochemistry plus laboratory is often recommended by medical schools for pre-medical students and is listed by them under the Chemistry requirements, not Biology.

Many medical schools require two terms of English; some require 2-3 terms.

Increasingly, medical schools are recommending/requiring courses in statistics, psychology, and other social sciences.

Medical schools require that all courses used to fulfill the basic pre-medical requirements be taken for a letter grade, not Credit/D/Fail. In addition, only grades of C or higher are accepted. C- or lower grades are not acceptable.

Students who expect to apply to medical school should consult the Health Professions Advising Program (HPAP) at the Office of Career Strategy (OCS) located at 55 Whitney Avenue (203-432-0803), preferably during their first term at Yale. Catalogues for every American and most Canadian medical schools are available on the Internet.

Some state-supported medical schools and a few private medical schools have additional course requirements in the humanities and social sciences. All pre-medical students should check the requirements of their state-supported medical schools, as more than 70% of applicants matriculate in such schools. Individual medical school course requirements for American and Canadian applicants can be found in the AAMC publication, *Medical School Admission Requirements (MSAR),* available in the Health Professions Department at the Office of Undergraduate Career Services. Also see https://students-residents.aamc.org/

The HPAP publishes an informational bulletin with general information, *Preparing to Become a Health Care Professional*, plus specific information for those about to apply for admission to medical school (primarily junior and seniors), *Applying to Medical School*.

Students who are interested in applying as MD/PhD applicants should obtain a copy of the OCS publication, *General Information about MD/PhD Programs*. All are available on the OCS website at www.yale.edu/career/students/gradprof/medschool or at the OCS office.

Facilities

The offices and laboratories of the primary faculty members in EEB are in two buildings on Science Hill – Osborn Memorial Laboratories (OML) and the Environmental Sciences Center (ESC). OML will be undergoing renovations from 2025-2028, during which time its offices will be redistributed through SCL, YSB, KGL, and the Peabody Museum. Joint appointees are housed in their home departments. Other laboratories are in the buildings listed below.

Libraries: The several science libraries collectively constitute one of the greatest collections of biological literature in the world. The Marx Science and Social Science Library (formerly CSSSI), Peabody Museum (ornithology and entomology), Kline Geology Library (paleobiology), School of the Environment, (forestry and environmental biology), Engineering Library and Medical Library (biomedical sciences) together represent a collection of approximately one million volumes.

The Marx Library is in the concourse level of Kline Tower at 219 Prospect Street. It houses both the literature of sciences and social sciences and supports computing and analysis with its StatLab. Please visit their web site for additional information. marx.library.yale.edu

Computer Facilities: Yale Information and Technology Services (ITS) provides both mainframe and microcomputer resources to the student community. A software library is available for download. Biomedical Computer Facilities, located at the Medical School's Center for Medical Informatics (medicine.yale.edu/ycmi) and accessed through remote or local terminals, are available for DNA and protein sequence analysis. The residential colleges are fully networked for access to Yale computing facilities and the Internet.

Peabody Museum of Natural History: With collections dating to 1825 and now numbering over 2,000,000 units, Yale's Peabody Museum is a major resource for research and teaching in the biological sciences. Of interest to those studying the history and diversity of life are its world-famous holdings of fossil vertebrates, including dinosaurs (150,000 units), fossil invertebrates (275,000 units), and fossil plants (100,000 units), as well as its collections of modern birds (100,000 units), insects (1,250,000 units), other animals (300,000 units), and plants (250,000 units). Students may do research and work with any of the scientific staff members of the Museum. peabody.yale.edu/education/yale-community/research-work

Genomics and Molecular Biology Facilities: University services for all aspects of molecular biological research are available in various Yale facilities. These include oligonucleotide synthesis, DNA sequencing, monoclonal and polyclonal antibody preparation, peptide synthesis, cell sorting, and amino acid analysis. In addition, facilities are available for mass spectrometry and X-ray crystallography. Equipment to generate and analyze DNA chips and protein microarrays are located both at the Yale Medical School and in the Department of Molecular, Cellular, and Developmental Biology (MCDB). Mass spectrometry, high throughput chemical genomic screening, and next generation genomic DNA sequencing including Roche/454 and Illumina/Solexa are available in the MCDB Department. In addition, the laboratories for teaching and faculty research are equipped with state-of-the-art instrumentation and equipment for specific projects.

Imaging Facilities: MCDB operates a modern light microscope imaging facility supervised by Dr. Joseph Wolenski. These microscopes are available to the Yale scientific community at competitive hourly rates. Equipment includes two Zeiss LSM 510 confocal inverted microscopes, one with near-infrared two-photon imaging capabilities and a temperature- controlled stage. MCDB also houses a spinning disk confocal microscope and a Nikon wide field microscope equipped with a color camera

for histological slides and a sensitive CCD camera for fluorescence imaging.

Structural Analysis/Electron Microscopy Facilities: MCDB operates a Structural Analysis Laboratory that includes both scanning and transmission electron microscopes and related equipment for processing, sectioning, and imaging support. These facilities are used in both teaching and research and are core resources also available to members of E&EB and other Science Hill departments.

Yale Institute for Biospheric Studies (YIBS), located on the first floor of the Environmental Science Center, is the umbrella environmental science center on campus. We support and inspire the environmental community at Yale through research and training, grants and fellowships, and weekly seminars and events. We use a collaborative and cross-disciplinary approach to study the entire biosphere: from molecules to landscapes, and everything in between. yibs.yale.edu

The Center for Genetic Analyses of Biodiversity (CGAB) within YIBS offers one-on-one training and workshops to teach students how to select and use genetic markers and analytical tools. In addition to standard molecular lab equipment, it offers many pieces to assist with modern techniques such as creating libraries for Next Generation Sequencing. cgab.yale.edu

Yale Center for Earth Observation (YCEO) is a centralized source of remote sensing hardware, software, and expertise for the Yale community. Assistance is available to help users in the selection, procurement, and analysis of satellite images for their research. This research and teaching lab is one of the Yale Institute of Biospheric Studies (YIBS) research centers, and is co-sponsored by the Yale School of the Environment. Visit: yceo.yale.edu

Plant and Animal Husbandry: Numerous controlled-environment growth chambers, constant temperature rooms, greenhouses and plant tissue culture facilities are available for environmentally controlled growth of plant materials. The major animal care facility for small mammals for the Arts and Sciences campus is also located on Science Hill.

Herbarium: The Yale Herbarium (currently housed in the Peabody Museum) consists of 350,000 systematically arranged plant specimens from the algae to vascular plants. The collection includes significant type specimens in the mosses and ferns with a representation of most families and important genera of the flowering plants.
peabody.yale.edu/explore/collections/botany

Marsh Botanical Garden: The University's botanic garden and arboretum is located north of OML on the grounds of Marsh Hall at Prospect Street and Hillside Terrace. The garden features a diverse collection of native and exotic trees, shrubs, and perennials highlighting plant communities and environmental change. The greenhouses feature plants from tropical regions and arid climates as well as economically important crops. Erika Edwards (Professor of Ecology and Evolutionary Biology) is the Director of the Marsh Botanical Gardens. Kunso Kim is the Associate Director. Garden Staff includes Chris Bolick, Plant Research Facilities Manager, David Garinger, Curator of Greenhouse Plant Collections, Robert Rak, Research Aide and Nathan Guzzo, Horticulturist. marshbotanicalgarden.yale.edu.

Yale's West Campus: The Core Facilities on Yale's West Campus currently include: Yale Center for Molecular Discovery, Yale Center for Genome Analysis, West Campus Analytical

Core, West Campus Imaging Core, West Campus Materials Characterization Core, and West Campus Cleanroom. The Krios cryo-electron microscope, a technology that is enabling scientists to visualize the molecules of biological life in atomic detail, was unveiled at Yale in 2017. For more information visit: westcampus.yale.edu/core-centers

Yale Nature Preserve: This tract in the Westville section of New Haven adjoins the Yale Golf Course. It is heavily wooded and has a central pond. Many groups of terrestrial and freshwater organisms are well represented in natural communities.

Yale Forests & Other Natural Areas: There are more than 10,000 acres of Yale Forests managed as working forest by the School of the Environment. They are also available by arrangement for research and instruction. Largest and closest is the 7,800-acre Yale-Meyers Forest in northeastern Connecticut. It has some lakes and a diversity of fauna, flora, and natural habitats. forests.yale.edu

The Peabody Museum also administers several properties that are open to Yale Faculty, affiliates, and students for short-term and long-term research, study, and creative academic pursuits in environmentally protected areas adjacent to Long Island Sound: https://peabody.yale.edu/about/peabody-places

E&EB Courses 2024-2025

Required Introductory Courses

BIOL 101, Biochemistry and Biophysics. Edgar Benavides, Lilian Kabeche, Michael Koelle, & Thomas Loreng**.** MW 11:35 – 12:50, 1/2 credit

Introduction to the study of life at the molecular level. Topics include the three-dimensional structures and function of large biological molecules, the human genome, and the design of antiviral drugs to treat HIV/AIDS. The first of four modules in a yearlong introductory biology sequence; meets for the first half of the term.

BIOL 102, Principles of Cell Biology and Membrane Physiology. Edgar Benavides, Amaleah Hartman, Valerie Horsley, & Thomas Loreng. MW 11:35 – 12:50, 1/2 credit

Introduction to the study of cell biology and membrane physiology. Topics include the organization and functional properties of biological membranes, membrane physiology and signaling, rough endoplasmic reticulum and synthesis of membrane/secretory membrane proteins, endocytosis, the cytoskeleton, and cell division. The second of four modules in a yearlong introductory biology sequence; meets for the second half of the term.

BIOL 103, Genes and Development. Edgar Benavides, Thomas Loreng, Vivian Irish, & Weimin Zhong, MW 11:35 – 12:50, 1/2 credit

Introduction to genes, genetics, and developmental biology. How genes control development and disease; Mendel's rules; examples of organ physiology. The third of four modules in a year-long introductory biology sequence; meets for the first half of the term.

BIOL 104, Principles of Ecology and Evolutionary Biology. Edgar Benavides, Thomas Loreng, Thomas Near, & Carla Staver. MW 11:35 – 12:50, 1/2 credit

Introduction to ecology, evolutionary biology, animal behavior, and the history of life. Evolutionary transitions and natural selection. Adaptation at genic, chromosomal, cellular, organismal, and supra-organismal levels. Distributional and social consequences of suites of organismal adaptations. The fourth of four modules in a year-long introductory biology sequence; meets for the second half of the term.

Courses and Laboratories with No Prerequisites

E&EB 035a, The Ecology of Food. Linda Puth. M 1:30pm-2:20pm & W 1:30pm-3:20pm. *First Year Seminar.*

Food and ecology are inextricably linked, both in producing domesticated food through agriculture and livestock and in harvesting wild plants and animals. Furthermore, the production and consumption of food have downstream consequences through energy consumption, food waste, trophic interactions, and the transportation of food around the globe. These topics link to many of the fundamental concepts of ecology, including population biology, the niche, trophic interactions, nitrogen cycling, and the effects on biodiversity. In this class, we explore these topics intensively through a combination of lectures, readings, and interactive field trips to on/near campus ecosystems, including the Marsh Botanical Gardens, the Yale Sustainable Farm, a nearby forest and salt marsh, and an orchard. Each week, we meet twice for 50 minutes for a combination of lecture and discussion and for 110 minutes for field trips, discussions, and guest lectures. Enrollment limited to first-year students.

[E&EB 075, Virus Discovery & Evolution.]

E&EB 106a/MCDB 106a/HLTH 155a, Biology of Malaria, Lyme, and Other Vector Borne Diseases. Alexia Belperron. MW 1pm-2:15pm

This introduction to the biology of pathogen transmission from one organism to another by insects focuses on malaria and Lyme disease. Biology of the pathogens including modes of transmission, establishment of infection, host immune responses, and the associated challenges to prevention and treatments.

E&EB 115a, Conservation Biology. Linda Puth. MW 9am-10:15am

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 125b/EPS 125b, History of Life. Derek Briggs. HTBA

Examination of fossil and geologic evidence pertaining to the origin, evolution, and history of life on Earth. Emphasis on major events in the history of life, on what the fossil record reveals about the evolutionary process, on the diversity of ancient and living organisms, and on the evolutionary impact of Earth's changing environment.

E&EB 145b, Plants & People. Linda Puth. MWF 10:30am-11:20am

The interaction of plants and people throughout history explored from biological, historical, anthropological, and artistic perspectives. Basic botany; plants in the context of agriculture; plants as instruments of trade and societal change; plants as inspiration; plants in the environment. Includes field trips to the greenhouses at Yale Marsh Botanical Garden, the Yale Peabody Museum and Herbarium, the Yale Farm, and the Yale Art Gallery.

[E&EB 210/SD&S 101, Introduction to Statistics: Life Sciences.]

E&EB 223Lb, Laboratory for Principles of Ecology, Evolutionary Biology, and the Tree of Life. Marta Wells. T, W, or Th 1:30pm-4:30pm

Study of evolutionary novelties, their functional morphology, and their role in the diversity of life.

Introduction to techniques used for studying the diversity of animal body plans. Evolutionary innovations that have allowed groups of organisms to increase their diversity.

E&EB 225b, Evolutionary Biology. Paul Turner & Jenn Coughlan. TTH 10:30am-11:20am

An overview of evolutionary biology as the discipline uniting all of the life sciences. Reading and discussion of scientific papers to explore the dynamic aspects of evolutionary biology. Principles of population genetics, paleontology, and systematics; application of evolutionary thinking in disciplines such as developmental biology, ecology, microbiology, molecular biology, and human medicine.

E&EB 246a, Plant Diversity & Evolution. Erika Edwards. TTh 2:30pm-3:45pm

This course has several, interrelated objectives. First, it serves as an introduction to the science of phylogenetics, providing an overview of both the theory and methodology involved in constructing phylogenetic trees, and how to use trees to study character and organismal evolution. For our second objective, we put this new framework to immediate use by using phylogeny to explore and illustrate 400 million years of land plant evolution, with emphasis on the diversity of flowering plants. The course examines major trends in plant evolution from functional, ecological, and bio-geographical perspectives. Students acquire a basic understanding of 1) phylogenetic approaches to comparative biology, 2) plant anatomy and morphology, 3) evolutionary relationships among the major land plant clades (with emphasis on the flowering plants), and 4) major evolutionary trends that have significantly shaped the diversity of plant life that we see today. The third and most important objective is to instill in students the ability to look at any biological problem through the lens of "phylogeny-colored glasses"- a powerful way to examine the complexity of life that surrounds (and includes!) us.

E&EB 247La, Laboratory for Plant Diversity & Evolution. Erika Edwards. W 1:00pm-4:00pm

Hands-on experience with the plant groups examined in the accompanying lectures. Local field trips. To be taken concurrently with E&EB 246.

[E&EB 250, Biology of Terrestrial Arthropods.]

[E&EB 255, Invertebrates.]

E&EB 262a, Biology of Sharks and Their Relatives. Joshua Moyer. MWF 11:35am-12:25pm

An integrative course that examines the biology of sharks and other cartilaginous fishes (Class Chondrichthyes) from a variety of perspectives. Students learn about the taxonomy and systematics, paleontology, functional anatomy, behavior, physiology, ecology, and cultural significance of sharks. Coursework includes answers to discussion prompts, guided review of scientific literature, and in-class exams that allow students to demonstrate their understanding of chondrichthyan biology and sharks' unique place in the vertebrate tree of life. To be taken concurrently with E&EB 263L.

E&EB 263La, Laboratory for Biology of Sharks and Their Relatives. Joshua Moyer. Th 1pm-4pm

This is a hands-on, specimen-based overview of the fossil record, comparative anatomy, functional morphology, and biodiversity of sharks and their relatives, the skates, rays, and ratfish. Students examine and dissect fresh and preserved specimens and use the fossil remains of extinct sharks to investigate the evolution of cartilaginous fishes. This course should be taken concurrently with E&EB 262, The Biology of Sharks and Their Relatives.

[E&EB 264, Ichthyology.]

E&EB 272b, Ornithology. Richard Prum. MWF 9:25am-10:15am

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 system, and biogeography.

E&EB 273Lb, Laboratory for Ornithology. Richard Prum. T 1:30pm-4:30pm

Laboratory and field studies of avian morphology, diversity, phylogeny, classification, identification, and behavior.

E&EB 275a / EVST 400a, Biological Oceanography. Mary Beth Decker. HTBA

Exploration of oceanic ecosystems and how these environments function as coupled physical/biological systems. Ocean currents and other physical processes determine where nutrients are available to support primary production and where organisms from plankton to top predators occur. Includes discussion of anthropogenic impacts, such as the effects of fishing and climate change on marine ecosystems.

[E&EB 280 / ANTH 310, Mammalogy.]

E&EB 290b, Comparative Developmental Anatomy of Vertebrates. Joshua Moyer. MWF 11:35am-12:25pm

A survey of the development, structure, and evolution of major vertebrate groups. Topics include the micro-anatomy of major organ systems, the developmental underpinnings of the vertebrate body plan, and the development, structure, and evolution of the major organ systems such as the locomotory system, sensory organs, digestive tract, reproductive tract, and nervous system.

E&EB 291Lb. Laboratory for Comparative Developmental Anatomy of Vertebrates. Joshua Moyer. Th or F 1:30pm – 4:30pm

Microscopic examination of histological and embryological preparations. Dissection of selected vertebrate species including shark, bony fish, frog, lizard, and rat. Must be taken concurrently with EEB290.

Intermediate Courses

Note: Prerequisites for many E&EB courses numbered 200 and above are BIOL 101, 102, 103 and 104, or permission of the instructor.

[E&EB 210/SD&S 101, Introduction to Statistics: Life Sciences.]

E&EB 220a/E&EB 520a/EVST 223a. General Ecology. David Vasseur & Michelle Wong. MWF 10:30am – 12:50pm.

The theory and practice of ecology, including the ecology of individuals, population dynamics and regulation, community structure, ecosystem function, and ecological interactions at broad spatial and temporal scales. Topics such as climate change, fisheries management, and infectious disease are placed in an ecological context. *Prerequisite: MATH 112 or equivalent*.

E&EB 225b, Evolutionary Biology. Paul Turner & Jenn Coughlan. TTH 10:30am-11:20am

An overview of evolutionary biology as the discipline uniting all of the life sciences. Reading and discussion of scientific papers to explore the dynamic aspects of evolutionary biology. Principles of population genetics, paleontology, and systematics; application of evolutionary thinking in disciplines such as developmental biology, ecology, microbiology, molecular biology, and human medicine.

[E&EB 228, Ecology and Evolution of Infectious Diseases.]

[E&EB 230/E&EB 530/EVST 221/F&ES 221. Field Ecology].

E&EB 242b/E&EB 542b, Behavioral Ecology. Vanessa Ezenwa. TTh 10:30am-11:20am

An introduction to the study of animal behavior from an evolutionary and ecological perspective. Topics include decision-making, group living and cooperation, sexual selection and mating behavior, signaling and communication. In addition to lectures, in-class discussions and activities, students engage in the material by design and implement their own research projects. *Prerequisite: BIOL 104, or permission of instructor.*

E&EB 246a, Plant Diversity & Evolution. Erika Edwards. TTh 2:30pm-3:45pm

This course has several, interrelated objectives. First, it serves as an introduction to the science of phylogenetics, providing an overview of both the theory and methodology involved in constructing phylogenetic trees, and how to use trees to study character and organismal evolution. For our second objective, we put this new framework to immediate use by using phylogeny to explore and illustrate 400 million years of land plant evolution, with emphasis on the diversity of flowering plants. The course examines major trends in plant evolution from functional, ecological, and bio-geographical perspectives. Students acquire a basic understanding of 1) phylogenetic approaches to comparative biology, 2) plant anatomy and morphology, 3) evolutionary relationships among the major land plant clades (with emphasis on the flowering plants), and 4) major evolutionary trends that have significantly shaped the diversity of plant life that we see today. The third and most important objective is to instill in students the ability to look at any biological problem through the lens of "phylogeny-colored glasses"- a powerful way to examine the complexity of life that surrounds (and includes!) us.

[E&EB 250/E&EB 550. Biology of Terrestrial Arthropods.]

[E&EB 255/E&EB 555. Invertebrates.]

E&EB 262a, Biology of Sharks and Their Relatives. Joshua Moyer. MWF 11:35am-12:25pm

An integrative course that examines the biology of sharks and other cartilaginous fishes (Class Chondrichthyes) from a variety of perspectives. Students learn about the taxonomy and systematics, paleontology, functional anatomy, behavior, physiology, ecology, and cultural significance of sharks. Coursework includes answers to discussion prompts, guided review of scientific literature, and in-class exams that allow students to demonstrate their understanding of chondrichthyan biology and sharks' unique place in the vertebrate tree of life. To be taken concurrently with E&EB 263L.

[E&EB 264/E&EB 564. Ichthyology].

E&EB 272b, Ornithology. Richard Prum. MWF 9:25am-10:15am

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 system, and biogeography.

E&EB 275a / EVST 400a, Biological Oceanography. Mary Beth Decker. HTBA

Exploration of oceanic ecosystems and how these environments function as coupled physical/biological systems. Ocean currents and other physical processes determine where nutrients are available to support primary production and where organisms from plankton to top predators occur. Includes discussion of anthropogenic impacts, such as the effects of fishing and climate change on marine ecosystems.

[E&EB 280/ANTH 310. Mammalogy].

E&EB 290b. Comparative Anatomy of Vertebrates. Joshua Moyer. MWF 11:35am – 12:25am.

A survey of the development, structure, and evolution of major vertebrate groups. Topics include the micro-anatomy of major organ systems, the developmental underpinnings of the vertebrate body plan, and the development, structure, and evolution of the major organ systems such as the locomotory system, sensory organs, digestive tract, reproductive tract, and nervous system.

E&EB 295a. Life in Motion: Ecological and Evolutionary Physiology. Martha Muñoz. MW 9am - 10:15am.

Physiology is the study of the functions that organisms perform and how they use those functions to interact with the environment. To survive, grow, and reproduce, all organisms must acquire energy and avoid conditions that exceed their physiological limits. These interactions all involve motion—ions traveling across membranes, muscle fibers twitching, respiration, and locomotion, to name a few. In this course, we tackle physiological processes from both “bottom up” and “top down” approaches, with integration among these dimensions, to extract general physiological rules of life. Then, we link our discoveries to the broader context of ongoing global change, and consider whether and how organisms can physiologically respond to contemporary selective pressures. While the course focuses heavily on animal physiology, plants, fungi, and microbes are also featured. *Prerequisites: BIOL 101, 102, 103, 104, and CHEM 161, or permission of the instructor.*

Laboratories

[E&EB 075L. Laboratory for Virus Discovery and Evolution.]

E&EB 223Lb/E&EB 523Lb, Laboratory for Principles of Ecology, Evolutionary Biology, and the Tree of Life. Marta Wells. W 1:30pm-4:30pm

Study of evolutionary novelties, their functional morphology, and their role in the diversity of life. Introduction to techniques used for studying the diversity of animal body plans. Evolutionary innovations that have allowed groups of organisms to increase their diversity. ½ credit.

E&EB 247La, Laboratory for Plant Diversity & Evolution. Erika Edwards. W 1:00pm-4:00pm

Hands-on experience with the plant groups examined in the accompanying lectures. Local field trips. To be taken concurrently with E&EB 246. ½ credit.

[E&EB 251L/E&EB 551L. Laboratory for Biology of Terrestrial Arthropods]

[E&EB 256L/E&EB 556L. Laboratory for Invertebrates.]

E&EB 263La, Laboratory for Biology of Sharks and Their Relatives. Joshua Moyer. Th 1:00pm-4:00pm

This is a hands-on, specimen-based overview of the fossil record, comparative anatomy, functional morphology, and biodiversity of sharks and their relatives, the skates, rays, and ratfish. Students examine and dissect fresh and preserved specimens and use the fossil remains of extinct sharks to investigate the evolution of cartilaginous fishes. This course should be taken concurrently with E&EB 262, The Biology of Sharks and Their Relatives. ½ credit.

[E&EB 265L/E&EB 565L. Laboratory for Ichthyology.]

E&EB 273Lb, Laboratory for Ornithology. Richard Prum. T 1:30pm-4:30pm

Laboratory and field studies of avian morphology, diversity, phylogeny, classification, identification, and behavior. Enrollment limited to 12. ½ credit.

E&EB 291Lb. Laboratory for Comparative Developmental Anatomy of Vertebrates. Joshua Moyer. Th or F 1:30 – 4:30

Microscopic examination of histological and embryological preparations. Dissection of selected vertebrate species including shark, bony fish, frog, lizard, and rat. Must be taken concurrently with EEB 290. ½ credit

[E&EB 327L/E&EB 627L. Laboratory for Plant Structure and Function.]

Advanced Courses

[E&EB 305/E&EB 705, Plant Ecology].

[E&EB 320/E&EB 620, Community Ecology.]

[E&EB 321/E&EB 621, Philosophy of Biology].

[E&EB 322/E&EB 622, Evolutionary Genetics.]

[E&EB 325/E&EB 625, Limnology].

[E&EB 326/E&EB 626, Plant Structure and Function].

E&EB 330/E&EB 620/EVST 330, Ecosystem Ecology. Michelle Wong. MW 11:35-12:50.

Ecosystem ecology asks how abiotic and biotic processes come together to shape the diversity in form and function across Earth's ecosystems, from the flow of energy and materials through the environment, to how communities of organisms interact with their environment. This course examines the factors that influence ecosystem structure and function: the processes that shape how energy, water, carbon, and nutrients cycle through ecosystems, the role of disturbance on these processes, and feedbacks from human-induced global change. *Prerequisite: E&EB 220 or instructor permission.*

E&EB 335a/HLTH 250a/E&EB 635a, Evolution and Medicine. Brandon Ogbunu. TTh 1pm-2:15pm

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. *Prerequisite: BIOL 101–104.*

[E&EB 336/HUMS 336/HSHM 453, Culture and Human Evolution.]

E&EB 340a, Microbial Ecology. Martina Dal Bello. TTh 9am-10:15am

When thinking about microbes what comes to mind are usually diseases and unpleasant smells from the fridge or the basement. Nevertheless, microbes and the communities they form are key contributors to our wellbeing and the functioning of the planet. This course provides an introduction to microbial ecology, with an emphasis on how microbial systems differ from their macroscopic counterparts, including defining a microbial species; sampling/experimenting with microbes; principles of microbial growth, metabolism, and death; species interactions and community assembly in different environments; microbial community functions; elements of microbial evolution. *Prerequisites: BIOL 101, BIOL 102, BIOL 103, & BIOL 104. General Ecology E&EB 220 and MCDB 290 are encouraged but not required.*

[E&EB 342/E&EB 842/ANTH 335/ANTH 835, Primate Diversity and Evolution.]

E&EB 354a/E&EB 654a, Phylogenetic Biology. Casey Dunn. TTh 11:30am-12:50pm

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. *Prerequisites: E&EB 225 and an organismal course.*

E&EB 362b, Tropical Field Biology. Linda Puth. M 1:30pm-4:30pm

Firsthand experience of a region can inspire great insights and understanding of ecology and evolutionary biology. This course immerses students in the communities and ecosystems of a single tropical region each year, but locations rotate among a small group of sites. We spend the first half of the semester learning about the geology, history, biomes and organisms of the region. *Prerequisites: E&EB 220, E&EB 225, and permission of the instructor.*

[E&EB 375, Topics in Vertebrate Ecomorphology.]

[E&EB 380/E&EB 680, Life History Evolution,]

[E&EB 428/AMTH 428/G&G 428/PHYS 428/G&G 528, Science of Complex Systems.]

[E&EB 460/E&EB 960, Studies in Evolutionary Medicine I.]

[E&EB 461 E&EB 961, Studies in Evolutionary Medicine II.]

E&EB 464b/ANTH 464b/ANTH 864b/ARCG 464b/ARCG 864b, Human Osteology. Eric Sargis TTh 1pm-2:15pm

A lecture and laboratory course focusing on the characteristics of the human skeleton and its use in studies of functional morphology, paleo demography, and paleopathology. Laboratories familiarize students with skeletal parts; lectures focus on the nature of bone tissue, its biomechanical modification, sexing, aging, and interpretation of lesions.

E&EB Research and Tutorials

E&EB 469. Tutorial. Marta Wells

Individual or small-group study for qualified underclass students who wish to investigate an area of ecology or evolutionary biology not presently covered by regular courses. A student must be sponsored by a faculty member who sets requirements and meets with the student. A term paper is required at the end of the semester. To register, the student must submit a written plan of study (proposal) approved by the faculty instructor, as well as Assistant DUS Marta Wells. Students are encouraged to apply during the term preceding the tutorial by registering and submitting a pre-proposal. Students' final proposals must be submitted no later than the first 10 days of the term in which the student begins the tutorial. The final paper is due in the hands of the faculty instructor and the Assistant DUS by the last day of the reading period in the term of enrollment. In special cases, with approval of the director of undergraduate studies, this course may be elected for more than one term. Normally, faculty sponsors must be members of the E&EB department. Underclassmen will receive one credit and a grade of P/F.

E&EB 470. Senior Tutorial. Marta Wells

Tutorial for seniors in the B.A. degree program who elect a term of independent study to complete the senior requirement. Individual or small-group study for qualified students who wish to investigate an area of ecology or evolutionary biology not presently covered by regular courses. A student must be sponsored by a faculty member who sets requirements and meets weekly with the student. A term paper is required at the end of the semester. To register, the student must submit a written plan of study approved by the faculty instructor, as well as Assistant DUS Marta Wells. Students are encouraged to apply during the term preceding the tutorial by registering and submitting a pre-proposal. Students' final proposals must be submitted no later than the first 10 days of the term in which the student begins the tutorial. The final paper is due in the hands of the faculty instructor and the Assistant DUS by the last day of reading period in term of enrollment. Normally, faculty sponsors must be members of EEB department. Enrollment limited to seniors. Fulfills the senior requirement for B.A. degree.

E&EB 474. Research. Marta Wells

One term of original research in an area relevant to ecology or evolutionary biology. This may involve, for example, laboratory work, fieldwork, or mathematical or computer modeling. Students may also work in areas related to environmental biology such as policy, economics, or ethics. The research project may not be a review of relevant literature but must be original. In all cases students must have a faculty sponsor who oversees the research and is responsible for the rigor of the project. *An average of 10 hours per week is required*. To register, students are encouraged to apply during the term preceding the research by registering and submitting a *preproposal*. A student's *final proposal* must be submitted no later than the first 10 days of the term in which the student begins the research, with the faculty mentor's signature of approval. The final research paper is due to both the faculty mentor and Assistant DUS Marta Wells by the last day of the reading period in the term of enrollment. With the approval of the Director of Undergraduate Studies, this course may be elected for more than one term. Underclassmen will receive one credit and a grade of P/F.

E&EB 475/476. Senior Research. Marta Wells

Two terms of original research in an area relevant to ecology or evolutionary biology. This may involve, for example, laboratory work, fieldwork, or mathematical or computer modeling. Students may also work in areas related to environmental biology such as policy, economics, or ethics. The research project may not be a review of relevant literature but must be original. In all cases students must have a faculty sponsor who oversees the research and is responsible for the rigor of the project. *An average of 10 hours per week is required*. To register, students are encouraged to apply during the term preceding the research by registering and submitting a *preproposal*. A student's *final proposal* must be submitted no later than the first 10 days of the term in which the student begins the research, with approved signature by the faculty mentor. The final research paper is due to both the faculty mentor and Assistant DUS Marta Wells by the last day of the reading period in the term of enrollment. Enrollment is limited to seniors. A letter grade with two credits (1 credit per semester) will be awarded. Fulfills the senior requirement for the B.S. degree.

E&EB 495/496. Intensive Senior Research. Marta Wells

Two terms of intensive original research in an area relevant to ecology or evolutionary biology. This may involve, for example, laboratory work, fieldwork, or mathematical or computer modeling. Students may also work in areas related to environmental biology such as policy, economics, or ethics. The research project may not be a review of relevant literature but must be original. In all cases students must have a faculty sponsor who oversees the research and is responsible for the rigor of the project. *An average of 20 hours per week is required*. To register, students are encouraged to apply during the term preceding the research by registering and submitting a *preproposal*. A student's *final proposal* must be submitted no later than the first 10 days of the term in which the student begins the research, with the faculty mentor's signature of approval. The final research paper is due to both the faculty mentor and Assistant DUS Marta Wells by the last day of the reading period in the term of enrollment. Enrollment is limited to seniors. A letter grade with four credits (2 credits per semester) will be awarded. Fulfills the senior requirement for the B.S. degree.

Graduate Courses and Labs

With permission of the instructor, advanced undergraduates may take graduate courses for credit. If you are interested in one of these, first consult the instructor and then request permission through Yale Course Search registration. For current course descriptions and other information, please use https://courses.yale.edu/.

E&EB 500 & 501, Advanced Topics in Ecology & Evolutionary Biology. DGS.

[E&EB 530, Field Ecology.]

[E&EB 621, Philosophy of Biology.]

[E&EB 622, Evolutionary Genetics.]

[E&EB 636, Biosocial Science.]

[E&EB 652. Evolutionary Theory.]

[E&EB 712, Foundations of Ecology.]

E&EB 713, Ecological Niches in a Changing World. Walter Jetz.

[E&EB 717, Structuralism and Macroevolution.]

[E&EB 721, Foundations of Terrestrial Ecology.]

E&EB 724, Soft Skills Development. Martina Dal Bello.

[E&EB 725, Scientific Writing for Ecology & Evolutionary Biology.]

[E&EB 729, Microbial Ecology & Evolution.]

E&EB 750, Forgotten Grassy Ecosystems. Carla Staver.

E&EB 762, Ecology of Landforms. Eric Slessarev.

[E&EB 800, Seminar in Molecular Evolution.]

[E&EB 821, Advanced Topics in Philosophy of Biology.]

[E&EB 830, The Ecology of the Great Pandemics.]

[E&EB 842, Primate Diversity and Evolution.]

E&EB 850, The Macroevolution of Squamates. Thomas Near & Martha Muñoz.

[E&EB 854, The Behavioral Immune System.]

[E&EB 856, Special Topics in the Ecology and Evolution of Infectious Diseases.]

[E&EB 865, Evolutionary Architects: Organisms as Targets and Agents of Natural Selection.]

[E&EB 872, Speciation and Adaptation Genomics.]

[E&EB 875, Phenotypic Plasticity and Evolution]

E&EB 930, Seminar in Systematics. Jacques Gauthier

2024 Senior Projects

Presenter and Title	Faculty Advisor
River Abedon If You Catch Their Drift: An Integrative Approach to Unraveling the Biogeographic Dynamics of *Physalia spp*	Casey Dunn
Matt Appel Exploring Potential Trade-offs in *Pseudomonas arguinosa* via Experimental Evolution with *Caenorhabditis elegans* and Bacteriophage H6	Paul Turner
Yasmin Bergemann Greywater Remediation Effects on Plant Health and Photosynthetic Rates	Michelle Wong
Lauren Chong Outcomes of a Remote Blood Pressure Monitoring Program for Hypertension at a Federally Qualified Community Healthcare Center	Benjamin Oldfield
Cage Cochran Identifying Barrier Loci Involved in the Maintenance of Phenotypic Divergence between Two Species of Mimulus Flower with Extensive Gene Flow	Jenn Coughlan
Kate Edwards Characterizing Soil Seed Banks in Big Sagebrush Plant Communities Undergoing Restoration on Natural Gas Well Pads	William Lauenroth
Ingrid Ellis Investigating the Genomic Diversity in Fur Coat Color of Eastern Gray Squirrels across Urban and Rural Clines	Adalgisa Caccone
Rosemary Lee Patterns of Thermal Physiological Variability in Woodland Salamanders	Martha Muñoz
Spencer Lott Investigating the Evolutionary History of the Sao Tome Storm-petrel	Richard Prum
Aidan Maloney Effect of Dual-Tasking on Landing Mechanics on a Force Plate	Elizabeth Gardner
John Nash Nesting Interaction between Pomarine Jaegers (*Stercorarius pomarinus*) and *Somateria* eiders on the Arctic Coastal Plain	Richard Prum
Gabe Ransom The Transmission, Vector Ecology, and Molecular Phylogenetics of Jamestown Canyon Orthobunyavirus	Nathan Grubaugh
Sandra Redjali Chimpanzee Space Use in a Human-Dominated, Seasonally-Flooded Mosaic Landscape	David Watts
Jackson Roberts Deciphering the Relationship between PRDE-1 and Transcription Initiation Factors in piRNA Biogenesis in *C. elegans*	Valerie Reinke

Serena Sim — Vanessa Ezenwa
The Role of Climate Change on Antimicrobial Resistance Transmission from Livestock to Humans

Carolyn Skotz — Peter Krause
The Frequency of Human Babesiosis Approximates that of Lyme Disease in Endemic Areas

Melissa Tamarkin — Craig Brodersen
The Physiological Mechanism of Marcescence in *Quercus palustris* and the Influence of Ethylene

Adam Taylor — Thomas Near
Phylogeography and Species Delimitation of *Poecilichthyus*, a Clade of Darters

Lolyn Tejeda — Martha Muñoz
It's the Climb: Metabolic Testing of Plethodontid Salamanders Occupying a Hybrid Zone in Southern Appalachia

Austin Theroux — Paul Turner
Derivation and Assessment of *de novo* and Synthetic Viral Cheats

Mason Tipton — Elizabeth Gardner
Is Bigger, Faster, Stronger Better? A Research Study on the Evolution of Body Composition in Athletics

Anna Tredway — Kristen Brennand
Neurodevelopmental Impact of Schizophrenia-Associated NRXN1 Mutations in Forebrain Organoids

Stephanie Wang — Marta Wells
Green Darner Odyssey: Unraveling the Life Cycle, Behavior, and Climate-Driven Migration Pattern of *Anax junius* in North America

Hanwen Zhang — Jenn Coughlan
Dry, Drying, Drier: How Plants are Responding, Adapting, and Evolving in Drought

Appendix I – Worksheets for E&EB

The following pages are worksheets that may aid the potential major in planning a course of study.

Bachelor of Arts: Biodiversity & the Environment

Bachelor of Arts: Organismal Biology

Bachelor of Science: Biodiversity & the Environment

Bachelor of Science: Organismal Biology

E&EB Major Worksheet B.A. Degree B&E Track

Name:
Date:
Class:
College:
Advisor:
Email:

Prerequisites

Biology Introductory Courses		Course	Semester	Grade	Place Out
BIOL 101	Biochemistry & Biophysics				
BIOL 102	Principles of Cell Biology & Membrane Physiology				
BIOL 103	Genes & Development				
BIOL 104	Principles of Ecology & Evolutionary Biology				

2 terms of General Chemistry	Course	Semester	Grade	Place Out
CHEM 161 & 165				
CHEM 163 & 167				

2 terms of General Chemistry Labs	Course	Semester	Grade	Place Out
CHEM 134L				
CHEM 136L				

1 term of Math or Statistics & Data Science		Course	Semester	Grade	Place Out
MATH 115	S&DS 100				
MATH 116	S&DS 230				

4 total credits, no more than two term lecture courses per department			Course	Semester	Grade	# Credit
CHEM 174 or 220	MATH 115 or 116	S&DS 100-106				
CHEM 175 or 221	MATH 118 or 120	S&DS 220				
CHEM 222L	MATH 222 or 225	S&DS 230				
CHEM 223L	MATH 230 or 231	S&DS 238				
EPS 110	MATH 235	S&DS 240				
EPS 212	MATH 241	PHYS 170 or 180				
EPS 220	MATH 242	PHYS 171 or 181				
EPS 222	MATH 244	CPSC 100				
EPS 232	MATH 246	CPSC 112				
EPS 240	MATH 247	CPSC 123				
EPS 255	MATH 250	CPSC 201				
	MATH 255					

Required Core Courses: B&E Track		Course	Semester	Grade
E&EB 220	General Ecology			
E&EB 225	Evolutionary Biology			
E&EB 2xx or 3xx	Organismal Diversity Lecture			
E&EB 2xxL or 3xxL	Organismal Diversity Lab			

Independent Research for Underclassmen (P/F) (optional, but recommended)		Course	Semester	Grade	Advisor
E&EB 469	Tutorial				
E&EB 474	Research				

B.A. Senior Requirement - choose one. Must be taken in senior year.		Course	Semester	Grade	Advisor
E&EB 470	Senior Tutorial (1 credit)				
xxx	Senior Essay (0 credit)				

E&EB Major Worksheet B.A. Degree O.B. Track

Name:
Date:
Class:
College:
Advisor:
Email:

Prerequisites

Biology Introductory Courses		Course	Semester	Grade	Place Out
BIOL 101	Biochemistry & Biophysics				
BIOL 102	Principles of Cell Biology & Membrane Physiology				
BIOL 103	Genes & Development				
BIOL 104	Principles of Ecology & Evolutionary Biology				

2 terms of General Chemistry	Course	Semester	Grade	Place Out
CHEM 161 & 165				
CHEM 163 & 167				

2 terms of General Chemistry Labs	Course	Semester	Grade	Place Out
CHEM 134L				
CHEM 136L				

1 term of Math or Statistics & Data Science		Course	Semester	Grade	Place Out
MATH 115	S&DS 100				
MATH 116	S&DS 230				

4 total credits, no more than two term lecture courses per department			Course	Semester	Grade	# Credit
CHEM 174 or 220	MATH 115 or 116	S&DS 100-106				
CHEM 175 or 221	MATH 118 or 120	S&DS 220				
CHEM 222L	MATH 222 or 225	S&DS 230				
CHEM 223L	MATH 230 or 231	S&DS 238				
EPS 110	MATH 235	S&DS 240				
EPS 212	MATH 241	PHYS 170 or 180				
EPS 220	MATH 242	PHYS 171 or 181				
EPS 222	MATH 244	CPSC 100				
EPS 232	MATH 246	CPSC 112				
EPS 240	MATH 247	CPSC 123				
EPS 255	MATH 250	CPSC 201				
	MATH 255					

Required Core Courses: O.B. Track		Course	Semester	Grade
MCDB/MB&B 300	Biochemistry			
E&EB 295 or BENG 350	Comparative Physiology or Physiological Systems			
E&EB 290	Comparative Anatomy			
E&EB 291L	Comparative Anatomy Lab			

Independent Research for Underclassmen (P/F) (optional, but recommended)		Course	Semester	Grade	Advisor
E&EB 469	Tutorial				
E&EB 474	Research				

B.A. Senior Requirement - choose one. Must be taken in senior year.		Course	Semester	Grade	Advisor
E&EB 470	Senior Tutorial (1 credit)				
xxx	Senior Essay (0 credit)				

E&EB Major Worksheet B.S. Degree B&E Track

Name:
Date:
Class:
College:
Advisor:
Email:

Prerequisites

Biology Introductory Courses		Course	Semester	Grade	Place Out
BIOL 101	Biochemistry & Biophysics				
BIOL 102	Principles of Cell Biology & Membrane Physiology				
BIOL 103	Genes & Development				
BIOL 104	Principles of Ecology & Evolutionary Biology				

2 terms of General Chemistry	Course	Semester	Grade	Place Out
CHEM 161 & 165				
CHEM 163 & 167				

2 terms of General Chemistry Labs	Course	Semester	Grade	Place Out
CHEM 134L				
CHEM 136L				

1 term of Math or Statistics & Data Science		Course	Semester	Grade	Place Out
MATH 115	S&DS 100				
MATH 116	S&DS 230				

4 total credits, no more than two term lecture courses per department			Course	Semester	Grade	# Credit
CHEM 174 or 220	MATH 115 or 116	S&DS 100-106				
CHEM 175 or 221	MATH 118 or 120	S&DS 220				
CHEM 222L	MATH 222 or 225	S&DS 230				
CHEM 223L	MATH 230 or 231	S&DS 238				
EPS 110	MATH 235	S&DS 240				
EPS 212	MATH 241	PHYS 170 or 180				
EPS 220	MATH 242	PHYS 171 or 181				
EPS 222	MATH 244	CPSC 100				
EPS 232	MATH 246	CPSC 112				
EPS 240	MATH 247	CPSC 123				
EPS 255	MATH 250	CPSC 201				
	MATH 255					

Required Core Courses: B&E Track		Course	Semester	Grade
E&EB 220	General Ecology			
E&EB 225	Evolutionary Biology			
E&EB 2xx or 3xx	Organismal Diversity Lecture			
E&EB 2xxL or 3xxL	Organismal Diversity Lab			

Required Electives: B&E Track	Course	Semester	Grade
2 terms of science electives: choose from 200+ level lecture courses in E&EB,			
MCDB, or MB&B; 200+ level science labs, or other dept. with DUS approval			

Independent Research for Underclassmen (P/F) (optional, but recommended)		Course	Semester	Grade	Advisor
E&EB 469	Tutorial				
E&EB 474	Research				

B.S. Senior Requirement - 2 terms required in senior year		Course	Semester	Grade	Advisor
E&EB 475 & 476	Senior Research (1 credit each)				
E&EB 495 & 496	Intensive Senior Research (2 credits each)				

E&EB Major Worksheet B.S. Degree O.B. Track

Name:
Date:
Class:
College:
Advisor:
Email:

Prerequisites

Biology Introductory Courses		Course	Semester	Grade	Place Out
BIOL 101	Biochemistry & Biophysics				
BIOL 102	Principles of Cell Biology & Membrane Physiology				
BIOL 103	Genes & Development				
BIOL 104	Principles of Ecology & Evolutionary Biology				

2 terms of General Chemistry	Course	Semester	Grade	Place Out
CHEM 161 & 165				
CHEM 163 & 167				

2 terms of General Chemistry Labs	Course	Semester	Grade	Place Out
CHEM 134L				
CHEM 136L				

1 term of Math or Statistics & Data Science		Course	Semester	Grade	Place Out
MATH 115	S&DS 100				
MATH 116	S&DS 230				

4 total credits, no more than two term lecture courses per department			Course	Semester	Grade	# Credit
CHEM 174 or 220	MATH 115 or 116	S&DS 100-106				
CHEM 175 or 221	MATH 118 or 120	S&DS 220				
CHEM 222L	MATH 222 or 225	S&DS 230				
CHEM 223L	MATH 230 or 231	S&DS 238				
EPS 110	MATH 235	S&DS 240				
EPS 212	MATH 241	PHYS 170 or 180				
EPS 220	MATH 242	PHYS 171 or 181				
EPS 222	MATH 244	CPSC 100				
EPS 232	MATH 246	CPSC 112				
EPS 240	MATH 247	CPSC 123				
EPS 255	MATH 250	CPSC 201				
	MATH 255					

Required Core Courses: O.B. Track		Course	Semester	Grade
MCDB/MB&B 300	Biochemistry			
E&EB 295 or BENG 350	Comparative Physiology or Physiological Systems			
E&EB 290	Comparative Anatomy			
E&EB 291L	Comparative Anatomy Lab			

Required Electives: O.B. Track	Course	Semester	Grade
2 terms of science electives: choose from 200+ level lecture courses in E&EB,			
MCDB, or MB&B; 200+ level science labs, or other dept. with DUS approval			

Independent Research for Underclassmen (P/F) (optional but recommended)		Course	Semester	Grade	Advisor
E&EB 469	Tutorial				
E&EB 474	Research				

B.S. Senior Requirement - 2 terms required in senior year		Course	Semester	Grade	Advisor
E&EB 475 & 476	Senior Research (1 credit each)				
E&EB 495 & 496	Intensive Senior Research (2 credits each)				

Appendix II – Forms for Tutorial & Research Courses

PDFs of these forms can be found at https://eeb.yale.edu/forms

E&EB 469	Underclass Tutorial
E&EB 470	Senior Tutorial
E&EB 474	Research
E&EB 475 & 476	Senior Research
E&EB 495 & 496	Senior Intensive Research
	Senior Essay

EEB 469: Underclass Tutorial
Department of Ecology and Evolutionary Biology

Submission Date:		Semester:
STUDENT INFORMATION		
Student's Last Name:	First:	Middle:
Email Address:		
Class:	Student ID:	Cell Phone:
Title for Tutorial:		
Are you an EEB major?		
Student's Signature:		
Date:		

DESCRIPTION OF UNDERCLASS TUTORIAL REQUIREMENTS

Individual or small-group of underclass students who wish to investigate an area of ecology or evolutionary biology not presently covered by regular courses. A student must be sponsored by a faculty member who sets requirements and meets with the student. A term paper is required. To register, the student must submit a written plan of study (proposal) approved by the faculty instructor, as well as EEB Asst. DUS Marta Wells. Students are encouraged to apply during the term preceding the tutorial by registering and submitting a **preproposal**. A student's **final proposal** must be submitted no later than the first 10 days of the term in which the student begins the tutorial, with the faculty mentor's signature of approval. The final paper is due in the hands of the faculty mentor and the EEB Asst. DUS by the last day of reading period in the term of enrollment. In special cases, with the approval of the director of undergraduate studies, this course may be elected for more than one term. Please attach this form to your proposal and return to the Asst. DUA and EEB Registrar (see below). Underclass students will receive one credit and a grade of P/F.

TO THE TUTORIAL MENTOR

By signing this form, you agree to supervise the student's project. You also agree to grade the final paper and report a grade to the EEB Assistant DUS and EEB Registrar based on exam(s) or term paper. This should be reported no later than the last day of the final examination period. Notification by email is acceptable and preferred. Please email both the EEB Asst. DUS: marta.wells@yale.edu and the EEB Registrar: kelly.pyers@yale.edu.

MENTOR'S INFORMATION	
Mentor's Name:	
Mentor's Email:	
Mentor's Phone:	
Mentor's Signature:	
Date:	
FACULTY APPROVAL	
EEB Asst. DUS Signature:	
Date:	

Rev. 7/1/24

EEB 470: Senior Tutorial
Department of Ecology and Evolutionary Biology

Submission Date:		Semester:
STUDENT INFORMATION		
Student's Last Name:	First:	Middle:
Email Address:		
Class:	Student ID:	Cell Phone:
Title for Tutorial:		
B.A. Senior Requirement: YES NO		
Student's Signature:		
Date:		

DESCRIPTION OF SENIOR TUTORIAL REQUIREMENTS

Individual or small-group study for qualified students who wish to investigate an area of ecology or evolutionary biology not presently covered by regular courses. A student must be sponsored by a faculty member who sets requirements and meets weekly with the student. A term paper is required at the end of the semester. To register, a student must submit a written plan of study which has been approved by the faculty instructor to the EEB Asst. DUS. Students are encouraged to apply during the term preceding the tutorial by registering and submitting a **preproposal**. A student's **final proposal** must be submitted no later than the first 10 days of the term in which the student begins the tutorial, with the faculty mentor's signature of approval. The final paper is due in the hands of the faculty mentor and the EEB Asst. DUS by the last day of reading period in the term of enrollment. Please attach this form to your proposal and return to the faculty in charge (see below). Enrollment limited to seniors. Fulfills the senior requirement for the B.A. degree.

TO THE TUTORIAL MENTOR

By signing this form, you agree to supervise the student's project. You also agree to grade the final paper and report a grade to the EEB Assistant DUS and EEB Registrar based on exam(s) or term paper. This should be reported no later than the last day of the final examination period. Notification by email is acceptable and preferred. Please email both the EEB Asst. DUS: marta.wells@yale.edu and the EEB Registrar: kelly.pyers@yale.edu.

MENTOR'S INFORMATION
Mentor's Name:
Mentor's Email:
Mentor's Phone:
Mentor's Signature:
Date:
FACULTY APPROVAL
EEB Asst. DUS Signature:
Date:

Rev. 7/1/24

EEB 474: Underclass Research
Department of Ecology and Evolutionary Biology

Submission Date:		Semester:
STUDENT INFORMATION		
Student's Last Name:	First:	Middle:
Email Address:		
Class:	Student ID:	Cell Phone:
Project Title:		
Are you an EEB major?		
Student's Signature:		
Date:		

DESCRIPTION OF UNDERCLASS RESEARCH REQUIREMENTS

One term of original research in an area relevant to ecology or evolutionary biology. This may involve, for example, laboratory work, fieldwork, or mathematical or computer modeling. Students may also work in areas related to environmental biology such as policy, economics, or ethics. The research project may not be a review of relevant literature but must be original. In all cases students must have a faculty sponsor who oversees the research and is responsible for the rigor of the project. An average of **10 hours per week** is required. Students are encouraged to apply during the term preceding the research by registering and submitting a **preproposal**. A student's **final proposal** must be submitted no later than the first 10 days of the term in which the student begins the research, with the faculty mentor's signature of approval. The final research paper is due in the hands of the faculty mentor and the EEB Asst. DUS by the last day of reading period in the term of enrollment. Please attach this form to your proposal and return to the faculty in charge (see below). Underclass students will receive one credit and a grade of P/F.

TO THE TUTORIAL MENTOR

By signing this form, you agree to supervise the student's project. You also agree to grade the final paper and report a grade to the EEB Assistant DUS and EEB Registrar based on exam(s) or term paper. This should be reported no later than the last day of the final examination period. Notification by email is acceptable and preferred. Please email both the EEB Asst. DUS: marta.wells@yale.edu and the EEB Registrar: kelly.pyers@yale.edu.

MENTOR'S INFORMATION

Mentor's Name:
Mentor's Email:
Mentor's Phone:
Mentor's Signature:
Date:

FACULTY APPROVAL

EEB Asst. DUS Signature:
Date:

Rev. 7/1/24

EEB 475 and 476: Senior Research
Department of Ecology and Evolutionary Biology

Submission Date:		Semester:
STUDENT INFORMATION		
Student's Last Name:	First:	Middle:
Email Address:		
Class:	Student ID:	Cell Phone:
Title for Research:		
B.S. Senior Requirement: YES NO		
Student's Signature:		
Date:		

DESCRIPTION OF SENIOR RESEARCH REQUIREMENTS

Two terms of original research in an area relevant to ecology or evolutionary biology. This may involve, for example, laboratory work, fieldwork, or mathematical or computer modeling. Students may also work in areas related to environmental biology such as policy, economics, or ethics. The research project may not be a review of relevant literature but must be original. In all cases students must have a faculty sponsor who oversees the research and is responsible for the rigor of the project. An average of **10 hours per week** is required. Students are encouraged to apply during the term preceding the research by registering and submitting a **preproposal**. A student's **final proposal** must be submitted no later than the first 10 days of the term in which the student begins the tutorial, with the faculty mentor's signature of approval. The final research paper is due in the hands of the faculty mentor and the EEB Asst. DUS by the last day of reading period in the term of enrollment. Please attach this form to your proposal and return to the faculty in charge (see below). Enrollment limited to seniors. A letter grade with two credits (1 credit per semester) will be awarded. Fulfills the senior requirement for the B.S. degree.

TO THE TUTORIAL MENTOR

By signing this form, you agree to supervise the student's project. You also agree to grade the final paper and report a grade to the EEB Assistant DUS based on exam(s) or term paper. This should be reported no later than the last day of the final examination period. Notification by email is acceptable and preferred. Please email both the EEB Asst. DUS: marta.wells@yale.edu and the EEB Registrar: kelly.pyers@yale.edu.

MENTOR'S INFORMATION
Mentor's Name:
Mentor's Email:
Mentor's Phone:
Mentor's Signature:
Date:
FACULTY APPROVAL
EEB Asst. DUS Signature:
Date:

Rev. 7/1/24

EEB 495 and 496: Intensive Senior Research
Department of Ecology and Evolutionary Biology

Submission Date:		Semester:
STUDENT INFORMATION		
Student's Last Name:	First:	Middle:
Email Address:		
Class:	Student ID:	Cell Phone:
Title for Research:		
B.S. Senior Requirement: YES NO		
Student's Signature:		
Date:		
DESCRIPTION OF INTENSIVE SENIOR RESEARCH REQUIREMENTS		
Two terms of intensive original research in an area relevant to ecology or evolutionary biology. This may involve, for example, laboratory work, fieldwork, or mathematical or computer modeling. Students may also work in areas related to environmental biology such as policy, economics, or ethics. The research project may not be a review of relevant literature but must be original. In all cases students must have a faculty sponsor who oversees the research and is responsible for the rigor of the project. An average of 2**0 hours per week** is required. Student are encouraged to apply during the term preceding the research by registering and submitting a **preproposal**. A student's **final proposal** must be submitted no late than the first 10 days of the term in which the student begins the tutorial, with the faculty mentor's signature of approval. Please attach this form to your proposal and return to the faculty in charge (see below). The final research paper is due in t hands of both the faculty mentor and the EEB faculty in charge by the last day of reading period in the term of enrollment. Enrollment limited to seniors. A letter grade with four credits (2 credits per semester) will be awarded. Fulfills the senior requirement for the B.S. degree.		
TO THE RESEARCH MENTOR		
By signing this form, you agree to supervise the student's project. You also agree to grade the final paper and report a grade to the EEB Assistant DUS based on exam(s) or term paper. This should be reported no later than the last day of the final examination period. Notification by email is acceptable and preferred. Please email both the EEB Asst. DUS: marta.wells@yale.edu and the EEB Registrar: kelly.pyers@yale.edu.		
MENTOR'S INFORMATION		
Mentor's Name:		
Mentor's Email:		
Mentor's Phone:		
Mentor's Signature:		
Date:		
FACULTY APPROVAL		
EEB Asst. DUS Signature:		
Date:		

Rev. 7/1/24

Senior Essay
Department of Ecology and Evolutionary Biology

Submission Date:		Semester:
STUDENT INFORMATION		
Student's Last Name:	First:	Middle:
Email Address:		
Class:	Student ID:	Cell Phone:
Topic for Senior Paper:		
B.A. Senior Requirement: YES NO		
Student's Signature:		
Date:		

DESCRIPTION OF SENIOR ESSAY REQUIREMENTS

The senior essay is graded, but it carries no course credit. The senior essay should be a critical evaluation of some portion of the current, primary biological literature. The topic may be anything within the realm of biology or it may explore the relationships of biology to other fields. Each student must obtain approval of the paper topic from a member of the EEB department to assure that the subject is a promising one. The paper must be a minimum of 20 double-spaced pages, not including bibliography. The EEB Asst. DUS will ask a faculty advisor to read and grade each paper. Students may suggest advisors if they wish. Final papers are to be submitted to the student's senior essay advisor and a copy to the EEB Asst. DUS by the last day of reading period. A letter grade will be assigned by the advisor, with Asst. DUS as second reader. If the essay is "Unsatisfactory," the student may make arrangements with the DUS to submit another paper. Papers received late may not be processed before Commencement.

Hints for finding a faculty member to advise on senior essay:
First decide on the general area you would like to explore in your senior essay. Then try to find which faculty member might have an interest or expertise in that area. The best sources are the faculty member's own website and the EEB department booklet, available from the E&EB office. Second, if a faculty member discussed the topic in a course, he/she would be a good choice. Otherwise, look through the Yale College Program of Study to see which faculty member teaches a course that includes your prospective topic.
Approach the faculty member identified above. If he/she is not the best person to advise you on your topic, the faculty member should know who wo be more knowledgeable in that area. Your senior essay advisor will often not be the same advisor that assists with your course schedule.
In discussion with the essay advisor, narrow your area of interest to a focused topic on which you can write in depth; a superficial review of a broad field is not appropriate. The advisor may also suggest a few references to start off your reading in the field.

TO THE SENIOR ESSAY MENTOR

By signing this form, you agree to supervise the student's senior essay project and provide the necessary support. You also agree to grade the final paper and report a grade to the EEB Asst. DUS. This should be reported no later than the last day of the final examination period. Notification by email is acceptable and preferred. Please email both the EEB Asst. DUS: marta.wells@yale.edu and the EEB Registrar: kelly.pyers@yale.edu.

MENTOR'S INFORMATION
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