

Thesis Prospectus

Choosing a thesis project can seem like a daunting task. At the outset, it is difficult to gauge how long it will take to complete a set of experiments or how successful those experiments will be. Development of the thesis project is a continual process that starts as soon as you join a lab. It involves not only the creative and technical skills of the student, but the experience and input of the thesis advisor and committee. This section offers some pointers on how to find and choose a thesis project, how to select committee members, how to write a prospectus, and what to expect at the prospectus meeting.

Choosing a thesis project

Q: Where do I even start?

A: One great place to begin searching for a topic of study is within the research proposal section of the PI's current funded and pending grants. It is not unusual to be given an opportunity to read these upon joining a lab. PIs generally encourage students to choose from among the lab's current areas of interest a topic that intrigues them personally. It is helpful to choose something that is already funded or is likely to receive funding, as this will ensure the longevity of the project. Another advantage of selecting a project from an established grant is that experiments in the grant will have been designed such that they can be completed within a reasonable time frame. It is useful to consider the techniques involved in the project. Working with techniques that have been successfully used by the lab in the past might allow for faster progress and more success than techniques that are novel and/or risky.

Q: What should I do if my PI asks me to work on someone else's project?

A: In many cases, PIs will have a project in mind, based on your skills and interests or on the need to complete a set of experiments for another person's project. This should not discourage a student who ultimately wants to pursue a different line of inquiry. In the first two to three years of graduate school, students are mostly learning new techniques and becoming familiar with their particular fields of study. Working on someone else's project is a great opportunity to get this experience, as well as authorship on a paper or two. Also, any data collected can be used to convince a thesis committee that certain skills have been attained that can be applied in other experiments. Here, it is critical that you diverge completely from or take ownership of a unique angle on the project.

Q: How important is it that I actually like my project?

A: Personal interest should not be discounted when choosing a thesis project. This is the key ingredient for maintaining enthusiasm for the work, despite the inevitable experimental setbacks. This interest and enthusiasm will also help you "sell" their project to your mentor, a thesis committee, and even a potential funding institute. You opt to design your project from scratch (using techniques available in the

lab), there will be a greater burden on you to delve into the literature, rather than having a list of important references at hand.

Q: What happens once I pick a general topic of interest?

A: Once a general topic is chosen, a series of experiments can be planned that may form the foundation of the thesis project. These experiments should be designed primarily by you, but in collaboration with the PI.

Q: When should I write my prospectus?

A: As you enter your third year, you should begin considering who will be on your thesis committee, and what experiments you will do to have a cohesive scientific “story” for your dissertation. It is recommended that you schedule your prospectus meeting as early as possible, so that you can derive maximum benefit from discussion with your committee.

Q: Do I need preliminary data for my prospectus?

A: Although not every thesis prospectus will have a lot of preliminary data that is specific to the proposed project, it is important to be able to defend the proposed research with existing evidence from the literature or the lab. It is also critical to demonstrate proficiency in most of the techniques that are proposed. Preliminary data collected by the student that supports the proposal is particularly useful, as it meets both of these needs.

Choosing a committee

As much as you may hope that the science you pursue in your graduate studies will conquer all, the actual process will very much depend upon the people around you. You can't get around it: science is a very human endeavor. The people you choose to work with will dramatically impact upon both the quality of your science and the quality of your life.

Guiding Principles:

Choose people you like; choose people you respect; choose people you feel will support you and mentor you and sometimes really stick up for you when unforeseen obstacles arise (and they will). And choose people for whom you'd be willing to do the same.

It's not by mistake or by chance that the first thing mentioned above is choosing people you like. Don't spend 5 to 6 years of your life working with jerks, even if they're great scientists. Life is short, spending it with unpleasant people isn't worth it. Go do great science with people you like. [And incidentally, maybe optimistically, if everybody did this, there'd be fewer jerks, because the obnoxious people would have to start acting in a more reasonable fashion in order to have other people working with them.]

The committee as individuals: some notes about personalities

1. **Be wary of big egos.** Big egos stay big by thinking that compromise is bad and by always being right (even when wrong). That kind of behavior doesn't set the stage for a good mentoring relationship. In terms of your relationship with your committee, the prospectus, through dissertation, through graduation, should be a process of growing from a student & mentee into a colleague. Big egos are not invested in that process because they're more comfortable having students than colleagues.
2. **Be especially wary of four big egos on one little committee.** Don't choose the four biggest names you can find. Sometimes students think that having four big names on the committee will mean kudos for the CV. Not so. If you choose the four biggest names you can find, you may be setting the stage for a stand-off between them. No matter how fantastic the science in your dissertation is, those four individuals will still need to sign off on the work in order for you to graduate. Therefore, they need to get along, at least well enough to sit through your meetings. Differences of opinion will always arise between your committee members, so try to be mindful of how your prospective members handle such differences.
3. **Having said all that, big names are not always synonymous with big egos.** There are many excellent scientists and faculty members, well-known in their fields, who haven't felt the need to become jerks. These are the people you want to work with.
4. **Also be wary of little egos feeling a need to be bigger.** People who may feel a need to prove themselves by undermining you make bad committee members. This means faculty members who might be feeling a little insecure about their place in the pecking order, or who may feel the need to prove how smart they are (either to you or to the other faculty). Have you chosen a brand new faculty member as well as the chair of his or her department? Will that brand new faculty member be feeling the need to prove his or her mettle? Not all new faculty will be this way-- hopefully most will not--but there's a reason that people often hope that their grants or papers are not sent to brand new assistant professors for review.
5. **Be wary of faculty that are extraordinarily busy and who may not have time enough to fit you in.** There are some fantastic faculty members who, because of other responsibilities, really aren't going to be able to meet with you. If one of your faculty prospects has, for example, just become head of the department, or just started a company, or is splitting time between a lab in New Haven and one in Maui (no wait, that would be good, you could try to go along)... you might want to test the waters by trying to schedule an appointment to talk about data. Don't waste anybody's time: have some data to talk about, or a project, or a relevant question, but the point is just to see how easy it is for the faculty member to actually make time for that meeting.

The committee as a group: some notes about group dynamics

1. **Individuals, when they come together in a group, don't always behave in the same way.** You won't know this completely until the first meeting, but be aware of the fact that faculty members' behavior will shift a bit when they are together versus when you are meeting with them alone. Your best defense here is just to expect some differences and roll with them in the first meeting. But expect that there will be differences. Thereafter, you may be able to anticipate the dynamics a bit based upon past experience.
2. **Think about the balance of power.** This relates back to the issue of choosing four big names and the problems that may arise from that. Instead, consider who will work well together. If your members are in the same department, how do they get along? Who outranks whom, and how do the individuals react to that? On one hand, these pecking order issues are silly, but they happen all the time. Your best safeguard against getting caught in the middle is to try and consider in advance how the relations will work. Some are obvious, some are unknowable.
3. **Have some diversity.** It's generally great for your learning and can also be helpful for group cohesion to pull together people with some diversity. You stand to learn more from people who know different things. That said, they still need to be able to speak the same language. As is often the case, the question is, what kind of diversity do you want and how much diversity is the right amount? Some areas of diversity that may be useful are the following: background (faculty members' areas of expertise); age (some younger faculty, some older and more experienced); different departments (have at least one voice from outside your department's dogma, not necessarily a strident voice, but at least one voice).

The educated consumer/student: some pointers for choosing

1. **How do you know who would be a good faculty member to have on your committee?** You will know them by their generous nods and smiles during student research talks or classes. You will know them by the way they ask good, even challenging and difficult questions, but do so in a way that is helping a person learn rather than showing that person up. Watch the way faculty members interact with one another and how they behave during talks (their own talks and others'). Is he or she defensive? Does he always have to have the last word? Are the questions good questions? What do they do when they don't know the answer? If possible, consider taking a class with someone who might be on your committee. How is that person as a teacher? What about as a grader?
2. **Learn from people who've been around longer than you have.** Carol. Carol knows. Carol knows a lot about faculty members and how they've been with students through the years. Ask. Other students, post-docs. Ask. Send emails, sound it out.

3. **Learn from the qualifying process.** How reliable were the faculty members on your committee? Did they have time for you? Did you enjoy the process of learning? Did you learn a lot? How did those faculty members behave during the qualifying exam? Everything you learn during qualifying should inform your choices about committee members. Some of the people may be the same, some not, but learn from your interactions with them.
4. **Some mentors don't have to be on your committee.** There's no reason why you can't talk about your dissertation with faculty members who are not on your committee. If you respect a person's scientific work but have reason to believe that he or she may be difficult to deal with on a committee, consider leaving that person off the committee but meeting with him or her intermittently anyway.

The thoughts above (as in most of the rest of the guidebook) are not one-size-fits-all. They're suggestions. One of the most important modifiers is knowing yourself as a student and knowing what you're looking for. Do you want a lot of face time and hands-on guidance with your mentors, or do you prefer a more hands-off management style? How much do you expect of your committee members, and how much do they expect of you? Trying to understand those expectations as early as possible is critical. Trying to gauge whether they're realistic before you have your committee set is even more important.

Turning your project into a prospectus

By May of the third year of graduate school, all students must prepare and defend a thesis prospectus. The thesis prospectus consists of two parts: the written research proposal and a short presentation.

Q: How long should the written part be, and what information should it contain?

A: In brief, the written prospectus should be about ten pages and formatted in the style of an NRSA application research plan. It should include research aims, background information, preliminary data, research design and methods, interpretation, and a description of alternative outcomes and potential pitfalls.

Q: Can I look at other students' prospectuses as a guide?

A: Examples of NRSA applications and prospectuses can be obtained from Carol for reference. You can also make use of the PI's grants to aid with writing a proposal that reflects the style used in his or her specific research field.

Q: Do my committee members need to see my prospectus before the meeting?

A: You should plan to complete the written prospectus one to two weeks before the scheduled prospectus meeting, so that committee members have ample time to read it. If they read it, they will be in a better position to make critical and constructive comments at the prospectus meeting. Be careful not to send it too early, however, so that it will be fresh in their minds. Again, one to two weeks is

probably just right. NOTE: Do not send multiple working copies of your prospectus to your committee. Just send the last copy that is agreed upon by yourself and your thesis advisor.

Q: What about the presentation?

A: Once the written document has been sent off to the thesis committee, you can prepare a short presentation that highlights the main points of the project. This will help to keep the prospectus meeting organized and moving forward. Since the committee members will have read the written proposal, the presentation does not need to contain every last detail and nuance of the project. It is more important that you leave plenty of opportunities for discussion and feedback. The presentation should contain limited but essential background, research aims and hypotheses, research design, possible outcomes, and a timeline.

Q: Am I officially bound to the experiments described in my prospectus?

A: The prospectus is not intended to be a written or verbal contract between the student and the committee. Instead, it is used to demonstrate the student's ability to develop a research plan and to allow for critical discussion of the project between the student and the members of his or her committee. It is expected that every research project has the potential to change direction for any number of reasons. It is possible that you may be allowed to defend even if all of the experiments proposed in your prospectus are not completed. On the flip-side, completion of all of the proposed experiments does not guarantee that your committee will allow you to defend. These matters are decided by the committee.

The prospectus meeting

Scheduling the meeting:

Carol can help with this, or you can do the scheduling yourself. In either case, it will be an involved process that will take a lot of coordination. You may have already learned this from scheduling the qualifying exam, but if not, you will be shocked to realize how difficult it will be to find a time when all four of your advisors can actually be together in one room for the same two hours. It will take work, but it will happen.

Materials expected at the meeting:

Prepare a short presentation. However, the committee meeting is not a presentation, it's a conversation. Having slides will be useful but don't expect to give an hour-long, uninterrupted talk. Bring paper 'notes' copies of your slides, so you can take copious notes on all of the brilliant things your committee members will say (and also on the ideas that pop into your head during discussion.)

What to expect during the meeting:

Remember that your committee members will behave differently as soon as they're in that room together. If you expect that, it'll be a little less surprising. Your committee members will want to ask lots of questions and also to share their input and ideas. New questions that you may or may not be able to answer (or that you may or may not want to devote your research hours to) may also arise from the group discussion. Expect it.

Q: When my committee is talking, what should I be doing?

A: Take notes. Good ones. If you are asked to revise your prospectus before you submit it, then those notes will come in handy.

Q: One meeting or many meetings?

A: Your prospectus meeting will be the first time your committee meets together as a whole. But that doesn't mean you can't have met with the individual members beforehand. The best way to have a good prospectus meeting--and also the best way to minimize the degree to which your committee members change their behavior in the group setting--is to keep them informed. The more accurately they understand what you'll be showing them, the more smoothly things will go. This might seem counterintuitive: why have the meeting if they already know what you're going to talk about? In fact, you want them to know exactly what you'll be talking about, and you want a good idea of what their reactions will be before you get those reactions.

This same principle will also apply to later committee meetings. As far as your dissertation committee goes, meetings are good. Keep your committee informed of your progress. They should see you a lot. They should know what you're working on and that you're making progress. Either individually or, more importantly, with the group as a whole, meetings will help the process keep moving.

A possible shift in attitude

Mentors like to mentor, that's what they're there for. Let them do it. If you allow this to happen, you may find that your mentors are happier and that you're also learning more in the process. That might sound obvious, and you may assume that you're already doing it. However, as high-achieving students, good at getting the answers right, many of us have spent years trying to show up on deadline day with the perfect project all finished ("A+", "Good job"). This is not actually a good approach to either the dissertation or a prospectus meeting. Mentors want to mentor. They want to have input--and input they will give. That is, if you fail to keep them informed of what you're doing, and you turn up at the prospectus or committee meeting with a lot of stuff they've never seen before, they will give you lots of input at one time, and it may not always be what you were hoping for. The best way to avoid this pitfall is to keep them informed.

After the prospectus meeting

Q: What happens next?

A: Your committee may or may not ask you to revise your prospectus to incorporate changes discussed at the meeting. If not, then all of the committee members will sign off, and a copy of your written prospectus will accompany the signatures to the Graduate School. If so, then you will have until the May 20 deadline (or until the date set by your committee) to complete the revisions and collect the signatures of your committee members.

Q: What does it mean if I am asked to write revisions?

A: Honestly, this is one of those things that totally depends on your committee. If your committee members come from a department that essentially requires perfection in everything they submit, you will probably have to make some revisions. If your committee members feel that time spent working on revisions is time away from collecting data, and that things are likely to change anyway, then you may be able to submit your original document. In either case, this decision does not necessarily hinge on the quality of your research proposal. Even if you are not asked to make revisions, you should take the critical comments of your committee very seriously and take them into account when planning experiments.