

# REED COLLEGE BIOLOGY DEPT

## HANDBOOK

This Handbook is not meant  
to be comprehensive!

For complete information & to stay informed be sure to:

**1** **Ask your Adviser** (or any Bio faculty member,  
or the department's admin coordinator)

**2** **Read the Reed Biology Website:**  
<http://academic.reed.edu/biology>  
**& the Reed Catalog\***  
<https://www.reed.edu/biology/program.html>

**3** **Check your Email** for important notifications  
(all affiliated majors are automatically signed up  
for the Bio mailing list.)

\*The Reed Catalog is the final "official word" and therefore should be consulted frequently.

# 4 - YEAR BIOLOGY MAJOR ROADMAP

## 1ST YEAR

- Get to know your academic adviser + other Biology faculty and staff (go to office hours!)
- Take Bio 101 + 102 (in most cases).
- Start attending Biology seminars & events.
- Potentially look into jobs and/or volunteer opportunities in Bio (and elsewhere).

## 2ND YEAR

- Keep attending the Bio seminars & events + office hours!
- Think about taking Biology 211: Intro to Sci Lit & Discourse.
- Start taking upper division Biology courses.
- Declare your major.
- Plan for summer internships or research opportunities early (many applications are due in Jan, Feb & March). Start to get familiar with the resources available at CLBR.

## 3RD YEAR

- Keep attending the Bio seminars & events + office hours!
- Take more upper division courses and perhaps a Biology 431 seminar course.
- Take the Biology Qual.
- Be sure to make plans for a summer internship or research opportunity this year.
- If you want extra research experience, perhaps consider petitioning to do independent study.
- If you conducted research over the summer, consider presenting it at a conference.
- Start strategizing for your post-Reed plans (faculty and/or CLBR can help).

## 4TH YEAR

- Keep attending the Bio seminars & events + office hours!
- Start your thesis.
- Complete your oral exams.
- Some students may apply to continue their thesis research over the summer with a post-bac fellowship.
- Work on your post-Reed plans with faculty and/or CLBR.
- Graduate! (But keep in touch!)

# BIOLOGY FACULTY

**Derek A. Applewhite- B140,**

*Cellular biology, cytoskeletal dynamics, cell motility, & morphogenesis.*

My lab seeks to understand the regulation of the cytoskeleton. Just as we have bones and muscles that give our bodies shape and allow us to move, cells have analogous structures known as the cytoskeleton. The cytoskeleton is critical to the shape change or morphogenesis cells undergo during development, immune functions, the path finding that developing neurons undergo when establishing connections, and in cases where the cytoskeletal machinery works aberrantly, metastasis during tumorigenesis.

**Kara Cervený- B224**

*Developmental biology, growth control, and the visual system*

I'm interested in understanding growth control. My lab investigates how neuronal stem and progenitor cells behave in the growing zebrafish retina. By analyzing behaviors of mutant cells grafted into wild-type retinæ, monitoring cell cycle progression in the developing eye, and interrogating how specific extrinsic signals impinge on cell cycle exit, I aim to uncover how local environmental signals influence cell cycle exit and differentiation of neuronal progenitors

**Sam Fey- B212**

*Population ecology; species interactions; global change ecology*

I am interested in the role of food web interactions in mediating the response of biological communities to environmental variation, and primarily focus on aquatic ecosystems. Given the ongoing and predicted future impacts of global change on environmental fluctuations, a predictive framework is needed to understand how such changes will impact life on Earth. I seek further the development of ecological theory and to enhance ecological predictions associated with a warming climate and altered patterns of nutrient cycling.

**Keith Karoly- B240**

*Plant evolution; evolution of plant mating systems*

Research in my lab focuses on investigating the ecology and evolution of flowering plants, with a primary emphasis on understanding their reproductive biology. Northwest species in the genus *Delphinium* appear to be a recently diverged group. Our studies have focused on determining the pattern and causes of diversification for two closely related species, *Delphinium nuttallii* and *Delphinium leucophaeum*, using molecular genetic markers (primarily from the chloroplast DNA) to investigate the relationships among populations of the two taxa.

# BIOLOGY FACULTY



## **Jay Mellies- B122**

*Microbiology; pathogenesis*

Our long-term research goal is to understand the molecular mechanisms of how enteropathogenic *E. coli* (EPEC) causes disease. One main focus is the regulation of EPEC virulence factors by a novel protein called Ler. A second project involves delineating the regulatory pathways controlling niche adaptations by the plasmid-encoded regulator, PerC, which also manipulates the host innate immune system. In a more applied project, we are isolating bacteriophage that kill *E. coli* pathogens, while retaining the integrity of the host microbiome.



## **Aaron Ramirez- B210**

*Translational ecology, fire and drought, socio-ecological systems*

Drought and wildfire are natural processes that shape many important patterns within complex socio-ecological systems. Environmental change & human activities can alter these natural processes and increase negative impacts. My research focuses on the physiological, ecological, and social mechanisms that underlie the changing natural processes of drought and fire. My research prioritizes engaging directly with managers, policy-makers, and other stakeholders to inform their efforts and bring their diverse perspectives into our research.



## **Suzy Renn- B124**

*Behavioral biology; genomic analysis of animal behavior*

Through the synthesis of comparative genomics with functional studies in behavior, physiology, and ecology, I aim to understand the genomic basis of behavior from an evolutionary perspective. The African Cichlid Fishes have experienced an incredibly rapid recent and repeated evolutionary radiation. We aim to identify the structural & functional differences among genomes that are responsible for closely related species that exhibit a wealth of morphological and behavioral diversity.



## **Anna Ritz- B200B**

*Computational biology; genome structural variation; signaling pathways*

New technological and experimental advances have resulted in the massive accumulation of biological measurements, requiring computational analysis to facilitate data interpretation. My work lies in computational genomics and computational systems biology. I develop algorithms that draw from core areas of computer science and mathematics. I study large rearrangements of DNA in human genomes called structural variants (SVs) which are an important contributor to genetic variation and are also associated with a host of cancers.

# BIOLOGY FACULTY

## **Sarah Schaack- B106**

*Genetics/genomics; transposable elements; mutation*

My two main interests are the rate, spectrum, and consequences of mutation in nuclear and organellar genomes and the mobilome-- the most dynamic and exciting portion of the genome. I am interested in the short- and long-term consequences of spontaneous mutation in terms of shaping the size, organization, and landscape of the genome.

I am interested in the rate of mutation, and thus its impact on fitness, adaptation, the evolution of sex, and speciation in various environments.



## **Janis Shampay- B226**

*Molecular biology; chromosome structure and function*

My laboratory investigates the structure and behavior of chromosome ends, or telomeres. These specialized structures are required for chromosome stability and maintenance, yet some of their features are quite dynamic. Chromosome ends are maintained by the ribonucleoprotein, telomerase, in a regulated manner. When telomerase is absent and cells divide, telomeres erode; when telomeres reach a critical length or the structure is perturbed, the cells will either cease dividing or undergo programmed cell death.



## **Erik Zornik- B108**

*Neurobiology, neural basis of behavior*

The overarching goal of my research is to discover mechanisms in the brain that generate behaviors. More specifically, I want to learn how behavioral variation is encoded in neural circuits. To achieve these goals, I am investigating courtship vocal behaviors of African clawed frogs, *Xenopus laevis*. Adults of this species exhibit a rich vocal repertoire of at least seven call types that range from rhythmically simple to temporally complex. *Xenopus* vocalizations are sexually differentiated; males and females produce calls with distinct temporal characteristics that are regulated by steroid hormones during development and in adulthood. This rich palette of rhythmic behaviors combined with robust hormone dependence make *X. laevis* vocal behaviors an ideal subject for understanding the neural basis of behavior and behavioral plasticity.



# BIOLOGY STAFF

**Greta Glover- B8**

*Instrumentation Biologist*

She can help you with all your stockroom & equipment questions.

**Crystal Chaw '02- B138**

*Departmental Associate*

She is available to help all students in the introductory course sequence.

**Kristine Hayes- B10**

*Stockroom Manger*

She can help you with all your stockroom questions & help you order supplies.

**Katie Reichard- B12**

*Departmental Associate*

She is available to help all students in the introductory course sequence.

**Kristy Gonyer '10- B115**

*Faculty Admin Coordinator*

She is a good starting point for most questions about the department.

**Siira Rieschl- B2**

*Science Outreach Manager*

Connect with to learn about opportunities to teach science!

# "Flavors" of Biology

...and How to Declare Your Major

NO PETITION REQUIRED

## **BIOLOGY**

## **BIOCHEMISTRY AND MOLECULAR BIOLOGY (BMB)**

## **ENVIRONMENTAL STUDIES- BIOLOGY**

## **NEUROSCIENCE**

What to do: In your sophomore year, with your adviser, fill out a declaration of major form indicating how you will fulfill your major and distribution requirements, and then file it with the registrar.

PETITION REQUIRED

## **ALTERNATE BIOLOGY**

## **AD-HOC MAJORS (BIO-ART, BIO-ANTRHO, BIO-MATH, ETC)**

What to do: Consult with your adviser to write a petition, outline your proposed course of study, to be approved by the department (and sometimes division) before filing it with the registrar's office.

# Types of Courses In Biology

## 100 & 200 LEVEL

**Topics in Biology:** Introductory course usually taken in the 1st year.

**Biology 131:** Introduction to Computational Biology can also be taken in the 1st year.

**Biology 211:** Introduction to Scientific Discourse is a great class for you to consider taking your 2nd year.

## 300 LEVEL

The courses offered at the 300 level will make up the bulk of the courses you take in the Biology department. Each up level course is taught by a faculty member in their area of expertise, and each course will include a lab and a component of independent research.

## 400 LEVEL

**431 Seminar in Biology, Contemporary Topics-** Each semester faculty offer seminar courses examining the primary literature in their area of expertise. These courses are offered to juniors and seniors.

## 400 LEVEL

**481 Special Topics-** If Juniors/ Seniors wish to gain additional experience in lab or library research they may propose an independent project (often a follow-up to 300 level or summer research.)

**How to do it:** Work with any faculty member to write a proposal that must be approved by the department and the division.

## 400 LEVEL

**470 Thesis-** You will complete your study in the Biology Department with your senior thesis. See pg X. for more detail on the process.

# Biology Qual

## WHO TAKES THE BIOLOGY QUAL?

- Biology Majors
- Alt Bio Majors
- BMB Majors (who also have to take the Chemistry Qual)
- ES-Bio Majors (who also have to take the ES Junior Seminar).
- And some Ad-hoc Bio Majors (TBD in your ad hoc major petition.)

Neuroscience Majors will take a separate Neuroscience Qual, that is similar in format to the Biology qual, usually during the beginning of the 2nd semester of your Junior year.

## WHAT IS THE GOAL OF THE QUAL?

The qual is the primary, but not the only way, that the department determines if a student is ready for thesis. It was designed to reflect the skills that you will need to use during a senior thesis: acquiring and analyzing biological data; formulating and defending arguments. Overall the qualifying exam is geared toward identifying weaknesses in dealing with biological concepts at a sophisticated level and writing about them in a clear and professional manner.

It also can serve as a learning experience, especially if you are asked to discuss and rewrite a section.

## WHEN DO I TAKE THE QUAL?

You usually will take the qual midway through the 2nd semester of your Junior year. Students who have studied abroad, spring-fall seniors, or students who need to retake the qual, may take the qual at the beginning of the semester of their senior year.

It is often helpful if you have taken at least 2 upper-level courses before you take the qual.

# Biology Qual (cont.)

## WHAT DOES THE QUAL LOOK LIKE?

The junior qualifying (qual) exam is an open-book, open-library, open-internet exam over a weekend.

Each faculty member writes 2 types of questions for the qual, drawing from material that they covered in their Topics in Biology section or their 300 level course.

### QUANTITATIVE QUESTIONS

- You will pick 4 questions to answer.
- You may be asked complete tasks such as designing a primer, analyzing and interpreting a graph, calculating a serial dilution, etc.

### QUALITATIVE (ESSAY) QUESTIONS

- You will pick 2 questions to answer.
- Your answers are expected to be of a level appropriate for someone who has completed a relevant upper division course, often requiring the use of primary literature sources.

## HOW IS THE QUAL GRADED?

Answers are graded by the individual faculty who provided the questions, but the department meets as a whole to discuss the results of the exam. There are three potential results:

### PASS

Congrats! You are done with the qual and you can now register for the thesis!

### CONDITIONAL PASS

It is not uncommon for students to be asked to consult with faculty and to rewrite 1 or 2 questions. Once you successfully rewrite these questions you will have passed the qual!

### FAIL/RETAKE

It is rarer, but if you do poorly on multiple questions (or fail to rewrite your conditional pass questions), you will be asked to retake the qual, usually at the beginning of the next semester.

\*In Biology it is very rare, but students who fail the qual twice must choose a new major.

# Thesis in Biology

## WHICH MAJORS MIGHT HAVE A THESIS ADVISER IN BIOLOGY?

Biology, Alt-Bio, Ad-Hoc Bio, BMB , ES-Biology, and Neuroscience majors may be assigned an adviser in the Biology department.

## HOW DO I PICK MY THESIS TOPIC & WHAT TYPES OF THESIS PROJECTS CAN I DO?

During the first few days of classes in your senior year you will meet faculty members to discuss your academic interests and learn about their research programs. ***We do not expect you to have designed your own thesis project*** at this point; in fact it is preferable to develop a project in conjunction with your thesis adviser.

Data can be generated in the **laboratory or field**; a model can be developed as part of a **theoretical approach**; or **literature** can be used to generate a comprehensive analysis of a particular problem. You will work closely with your adviser to investigate the relevant literature, design & execute empirical (or theoretic) research. Everyone starts with different levels of expertise, but over the year you will grow as a scientist and gain ownership of your project.

You may also consider off-campus resources and advisers for your thesis work. Faculty can provide leads for **off-campus advisers**, but it is your responsibility to develop an agreement to use the time and resources of a scientist at another institution. If you are interested in doing a thesis off campus you still will need to discuss the project with a faculty member in the department who will serve as a co-adviser.

## HOW IS MY THESIS ADVISER DETERMINED?

Discuss your ideas with faculty, making return visits if necessary, to develop your thesis proposals. Thesis proposals are due the Wednesday during the second week of classes. After you submit your proposals, the department will make final thesis adviser assignments.

# Thesis in Biology (cont.)

## HOW DO I PREPARE A THESIS PROPOSAL?

### **BIOLOGY, ALT-BIO, & ES-BIOLOGY MAJORS**

You will be asked to develop a number of short proposals (usually 3), each with different faculty members. You will then submit a rank list of your preferred thesis advisers along with a brief description (800 characters or less) of the question you propose to investigate and a general approach you would take in your investigation.

### **AD-HOC BIO MAJORS**

Your thesis proposals should be developed in collaboration with Biology and your allied field. You will often be co-advise by a thesis adviser in Biology and in your allied field. Depending on your particular circumstances you may be asked to submit 3 proposals similar to other Biology majors.

### **BMB MAJORS**

You will be asked to submit proposals similar to Biology majors, except that you must have at least one proposed adviser in both Biology and Chemistry.

### **NEUROSCIENCE MAJORS**

You will be asked to submit proposals similar to Biology majors, except that you must have at least one proposed adviser in both Biology and Psychology.

## **ARE THERE DRAFT DEADLINES IN THE BIOLOGY DEPARTMENT OR MNS DIVISION?**

Biology and the MNS division do not set draft deadlines like other departments. You will work with your adviser to set deadlines according to your project. The only department deadline is that you must submit a draft of your introduction to your thesis adviser no later than the first day of classes of the second semester.

# Thesis in Biology (cont.)

## HOW DO I RECEIVE FUNDING FOR MY THESIS PROJECT?

If your project will require supplies, materials, or services that will cost more than \$500 you will need to apply for BURP (Biology Undergraduate Research Project) funding. You will receive an email early in the semester with instructions for how to apply. There are two application deadlines on the Wednesday of week 7 of your first semester of senior year and week 4 your second semester.

## HOW ARE ORALS SCHEDULED?

If you have a thesis advisers in Biology, the department will assign the date, time, and place for your 90 minute senior oral examination. It will also assign your first (thesis adviser) and second reader. The schedule is usually released shortly after week 8 of instruction.

Once you receive your oral exam time (and please not before, since faculty can't commit to other orals until they know the schedule for their own thesis students and department), it is up to you to recruit a 3rd reader (a faculty member from the MNS division outside Biology) and a 4th reader (someone from outside the division).

BMB majors should have a reader from both Biology and Chemistry, and ES-Bio students' 3rd or 4th reader should be a member of the ES committee. Neuroscience students will have a 3rd reader from Psychology assigned to them.

## HOW SHOULD I PREPARE FOR ORALS?

Your thesis adviser will work closely with you to prepare you for orals. Keep in mind that the orals are primarily a series of questions from your readers (about both your thesis and potentially other materials from classes you took) rather than a long presentation about your thesis. Some students prepare a few slides of figures that they think would help them to answer questions about their thesis that they expect will come up, and others will draw figures on a board and/or answer verbally.

# Opportunities to be Aware of....

Consult with the website, your adviser, or the department faculty admin coordinator for more details!

## **SUMMER UNDERGRADUATE RESEARCH FUNDS**

Funds (including living stipends) are available to support students' research projects over the summer.

## **POST-BAC RESEARCH FUNDS**

There are also limited funds (including living stipends) available to support recent graduates' research projects over the summer.

## **ATTEND A CONFERENCE**

The college (& sometimes the department) has funds available to send students to academic conferences (especially to present your work.)

## **SEMINAR SERIES**

Rare for a college of Reed's size, be sure to join the Biology department nearly every Friday at 4pm for our series of talks given by scientists from around the country.

## **JOBS IN BIOLOGY**

Check for postings on Reed's Handshake Platform (through the Center for Life Beyond Reed) or ask faculty & staff about jobs around the department (stockroom prep, animal care, etc.)

## **FUNDING FOR INTERNSHIPS & CAREER DEVELOPMENT**

The Center for Life Beyond Reed can help with your internships/job search; resume & interview prep; and funding for unpaid internships & other career development expenses (GRE, application fees, etc.)

## **SCIENCE OUTREACH**

Paid and volunteer opportunities to teach science to elementary student in the Portland public school system.