Helpful hints for the Qualifying Exam

1. The qualifying exam needs to be taken in January of your second year. Therefore, you should start considering topics during the summer before the beginning of your second year. The deadline for submission of a topic to the Program Director is October 1st.

2. Talk to your thesis advisor because he/she has the primary responsibility of making sure that your topic is suitable. You and your advisor need to make sure that your topic is not too closely related to your thesis work or other work that is being pursued in the lab. Also, the topic needs to be of reasonable scope for a single investigator, three-year project. Allow plenty of time to explore topics to make sure that you can find one that fits your interests and for which you can formulate a testable hypothesis.

3. Take advantage of the scientists in the Plant Program, elsewhere at Washington University, and among the international community. As you research your topic, feel free to e-mail the authors of key papers with questions that you might have. When it comes time to prepare for the exam itself, it is especially important to seek advice from those that have experienced qualifying exams from both sides of the table. You should start with your mentor and members of your lab. However, it is wise to also seek out members of other labs at Washington University who might have a different perspective. For instance, a genetics lab and biochemistry lab might approach a topic very differently.

4. Follow the instructions for writing your proposal. The proposal is supposed to be written in the format of the research training proposal section of an NIH postdoctoral fellowship proposal (~10 pages, single-spaced, 12 pt font). Follow the instructions for the Individual National Research Service Award (NRSA) proposal at: http://grants.nih.gov/grants/funding/416/phs416.htm. Note that unlike a real fellowship application, you can ignore other sections of the NRSA applications such as grades, career goals, etc. Remember that this is a grant proposal. If you were applying for a postdoctoral fellowship (and we hope that eventually you will successfully achieve this goal) you need to follow the instructions for the research training plan section explicitly. Failure to do so will guarantee a lack of funding. Take this opportunity to become accustomed to adhering to the proposal format as doing so is an essential part of good grantsmanship.

5. When writing your proposal, do not superficially gloss over the background or the proposed experiments. You need to make a case for why your proposed study is interesting and worthy of support. Make sure that the organisms that you have chosen is the most suitable for the experiments that you are proposing. Make sure that you are up to date on the experiments that relate to your chosen field-of-study. If there are review articles out there, start with them, but know the primary papers in detail as well. Review articles alone will not provide a sufficient depth of understanding. You must be able to evaluate critically the existing literature in a field-of-study before you can propose meaningful experiments that will take the field forward. This evaluation must include knowing the strengths and weaknesses of methods and approaches used by the various researchers who have gone before you.

6. Make sure that you have a clear hypothesis leading to experiments that beg to be done based on the results from previously published experiments. You should propose at least two tractable specific aims. Try to avoid broad searches or characterization of a system in hopes that something interesting will come up ("fishing trips"). If the mutant screen is part of your proposal, make it the last specific game and make sure that the mutants identified will address your question(s).

7. For your specific aims, make sure that they are based on clear, testable hypotheses. The best experiments are the ones where, no matter what the outcome, the results are interpretable, interesting and suggest at least one follow-up experiment. Make sure your specific aims address the question that you are proposing to study.

8. Make sure that you completely understand the relevant experimental procedures, both with regard to your evaluation of the literature and the experiments you propose. Understand the ease or difficulty of the proposed experiments proposed, the necessary controls, and what the outcomes will reveal. Identify any assumptions that you are making in the use of the methods you chose. Take advantage of the knowledge of those that have experience with these techniques.

9. One of the best ways to understand and "get inside" the experiments you are proposing is to physically draw out each step in detail and be able to fit them into a "big picture" flow-chart or time-line. This exercise will help you determine both if the experiments are feasible and if they will actually answer the question(s) at hand. Once you have your ideas clearly mapped out (both physically and mentally); you should be discussing them with people who are intimately familiar with the execution of such experiments. Choose your critics carefully. If they cannot give you the information that you need, you are wasting their and your time. After critically evaluating their feedback, you should be able to generate figures that, when included in your proposal and presentation, help the reviewers conclude that you have fully explored your ideas and their implications. An inability to do this demonstrates a lack of ownership for the proposed experiments.

10. Have your proposal done well before the exam deadline. If you have it done three to four weeks before the deadline, you will have time to practice your talk, get feedback and adjust the proposal accordingly. The proposals should be handed to the committee at least two weeks before the exam.

11. Practice your talk multiple times with a critical audience experienced in qualifying exams. Make sure that the audience for your practiced talk/exam has had ample time to read your proposal. If they did not read your proposal, they will not be able to give you the best, most critical, feedback. Do not give them two days read the proposal. Get it to them before or coincident with when you hand the proposal to your committee. Make sure that you have a critical audience. Choose the most critical graduate students that you can find (journal clubs should help you find them). Get a postdoc or two, and a faculty member if possible.

12. The talk should take about 45 minutes without questions. You should have no more than 40 slides - but 30 might be better. The introduction should take less than 15 minutes. Treat the practiced talks like a real exam and asked your audience to do the same. If your audience is not asking critical questions (including “big picture” questions – *e.g.,* Why is this important? How does that experiment address your central hypothesis?), then they are probably not helping you. If it appears too easy, ask your audience to ask harder questions.

13. During your practice talks, have your audience ask how the methods you are using really work. For instance, if you are using PCR in your proposal, be prepared to sketch out on the blackboard several cycles of a PCR reaction to show how it really works. If you are using a Southern blotting, why do you treat gels with sodium hydroxide? If you are running protein gels, what does SDS do that makes proteins migrate proportional to their mass? You should know your methods in this sort of detail. There are many resources for understanding the theories and specifics of experimental detail. In addition to your classes and textbooks, the New England Biolabs and National Diagnostics Life Science Catalogs can be excellent resources, as is the Promega Protocols and Applications Guide.

14. Coming out of your practice talks, you may realize that a proposed experiment will not work, that your specific aims are not in the correct order, or that there is background information that you should have included in your original proposal. Relax. This situation happens often. You should let the committee know that there are changes that you now realize should be made. You are allowed to modify the order or nature of proposed experiments during the exam. Your committee members are likely to have found similar holes in your proposal and will appreciate the fact that you have also found them and have acted accordingly.

15. When giving your presentation for the exam, try to be smooth with few pauses. Exude confidence! When you are asked questions… pause… before you answer. This approach will help you think through your answer, possibly preventing you from saying something you do not want to say. Developing this approach is a good trait that will serve you well in the future when giving lab meeting presentations and seminars.

16. Your committee members will ask questions until you reach a point where you do not know the answer. Hopefully, that point will not be reached too quickly. If you do not know the answer, admit it (they have probably already figured that out). Then show the committee that you can think on your feet by coming up with ways to find the answer. Being able to think on your feet is a critical part of passing the Qualifying Exam.

17. Hang in there. We all want you to pass the exam. The Qualifying Exam is a serious hurdle that all of us have had to go through. However, it is worth it. The Qualifying Exam helps develop skills that will serve you well throughout your career, such as handling questions-and-answer sessions at national and international scientific conferences where you might find yourself needing to defend an experiment or conclusion. You can do it!