EEB Research Projects: Before Senior Year, Senior Projects, and How to Get Into a Lab

PRESENTATION BY EEB RESEARCH COORDINATOR, DR. ANNISE DOBSON

IN COLLABORATION WITH THE YALE ECOLOGY & EVOLUTIONARY BIOLOGY UNDERGRADUATE GROUP (YEEBUG)

Outline

Research to fulfill your degree

Credit selection

How to find a lab

Cultivating your mentor relationship

Executing research

Lab overview

Research for

Pay

- Summer Fellowships
- Work-study
- YEEBUG listserve

Volunteering

- Limited options unless you are shadowing a mentor or learning a technique

Credit

- Reading, literature synthesis, independent research

What topics would you like to cover today?

Ecology & Evolutionary Biology

Degrees Offered	**B.S.** **Ecology and Evolutionary Biology** *Concentrations:* *Biodiversity and the Environment,* ***or*** *Organismal Biology*	**B.A.** **Ecology and Evolutionary Biology** *Concentration:* *Biodiversity and the Environment*	**B.A.** **Ecology and Evolutionary Biology** *Concentration:* *Organismal Biology*
Prerequisites for entering the major	**Intro Biology sequence** (BIOL 1010, 1020, 1030, and 1040)		
	2 term lecture sequence in General Chemistry (CHEM 1610, 1650 or CHEM 1630, 1670) with labs (CHEM 1340L, 1360L)		
	1 term of mathematics or 1 term of statistics & data science MATH 1150 or MATH 1160 or MATH 1200 or S&DS 1000 or S&DS 2300		
	4 total credits chosen from this entire list; no more than two term lecture courses from a single department		
	MATH 1150 or 1160 MATH 1180 or 1200 MATH 2220, 2250, or 2260 MATH 2350 MATH 2410 MATH 2420 MATH 2440 MATH 2460 MATH 2470 MATH 2550 or 2560 MATH 3020	S&DS 1000 S&DS 2200 S&DS 2300 S&DS 2380 S&DS 2400 CPSC 1000 CPSC 1001 CPSC 1230 CPSC 2010 PHYS 1700 or 1800 PHYS 1710 or 1810	CHEM 1740 or 2200 CHEM 1750 or 2210 CHEM 2220L CHEM 2230L EPS 1100 EPS 2120 EPS 2200 EPS 2220 EPS 2320 EPS 2400 EPS 2550
Core Courses for EEB Major	**B.S. Degree** **5.5 course credits** (not incl prereqs or senior req)	**B.A. Degree** **3.5 course credits** (not incl prereqs or senior req)	**B.A. Degree** **3.5 course credits** (not incl prereqs or senior req)
	Same as B.A. degree requirements (either concentration)	EEB 2220 (General Ecology)	EEB 2290 and 2291L (Comparative Anatomy with Lab)
	Two electives; at least one elective must be a lecture or a seminar.	EEB 2225 (Evolutionary Biology)	EEB 2295 (Comparative Physiology) or BENG 3200 (Physiological Systems)
		1 'ology' course with lab (EEB 2246-2273L or EEB 3326 and 3327L)	MCDB 3000 (Biochemistry) or MB&B 3000 (Principles of Biochemistry I)
Senior Requirements	**2 terms original research** (EEB 4475, 4476) **or** (EEB 4495, 4496)	**1 term independent study** (EEB 4470) **or** **Senior Essay in a course**	**1 term independent study** (EEB 4470) **or** **Senior Essay in a course**
Substitutions	Substitutions permitted with DUS approval (see YCPS for details).		

Updated March 2025

Which credits are right for me?

1. Currently in senior year?

- **No (Younger than senior year)** → Go to 2
- **Yes (Senior year)** → Go to 3

2. Prefer literature-based or hands-on work?

- **Literature-based** → *EEB 4469 (Tutorial)*
- **Hands-on** → *EEB 4474 (Research)*

3. Pursuing a BA or BS?

- **BA** → EEB 4470 (Senior Tutorial, 1-term essay)
- **BS** → Go to 4

4. Intensive or typical research track?

- **Intensive** → EEB 4495/4496 (Intensive Senior Research, 2-term research)
- **Typical** → EEB 4475/4476 (Senior Research, 2-term research)

Before Senior Year…

EEB 4469: Tutorial

I want to…

- Do a deep dive into a topic not covered by existing courses
- Get familiar with background literature for future research
- Work individually or in small groups
- Get more experience reading scientific papers
- Become more familiar with a specific faculty member's research

Before Senior Year…

EEB 4469: Tutorial

- Faculty-guided independent study
- Literature review focus
- Requires:
  - Faculty sponsor (weekly/biweekly meetings)
  - Approved proposal (due Week 2)
  - Final paper (due end of term)
- Multi-term option with approval
- Register: EEB form + YCS

Deadlines:

✓ Proposal: Week 2

✓ Paper: Reading period end

Before Senior Year…

EEB 4474: Research

I want to…

- Want to test if research excites you before senior year
- Try out a lab before committing to doing a thesis there
- Start working in a lab you would like to have a deep, multi-year relationship with
- Crave hands-on discovery/responsibility over a project

Before Senior Year…

EEB 4474: Research

- Original research (lab/field/modeling, or environmental policy/economics)
- **Not a literature review** – must be original work
- Requires
  - Faculty sponsor (including outside EEB)
  - 10 hrs/week commitment
  - Deliverables: Exam(s) and/or research paper
- Multi-term option with DUS approval
- Register: **EEB form + YCS**

Deadlines:

✓ Proposal (faculty-approved): **Week 2**

✓ Final paper: **Reading period end**

Senior Year…1-Term Essay for a B.A.

I want to…

- Get my BA
- Do a deep dive into something you found interesting in one of your courses
- Get familiar with background literature for future research/career
- Get more experience reading scientific papers
- Become more familiar with a specific faculty member’s research
- Home your writing skills

Senior Year…1-Term Essay for a B.A.

EEB 4470: Senior Tutorial (BA)

- Fulfills BA senior requirement
- Independent study with literature-based critical essay
- Requires:
  - ✓ Faculty sponsor (weekly/biweekly meetings)
  - ✓ Approved proposal (due **Week 2**)
  - ✓ Final paper (due **reading period end**)

Register: **EEB Senior Tutorial Form + YCS**

One-term commitment for BA seniors.

Senior Year…2-Term Research for a BS

I want to

- Get my BS
- Do original research
- Join a lab

Senior Year…2-Term Research for a BS

EEB 4475/4476: Senior Research (BS)

- Fulfills BS senior requirement (2-term commitment)
- Original research (lab/field/modeling or environmental policy/economics)

Requirements:

✓ Faculty sponsor (often outside EEB)

✓ 10 hrs/week commitment

✓ Research proposal (due **Week 2** of first term)

✓ Exam(s) and/or final paper/progress report

Register:

✓ Fall: EEB 4475 | Spring: EEB 4476

✓ Submit **EEB Senior Research Form** + YCS enrollment

Note: 1 course credit per term.

Senior Year…2-Term Intensive Research for a BS

I want to

- Do everything in the last slide plus
  - Simulate graduate-level research intensity
  - Prioritize depth over breadth of experience
  - Potentially publish my thesis
  - View research as a primary intellectual commitment for senior year

Senior Year…2-Term Intensive Research for a BS

EEB 4495/4496: Intensive Senior Research (BS)

- *Fulfills BS requirement with enhanced commitment*
- **20+ hrs/week** research (vs. 10 hrs in standard track)
- **2 course credits per term** (vs. 1 in standard track)

Same requirements as EEB 4475/4476:

✓ Original faculty-sponsored research

✓ Proposal due **Week 2** of first term

✓ Final paper/progress report

Register:

✓ Fall: EEB 4495 | Spring: EEB 4496

✓ Submit **EEB Senior Research Form** + YCS

Ideal for dedicated research focus.

Where do I start?

What tools do I want to learn?

What questions are interesting?

What will set me up for the career I want?

Where can I find good mentorship?

What kind of scientist do I want to be?*

When you really have no idea where to start

What do I not want to do?

Who needs my help?

Don’t overthink it- inspiration and self-reflection will come once you are in it!

Annise can help you find a place to start!

How to Find a Lab/Project

If you don't have a good idea of what would you like to do:

- Look at past projects for inspiration
- Go to the websites of Departments such as:
  - E&EB
  - School of Medicine
  - Department of Anthropology – Profs. Sargis, Valeggia
  - School of the Environment – Profs. Comita, Queenborough, Lauenroth, Brodersen, Duguid
- Talk to your peers already in a lab
- Ask ChatGPT which labs match your interests*

How to Get Into a Lab

Choose 3-5 candidate labs

→

Read abstracts

Sort for recent papers

Look for first/last author publications

→

Look through lab website, identify postdoc and student projects of interest

→

Write a short email to the PI of each lab and say something about your interest in the research

Meet with the PI

Meet a student/postdoc

Ask about attending a lab meeting

You Found a Lab!

Advising relationships are like gardens – you need to tend them!

Shift your mindset – you are in the driver's seat

Ask about attending lab meetings regularly

Keep communication lines open with mentors

Make a timeline and a plan

Have gratitude but don't be afraid to ask for help

Ask PI about conferences or publishing your research if interested

Reach out to Dr. Dobson or the DUS (Dr. Near) for guidance + concerns

Executing Research

Read the helpful thesis guide on the EEB website

Ask PI/mentors for background reading

Discuss expectations for a proposal with your PI

Consider shadowing/helping lab members to learn techniques

Ensure permits are available especially if doing fieldwork, working with animals, human subjects

Think about materials you will need, ask your PI about ordering, look into additional funding from Residential College Mellon funds.

Look into summer fellowships from Yale directed fellowships website

Executing Research

Take lots of photos, videos, detailed lab or field notebook

Organize your files
- Think through data management

Learn the stats you will need (courses, stats consulting, lab members, ChatGPT*)
- Consider running analysis on simulated data in planning stages

Poorvu for writing help

Present results at the EEB symposium in late April

Example timeline - thesis

Summer

Reach out to PIs and graduate students

Background reading

Early Fall Semester

Plan experiment

Late Fall Semester

Collect data

Early Winter

Weekly cohort meeting

Data Analysis

First thesis draft

Spring

Final thesis draft

Get feedback and present at symposium

How to Find and Get Into a Lab

QUESTIONS?

Labs currently in need

(more details in the link)

Faculty in E&EB

Martina Dal Bello

Community ecology,
Microbial ecology,
Marine ecology,
Climate change.

Jenn Coughlan

Evolutionary genetics,
Evolutionary causes of adaptation and speciation

Mary Beth Decker

Biological oceanography,
changing coastal estuarine ecosystems

Casey Dunn

Evolution of genomes, genome Function,
Morphology, and Siphonophores

Faculty in E&EB

Erika Edwards

Evolution; phylogenetics; plant structure and function; ecological adaptation

Vanessa Ezenwa

Disease ecology, behavioral ecology, eco-immunology, parasitology

Josh Moyer

Functional anatomy & biodiversity of vertebrates, ecological morphology & systematics of cartilaginous fishes using methods in kinematics, behavior, anatomy & dissection, histology, & biomedical imaging

Martha Muñoz

Evolution, ecophysiology, animal behavior, and phylogenetics

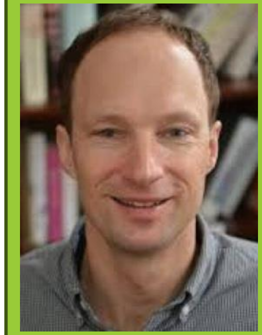
Tom Near

DNA sequence data to reconstruct the evolutionary relationships of species represented through branching diagrams and phylogenies

Faculty in E&EB

Brandon Ogbunu

Systems biology, population genetics, epidemiology, disease ecology and evolution, science and society



Walter Jetz

Macroecology; community ecology; biogeography; global change biology; conservation; terrestrial vertebrates

David Post

Aquatic ecology; food-web structure and dynamics, eco-evolutionary interactions, environmental change

Rick Prum

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

Linda Puth

Aquatic ecology; food-web structure and dynamics, eco-evolutionary interactions, environmental change

Faculty in E&EB

Eric Slessarev

Soil science, terrestrial biogeochemistry, ecosystem-geosphere interactions, carbon and nutrient cycling

David Vasseur

Biodiversity-ecosystem function; impacts of environmental variability, and ecosystem processes; spatial population synchrony

Annise Dobson

Invasion Biology, Plant ecology, Forest ecology, Soil Ecology, Biogeochemistry

Paul Turner

Virus evolutionary genetics and genomics, mostly in bacteriophages and arthropod-borne viruses

Michelle Wong

Ecosystem ecology, biogeochemistry, plant-soil feedbacks, nutrient cycling

Erika Edwards

Evolution; phylogenetics; plant structure and function; ecological adaptation

Understanding leaf formation (evolutionary plant biology, scientific imaging, applying machine learning).

Contact oluwatobi.oso@yale.edu.

1 student

Jenn Coughlan

Evolutionary genetics, Evolutionary causes of adaptation and speciation

We study the genetic basis of the origin of species, as well as how these species adapt to their environments using a combination of population and quantitative genetics, development, greenhouse experiments, and fieldwork. We use a rising model wildflower system to address these questions.

2 students

Minimum 3 hours per week

Eric Slessarev

Soil science, terrestrial biogeochemistry, ecosystem-geosphere interactions, carbon and nutrient cycling

My research focuses on assessing the role of calcium in soil carbon storage. With an increase in the use of enhanced rock weathering and other forms of calcium supplementation provided for agricultural lands, it's important we do the work to understand the mechanisms behind how and why calcium contributes to organic matter retention in soils as not only a function of soil carbon accounting but as an ecosystem function.

I am recruiting a student to help study how organic carbon, minerals, and microbes interact at different levels of soil calcium availability. This study will help us to understand why certain soil types (particularly grassland soils) store more carbon than others.

2 students

Contact mariela.arredondo@yale.edu

Tom Near

DNA sequence data to reconstruct the evolutionary relationships of species represented through branching diagrams and phylogenies

Our work is aimed at discovering the mechanisms that generate biodiversity. We use phylogenies, or evolutionary trees, inferred from DNA sequence data to investigate speciation, historical biogeography, and the timing of lineage diversification. An important component of our work is the discovery of biodiversity that results in the description of new species. Our research is mostly focused on fishes.

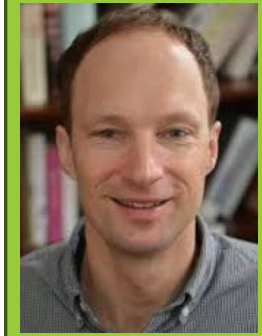
3 students

Michelle Wong

Ecosystem ecology, biogeochemistry, plant-soil feedbacks, nutrient cycling

We study plant-soil-microbe interactions and nutrient limitation! We want to understand how variation in soils can drive variation in ecosystem structure and function, and how plants can impact soil biogeochemistry

1 student



Walter Jetz

Macroecology; community ecology; biogeography; global change biology; conservation; terrestrial vertebrates

Analysis of species occurrence data; biodiversity mapping; software tools for geospatial analysis and ecological forecasting; macroecological analyses; collection and analysis of ecological data collected with drones.

1 student

Preference for Sophomore, Junior, Senior

Jeff Powell

Population genetics and evolution of mosquitoes.

We are looking for help performing computationally intensive analyses of large genetic data sets. Our primary research subject is Aedes aegypti and closely related species. Much of the work can be done remotely.

1 student

Jeffrey Townsend - School of Public Health

Cancer Evolution, Evolution of Infectious Disease, Fungal Gene Expression and Evolution of Development, Phylogenetic Experimental Design (Theory & Computation), Molecular Evolution

Our research focus is the evolutionary dynamics shaping life and disease. Our work in cancer evolution uncovers how somatic mutations and selective pressures drive tumor development and resistance. In infectious disease, we apply evolutionary principles to understand pathogen adaptation and immune escape. Our studies of fungal gene expression, the evolution of development, and pathogenesis reveal how regulatory and morphological traits evolve across species. We are also pioneering theoretical research on phylogenetic experimental design, developing theory and computational tools to optimize phylogenetic inference across the tree of life. Uniting these efforts is a deep commitment to molecular evolution—using comparative frameworks to illuminate the processes that generate biological diversity.

Preference for Freshmen, Sophmores, Juniors yeebug

Yale Ecology & Evolutionary Biology Undergraduate Group

Field Trips! Dinners! Panels! Meet your Profs!
(and ever-so-patient guidance)

President: Karinne Tennenbaum '26

Treasurer: Michelle So '28

Events Coordinator: Erica Yu '28

Collaborations Lead: Hannah Qin '26

Faculty Liaison: Lynna Thai '27

Graphic Design: Alex Durt '27

Newsletter Coordinator: Ke'Mara Davis '27

Botanic Liaison: Wyatt Aiken '28

Marine Liaison: Madelyn McElroy '27

yeebugboard@gmail.com

groupme.com/join_group/102134964/UCggK5J7

yee.bug on instagram

Forms & Links:

Underclass Research & Tutorial Form (EEB 4469 & 4474)

Senior Essay for B.A. Form (No YC Credit)

Senior Tutorial for B.A. Form (EEB 4470)

Senior Research for B.S. Form (EEB 4475, 4476, 4495, 4496)

EEB Major Outline Worksheet Forms

Peer Guide to Research

Guides to Independent Study & Senior Theses

Past Senior Projects

Research Funding

EEB Majors Handbook

EEB Faculty & Affiliates