

Conducting Your Research

Completing your preliminary and comprehensive exams can be a huge relief because you finally have a chance to concentrate on your research. You've taken your required classes, your research plan has been approved, and now nothing is standing between you and your Ph.D. -- except some experiments, data analysis, and writing. Well, you will quickly realize that there are still more hurdles to face, although later in life, you may come to relish these years that you can indulge in the luxury of focusing on a single research problem.

Original Research. Despite this luxury of focusing on your topic, it is important that you finish your work in a timely fashion. A Ph.D. represents work on an *original* research topic, so if the years begin passing by and you are still trying to decide on the color of your notebook, be forewarned that another eager graduate student could render your research unoriginal before you know it. If you are working on an important research topic (and why work on an unimportant topic?), others will be working on the same problem. This issue highlights the importance of keeping aware of the literature and conference topics in your field.

Keeping Your Committee Informed. To aid you in monitoring your research progress, you should stay in close contact with the members of your thesis committee. The situation you want to avoid is to work, work, work until you convince yourself and your advisor that you are done, only to find out that members of your committee do not have the same high opinion of your work as that held by you and your advisor. To avoid such surprises, simply keep your committee members well-informed of your progress. To keep your committee informed, we will require that you schedule at least one committee meeting *at least two months prior to your thesis defense*. The purpose of this meeting is to present to the committee a comprehensive written outline of your thesis (10 to 20 pages) and copies of submitted and published papers. You may not schedule your thesis defense before holding this committee meeting.

We strongly suggest that you arrange a regular schedule of committee meetings to keep your committee well-informed of your progress. This process can include semiannual committee meetings, attendance by committee members at seminars you will give in the department, distribution of manuscripts and completed chapters, and frequent informal discussions.

Writing Your Thesis As You Go. The issue of keeping in contact with your thesis committee raises an important point about how to balance the tasks of experimentation, data analysis, and writing. It is advantageous to complete experiments, analyze the data, and write up the results as you go rather than delaying the writing until the end of your Ph.D. career. If you attempt to write the entire thesis at the end, you will most likely produce a poorly organized, poorly written thesis that your committee will resent having to read all at once. If you write as you go, you can present your chapters and manuscripts to your committee members in smaller, manageable chunks. Note that completing your thesis in this manner allows you to submit manuscripts before you have received your

degree. If you get manuscripts accepted to respected journals before your defense, you will have indisputably fulfilled one of the major criteria to get a Ph.D.: producing publishable research.

Laboratory Research. You will be conducting your research in laboratories and with instruments that are shared with other students. In sharing these facilities, keep in mind these three concerns: (1) safety, (2) courtesy, and (3) leadership. The safety of you and your fellow students is your primary concern. Unsafe laboratory practices will not be tolerated. If you don't know what is safe or unsafe, make the effort to learn. Your second concern is laboratory courtesy. Avoid the egocentric view that *your* research is more important than that of your fellow students. Like kindergarten, you must learn how to share. Finally, as a Ph.D. student, you are expected to provide leadership in the lab. This leadership includes setting a good example in safety and courtesy.

Academic Honesty. Academic honesty is the foundation of the scientific community. Recently, the uncovering of academic fraud has become common, perhaps demonstrating the pressures of the academic world to secure funding and fame. It is rarely acknowledged in the scientific world, but there are great temptations to "find the right answer" after running into experimental dead-ends. Remember that you will be evaluated by your committee on how well you have learned the *process* of scientific research and not on having arrived at the "right answer." Also, remember that the unexpected result, or the "wrong answer," is often the clue to new discoveries.

There are other issues involved in academic honesty -- keeping accurate records of your laboratory work in notebooks, giving proper recognition of ideas and contributions, maintaining proper secrecy of manuscripts and proposals reviewed, and providing impartial appraisals of the work of your colleagues -- but the issue of academic honesty in reporting results is the most important. Let this message also serve as a warning: academic dishonesty will not be tolerated by the faculty of this program nor will it benefit you in the long run. Eventually, someone will attempt to reproduce your results and, if they can't, you will be asked how you arrived at the results. Don't even think of putting yourself in that position.