

**THE MAJOR IN ECOLOGY & EVOLUTIONARY  
BIOLOGY (EEB) IN YALE COLLEGE**

**August 2015**

# TABLE OF CONTENTS

INTRODUCTION .....	1
What does the EEB Major do for me?	
COURSES FOR STUDENT MAJORING IN OTHER SUBJECTS .....	2
AN OVERVIEW OF THE PROGRAMS FOR MAJORS .....	4
OVERVIEW OF THE PROGRAM FOR EEB MAJORS .....	4
Choosing a New Major	
The BIOL Introductory Course	
Placement Exam – Requirement	
Core Course Requirements	
THE SENIOR REQUIREMENT .....	7
The B.A. Degree	
The B.S. Degree	
RESEARCH OPPORTUNITIES .....	8
Research Courses	
Summer Research	
STUDIES ABROAD .....	10
WHERE TO GET ADVICE .....	12
The First Year	
...and Beyond	
ADVISORS .....	14
RECOMMENDATIONS FOR PRE-MEDICAL STUDENTS .....	20
FACILITIES .....	21
COURSES IN EEB 2015-2016 .....	24
Required Introductory Courses	
Introductory Courses and Laboratory without Prerequisites	
Intermediate Courses	
EEB Laboratories	
Advanced EEB Courses	
EEB Research Tutorials	
ADDITIONAL GRADUATE COURSES AND LABS IN EEB 2015-2016 .....	33
UNDERGRADUATE RESEARCH PROJECTS.....	34
APPENDICES .....	37
Appendix I – Worksheet for EEB	
Appendix II – Forms for Tutorial and Research Courses	



# INTRODUCTION

## The Major in Ecology and Evolutionary Biology (EEB) at Yale University

The Department of Ecology and Evolutionary Biology (EEB) offers broad education in the biological sciences. The subject matter ranges from molecules, to cells, organs, organisms and ecosystems, and the evolutionary processes that shape them. Biology is currently undergoing an explosion of discovery, with implications for the analysis and treatment of human disease, biotechnology, and the capacity to recognize and deal with human impact on the environment.

The department offers a B.A. or B.S. degree. The B.A. program is intended for students who are interested in ecology, evolution and organism diversity as part of a liberal education, but do not intend to pursue graduate work in the discipline. The B.S. program is designed 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 the same prerequisite and core requirements, but differ in elective and senior requirements.

The prerequisites for the EEB major are intended to provide core scientific literacy. Beyond the prerequisites, pursuing either of two tracks may satisfy the EEB major. The requirements for the first track emphasize courses appropriate for ecology, evolutionary biology, and environmental science careers; the second track is most appropriate for pre-medical and pre-veterinary students. Pre-medical and pre-veterinary students can use courses required by medical schools, but not required by the major as electives.

The department also has several courses offered without prerequisites suitable for non-majors. These include all 100-level offerings, as well as the 200-level courses that deal with particular organism groups (e.g., plants, fishes, mammals, birds and insects). The EEB major offers opportunities for independent research in both laboratory and field-based investigations. With approval, independent research can be conducted under the supervision of faculty members in any department at Yale. Participation in study abroad programs is encouraged (credit for which may apply toward the major; consult with the DUS prior to going abroad to confirm what requirements a study abroad program satisfies toward an EEB major). Students majoring in EEB must take all courses in the major for a letter grade. College seminars do not count toward the requirements of the major.

The teaching and research facilities in biology are distributed in three buildings: Osborn Memorial Laboratories (OML), Environmental Science Center (ESC), and Kline Biology Tower (KBT). There are more than 50 faculty members, 60 postdoctoral fellows, and 70 graduate students and approximately 150 undergraduate students that work and study in these buildings. The quality and breadth of expertise in this community of biologists has made Yale a premier center for both students and scientists.

### *What does the EEB Major do for me?*

The major in EEB contributes to a liberal education as well as providing excellent preparation for a wide range of professional careers in medicine, public health, the pharmaceutical industry, science writing, teaching, conservation, and biological research. EEB undergraduates at Yale have a high rate of acceptance at medical and graduate schools.

Official Yale College program and course information is found in *Yale College Programs of Study*, available on line at <http://yalecollege.yale.edu/content/yale-college-programs-study>.

## **COURSES FOR STUDENTS MAJORING IN OTHER SUBJECTS**

For students who do not intend to major in EEB, we offer a variety of courses that have no prerequisites.

E&EB 106a	Biology of Malaria, Lyme and Other Vector Borne Diseases
E&EB 115a	Conservation Biology
E&EB 125b	History of Life
E&EB 145b	Plants & People
E&EB 190a	The Evolution of Beauty
E&EB 210a	Introduction to Statistics: Life Sciences
E&EB 246b	Plant Diversity & Evolutionary Biology
E&EB 250a	Biology of Terrestrial Arthropods
E&EB 264a	Ichthyology
E&EB 272b	Ornithology
E&EB 290b	Comparative Anatomy

**E&EB 106a / MCDB 106 / HLTH 155, Biology of Malaria, Lyme and Other Vector Borne Diseases.** Introduction to the biology of pathogen transmission from one organism to another by insects; special focus on malaria and Lyme disease. Biology of the pathogens including modes of transmission and establishment of infection; immune responses and the associated challenges to prevention and treatment.

**E&EB 115a, Conservation Biology.** 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, History of Life.** An 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 tells us about the evolutionary process, on the diversity of ancient and living organisms, and on the evolutionary impact of the changing environment of the Earth.

**E&EB190a / DEVN196 / HUMS289, The Evolution of Beauty.** Aesthetics and beauty explored from the perspective of evolutionary biology, zoology, human biology, arts and culture. Survey of the mechanisms and processes of aesthetic evolution in animals and plants; the nature of sexual conflict over reproduction; the role of aesthetic preferences in the evolution of sexual autonomy; human aesthetics and human art.

**E&EB 210a / MCDB 215a, Introduction to Statistics.** Life Sciences, presents the statistical and probabilistic analysis of biological problems with a unified foundation in basic statistical theory. Problems are drawn from genetics, ecology, epidemiology, and bioinformatics.

**E&EB 246b, Plant Diversity & Evolution.** Introduction to the evolutionary relationships of plant lineages. The complexity, diversity, and characteristics of the major plant groups, including the green algae, mosses, ferns, conifers, and flowering plants, with a phylogenetic context.

**E&EB 250a, Biology of Terrestrial Arthropods.** Evolutionary history and diversity of terrestrial arthropods (body plan, phylogenetic relationships, fossil record); physiology and functional morphology (water relations, thermoregulation, energetics of flying and singing); reproduction (biology of reproduction, life cycles, metamorphosis, parental care); behavior (migration, communication, mating systems, evolution of sociality); ecology (parasitism, mutualism, predator-prey interactions, competition, plant-insect interactions).

**E&EB 264a, Ichthyology.** A survey of fish diversity, including jawless vertebrates, chimaeras and sharks, lungfishes, and ray-finned fishes. Topics include the evolutionary origin of vertebrates, the fossil record of fishes and evolutionary diversification of major extant fish lineages, biogeography, ecology, and reproductive strategies of fishes.

**E&EB 272b, Ornithology.** A general overview of avian biology and evolution, including the structure, function, behavior, and diversity of birds. Topics include the evolutionary origin of birds, avian phylogeny, anatomy, physiology, neurobiology, breeding systems, and biogeography.

**E&EB 290b, Comparative Anatomy.** A survey of the structure, variation, and evolution of major vertebrate groups. Topics include the microanatomy of major organ systems, the embryology of the vertebrate body plan, and the structure and evolution of the major organ systems such as the locomotory system, sensory organs, digestive tract, reproductive tract, and nervous system.

# OVERVIEW OF THE PROGRAM FOR EEB MAJORS

## ***BIOL Introductory Courses***

EEB, MCDB and MBB have combined efforts to launch 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 professions, regardless of the student's major.

**BIOL 101a, b Biochemistry and Biophysics, Michael Koelle (P), Anthony Koleske (P), Samantha Lin**

**M W 11:35 – 12:50, 1/2 Course 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. Prerequisite: The first of four modules in a yearlong introductory biology sequence; meets for the first half of the fall term.

**BIOL 102a, b Principles of Cell Biology and Membrane Physiology, Mark Mooseker (P), Valerie Horsley (P), Samantha Lin**

**M W 11:35 – 12:50, 1/2 Course credit**

Introduction to the study of cell biology and membrane physiology. Topics include 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. Prerequisite: The second of four modules in a yearlong introductory biology sequence; meets for the second half of the fall term.

**BIOL 103a, b Genes and Development, Vivian Irish (P), Weimin Zhong (P), Surjit Chandhoke**

**M W 11:35 – 12:50, 1/2 Course credit**

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

**BIOL 104a, b Principles of Ecology and Evolutionary Biology, Leo Buss (P), Michael Donoghue (P), Surjit Chandhoke**

**M W 11:35 – 12:50 , 1/2 Course 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 particular suites of organismal adaptations. Prerequisite: The fourth of four modules in a year-long introductory biology sequence; meets for the second half of the spring term.

## **Placement Exam – Requirement**

All students are required to take all four of the new introductory modules as prerequisites for the EEB, MBB and MCDB majors. Students with score of 5 on the AP Biology Exam or a score of 7 on the IB Biology exam are now eligible to take a Yale-developed placement exam in the biological sciences. This will be available to incoming freshmen 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.

Please note that many courses will now require one or more of these new introductory modules as prerequisites. Please check each course description carefully.

### *Core Course Requirements*

#### **Requirements for the EEB major are described below:**

Prerequisites: BIOL 101a/b, 102a/b, 103a/b, 104a/b; 2 terms of General Chemistry (CHEM 161, 165 or CHEM 163, 167), 2 terms of General Chemistry Labs, 1 term of Organic Chemistry, with 1 term of Organic Chemistry Lab, 2 terms of Physics (170/171 or higher), 1 term of Math (115 or higher) or Statistics (101-106). A different statistics course approved by the Director of Undergraduate Studies may be substituted for the mathematics prerequisite.

Acceleration credit awarded in chemistry, mathematics, and physics, or completion of advanced courses in those departments, is accepted in place of the corresponding prerequisites for the EEB major. Students who have the mathematics preparation equivalent to MATH 115 or higher are encouraged to take a statistics course (most often STAT 101-106 and/or additional mathematics courses such as MATH 120, 121, 222, or 225). Because chemistry courses are prerequisite to several EEB courses, students are strongly urged to take general and organic chemistry in the freshman and sophomore years. Students who place out of general chemistry should take organic chemistry during their freshman year. Finishing the prerequisites early allows for a more flexible program in later years.

**E&EB**

B.A. \_\_\_\_\_ B.S. \_\_\_\_\_

Name: \_\_\_\_\_

Year: \_\_\_\_\_ College: \_\_\_\_\_ ID#: \_\_\_\_\_

Advisor: \_\_\_\_\_ Cell: \_\_\_\_\_

<b>Prerequisites:</b>	<b>Course #</b>	<b>Taken</b>	<b>Will be Taken</b>	<b>Placement Exam</b>
BIOL 101 a/b Biochemistry & Biophysics	_____	_____	_____	_____
BIOL 102 a/b Principles Cell Bio & Memb Phys	_____	_____	_____	_____
BIOL 103 a/b Genes and Development	_____	_____	_____	_____
BIOL 104 a/b Principles of E&EB	_____	_____	_____	_____
2 terms of General Chemistry (CHEM 161,165; or CHEM 163,167)	_____	_____	_____	_____
2 terms of General Chemistry Lab (CHEM 134L, 136L)	_____	_____	_____	_____
1 term of Organic Chemistry (CHEM 174a, 175b; or CHEM 220a, 221b)	_____	_____	_____	_____
1 term of Organic Chemistry Lab (CHEM 222L)	_____	_____	_____	_____
2 terms of Physics (170a, 171b or higher)	_____	_____	_____	_____
1 term of MATH 115 or STAT 101	_____	_____	_____	_____
2 terms of Math or Geology (may be taken in lieu of the organic chemistry requirement, at the discretion of the DUS, not including MATH 190 and geo may not include paleobiology courses at 100-level offerings)	_____	_____	_____	_____

<b>Core courses Track 1:</b>			<b>Term Taken</b>	<b>Will be Taken</b>
Required:	E&EB 220a	General Ecology	_____	_____
Required:	E&EB 225b	Evolutionary Biology	_____	_____
Required:	E&EB 2xx	Organismal Diversity Course	_____	_____
Required:	E&EB 2xxLb	Organismal Diversity Lab	_____	_____

<b>Core courses Track 2:</b>			<b>Term Taken</b>	<b>Will be Taken</b>
Required:	MCDB 300	Biochemistry	_____	_____
Required:	E&EB 295	Comparative Physiology	_____	_____
OR	BENG 350	Physiological Systems	_____	_____
Required:	E&EB 290	Comparative Anatomy	_____	_____
Required:	E&EB 291L	Comparative Anatomy Lab	_____	_____

Independent Research for Underclassman (Pass/Fail):

E&EB 469 a or b (Tutorial) \_\_\_\_\_

E&EB 474 a or b (Research) \_\_\_\_\_

B.A. degree only:  
(Choose one; must be taken in senior year)

E&EB 470 (Senior Tutorial) (1 credit) \_\_\_\_\_

Senior Essay (no credit) \_\_\_\_\_

B.S. degree only:  
(3 credits required; one must be taken in senior year, for letter grade)

E&EB 475a and b (Senior Research) \_\_\_\_\_

E&EB 495a, 496b (Intensive Sr Research) \_\_\_\_\_

Elective lecture, lab or research (1 credit) \_\_\_\_\_

## THE SENIOR REQUIREMENT

In addition to the course work described on previous pages, all majors in EEB must satisfy the senior requirement of Yale College. This can be accomplished in several ways, depending on whether the student is a candidate for a B.A. or B.S. degree. *The senior requirement must be done during the senior year.*

### *The B.A. Degree*

The requirement can be met in one of two ways: by submitting a Senior Essay of 15-20 pages evaluating current research in a field of biology; or by successful completion of one credit of tutorial work (E&EB 470).

A senior choosing to fulfill the requirement with a Senior Essay must consult with a faculty advisor on the scope and literature of the topic and submit their written approval to the director of undergraduate studies at least one month before the paper is due in the student's last term. The Senior Essay may be related to the subject matter of a course, but the essay is a separate departmental requirement *in addition* to any work done in a course. It does not count toward the grade in any course. The senior essay must be completed and submitted to the office of the director of undergraduate studies by the last day of classes. Students electing this option should obtain an approval form from the office of the director of undergraduate studies. *See EEB Senior Essay Requirement Form at the end of booklet.*

EEB 470 Senior Tutorial is a term of independent study. A student must be sponsored by a faculty member who sets requirements and meets weekly or every two weeks with the student. A term paper is required. To register, the student must submit a written plan of study approved by the faculty instructor to the director of undergraduate studies. Students are encouraged to apply during the term preceding the tutorial. Proposals must be submitted no later than the first day of the second week of the term in which the student enrolls in the tutorial. The final paper is due in the hands of the director of undergraduate studies by the last day of the reading period in the term of enrollment. Normally, faculty sponsors must be members of the EEB department. Fulfill the senior requirement for the B.A. degree.

### *The B.S. Degree*

The B.S. differs from the B.A. in its greater emphasis on individual research. The senior requirement for the standard B.S. is either two contiguous terms of EEB 475 a or b, and one elective or one term of EEB475 a or b and two electives. The former option is highly recommended. One term of intensive original research of 495 a or 496 b, and one elective course also will fulfill the B.S. degree. At least one term of EEB 475 must be taken during the senior year. Ordinarily both terms of EEB 475 a or b, will be taken during the senior year, but it is possible for a student to begin work toward the senior requirement in the spring of the junior year, continue it over the summer, and complete it during the final year, an arrangement that may be particularly useful for students doing field work. Yale College does not grant academic credit for summer research unless the student is enrolled in an independent research course in Yale Summer Session.

## RESEARCH OPPORTUNITIES

There are many opportunities for students to carry out research in the laboratory of a faculty member. A broad spectrum of state-of-the-art research activities is performed at Yale in the EEB department and in related departments including the Yale Medical School of Medicine and the School of Forestry & Environmental Studies. This research is in molecular biology, biochemistry, genetics, cell biology, neurobiology, physiology, environmental sciences, plant science, ecology and evolution. All interested students are encouraged to participate in research. Students may work in laboratories for academic credit and/or experience. Financial support may be available in some cases, but students being 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. Opportunities can be found on the following web sites: <http://www.eeb.yale.edu> and <http://www.biology.yale.edu>. Detailed descriptions of research programs in EEB can also be found in the back of this booklet entitled, *Faculty and Research Interest*.

### *Research Courses*

During the academic year, students with DUS approval may take, EEB 475 a or b. This course is primarily for students who are culminating their undergraduate experience by doing independent research to fulfill the senior requirement. It is possible for underclassmen students who wish to do research earlier in their course of study to take EEB 474 a or b before their senior year, but it does not substitute for other course requirements. EEB 474 counts towards the 36 credits required for the Yale College degree. For research course, hours are typically arranged at the mutual convenience of the student and the faculty advisor. ***Please note that taking EEB 475 at any time does not satisfy the lab requirement or the elective requirement for a course from EEB at 350 or above.***

Approval from the Yale College Committee on Honors and Academic Standing is required if certain limits are exceeded. A student must petition the committee for permission to enroll in more than one such course credit in any one term before the senior year or in more than two such course credits 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 the student must give sound academic reasons for exceeding these limits.

Students taking EEB 475 a or b are expected to spend at least ten hours per week in the laboratory of a faculty member. This course can be taken more than once. Student must reapply each semester to be enrolled, and at the completion of *each* term, a paper must be submitted to their professor. This course, 475 a and b, partially fulfills the senior requirement if one semester is taken in the senior year.

### *Summer Research*

Yale students can also perform research with a faculty member during the summer months, which allows students to devote full-time effort to a research project. Summer research enables students to continue research that was initiated during the previous academic year or to begin research that will be continued during the follow academic year. Sometimes the faculty member has 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 director of undergraduate studies. 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 <http://studentgrants.yale.edu> to look for sources of money.

Go to Yale F&ES Career Development Office for internship opportunities.

### **USA Summer Programs in Field Stations**

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

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

Institute of Ecosystems Studies: <http://www.ecostudies.org/about.html>

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

Mountain Lake Biological Station – University of Virginia: <http://www.mlbs.org>

The School for Field Studies: <http://www.fieldstudies.org>

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

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

## STUDIES ABROAD

It is possible for EEB majors to 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 can be applied to fulfilling the EEB major requirements depends on the particular program chosen and should be discussed with the DUS early in planning.

Information on some studies abroad in EEB is available below.

### **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.

<http://www.ots.ac.cr/>

### **Tropical Biology Association – Uganda, Tanzania, Madagascar**

Summer and four month course in tropical ecology and conservation. The course highlight up-to-date concepts and techniques in tropical ecology and conservation.

<http://www.tropical-biology.org>

### **School for Field Studies (SFS) – Australia, Baja Mexico, Caribbean, Costa Rica, Kenya**

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.

<http://www.disp.dk/>

**Institute for Study Abroad (ISA) – Australia, New Zealand**

Semester or academic year program available. ISA offers programs at universities in Australia and New Zealand. Students can choose from a variety of arts and science courses including: Anatomy, Biology, Ecology, Entomology, Environmental Science, Forestry, Genetics, and Zoology. Internship programs are also available in Australia, Chile, England, Ireland, and New Zealand.

<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 EEB provides a source of clear and readily available information regarding programs of study through the students' four years at Yale. Each student will have three formal advisors to guide academic choices, but finding the right person for the problems sometimes requires student initiative.

### *The First Year*

Upon entrance into Yale University, each student is assigned to one of the twelve residential colleges on campus. With this initial assignment, the first-year student encounters a team of three important advisors who will be helpful in answering questions and directing the student's choice of classes.

First, each entering student is assigned a *freshman counselor*, who is a senior student living with the freshman class. The student counselor gives the freshmen 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. This is particularly important for freshman that are considering a major in science. The second advisor is also a member of the student's residential college, is usually a faculty fellow of that student's college, and is sometimes a member of the EEB department. This faculty advisor is responsible for advising the student about fulfilling distributional requirements in the first year. The third person on the first-year advising team is, of course, the student's residential dean. The dean has ultimate authority over the student's decisions for courses and programs of study. If the freshman advisor is not a member of a science department in Yale College, the student is strongly advised to consult with the director of undergraduate studies in the field of the student's primary interest. There are also meetings for prospective science majors that are held the fall before classes get started.

***The most important issue for prospective EEB majors is to take chemistry during their first year.*** This is because many courses have prerequisites of two years of chemistry followed by biochemistry. An early start on this sequence is therefore essential. If the student is going to take a second science course, it should be Introductory to Biology sequence (BIOL 101 – 104). It is possible to postpone the laboratory for chemistry until the year after the course is taken, although this is not recommended. Math and physics can be taken later years.

### *...and Beyond*

At the end of the freshman year, the student has the option of continuing with the faculty fellow advisor assigned for the first year or of choosing a new faculty advisor for the sophomore year. EEB majors should find an advisor in the program as soon as they decide on the major. A list of EEB faculty fellows and their affiliated colleges is presented on the next section. The sophomore year advisor usually remains a student's advisor for the next two years, but it is possible to switch if a student prefers another individual. Students might find it most convenient to consult with the EEB Undergraduate DUS to identify an appropriate faculty advisor. However a faculty advisor is identified – communicating that choice to the EEB Undergraduate Registrar will ultimately be useful to both you and the Department.

The EEB faculty advisor's role is four-fold. First, the advisor ensures that the student selects and fulfills the requirements needed for graduation. Second, the advisor ensures that the major's distributional requirements are fulfilled. Third, the advisor gives guidance on the student's curriculum and future career plans. Finally, the faculty advisor may be asked to write letters of recommendation if the student should so desire.

The regular faculty advisor should handle most routine issues, including signing schedules. Certain matters required the attention of the director of undergraduate studies. The EEB DUS can be reached by email or through the undergraduate registrar. See the inside cover of this booklet for names, phone numbers and email addresses.

## **EEB Faculty and Research Interests**



### **Leo W. Buss**

Professor of Ecology and Evolutionary Biology, Professor of Geology & Geophysics,  
Curator of Invertebrates, Peabody Museum

165 Prospect St, New Haven, CT 06511-8934

[leo.buss@yale.edu](mailto:leo.buss@yale.edu)

Phone: 203-432-3869

[Saybrook College Fellow]

Theoretical research on ontological foundations of evolutionary theory;  
empirical research on hydroid biology



### **Adalgisa Caccone**

Lecturer in Ecology and Evolutionary Biology and Senior Research Associate in Forestry  
And Environmental Studies; Sr Rsrch Sci/Scholar Ecology/Evolutionary Bio; Sr Rsrch  
Assoc Sch of For & Env Stu; Sr Rsrch Sci/Scholar School of Public Health

165 Prospect St, New Haven, CT 06511-8965

[adalgisa.caccone@yale.edu](mailto:adalgisa.caccone@yale.edu)

Phone: 203-432-5259

[Saybrook College Fellow]

Molecular evolution and conservation genetics



### **Mary Beth Decker**

Research Scientist Ecology and Evolutionary Biology, Lecturer School of Forestry &  
Environmental Studies

165 Prospect St, New Haven, CT 06511-8934

[marybeth.decker@yale.edu](mailto:marybeth.decker@yale.edu)

Phone: 203-432-6293

Biological oceanography, jellyfish blooms in changing coastal and estuarine ecosystems



### **Michael J. Donoghue**

Sterling Professor of Ecology and Evolutionary Biology and Professor of Forestry And  
Environmental S; Curator of Botany Peabody Museum; Prof Sch of For & Env Stu &  
Geology & Geophysics; Director Marsh Botanical Gardens

21 Sachem St, New Haven, CT

[michael.donoghue@yale.edu](mailto:michael.donoghue@yale.edu)

Phone: 203432-2074

[Calhoun College Fellow]

Plant evolution and systematics; phylogenetic biology



**Walter Jetz**

Associate Professor – Tenured Ecology Evolutionary Biology; Associate Professor  
School of Forestry & Environmental Studies  
165 Prospect St, New Haven, CT 06511-8934  
[walter.jetz@yale.edu](mailto:walter.jetz@yale.edu)  
Phone: 203-432-7540  
[Saybrook College Fellow]

Macroecology; community ecology; biogeography; global change biology; conservation;  
ecology and evolution of terrestrial vertebrates



**Thomas Near**

Associate Professor of Ecology and Evolutionary Biology, Associate Curator Peabody  
Museum  
21 Sachem St, New Haven, CT 06511  
[Thomas.near@yale.edu](mailto:Thomas.near@yale.edu)  
Phone: 203-432-3002  
[Master of Saybrook College]

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



**David M. Post**

Professor of Ecology and Evolutionary Biology; Chair, University-Wide Committee on  
Sexual Misconduct  
165 Prospect St, New Haven, CT 06511-8934  
[david.post@yale.edu](mailto:david.post@yale.edu)  
Phone: 203-432-3005  
[Timothy Dwight Fellow]

Aquatic ecology; food-web structure and dynamics



**Jeffrey R. Powell**

Professor of Ecology and Evolutionary Biology, Professor Environmental Health  
Sciences; School of Forestry & Environmental Studies and School Public Health  
21 Sachem St, New Haven, CT 06511-8934  
[jeffrey.powell@yale.edu](mailto:jeffrey.powell@yale.edu)  
Phone: 203-432-3887  
[Calhoun College Fellow]

Evolutionary genetics; molecular evolution and conservation genetics



**Richard O. Prum**

William Robertson Coe Professor of Ornithology, Ecology and Evolutionary Biology,  
Curator Vertebrate Zoology Peabody Museum; Prof School of Forestry & Environmental  
Studies

21 Sachem St, New Haven, CT 06511-8934

[richard.prum@yale.edu](mailto:richard.prum@yale.edu)

Phone: 203-432-9423

[Calhoun College Fellow]

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



**Linda Puth**

Lecturer, Ecology and Evolutionary Biology

165 Prospect St, New Haven CT 06511-8934

[linda.puth@yale.edu](mailto:linda.puth@yale.edu)

Phone: 203-432-8099



**Carla A. Staver**

Assistant Professor Ecology and Evolutionary Biology and School of Forestry &  
Environmental Studies

165 Prospect St, New Haven, CT 06511

[carla.staver@yale.edu](mailto:carla.staver@yale.edu)

Phone: 203-436-9200

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



**Stephen C. Stearns**

Edward P Bass Professor of Ecology and Evolutionary Biology

165 Prospect St, New Haven, CT 06511-8934

[stephen.stearns@yale.edu](mailto:stephen.stearns@yale.edu)

Phone: 203-432-8452

[Saybrook College Fellow]

Life history evolution, evolution of sex, evolutionary genetics; population biology;  
functional genomics



**Paul Turner**

Professor, Chair of Ecology and Evolutionary Biology  
165 Prospect St, New Haven, CT 06511-8934

[paul.turner@yale.edu](mailto:paul.turner@yale.edu)

Phone: 203-432-5918

[Trumbull College Fellow]

Experimental evolution of bacterial and animal viruses; ecology and evolution of infectious diseases and pathogen emergence; host parasite interactions; evolution of sex; evolution of robustness



**David Vasseur**

Associate Professor of Ecology and Evolutionary Biology, Director of Graduate Studies  
165 Prospect St, New Haven, CT 06511-8934

[david.vasseur@yale.edu](mailto:david.vasseur@yale.edu)

Phone: 203-432-2719

[Saybrook College Fellow]

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



**Günter Wagner**

Alison Richard Professor of Ecology and Evolutionary Biology; Department of Obstetrics, Gynecology and Reproductive Sciences – Yale University; and Adjunct Professor of Obstetrics and Gynecology – Wayne State University  
300 Heffernan Dr #B31, West Haven, CT 06516

[gunter.wagner@yale.edu](mailto:gunter.wagner@yale.edu)

Phone: 203-737-3091 and 203-432-9998

[Silliman College Fellow]

Population genetics theory; evolutionary theory



**Marta Lucia Martinez Wells**

Senior Lecturer; Director of Undergraduate Studies for Ecology and Evolutionary Biology

165 Prospect St, New Haven, CT 06511-8934

[marta.wells@yale.edu](mailto:marta.wells@yale.edu)

Phone: 203-432-6294

[Trumbull College Fellow]

Insect behavior and Evolution. Mating signal and speciation in Neuropteran insects.

## **Faculty (Affiliated)**

### **Richard Bribiescas**

Professor of Anthropology; Deputy Provost for Faculty Development and Diversity; Prof Ecology/Evolutionary Bio  
1 Hillhouse, New Haven, CT 06511

[richard.bribiescas@yale.edu](mailto:richard.bribiescas@yale.edu)

Phone: 203-432-2049

### **Nicholas Christakis**

Sol Goldman Family Professor of Sociology and Professor in the Institute for Social and Policy Studi; Prof Int Med  
General Medicine and Ecology/Evolutionary Bio and Inst Soc Pol Studies and Biomedical Eng (SEAS)

17 Hillhouse Ave, New Haven, CT 06511-8965

[nicholas.christakis@yale.edu](mailto:nicholas.christakis@yale.edu)

Phone: 203-436-4747

### **Liza S. Comita**

Assistant Professor School of Forestry & Environmental Studies/Evolutionary Biology

205 Prospect St, New Haven, CT 06511

[liza.comita@yale.edu](mailto:liza.comita@yale.edu)

Phone: 203-432-5511

### **Peter Crane**

Carl W. Knobloch, Jr. Dean of the School of Forestry & Environmental Studies and Professor of Botany; Professor  
Ecology/Evolutionary Biology and Geology & Geophysics; Curator Peabody Museum 205 Prospect St, New Haven,  
CT 06511-2106

[peter.crane@yale.edu](mailto:peter.crane@yale.edu)

Phone: 203-432-5109

[Davenport College Fellow]

### **Forrest Crawford**

Assistant Professor, School of Public Health, Ecology and Evolutionary Biology

60 College St, New Haven, CT 06510-3210

[forrest.crawford@yale.edu](mailto:forrest.crawford@yale.edu)

Phone: 203-785-6125

### **Alison P. Galvani**

Burnett and Stender Families Professor of Epidemiology (Microbial Diseases) and Professor of Ecology; Prof  
Ecology/Evolutionary Bio

60 College St, New Haven, CT 06510-3210

[alison.galvani@yale.edu](mailto:alison.galvani@yale.edu)

Phone: 203-785-2642

[Berkeley College Fellow]

### **Vivian F. Irish**

Professor of Molecular, Cellular and Developmental Biology, Professor of Ecology and Evolutionary Biology  
219 Prospect St, New Haven, CT 06511-2106

[Vivian.irish@yale.edu](mailto:Vivian.irish@yale.edu)

Phone: 203-432-5572

[Davenport College Fellow]

**Kenneth Kidd**

Professor Genetics, Ecology and Evolutionary Biology, & Psychiatry  
333 Cedar St, New Haven, CT 06511-2106

[kenneth.kidd@yale.edu](mailto:kenneth.kidd@yale.edu)

Phone: 203-785-2654

[Morse College Fellow]

**James Noonan**

Associate Professor Genetics and Ecology and Evolutionary Biology  
333 Cedar Street, New Haven, CT 06510-3206

[james.noonan@yale.edu](mailto:james.noonan@yale.edu)

Phone: 203-737-1922

**Eric J. Sargis**

Professor of Anthropology; Curator Peabody Museum; Professor of Ecology and Evolutionary Biology  
10 Sachem St, New Haven, CT 06511-3707

[eric.sargis@yale.edu](mailto:eric.sargis@yale.edu)

Phone: 203-432-6140

[Trumbull College Fellow]

**Oswald J. Schmitz**

Oastler Professor of Forestry And Environmental Studies and Professor of Ecology and Evolutionary Biology; Dir  
Biospheric Studies

205 Prospect St, New Haven, CT 06511-2106

[oswald.schmitz@yale.edu](mailto:oswald.schmitz@yale.edu)

Phone: 203-432-5110

[Ezra Stiles College Fellow]

**David K. Skelly**

Oastler Professor of Forestry And Environmental Studies and Professor of Ecology and Evolutionary Biology;  
Curator of Peabody Museum; Dir of Peabody Museum

205 Prospect St, New Haven, CT 06511-2106

[david.skelly@yale.edu](mailto:david.skelly@yale.edu)

Phone: 203-432-3603

**Jeffrey Townsend**

Associate Professor of Biostatistics and Ecology and Evolutionary Biology  
Director of Bioinformatics; Yale Center for Analytical Sciences

135 College St, New Haven, CT 06510-2483

[jeffrey.townsend@yale.edu](mailto:jeffrey.townsend@yale.edu)

Phone: 203-737-7042

**J. Rims Vaisnys**

Professor of Electrical Engineering and Ecology and Evolutionary Biology  
15 Prospect St, New Haven, CT 06511-6816

[juozas.vaisnys@yale.edu](mailto:juozas.vaisnys@yale.edu)

Phone: 203-432-4253

[Jonathan Edwards College Fellow]

## RECOMMENDATIONS FOR PRE-MEDICAL STUDENTS

Most medical schools require:

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

Two years of Chemistry plus two years of laboratories

One year of Physics plus laboratories (Note: the requirements of the EEB major do not include physics laboratories)

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

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 as well as Biochemistry.

Medical schools require that all courses used to fulfill the basic pre-medical requirements must 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 Advisory Board (HPAB) at Undergraduate Career Services (UCS) located at 55 Whitney Avenue (203-432-0818), preferably during the first term of enrollment 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, since over 70% of applicants matriculate in one of these schools. Individual medical school course requirements for American and Canadian applicants can be found in the AAMC publication, Medical School Admission Requirements, which is available in the Health Professions Department at the Office of Undergraduate Career Services (<http://www.aamc.org/students/applying/requirements/>).

The HPAB publishes an informational bulleting that contains general information, *Preparing to Become a Health Care Professional*, and a second bulleting with 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 UCS publication, *General Information about MD/PhD Programs*. All are available on the UCS website at [www.yale.edu/career/students/gradprof/medschool](http://www.yale.edu/career/students/gradprof/medschool) or at the UCS office.

## FACILITIES

The offices and laboratories of the primary faculty members in EEB are in two buildings on science hill: Osborn Memorial Laboratories (OML), the Environmental Sciences Center (ESC) and West Campus (YWC). Joint appointees are housed in the home departments. In addition to the state of the art laboratories in the three buildings listed below, are additional facilities accessible to students for research and study at Yale.

**Libraries:** The several science libraries collectively constitute one of the greatest collections of biological literature in the world. The Center for Science and Social Science Information (CASSI), Peabody Museum (ornithology and entomology), Kline Geology Library (paleobiology), School of Forestry & Environmental Studies (forestry and environmental biology), Engineering Library and Medical Library (biomedical sciences) together represent a total collection of approximately one million volumes.

The CASSI is located in the concourse level of the Kline biology Tower and has replaced the Kline Science Library while retaining the library's former collection in the biological sciences and supplements to that additional and substantial functionality in computing with its state-of-the-art StatLab. Please visit their web site for additional information. <http://cassi.yale.edu>

**Computer Facilities:** Yale Information and Technology Services (ITS) provides both mainframe and microcomputer resources to the student community. A variety of computer languages and programs are supported. Biomedical Computer Facilities, located at the Medical School, accessed through remote or local terminals, is 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 particular 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). Research and work-study opportunities with any of the scientific staff members of the Museum are accessible to students.

**Genomics and Molecular Biology Facilities:** University services for all aspects of molecular biological investigations 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 through put chemical genomic screening, and new technologies of next generation genomic DNA sequencing such as Roche/454 and Illumina/Solexa are available in the MCDB Department. In addition, the laboratories for teaching and for faculty research are well 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, including 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 excellent 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 EEB and other Science Hill departments.

**DNA Analysis Facility on Science Hill (DAFSH):** We are a non-profit academic Core Facility for DNA Sequencing and Fragment Analysis. This service facility is located on the first floor of the ESC within the YIBS-MSCG Center (see below). Its services are utilized by over 600 users from Yale as well as other academic institutions and private companies from across the United States and around the world. Yale users have priority over external customers and reduced rates. Training and job opportunities for Yale students are available during both academic and summer months. Please visit our web site for additional information (<http://dna-analysis.research.yale.edu/#>).

**YIBS (Yale Institute for Biospherics Studies) Conservation Genetics Centers:** This center (YIBS-MSCG) is located on the first floor of the Environmental Science Center. Our support is for scientists at any level that would like to address environmental, biodiversity, epidemiological, and conservation questions using DNA analyses, but lack the equipment and or knowledge to do. A variety of learning opportunities and funding support are available to EEB and other Yale departments and schools members including rotations, seminars, one-on-one training sessions, and summer opportunities. For additional information please visit: <http://www.yale.edu/caccone/ecosave/index.html>.

**YIBS Center for Earth Observation:** A computer laboratory for the analysis of remote sensing data is available for research. The Center also offers courses in remote sensing on a regular basis to student, which provide students with the skills to use the facility. This Center is housed in the Department of Geology and Geophysics.

**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 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 Museum Field Station:** The Marine Biology facility on Long Island Sound is comprised of an on-shore laboratory, a 40-acre salt marsh, and a 17-acre island. Facilities include salt water holding tanks, a shops, and a small boat fleet. It is approximately 30 minutes from the Yale campus.

**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. Eric Larson, the garden manager, leads a staff that includes David Garinger, indoor plant curator, Chris Bolick, research plant curator, and Bobby Rak, research aide.

**Yale's West Campus:** There are also a series of Core Facilities established on Yale's West Campus. These currently include: High Throughput Cell Biology, Small Molecular Discovery Center, and Yale Center for Genome Analysis, and HPC-High Performance Computing Center. Please visit their web site for information: [http://www.yale.edu/westcampus/science\\_core.html](http://www.yale.edu/westcampus/science_core.html)

**Yale Nature Preserve:** This tract of acres 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:** There are more than 10,000 acres of Yale Forests managed as working forest by the School of Forestry & Environmental Studies. They are also available by arrangement for research and instruction. The 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.

## COURSES IN EEB 2015-2016

Note: The letter “a” following a course number indicates a fall term course; “b” indicates a spring term course; “G” indicates courses offered to undergraduate and graduate students; courses without an “a or b” are year-long; “\*” indicates permission from the instructor is needed. Bracketed courses are not offered in the academic year 2015-2016.

### *Required Introductory Courses*

**BIOL 101a, b Biochemistry and Biophysics, Michael Koelle (P), Anthony Koleske (P), Samantha Lin**

**M W 11:35 – 12:50, 1/2 Course 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. Prerequisite: The first of four modules in a yearlong introductory biology sequence; meets for the first half of the fall term.

**BIOL 102a, b Principles of Cell Biology and Membrane Physiology, Mark Mooseker (P), Valerie Horsley (P), Samantha Lin**

**M W 11:35 – 12:50, 1/2 Course credit**

Introduction to the study of cell biology and membrane physiology. Topics include 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. Prerequisite: The second of four modules in a yearlong introductory biology sequence; meets for the second half of the fall term.

**BIOL 103a, b Genes and Development, Vivian Irish (P), Weimin Zhong (P), Surjit Chandhoke**

**M W 11:35 – 12:50, 1/2 Course credit**

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

**BIOL 104a, b Principles of Ecology and Evolutionary Biology, Leo Buss (P), Michael Donoghue (P), Surjit Chandhoke**

**M W 11:35 – 12:50 , 1/2 Course 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 particular suites of organismal adaptations. Prerequisite: The fourth of four modules in a year-long introductory biology sequence; meets for the second half of the spring term.

*Introductory Courses and Laboratory with Prerequisites*

**EEB 106a. Malaria, Lyme & Vector Borne Disease.** Alexia Belperron

M W 1:00 – 2:15

Introduction to the biology of pathogen transmission from one organism to another by insects; special focus on malaria, dengue and Lyme disease. Biology of the pathogens including modes of transmission, establishment of infection, and immune responses; the challenges associated with vector control, prevention, development of vaccines, and treatment.

**EEB 115a<sup>G</sup> / EEB 515a / F&ES 315a. Conservation Biology.** Linda Puth, Jeffrey Powell

M W 10:30 – 11:00, 1 HTBA

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.

**EEB 125b / G&G 125b. History of Life.** Derek Briggs

T Th 11:35 – 12:50

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.

**EEB 145b. Plants and People.** Linda Puth

M W F 10:30 – 11:20

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 symbols; plants in the environment. Includes visits to the Peabody Museum, the Marsh Botanical Garden, and the Yale Art Gallery.

**[EEB 171a. The Collections of the Peabody Museum]**

### *Intermediate Courses*

Note: Prerequisites for all EEB courses numbered 200 and above are BIOL 101, 102, 103 and 104, or permission of the instructor.

**EEB 202a / MCDB 202a. Genetics.** Stephen Dellaporta, Joshua Gendron

T Th 11:35 – 12:50

An introduction to classical, molecular, and population genetics of both prokaryotes and eukaryotes and their central importance in biological sciences. Emphasis on analytical approaches and techniques of genetics used to investigate mechanisms of heredity and variation. Topics include transmission genetics, cytogenetics, DNA structure and function, recombination, gene mutation, selection, and recombinant DNA technology. *Prerequisite: BIOL 103 or equivalent performance on the corresponding biological sciences placement examination*

**[EEB 210<sup>G</sup> / EEB 510 / STAT 101. Introduction to Statistics: Life Sciences.]**

**EEB 220a<sup>G</sup> / EEB 520a / EVST 223. General Ecology.** Carla Staver, David Vasseur

M W F 10:30 – 11:20

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 a or b or equivalent.*

**EEB 225b<sup>G</sup> / EEB 525b. Evolutionary Biology.** Thomas Near, Paul Turner

T Th 11:35 – 12:50

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.

**[EEB 228b<sup>G</sup> / EEB 528b. Ecology and Evolution of Infectious Diseases.]**

**EEB 235a<sup>G</sup> / EEB 535a / HLTH 250. Evolution and Medicine.** Stephen Stearns

T 7:00 – 8:50p

Introduction to the ways in which evolutionary science informs medical research and clinical practice. Diseases of civilization and their relations 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 on line; class time focuses on discussion of lecture topics and research papers.

**EEB 246a<sup>G</sup> / EEB 546a. Plant Diversity and Evolution.** Michael Donoghue

M W 1:00 – 2:15

Introduction to the major plant groups and their evolutionary relationships, with an emphasis on the diversification and global importance of flowering plants. *To be taken concurrently with EEB 247L.*  
Prerequisite: a general understanding of biology and evolution.

**EEB 250a<sup>G</sup> / EEB 550a. Biology of Terrestrial Arthropods.** Marta M. Wells

T Th 11:35 – 12:50

Evolutionary history and diversity of terrestrial arthropods (body plan, phylogenetic relationships, fossil record); physiology and functional morphology (water relations, thermoregulation, energetics of flying and singing); reproduction (biology of reproduction, life cycles, metamorphosis, parental care); behavior (migration, communication, mating systems, evolution of sociality); ecology (parasitism, mutualism, predator-prey interactions, competition, plant-insect interactions). *To be taken concurrently with EEB 251L.*

**[EEB 264a<sup>G</sup> / EEB 564a. Ichthyology.]**

**EEB 272b<sup>G</sup> / EEB 672b. Ornithology.** Richard Prum

M W F 9:25 – 10:15

An overview of avian biology and evolution, including the structure, function, behavior, and diversity of birds. The evolutionary origin of birds, avian phylogeny, anatomy, physiology, neurobiology, breeding systems, and biogeography. *To be taken concurrently with EEB273L.* Enrollment limited to 50.

**EEB 275b<sup>G</sup> / EEB 575b / EVST 400b. Biological Oceanography.** Mary Beth Decker

T Th 11:35 – 12:50

Exploration of a range of coastal and pelagic ecosystems. Relationships between biological systems and the physical processes that control the movements of water and productivity of marine systems. Anthropogenic impacts on oceans, such as the effects of fishing and climate change. Includes three Friday field trips. Enrollment limited to 15.

**[EEB 280a / ANTH 310a. Mammalogy.]**

**EEB 290b. Comparative Anatomy of Vertebrates.** Günter Wagner

M W F 11:35 – 12:25

A survey of the structure, variation, and evolution of major vertebrate groups. Topics include the microanatomy of major organ systems, the embryology of the vertebrate body plan, and the structure and evolution of the major organ systems such as the locomotory system, sensory organs, digestive tract, reproductive tract, and nervous system. *To be taken concurrently with EEB 291L.*

*EEB Laboratories*

**EEB 223Lb<sup>G</sup> / EEB 523Lb. Evolution, Functional Traits, and the Tree of Life.** Marta Wells

HTBA

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. SC ½ Course cr

[**EEB 226Lb<sup>G</sup> / EEB526Lb. Laboratory for Evolutionary Biology.** Gisella Caccone]

**EEB 247La<sup>G</sup> / EEB 547La. Laboratory for Plant Diversity and Evolution.** Michael Donoghue

T 1:00 – 5:00

Hands-on experience with the plant groups examined in the accompanying lectures. Local field trips. *To be taken concurrently with EEB 246.* SC ½ Course cr

**EEB 251La<sup>G</sup> / EEB 551La. Laboratory for Biology of Terrestrial Arthropods.** Marta Wells

W 1:30 – 4:30

Comparative anatomy, dissections, identification, and classification of terrestrial arthropods; specimen collection; field trips. *Concurrently with or after EEB 250.* SC ½ Course cr

[**EEB 265La<sup>G</sup> / EEB 565La. Laboratory for Ichthyology.**]

**EEB 273Lb<sup>G</sup> / EEB 673Lb. Laboratory for Ornithology.** Richard Prum

T 1:30 – 4:30

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

**EEB 291Lb. Comparative Anatomy of Vertebrates Laboratory.** Günter Wagner

Th 1:30 – 4:30

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. *To be taken with EEB 290.* SC ½ Course cr

*Advanced EEB Courses*

**[EEB 310b<sup>G</sup>. Evolutionary Genetics.]**

**[EEB 315a<sup>G</sup>. Ecology and Evolution of Plant-Insect Interactions.]**

**EEB 320b. Advanced Ecology.** David Vasseur

T Th 1:00 – 2:15

An advanced treatment of ecology, including species interactions, species coexistence theory, species environment interactions, the maintenance and consequences of biological diversity, spatial ecology, food webs, and eco-evolutionary interactions.

**[EEB 330a / F&ES 330a. Ecosystem Ecology.]**

**[EEB 335b. Probabilistic Modeling in Ecology, Evolution, and Disease.]**

**[EEB 340b / EVST / F&ES. Community Ecology]**

**[EEB 342b / ANTH 335b. Primate Diversity and Evolution.]**

**[EEB 365a / EVST 365a / F&ES 365a. Landscape Ecology.]**

**[EEB 370a / EVST 370a / F&ES 370a. Aquatic Ecology.]**

**EEB 380b<sup>G</sup> / EEB 680b. Life History Evolution.** Stephen Stearns

T Th 11:35 – 12:50

Life history evolution studies how the phenotypic traits directly involved in reproductive success are shaped by evolution to solve ecological problems. The intimate interplay between evolution and ecology. After EEB 220 and 225, or with permission of instructor.

**[EEB 426. Phylogenetics and Macroevolution.]**

**[EEB 427. Phylogenetics Laboratory.]**

**EEB 428a / AMTH 428 / G&G 428 / PHYS 428. Science of Complex Systems.** Jun Korenaga

M W 9:00 – 10:15

Introduction to the quantitative analysis of systems with many degrees of freedom. Fundamental components in the science of complex systems, including how to simulate complex systems, how to analyze model behaviors, and how to validate models using observations. Topics include cellular automata, bifurcation theory, deterministic chaos, self-organized criticality, renormalization, and inverse theory. Prerequisite: PHYS 301, MATH 247, or equivalent.

**EEB 460b<sup>G</sup> / EEB 960b. Studies in Evolutionary Medicine I.** Stephen Stearns

T Th 4:00 – 5:15

This two-term course begins in January. Students learn the major principles of evolutionary biology and apply them to issues in medical research and practice by presenting and discussing original papers from the current research literature. Such issues include lactose and alcohol tolerance; the Hygiene Hypotheses and autoimmune disease; human genetic variation in drug response and pathogen resistance; spontaneous abortions, immune genes, and mate choice; parental conflicts over reproductive investment mediated by genetic imprinting; life history tradeoffs and the evolution of aging; the evolution of virulence and drug resistance in pathogens; the evolutionary genetics of humans and their pathogens; the ecology and evolution of disease; the evolutionary origin of diseases; and the emergence of new diseases. Students are required to develop a research proposal based on one of their own questions in spring term, to spend the summer on a research project related to their proposal, and to write a paper based on the results of their research in the fall term. Students must take both terms, fulfill the summer research project, and attend additional lectures to be scheduled in both terms. Admission is by competitive application only. Forms are available on the EEB website.

**EEB 461a<sup>G</sup> / EEB 961a. Studies in Evolutionary Medicine II.** Paul Turner

T Th 4:00 – 5:15

Principles of evolutionary biology applied to issues in medical research and practice. Lactose and alcohol tolerance; the “hygiene hypothesis”; genetics variation in drug response and pathogen resistance; spontaneous abortions, immune genes, and mate choice; the evolution of aging; the ecology and evolution of disease; the emergence of new diseases. Students develop proposals for research to be conducted during the summer. *Prerequisite: EEB 460b or with permission of instructor.* Continuation of EEB 460b.

*EEB Research and Tutorials*

**EEB 469 a or b. Tutorial.** Marta Wells

HTBA

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. One or more written examinations and/or a term paper are required. To register, the student must submit a written plan of study approved by the faculty instructor or the director of undergraduate studies. Students are encouraged to apply during the term preceding the tutorial. Proposals must be submitted no later than the first day of the second week of the term in which the student enrolls in the tutorial. The final paper is due in the hands of the director of undergraduate studies 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 EEB department.

**EEB 470 a or b. Senior Tutorial.** Marta Wells

HTBA

Tutorial for seniors in the B.A. degree program who elect a term of independent study to complete the senior requirement. A student must be sponsored by a faculty member who sets requirements and meets weekly with the student. One or more written examinations and/or a term paper are required. To register, the student must submit a written plan of study approved by the faculty instructor to the director of undergraduate studies. Students are encouraged to apply during the term preceding the tutorial. Proposals must be submitted no later than the first day of the second week of the term in which the student enrolls in the tutorial. The final paper is due in the hands of the director of undergraduate studies by the last day of reading period in term of enrollment. Normally, faculty sponsors must be members of EEB department. Enrollment limited to seniors. Fulfill the senior requirement for B.A. degree.

**EEB 474 a or b. Research.** Marta Wells

HTBA

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. Students are expected to spend ten hours per week on their research projects. Using the form available from the office of undergraduate studies or from the Classes server, students must submit a research proposal that has been approved by the faculty sponsor to the director of undergraduate studies, preferably during the term preceding the research. Proposals are due no later than the first day of the second week of the term in which the student enrolls in the course. The final research paper is due in the hands of the director of undergraduate studies by the last day of reading period in the term of enrollment.

**EEB 475 a or b. Senior Research.** Marta Wells

HTBA

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. Students are expected to spend ten hours per week on their research projects. Using the form available from the office of undergraduate studies or from the Classes server, students must submit a research proposal that has been approved by the faculty sponsor to the director of undergraduate studies, preferably during the term preceding the research. Proposal are due no later than the first day of the second week of the term in which the student enrolls in the course. The final research paper is due in the hands of the director of undergraduate studies by the last day of reading period in the term of enrollment. Enrollment is limited to seniors. Fulfills a portion of the senior requirement for the B.S. degree. Must be taken in the senior year.

**EEB 495a or 496b. Intensive Senior Research.** Marta Wells

HTBA

One term of intensive original research during the senior year under the sponsorship of a Yale faculty member. Similar to other research courses except that a more substantial portion of a student's time and effort should be spent on the research project (a minimum average of twenty hours per week). A research proposal approved by the sponsoring faculty member must be submitted to the director of undergraduate studies; forms are available from the office of undergraduate studies. For research in the fall term, approval is encourage during the spring term of the junior year. Proposals are due no later than the first day of the second week of the term in which the student enrolls in the course. The final research paper is due in the hands of the director of undergraduate studies by the last day of reading period in the term of enrollment. Fulfills a portion of the senior requirement for the B.S. degree. Must be taken in the senior year.

## **ADDITIONAL GRADUATE COURSES AND LABS IN EEB 2015-2016**

With permission of the instructor, advanced undergraduates may take graduate courses for credit. If you are interested in one of these consult the instructor and you will need to fill out a special form that should be available in your college dean's office.

### **EEB 500a and 501b. Advanced Topics in Ecology and Evolutionary Biology. DGS**

M 2:30 – 4:30

This seminar course meets on Mondays from 2:30 to 4:30, during both the fall and spring semesters. The year-long course is required for all 1<sup>st</sup>-year graduate students, and the primary goals are to acquaint new students with the research going on in the department, and for students to get to know the faculty. Topics to be announced.

**[EEB 555bu. Invertebrates I.]**

**[EEB 556Lbu. Laboratory for Invertebrates I.]**

**[EEB 557au. Invertebrates II.]**

**[EEB 558Lau. Laboratory for Invertebrates II.]**

### **EEB 545b. Responsible Conduct of Research. DGS**

M 2:30 – 4:30

**[EEB 712b. Foundations of Ecology.]**

**[EEB 715b. Speciation and Adaptive Radiation.]**

**[EEB 716a. Evolution of Cancer.]**

**[EEB 717a. Structuralism and Macroevolution.]**

**[EEB 842b. Primate Diversity and Evolution.]**

**[EEB 930a. Seminar in Systematics.]**

**UNDERGRADUATE RESEARCH PROJECTS**  
**Senior Symposium 2015**

**Presenter and Title**

**Faculty Advisor**

**Mallory Gwendolyn Brown, BS**

Understanding the Role of Fatty Acid Transporter Proteins  
 During Adipogenesis

**Matthew Rodeheffer**

**Sofia Cristina Carrera, BS**

Diurnal Variation of Testosterone in Adult Male Owl  
 Monkeys

**Richard Bribiescas**

**Sofia Campbell John, BS**

Understanding the Visual Attention of Others: A  
 Comparison between Rhesus Macaques, Dingoes and Dogs

**Laurie Santos**

**Ashley Renee Schwarzer, BS**

Characterizing burst time in RNA bacteriophage  
 $\phi$  6 lineages after long-term experimental evolution.

**Paul Turner**

**Kristen Avery Dowling, BS**

Phylogenetics of Underwing Moths, *Catocala*:  
 Erebidae: Lepidoptera

**Larry Gall / Marta Wells**

**Kristina Marie Krebs, BS**

Land use Change Impacts on Green Frog Sexual  
 Dimorphism

**David Skelly**

**Logan Cheyenne Kozal, BS**

Undescribed Species Diversity within *Etheostoma zonistium*

**Thomas Near**

**Chantal Elyse Parker, BS**

Molecular phylogenetics and morphometrics support a  
 dramatic reduction of recognized species diversity in  
*Pogonophryne* (Notothenioidei: Artedidraconidae)

**Thomas Near**

**Zoe Jean Kitchel, BS**

Savanna and forest tree demography along a rainfall  
 gradient

**Carla Staver**

**Dillon Emerson Thompson, BS**

Crossroads at Kra: Disentangling the *Tupaia glis-T.*  
*belangeri* Complex on the Malay Peninsula

**Eric Sargis**

**Kathryn Elena Culhane, BS**

Context dependence of lizard prey communities in  
 the Greek Archipelago

**Oswald J. Schmitz, PI**

**Elena Kim Perry, BS**

*Amicoumacin* Antibiotic Biosynthesis in  
an Entomopathogenic Bacterium

**Presenter and Poster**

**Ruth Assefa, BA**

Understanding Emergence: elucidating the three  
evolutionary mechanisms of human disease  
emergence through neglected disease

**Alec David Borsook, BS**

Effects of biostimulants on plant performance and  
crop yield of tomato and radish

**Noah James Connally, BS**

Estimation of intragenic clustering of selected sites  
between *Drosophila melanogaster* and *D. simulans*

**Paul Nathan Elish, BA**

Kinship Theory, Marsupials, and the X Chromosome  
Inactivation (XCI) Debate

**Kara Mackenzie Fikrig, BA**

The Function and Conservation of OvhtsRC in  
*Drosophila*

**Rohan Kishore Goswami, BS**

Differentiation and Characterization of A9 Dopaminergic  
Neurons from Human Stem Cells

**Eric Tzong-Lin Hsieh, BS**

Assessment of Exosomal Membrane Phospholipids  
in Binding to Immunoglobulin Free Light Chains

**Kelly Hsu, BA**

The effect of climate change on the distribution of  
Lyme disease

**Allison Taylor Thomas, BA**

Comparative Anatomy of the Heart: A Study of the  
Bifurcation in the Evolution of Systemic Aortic  
Arches in Amniotes

**Rachel Elaine Tobin, BS Int.**

Exploring the Role of Surfactant Protein C in Type II  
Pneumocyte Survival and Proliferation

**Jason Crawford**

**Faculty Advisor**

**Paul Turner**

**Graeme P Berlyn**

**Jeffrey Townsend**

**Stephen Stearns, PI**

**Lynn Cooley**

**Eugene Redmond**

**Philip Askenase**

**Kealoha Freidenburg**

**Gunter Wagner**

**Diane Krause**

**John Tyler Varga, BS**  
Weight-loss in AIF-Knockout Mice

**Michael Jurczak**

**Zi Yin Xu, BA**  
Evaluation of Child Development under  
Institutionalization

**Fred Volkmar**

**Alirio De Meireless, BA**  
The Effects of Phosphorylation of Seine-174  
on N-Ras Signaling and Trafficking

**Thomas Near**

**William Carroll Vaughan, BA**  
The Evolution of Bipedalism in Hominins

**Thomas Near**

**Christian Nazhone Brown, BA**  
Exploring the “Thrifty Gene” Hypothesis:  
Comparing Evolutionary Viewpoints on Human  
Predisposition Towards Diabetes and Obesity

**Kenneth Kidd**

## **Appendix I – Worksheet for EEB**

The following page contains a worksheet that will aid the potential major in planning their course of studies. Students may wish to make copies, to share with their advisors and/or to play around with to optimize their programs.



**E&EB**

B.A. \_\_\_\_\_ B.S. \_\_\_\_\_

Name: \_\_\_\_\_

Year: \_\_\_\_\_ College: \_\_\_\_\_ ID#: \_\_\_\_\_

Advisor: \_\_\_\_\_ Cell: \_\_\_\_\_

**Prerequisites:**

	<u>Course #</u>	<u>Taken</u>	<u>Will be Taken</u>	<u>Placement Exam</u>
BIOL 101 a/b Biochemistry & Biophysics	_____	_____	_____	_____
BIOL 102 a/b Principles Cell Bio & Memb Phys	_____	_____	_____	_____
BIOL 103 a/b Genes and Development	_____	_____	_____	_____
BIOL 104 a/b Principles of E&EB	_____	_____	_____	_____
2 terms of General Chemistry (CHEM 161,165; or CHEM 163,167)	_____	_____	_____	_____
2 terms of General Chemistry Lab (CHEM 134L, 136L)	_____	_____	_____	_____
1 term of Organic Chemistry (CHEM 174a, 175b; or CHEM 220a, 221b)	_____	_____	_____	_____
1 term of Organic Chemistry Lab (CHEM 222L)	_____	_____	_____	_____
2 terms of Physics (170a, 171b or higher)	_____	_____	_____	_____
1 term of MATH 115 or STAT 101	_____	_____	_____	_____
2 terms of Math or Geology (may be taken in lieu of the organic chemistry requirement, at the discretion of the DUS, not including MATH 190 and geo may not include paleobiology courses at 100-level offerings)	_____	_____	_____	_____

**Core courses Track 1:**

			<u>Term Taken</u>	<u>Will be Taken</u>
Required:	E&EB 220a	General Ecology	_____	_____
Required:	E&EB 225b	Evolutionary Biology	_____	_____
Required:	E&EB 2xx	Organismal Diversity Course	_____	_____
Required:	E&EB 2xxLb	Organismal Diversity Lab	_____	_____

**Core courses Track 2:**

			<u>Term Taken</u>	<u>Will be Taken</u>
Required:	MCDB 300	Biochemistry	_____	_____
Required:	E&EB 295	Comparative Physiology	_____	_____
OR	BENG 350	Physiological Systems	_____	_____
Required:	E&EB 290	Comparative Anatomy	_____	_____
Required:	E&EB 291L	Comparative Anatomy Lab	_____	_____

**Independent Research for Underclassman (Pass/Fail):**

E&EB 469 a or b (Tutorial)	_____
E&EB 474 a or b (Research)	_____

**B.A. degree only:**

(Choose one; must be taken in senior year)

E&EB 470 (Senior Tutorial) (1 credit)	_____
Senior Essay (no credit)	_____

**B.S. degree only:**

(3 credits required; one must be taken in senior year, for letter grade)

E&EB 475a and b (Senior Research)	_____
E&EB 495a, 496b (Intensive Sr Research)	_____
Elective lecture, lab or research (1 credit)	_____



## **Appendix II – Forms for Tutorial and Research Courses**

EEB 469	Underclassman Tutorial
EEB 474	Research
EEB 470	Senior Tutorial
EEB 475 a, b	Senior Research
EEB 495a, 496b	Senior Intensive Research
	Senior Essay



EEB 469 Underclassman Tutorial  
Department of Ecology and Evolutionary Biology

Submission Date:	Semester:	
<b>STUDENT INFORMATION</b>		
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:		
<b>DESCRIPTION OF UNDERCLASSMAN TUTORIAL REQUIREMENTS</b>		
<p>Individual or small-group of underclassmen 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. One or more written examinations and/or a term paper are required. To register, the student must submit a written plan of study approved by the faculty instructor to the director of undergraduate studies. Students are encouraged to apply during the term preceding the tutorial. Proposals must be submitted no later than the first day of the second week of the term in which the student enrolls in the tutorial. The final paper is due in the hands of the director of undergraduate studies 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 DUS Office. Underclassmen will receive one credit and a grade of P/F.</p>		
<b>TO THE TUTORIAL MENTOR</b>		
<p>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 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 to the EEB director of undergraduate studies: <a href="mailto:Marta.Wells@yale.edu">Marta.Wells@yale.edu</a> (or her assistant, the EEB Registrar: <a href="mailto:Laura.Rotter@yale.edu">Laura.Rotter@yale.edu</a>).</p>		
<b>MENTOR'S INFORMATION</b>		
Mentor's Name:		
Mentor's Email:		
Mentor's Phone:		
Mentor's Signature:		
Date:		
<b>DUS APPROVAL</b>		
DUS Signature:		
Date:		



**EEB 474 Underclassman Research**  
**Department of Ecology and Evolutionary Biology**

Submission Date:	Semester:	
<b>STUDENT INFORMATION</b>		
Student's Last Name:	First:	Middle:
Email Address:		
Class:	Student ID:	Cell Phone:
Project Title:		
Are you an EEB major?		
Student's Signature:		
Date:		
<b>DESCRIPTION OF UNDERCLASSMAN RESEARCH REQUIREMENTS</b>		
<p>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. Students are expected to spend ten hours per week on their research projects. Using the form available from the office of undergraduate studies or from the Classes server, students must submit a research proposal that has been approved by the faculty sponsor to the director of undergraduate studies, preferably during the term preceding the research. Proposals are due no later than the first day of the second week of the term in which the student enrolls. The final research paper is due in the hands of the director of undergraduate studies by the last day of reading period in the term of enrollment. Underclassmen will receive one credit and a grade of P/F.</p>		
<b>TO THE TUTORIAL MENTOR</b>		
<p>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 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 to the EEB director of undergraduate studies: <a href="mailto:Marta.Wells@yale.edu">Marta.Wells@yale.edu</a> (or her assistant, the EEB Registrar: <a href="mailto:Laura.Rotter@yale.edu">Laura.Rotter@yale.edu</a>).</p>		
<b>MENTOR'S INFORMATION</b>		
Mentor's Name:		
Mentor's Email:		
Mentor's Phone:		
Mentor's Signature:		
Date:		
<b>DUS APPROVAL</b>		
DUS Signature:		
Date:		



EEB 470 Senior Tutorial  
Department of Ecology and Evolutionary Biology

Submission Date:	Semester:	
<b>STUDENT INFORMATION</b>		
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:		
<b>DESCRIPTION OF SENIOR TUTORIAL REQUIREMENTS</b>		
<p>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. One or more written examinations and/or a term paper are required. To register, a student must submit a written plan of study approved by the faculty instructor to the director of undergraduate studies. Students are encouraged to apply during the term preceding the tutorial. Proposals must be submitted no later than the first day of the second week of the term in which the student enrolls in the tutorial. The final paper is due in the hands of the director of undergraduate studies by the last day of reading period in the term of enrollment. Normally, faculty sponsors must be members of the EEB department. Enrollment limited to seniors. Fulfills the senior requirement for the B.A. degree.</p>		
<b>TO THE TUTORIAL MENTOR</b>		
<p>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 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 to the EEB director of undergraduate studies: <a href="mailto:Marta.Wells@yale.edu">Marta.Wells@yale.edu</a> (or her assistant, the EEB Registrar: <a href="mailto:Laura.Rotter@yale.edu">Laura.Rotter@yale.edu</a>).</p>		
<b>MENTOR'S INFORMATION</b>		
Mentor's Name:		
Mentor's Email:		
Mentor's Phone:		
Mentor's Signature:		
Date:		
<b>DUS APPROVAL</b>		
DUS Signature:		
Date:		



EEB 475 a and b Senior Research  
Department of Ecology and Evolutionary Biology

Submission Date:	Semester:	
<b>STUDENT INFORMATION</b>		
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:		
<b>DESCRIPTION OF SENIOR RESEARCH REQUIREMENTS</b>		
<p>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. Students are expected to spend ten hours per week on their research projects. Using the form available from the office of undergraduate studies or from the Classes server, students must submit a research proposal that has been approved by the faculty sponsor to the director of undergraduate studies, preferably during the term preceding the research. Proposals are due no later than the first day of the second week of the term in which the student enrolls. The final research paper is due in the hands of the director of undergraduate studies by the last day of reading period in the term of enrollment. Enrollment limited to seniors. Fulfills the senior requirement for the B.S. degree.</p>		
<b>TO THE TUTORIAL MENTOR</b>		
<p>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 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 to the EEB director of undergraduate studies: <a href="mailto:Marta.Wells@yale.edu">Marta.Wells@yale.edu</a> (or her assistant, the EEB Registrar: <a href="mailto:Laura.Rotter@yale.edu">Laura.Rotter@yale.edu</a>).</p>		
<b>MENTOR'S INFORMATION</b>		
Mentor's Name:		
Mentor's Email:		
Mentor's Phone:		
Mentor's Signature:		
Date:		
<b>DUS APPROVAL</b>		
DUS Signature:		
Date:		



EEB 495a / EEB 496b Intensive Senior Research  
Department of Ecology and Evolutionary Biology

Submission Date:	Semester:	
<b>STUDENT INFORMATION</b>		
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:		
<b>DESCRIPTION OF INTENSIVE SENIOR RESEARCH REQUIREMENTS</b>		
<p>One term of intensive original research during the senior year under the sponsorship of a Yale faculty member. Similar to other research courses except that a more substantial portion of a student's time and effort should be spent on the research project (a minimum of twenty hours per week). To register, the student must submit a written plan of study approved by the faculty instructor to the director of undergraduate studies. Students should attach a two-page proposal of the planned research. This should include an introduction covering why this research is interesting and important and an outline of the research methodology to be used. Students are encouraged to apply during the preceding term. Proposals must be submitted no later than the first day of the second week in the term in which the student enrolls in the Intensive Senior Research. The final paper is due in the hands of the director of undergraduate studies by the last day of reading period in the term of enrollment. Please attach this form to your proposal and return to the DUS Office. One term of intensive research fulfills a portion of the senior requirement for the B.S. degree.</p>		
<b>TO THE RESEARCH MENTOR</b>		
<p>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 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 to the EEB director of undergraduate studies: <a href="mailto:Marta.Wells@yale.edu">Marta.Wells@yale.edu</a> (or her assistant, the EEB Registrar, <a href="mailto:Laura.Rotter@yale.edu">Laura.Rotter@yale.edu</a>).</p>		
<b>MENTOR'S INFORMATION</b>		
Mentor's Name:		
Mentor's Email:		
Mentor's Phone:		
Mentor's Signature:		
Date:		
<b>DUS APPROVAL</b>		
DUS Signature:		
Date:		



**Senior Essay**  
**Department of Ecology and Evolutionary Biology**

Submission Date:	Semester:	
<b>STUDENT INFORMATION</b>		
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:		
<b>DESCRIPTION OF SENIOR ESSAY REQUIREMENTS</b>		
<p>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 is to be 20 double-spaced pages, not including bibliography. The DUS or the faculty in charge of senior projects will ask a faculty advisor to read and grade each paper. Students may suggest readers if they wish. Papers are to be submitted to the student's senior essay advisor and a copy to the faculty in charge of the senior projects. Normally, a letter grade is reported to the registrar by the faculty in charge. 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.</p> <p>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 office of the director of undergraduate studies (OML 103), on "Faculty Research Interests."          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 (blue book) 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 would be more knowledgeable in your area. Your senior essay advisor will often not be the same advisor that signs your course listings.          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.</p>		
<b>TO THE SENIOR ESSAY MENTOR</b>		
<p>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 DUS. This should be reported no later than the last day of the final examination period. Notification by email is acceptable and preferred to the EEB director of undergraduate studies: <a href="mailto:Marta.Wells@yale.edu">Marta.Wells@yale.edu</a> (or her assistant, the EEB Registrar: <a href="mailto:Laura.Rotter@yale.edu">Laura.Rotter@yale.edu</a>).</p>		
<b>MENTOR'S INFORMATION</b>		
Mentor's Name:		
Mentor's Email:		
Mentor's Phone:		
Mentor's Signature:		
Date:		
<b>DUS APPROVAL</b>		
DUS Signature:		
Date:		

