

Rushworth Lab Guide

Joining the lab

Welcome! We are a group of researchers at all career stages who have chosen to pursue research in plant evolutionary biology and ecology. We study the evolution and ecology of plant reproductive strategies and the role of those strategies in adaptation and speciation. To do this, we integrate field and greenhouse experiments, genetics, and theory. We're so glad you're joining us!

As the principal investigator (PI) of this lab, my job is to help you learn how to conduct scientific research and to communicate it in both professional and casual settings. Please see my mentorship statement for more information on how I plan to accomplish this.

For the nitty gritty of how to get started at USU, please see the [lab onboarding document](#) (in development) when you first join the Rushworth Lab.

Big picture

Our goal is to contribute new scientific knowledge to the world, and to make these contributions in a way that is ethical, collaborative, and kind. A main part of all our jobs is to help one another develop as scientists: to learn new concepts, skills, and ways of thinking; to teach each other what we have learned; and to help each other whenever we can, just as we expect others to help us. We also seek to improve the practice of science for both our own lab group and for others. To that end, **I expect all graduate student, postdoc, and technician members of the Rushworth lab to engage in service.** This service may benefit the department, the broad field of ecology and evolutionary biology, or the broader community (such as the public).

What is academic science?

Academic science is the production of new research findings to the world, usually conducted in a university or government lab, and presented to the public chiefly as publications in scientific journals. Journal publications are the “currency” of our field and are extremely important for our success (as measured not by personal standards of happiness but by academic standards, including grant and fellowship funding, placement in competitive jobs, awards, admission to programs, etc.). Graduate students and postdocs should expect to spend most of their time on research, but also on teaching, service, and mentorship.

Academic science is:

- **Collaborative:** Contrary to public perception, science is highly collaborative. For every Nobel Prize winner, there are huge teams of researchers who supported their work through idea generation, writing, analyses, or constructive criticism. We work hard to create an environment that supports collaborative scientific progress.

- **Perplexing:** Science is hard work, and it is often confusing. There are no right answers to the questions we ask. Sometimes our experiments fail and we don't know why. In fact, you should expect many of the things you do in the lab to fail. The best we can do is our due diligence to design robust experiments and studies that can answer our questions, if they succeed. We do this by reading the scientific literature and talking with our colleagues and collaborators to learn how others have handled similar questions.

- **Relentless:** Academic science takes a long time to do right. Sometimes it feels like we aren't accomplishing much, and it's hard to know why not. It can be stressful with its many deadlines, its frequent rejection, and its lack of positive feedback. We all lose momentum sometimes, and you should expect your interest to wax and wane over time. This is normal, and does not say anything about your abilities or potential as a scientist. You should expect yourself to feel imposter syndrome ([or imposter phenomenon](#)) sometimes. I recommend that you create/maintain a good support network in both your personal and professional life, and that you seek out counseling if it might help (if you're unsure, my own experience is that it usually helps!).

How do I find a research project?

Some lab members will design their own projects, and some will be hired to work on a specific question. Regardless of which situation applies to you, reading the relevant literature is critical. We read to find out how other people have conducted experiments/analyses, to figure out the history of our field and where our research stands within that context, and to find new and exciting questions to pursue.

To find a project, you should first read the primary literature to find questions that interest you, and we'll go through these together. Once a larger question is chosen, we'll break it down into smaller questions and what is needed to answer those. Once we have those steps identified, we'll design experiments and studies together that can carry us from question to answer. Not everything will work out perfectly—experiments will go wrong, questions will prove unanswerable, etc. That's expected and normal. We will publish as we go, for three reasons: 1) earlier results can help shape future research questions/areas; 2) it gives you a stronger chance in the academic job market down the road; 3) writing a first paper is hard and slow, and best done early.

Academic products

General: My job is to teach you how to be a scientist. That means I'm contributing to your intellectual and technical development, and thus that we'll be working together to design and conduct experiments, analyze data, fund your research, and publish results. Consider me your collaborator and guide, to the best of my ability, in this process.

Many PIs require approval of manuscripts, proposals, presentations, conference abstracts, etc. I ask that you use your best judgment in this. In general, all coauthors on a publication, presentation, or proposal should approve a final version. For graduate students and undergrads, I expect that any publication/poster/talk coming out of the Rushworth lab will involve my efforts, so I would want to see a final version well before it is submitted and provide

feedback/edits. For postdocs, you may have previous research I'm not involved in that doesn't require my feedback, but I'm happy to give it if you want it!

Publications: Early career researchers are sometimes surprised to learn how important publishing is to academic science. Graduate students should expect to publish at least one paper before graduating, and possibly more, depending on their career goals. This is especially important because the publishing process is really long and complicated, and it's my job to help you learn how to navigate it before you leave the lab.

Authorship: Authorship order can be a fraught issue! Collaborators on a project should tackle authorship head-on, determining an authorship order in the very early stages of a project. This should also be frequently revisited, as different experiments and research contributions are often added to a publication as it progresses.

In our field, the first and last authors are the people who've contributed the most. The first author is the lead for the intellectual development of the project and writing of the manuscript. On dissertation publications, graduate students will be the first author. The last author is usually senior to the first. In most publications to come out of the Rushworth lab, Cathy will probably be the last author (unless you were working with another PI who helped develop the project, in which case Cathy might be a middle author, if she made contributions deemed sufficient by you and the lead PI for authorship at all!). Middle authors contribute to the work, but to a lesser extent. Middle authorship contributions may include collecting data for one experiment, helping with an analysis, or writing a small portion of the manuscript. Sometimes co-first authors are the best strategy; if this seems like a good approach for a certain paper, it will be discussed extensively throughout manuscript development.

Organization and coding: The Rushworth lab works chiefly in R and has a long illustrious history of "trying to get into Python". Never used R? That's ok! Here's a great set of videos on [how to get started in R](#).

It is extremely important to keep detailed and organized records for any and all analyses. This is honestly one of the most important things in scientific research! This is best practice for any collaborative effort, is the easiest way to transition into and out of a project, and allows for reproducibility of published analyses ([read about the reproducibility crisis here](#)). Here's an example of a [thorough plan for record keeping](#) for computational projects, although all the same principles apply for other kinds of projects as well. Here's a fun link for [best practice on file naming](#). Thank you to the Goldberg Lab at Duke for these links! Here are some other great tips from Dr. Goldberg, which are also standards in the Rushworth Lab:

- Original data should be kept in unedited form on Box, and backed up as needed. You can also have the data on your own computer, of course!
- All analyses should be recorded in an electronic or paper lab notebook, even if they don't make it into the final paper.

- Final cleaned data used in any figures/analyses should be stored in Box and labeled. A README file describing the steps between original data and cleaned data should be stored next to data.
- Code should be commented with enough detail for another lab member to be able to use. Use version control.
- Have a preplanned file system. It should delineate analyses by date with associated code, produced figures, data, etc. File names should include date (see above link).
- All data and code should be made publicly and permanently available upon publication, unless prevented by IRB or other policies.

Presentations: Presentations, whether visual (posters) or oral (talks), are tricky to get the hang of! Lab members should expect to give practice talks to the lab as they prepare for conferences, seminars, and the public. Everyone can benefit from more practice. The Rushworth lab is new but over time we will work on a template poster that everyone can use if they like. Those who have contributed to the research presented, either in an oral or visual presentation, should be included as authors. Here are some great [guidelines for presentations](#) from the Hargreaves lab.

Conferences/workshops: To the best of my ability, I will pay for every student and postdoc to attend one conference per year. This is dependent on available funding. Everyone should apply for funding to attend conferences when possible (whether internal funding through the Biology Department, the Ecology Center, or through the professional societies that host these conferences). If payment for your conference attendance is coming from grant funding, you must present a poster or talk at the conference. This is because taxpayers are paying for your conference participation; to honor the public's contribution to our science, we should ourselves contribute to scientific advancement by presenting our work. We will discuss well in advance the conference options available and determine the best choices for each of us. Conferences that are relevant to the Rushworth Lab include Evolution, Botany, GSA PEQG (Population, Evolutionary, and Quantitative Genetics), ESEB (European Society of Evolutionary Biology), SMOBE (Society of Molecular Biology and Evolution), and ASN (American Society of Naturalists).

Lab and field safety: All members must complete both online and in-person lab safety courses. Please talk to our lab safety officer, Dr. Gabrielle Sandstedt, about requirements.

Field work should never be conducted alone, whether on campus or off. Plant tissue collection must be permitted by the relevant federal agency (usually the US Forest Service). USU's field safety policy is currently in draft form ([viewable here](#)) and The Rushworth lab's field safety policy will be drafted as required by the university under this policy (TBA). Field vehicles can be reserved in advance through [the Ecology Center](#). These vehicles are great for mountain fieldwork, as most have 4 wheel drive, robust off road tires, and high clearance for rocks.

Greenhouse/growth chamber: The USU Research Greenhouses are located off campus, a four minute drive up N 800 (a 20-minute walk or free 20-minute bus ride via the #15, #1, or B1/B2). Greenhouse staff does not water plants; all lab members are expected to contribute to a shared schedule of plant watering. Watering protocols will be posted in the greenhouse and in the shared lab Box folder. In the event that plants look unusual—bugs, plants dying, or even

unexpected leaf coloring/patterning—please take a picture and share it with Cathy. Sometimes these may be due to insects, even if none are visible. The greenhouse staff does take care of insects, but we have to notify them to start that process. By keeping a close eye on the plants, we can head off loss of our experiments!

Lab culture

Productivity: Work hours, vacation/sick time, availability/meetings, and how these interact

What does work look like in academia? One of the greatest benefits of academia is its flexibility in working hours. With a small kid at home, I may have to unexpectedly leave early sometimes, and I often catch up in the evening—so I like this flexibility. But over time, many of us find ourselves thinking that if we can work at any time, and the demands of the job are always to be working harder and publishing more, we should be working ALL the time. This is a trap! Avoid it at all costs.

When do I have to be in lab? Everyone works best, and is happiest, when they have autonomy to choose their own schedule and work location. I expect lab members to think critically about what working schedule works best for them and to let me know what that might be. This may be in the lab/office 100% of your time, or it may involve working from home, the library, or other places such as coffee shops. It will likely change over time as well!

I do not expect anyone to respond to emails outside their working hours, and I might not respond to emails outside my working hours, either. I do not expect that everyone in the lab will have the same working hours as one another. At the same time, getting comfortable with one another, sharing ideas, and forming relationships is a critical part of lab cohesion and satisfaction. Every semester we will mutually agree to a period of time every day or week when most of our group will be in, so that we can interact as a lab group while respecting our own unique work schedules.

How much am I expected to work? Graduate students and postdocs should expect to work 40-50 hours per week. More than this is inefficient at best and can result in burnout at worst. Just as one example, I usually work 9-5 and might fit in some emails or service work for an hour or so on weeknights. Sometimes, a deadline or an experimental setup will require you to work longer hours for a short period of time. When this happens, I expect you to take time off to relax or to work fewer hours to make up for it.

So how exactly do you expect me to work? Our lab group will work not within set hours, but within set projects. Graduate students, postdocs, and technicians will meet with me weekly. For each person, we will collaboratively maintain a Google doc agenda/schedule. This will be a brief summary of what you're up to that week, any issues that may have arisen or questions you may have, or results you want to share. We'll both maintain this document, adding to it every week. This makes it really easy to add a thought that pops into your head but that you might forget about later on! Your work progress will be made clear through your engagement with this

document, rather than by how much you're in the office or lab. In accordance with departmental policy, all graduate students will also fill out an Individual Development Plan (IDP) every year.

Lab meetings: We will meet weekly either as a group or in conjunction with other lab groups who share mutual interests (the Rothfels lab, the Gompert lab, etc). Lab meetings will be paper discussion, practice talks, or progress updates. We may also discuss relevant issues in science and society. Postdocs and/or the senior grad student will be asked to organize a lab meeting schedule. Each member should expect to lead lab meeting at least once a semester, with early career grad students and undergrads leading paper discussion most of the time. Our first lab meeting of each fall will be a "State of the Lab" presentation given by me to update everyone on grant applications, funding, etc.

Vacation time: I expect everyone to take vacation to visit friends and family and to explore new places, and to take holidays in accordance with their personal beliefs or religion. Our lab Google calendar has seminars, lab events, meetings, and my teaching on it. Please add your vacation times to the calendar a few weeks before your departure. This is not for anyone to keep tabs on you, but to ensure we can all handle any issues that may arise in your absence (such as plant care).

Sick time: If you feel sick, please please *please* stay home. As colleagues, we should take care of each other and value each other's health. We are not always aware of how susceptible our labmates are to illness. For example, members of the lab may be immunocompromised but not open about their status (this happens in pregnancy, among many other conditions). If you're sick, please tell folks you're scheduled to meet with that you will not be in. You can put your sick days on the lab calendar, or email me to let me know you're sick, if you would like the lab to know why you're not there, but the main priority is that you take care of yourself.

Interacting with our colleagues

Professionalism: What is professionalism? Traditionally, professionalism is a set of conduct standards that are based on professional expectations in the USA. This means that professionalism can exclude folks from other countries or cultures. It can also be overtly discriminatory (for example, some organizations define certain hairstyles as unprofessional, when they're standard hairstyles in non-Eurocentric cultures). My definition of professionalism is not as a standard of conduct/appearance/productivity but as a standard of behavior: lab members should be kind to one another, communicate clearly, give each other the benefit of the doubt, approach situations with curiosity, care for one another, and prioritize collaborative environments. Within this framework, all kinds of communication styles (direct and indirect, brusque and gentle, communicating in English or other languages/lexicons) and preferences are supported.

Departmental expectations: Being a good community member is an integral part of science. Lab members are expected to attend departmental seminars and Ecology Center seminars, job

search seminars, retreats, relevant journal clubs and symposia. When our labmates of any career stage are presenting research, we should all do our best to attend and support them!

Lab events, birthdays, and holidays: I expect all lab members to do their best to attend special lab events (like Halloween pumpkin carving) as best they can. These will be added to the calendar after mutual agreement, so that everyone can see them. Every year we'll come up with a birthday policy in accordance with what lab members prefer. If many lab members are on vacation at the same time (e.g. over the winter holidays), we will figure out a shared watering plan for the greenhouse.

Lab communication: We have a lab Slack, shared with the Rothfels lab. Slack is great for communication but not so great for our ability to focus on work, because the reminders are a constant interruption. Please feel free to set the reminders to a lower frequency if you prefer. Any important correspondence should be sent by email (or the combination of email and Slack).

Conflict resolution: Conflict is a normal part of life and is to be expected in the lab from time to time. We all have different cultures, beliefs, and ways of behaving, and this leads to conflict. I am not particularly conflict-averse; I am a strong advocate for dealing with problems early so they don't fester and make lab members unhappy. If someone does something that bothers you, I encourage you to speak up—gently, respectfully, using “I” statements, and in private, when possible—to resolve it in the moment. If a conflict is too large, grows larger over time, occurs frequently, is a micro- or macroaggression, or otherwise requires support, please come to me or another trusted faculty member to help resolve it. [Here's a great podcast](#) to help guide us in the first steps to resolve conflict.

As previously stated, I do not avoid conflict and I am a direct communicator, which can be uncomfortable for indirect communicators. Issues will undoubtedly arise because of this. If you have a conflict that you don't want to address with me (although you are encouraged to!), please go to another trusted labmate or faculty member, and do so early on, before the issue becomes worse.

Harassment: Harassment and/or discrimination of any kind is not acceptable in the Rushworth lab, the Department of Biology, and the university. All lab members must pledge to the [Biology Department Code of Conduct](#). The University's Code of Conduct is currently undergoing revision, but you can learn more about the university's principles of community [here](#) and report misconduct [here](#). Please report any kind of harassment to Cathy or to another trusted faculty member.

Other behaviors may also count as harassment. [A recent large-scale study](#) showed that toxic work environments result from five main types of behaviors: disrespectful, non-inclusive or inequitable, unethical, cutthroat, and abusive. Surprisingly, disrespectful behavior disrupted the work environment the most, out of all five behaviors—even more than abusive behavior! We strive to create a supportive lab environment and will not engage in or tolerate these kinds of behaviors. Unintentionally toxic behavior should be addressed courteously and respectfully, or brought to the attention of Cathy or another trusted faculty member.

Exiting the lab: When departing the lab, please keep in mind that all data and lab records, including lab notebooks, technically belong to the University. So that each lab member can take their notes with them when they leave, if they want to, we use carbon copy lab notebooks. All data files should be stored in a shared location with informative file names and README files explaining their contents and any column names (see above). This can take a while—give yourself a few weeks to make sure this is well-organized and well-annotated. Before leaving, each lab member will meet with me or their direct supervisor and go over these files together.

When someone leaves the lab, my main job doesn't change: I still have to make sure papers get out, and if someone has contributed substantially to a paper, I need to get *their* papers out. But their job changes a lot as they move on to bigger and better things! Old papers are often not a main priority when one's life and obligations have changed substantially, and this is more than understandable. Before anyone departs, we'll discuss a publication plan moving forward, and a back-up publication plan. During these meetings, my goal will be to balance your needs, goals, and interests with the needs/health of the lab (i.e. its ability to be productive and generate funding, so that our wonderful lab members can continue doing science!).