**Course Work:**

Requirements:

You should plan to have all your course work finished by the end of your second year. If a course appears that you did not have an opportunity to take, and that is particularly valuable to your research, by all means take it, even if it is in your 3-5th years. The requirement is 24 formal course credits and 30 credits of dissertation research for PhD students (15 and 9 for MS).

**MS/PhD Comprehensive Exam & Proposal Construction Guidelines:**

**Timing of the Comprehensive Exam and Dissertation Proposal**

In the ND Department of Biological Sciences Graduate Student Handbook the deadlines for taking your comprehensive exam are somewhat nebulously defined. One thing clear is that once you take the written exam you must defend your proposal within six months. My sense of it is that you should do it when you are comfortable, but if you can try to accelerate it a bit:

- Establish a committee by the end of the Fall term in your second year for PhD students (by the end of the Spring term of your first year for MS students).
- Schedule your written exam by the end of the Spring term of your second year.
- Schedule the oral exam/proposal defense within 6 months of completing the written exam (The sooner the better).

These guidelines are based on the expectation that you will finish your dissertation in 4-5 years. It is difficult to complete a PhD in 4 years but it can be done if you are well organized and focus on your research quickly. Five years is more reasonable but still requires that you get focused quickly and complete your research. The end of your second year is the near halfway point. Among the many reasons to get on with this part and complete the comprehensive exams is that you cannot apply for things like the NSF Doctoral Dissertation Improvement Grant until you have candidacy. Remember that you must have completed your course work and have completed one year of teaching to fulfill all the requirements. So, don’t put the teaching off too long or it will slow you down.

**Committee Members:**

**Expectations for the Comprehensive Exam:**

How should I study? What are the expectations? *(I'll add to this later)*

**Planning Your Research and Timing**

*How much research is appropriate for a PhD dissertation project?* This is always a pressing question for young students. A reasonable rule of thumb is that you should have at least 3 data/theory chapters in your proposal. Plan accordingly. Data chapters require that you generate the data. If this requires field work then the sooner you get started the better. Field work is a funny animal. Sometimes it works as planned sometimes (fairly often!) it does not. If you plan on a field intensive project then you will have to be prepared to think on your feet and adapt to changing condition and unforeseen challenges. You will likely need at least 2 and perhaps 3 field seasons depending on the scope of your projects. Plan accordingly. Theory
projects are a bit easier to manage in that they can be done anytime, but they present different challenges in that it is hard to predict how long they will take. Lab-based research is safer, unless you are pushing the technical boundaries of the lab. If you are planning challenging lab work, early on we will need to identify appropriate resources in other labs to acquire the necessary expertise. I’m happy to sponsor visits to other labs for this purpose and I can help find the right colleagues to visit. An ideal combination would be a mix of all three. As you work out the details of your proposal keep these timing and practicality issues in mind. In large part, this will determine the answer to the question, “How much is enough?”

How do I pick a research project? How will I know? These are even more common questions and capture what is perhaps the most difficulty part of the whole PhD process. When I was a grad student at Michigan the prevailing wisdom/fooklore was that it would come to you in THE DREAM. Unfortunately, Personally, I never had THE DREAM although I know people who swear this is how it happened for them. My view is think about it carefully is better than holding your breath and waiting for it to happen. So, how do you pick? This is the real goal of the first year of classes, readings, and dialog is to define your interests in ecology, evolutionary biology, and genomics. It is critical that you work on something you are passionate about. This PhD thing takes time and effort and if you are not fully committed to your work it makes it extremely challenging to get through. So make it easy and pick something you are really curious about.

Also, very importantly it is critical that you think about your long-term goals. Different tracks require different skills and the things we do here may well vary depending on these goals. There are many great careers out there that build off a Biology PhD. For example, you might think an academic research faculty job at a tier one university is you dream job (it is mine). This track puts the premium on research, research, research. You might have a faculty position at a high-tech liberal arts college in mind. If this is your goal, then a combination of research and teaching is the ticket. Not just any teaching, it has to be more than a TA for a few classes. You need to get experience running a course and being the lecturer. Agency positions are a whole different ball of wax.

It is worth commenting at this point about the relationship between your work and mine. Unlike the model in a cell/molecular lab where a PhD project is a component of a larger machine (really boring) in ecology and evolution labs we have a more flexible model. I am always happy if a student works on questions that are central to my interests for three reasons. First, it plays into my strengths and I can function as a better advisor if I have expertise in the area you are working on. Second, there is a greater chance that we have funding in place or can get funding in the areas I have strengths. Third, the synergism we can generate by working on related questions has the potential to elevate both of our research interests. Always keep in mind that I’m here for the same reason you are, I just like to learn stuff and push science forward. That said, your dissertation project should be your independent research. Conceived by you, carried out by you, defended by you. I’m here to grease the wheels. My general view of graduate students is that you are junior colleagues. I’ve just been at it longer than you have. If you choose to work in an area that is outside our lab strengths it is fine as long as the questions are compelling. There are practical considerations in this case. I am constrained in my ability to generate funding to the areas where I have a track record. So, if you are working on the duck-billed platypus, I’m very, very excited about it, but I can’t be much help funding it. You will have to work extra hard to figure out how to fund your research. If your interests range too far afield I’m probably not the best advisor for you and we’ll find a better one.

**GENERAL COMMENTS ON THE PROPOSAL**
Your research proposal should generally follow the format and rigor of a NSF Doctoral Dissertation Improvement Grant. There is no fixed target length. Something between 12 and 15 pages is reasonable. There is no reason it should ever be longer than 15 single-spaced pages. Shorter is fine. The critical thing is whether the proposal accomplishes its goals. The main points of doing a research proposal are: 1) It forces you to think deeply about your research over the next few years; 2) if done correctly it forms the basis of future grant proposals and the outline for your thesis/dissertation, for example, if the background part is done in a comprehensive manner you will only need to update it with current references when you go to write a manuscript or thesis; and 3) it is a valuable document to give to committee members.

The proposal should have a central theme that is question oriented, hypothesis driven science. Try to think in discrete blocks so that there is a direct relationship between the proposed work and manuscripts you will publish. Importantly, be very calculating about this. When you have finished and done a postdoc or two you will be out selling yourself for a job. The research you do as a graduate student will be the basis of job talks and the papers you publish from this work will be the tangible evidence of your research expertise. Further, when you land you dream job, you will immediately be under pressure to write a major NSF or NIH grant. The research you do as a graduate student and postdoc forms the foundation of future research you will propose in these first applications. You can't get a grant in an area that you have no track record in. This is your track record.

As you plot and strategize to develop your proposal, ask yourself the following questions:

- Are your questions/hypotheses compelling and at the leading edge of scientific inquiry?
- Are your experiments appropriate (i.e., will they answer your questions?) and likely to succeed?
- Is the scope reasonable for a dissertation project?
- How much will it cost and what resources will you need to complete the work?

**PARTS OF A PROPOSAL:**

**INTRODUCTION/OVERVIEW**

This section should be a single page or so that satisfies the following objectives:

- Define the general area of investigation. Why is it significant?
- Establish the current state of affairs in the field. What do we know?
- Define the gap in knowledge that prevents further conceptual progress in the field. This one is critical!
- Overview the experimental/conceptual approaches that you will use to overcome the gap and move the field forward.
- Describe how your expected results will advance the field.

**BACKGROUND/PRELIMINARY DATA**

This section is meant to explore in more depth the development of the field leading to your project. It will likely be 3-5 pages in length, but there is no way to define that until it is written. This section should give the reader all the sufficient information they need to understand the hypotheses and critically view the specific experiments proposed in the next section.

**PROPOSED RESEARCH**
This section describes the research planned for this project. It should be divided into logical sections, one for each separate experiment/project. The number depends on the scope for the project. 2-3 for a MS and 3-5 for a PhD. The experiments should be developed in a linear fashion so that as a package they form a unified set of investigations that will lead to specific insights. The experiments should have a common theme related to the gap defined in the first section and building off the background information. They should not be a disjointed series of projects. One easy way to view these sections is to craft them so that each section is the basis of a distinct manuscript. Some times a single experiment can accomplish that goal, sometimes multiple experiments are required.

Each section should cover the following:

- Define the specific hypothesis(es). This can be done by posing a null hypothesis and an alternative hypothesis if the null is rejected.
- Describe the experiment in a Materials & Methods section. How will it be done? What is required for equipment, materials, etc.
- Describe the nature of the data collected and the analytical/statistical approaches that will be used to test the specific hypotheses.
- Describe the expected outcomes and the significance of rejecting the null hypothesis and failing to reject the null hypothesis.

**SUMMARY**

Return to the theme of the introduction and revisit the gap, the main questions, and the expected outcomes of the project as a whole. What is the overall significance of this project? Why is it necessary? How will your anticipated results change our view? What future research will this project lead to?

*I'll work on these sections later:*

**WRITING PAPERS:**

**APPLYING FOR FELLOWSHIPS AND GRANTS:**

When should I apply for grants and fellowships? What programs are available for graduate students?

**MOVING TO THE NEXT STEP – SEARCHING FOR THE IDEAL POSTDOC**