PREPARING A PHD PROPOSAL

This is an informal set of tips for students who are preparing for their PhD proposal.

- Before attempting a proposal, you should have accomplished at least one major result, together with one publication submitted to or accepted by a journal.

- At the University of Utah, the time at which the proposal is given seems to vary. Sometimes it is given approximately 40% of the way through the PhD, but other times, it is given when as much as 80% of the way through. Aim for 50%.

- Do not announce the proposal defense until your proposal is essentially completed (and don't forget to schedule practice times for the presentation with your advisor).

- Give your advisor plenty of time to work on content, grammar, and style of your written proposal. The writing style should be scrupulously professional. Don't add cute quotations to each chapter. Don't use empty adjectives like "wonderful" or inflammatory words like "egregious." Ask yourself: Does this come off as a credible piece of work?

- Your proposal should emulate proposals in professional practice. Ideally, your PhD proposal should be an *actual* proposal that you are submitting to a funding agency such as NSF, NIH, etc. Find funding opportunities in your subject area, and write the proposal according to the funding agency's proposal preparation guidelines. For government grants, this means following procedures outlined at www.grants.gov. Your PhD proposal itself might include supplementary information that is not typical in a grant proposal. For example, you might include a *brief* summary of background mathematics, an extended literature review, and a glossary or nomenclature list. Some Advisors like a lengthy PhD proposal (30-40 pages), but other Advisors prefer the 10-12 page length (single spaced in NSF format) that is typical of "real life" proposals, in which case you can assemble around 10 pages of supplementary materials (such as tutorials about the mathematics or physical principles that would not be expected in an NSF proposal but might be appreciated by your committee members who are not experts in your field).

- Long before the proposal date, get to know the members of your committee. Visit with each one at least three times before the proposal: (1) introduce yourself and describe the status of your work, give them one relevant publication, and ask for their advice on improving the proposed work (2) follow up with them to describe what you have done in response to their initial guidance, and (3) hand deliver your proposal and spend time walking them though the table of contents so that they will know which parts are most exciting.

Contents of the Proposal

- Your proposal should contain the following sections (from the NSF guidelines):
    - Project Summary (1 page)
    - Table of Contents
    - Project Description

  The Project Description should contain an introduction, literature review, objectives and aims, experimental methods, etc.

- Spend at least 50% of your proposal indicating what work you are going to do (objectives and aims), how you are going to do it (materials and methods), how you are going to analyze the data (statistics and significance), and why the experiments/simulations you are completing will accomplish your aims and objectives. Describe in detail the proposed efforts you are planning to make.

- The literature review in the proposal should be far more than a lightweight survey of tangentially relevant papers. It should show depth of study and critique in at least two publications. Focus on the publications most relevant to your research. Papers that provide "broad background" are not of interest.

- The proposal should cover results to date and a *crystal clear* plan for the remainder of the work. In deciding what work remains to be done, be aware that the dissertation should represent accomplishments that have been (or will soon be) published in three or four journal articles.

- The proposal should emphasize what makes your work an original contribution. Is the work a new experimental tool? If so, what recommends it over existing tools? Is your work essentially systems engineering such that it isn't the parts themselves that are original, but the way that they are integrated together – if so, what can the assembled system do that other systems can't already do? In your proposal, include a list of contributions that you anticipate making as part of the dissertation research, and indicate why they are important.

- Your committee is very interested in how long it will take you to complete the proposed work, so include a timeline including what has been completed and when you anticipate completing the important milestones in the proposal. Ideal milestones include paper submission.

- Make an honest inventory of shortcomings of your work, and address them in the proposal.

- Most PhD dissertations in engineering include both experimental and simulation chapters. Be sure that you are providing at least some depth in both areas, though you can certainly be heavily weighted in either one direction or the other.

Presentation and Defense of the Proposal

- Your proposal presentation should take no longer than 45 minutes. Thus, plan to use no more than 40 slides. You might actually have to leave some things out, which is fine, since it shows you can prioritize.

Parting Thoughts on the Proposal

- Your committee will help you determine if the methods and approach are reasonable and valuable. By listening carefully to your committee, you can help prevent the need to redo experiments or reinterpret data.

- The dissertation must establish you as a world's leading expert in a particular *highly advanced* topic. As an engineering endeavor, your proposal *must* include applications. However, merely applying existing technology (such as running a few canned simulations or experiments) does not merit a PhD unless you can show that your work exploited existing technology in such a clever way that you managed to solve a problem that has never been solved before *despite numerous efforts in the literature to do so*. Demonstrate that your PhD research has depth of scholarly research. If your graduate work is currently funded by a commercial or government sponsor, you might need to expand the work beyond their deliverables to identify and pursue truly scholarly aspects of the work that are appropriate for journal publication – even if not of interest to your sponsors. If you can't identify scholarly aspects of your work, then expand your literature review.

- Look at your proposal as a contract that you are making with your committee. This contract accomplishes several important goals:
    - When you have accomplished the aims in your proposal, your committee MUST let you graduate. Thus, don't put in any more aims than you really want to complete for your PhD. The proposal protects you as a student from having additional aims piled on you as complete the aims you proposed.
    - The committee does not have to let you graduate UNTIL you have completed the aims you proposed. Thus, the committee may look at the proposal as the minimum requirements for your graduation. Accordingly, the committee may add or remove proposed aims from you proposal to make sure that the committee will be satisfied with the completed work. This process could be considered a negotiation. Feel free to argue why certain aims should or should not be included.
    - Overall, the proposal describes in detail the scope of the project. The committee will look closely at the document to determine if you are trying to do too little or two much. The way to make determining the scope of

the project simple is by tying the aims you will complete to refereed journal publications in respected journals. A typical PhD is often considered the equivalent of three papers. You don't actually have to publish the papers, but the work should be equivalent.

o The proposal or contract is not carved in stone. If research results or objectives change, you can change the direction of your PhD research. In this case, though, it is best to notify all members of your committee of this change in scope/direction and be sure that they approve.