

So You Want to go to Graduate School?

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Spring 2007

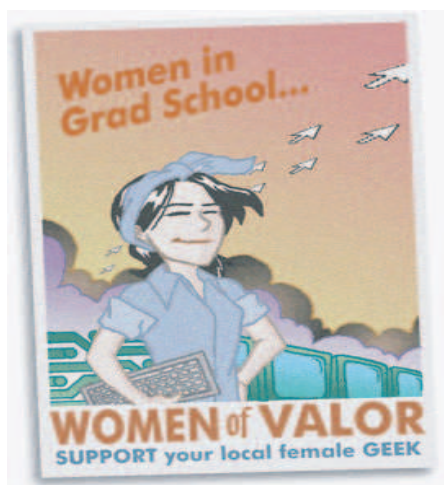


Figure 1: Inspiration from Piled Higher and Deeper

1 Introduction

There are a lot of things you need to do to apply to graduate school, and it can seem overwhelming; but it is not an insurmountable problem. This guide is meant to break it down into well-defined tasks with a definite timeline. It is also meant to make you sit down and think about what you want.

Everyone has slightly different advice, so read through this and then talk to more people and get as many points of view as you can.

2 Whether to Apply?

2.1 Do you really want to do it?

Before you start any of this you need to sit down and think about what you really want to do. It may turn out that you do not need a Ph.D. to do it. There are many things to do with a B.A. in physics that you may not have thought about. Berkeley graduates are working at Microsoft, teaching high school, and working in finance or information technology. Another option is to apply to master's programs. SF State has an excellent program which is only two years long and is equivalent to the first two years in a Ph.D. program. A masters in physics will open doors in industry that a bachelors would not. Other universities also offer master's programs in the physical sciences, and some will grant you a master's after the first couple of years in the Ph.D. program if you then decide to go do something else. So look around, get advice from mentors and colleagues, and consider all your options. The average time for getting a Ph.D. is 5.5 years, which means that if you embark on a doctoral program, you will be spending the better part of your twenties as a student. There are some perks, such as getting to travel and having a flexible work schedule, but there are also some definite drawbacks, like having limited income and working long hours. You definitely shouldn't go this route unless you have a real interest and investment in the subject. Do you have research experience? If not you should consider taking some time to do some before applying. Graduate school is mostly research so you need to be sure you enjoy it.

2.2 Do you need time off?

Now if you are sure a Ph.D. is what you want, the next question to ask is whether you need time off after you graduate. There is a trade-off between taking time off and going directly to grad school. If you take time off you may become rusty and forget much of what you've learned. Most physics graduate schools have an exam within the first year or two on your undergraduate

education, so the more time you take off, the more you'll have to study for this exam. However, if you do take time off, you can use this time to strengthen your application by getting more research experience or doing some teaching. You could also take this opportunity to try something different, work for a non-profit organization, go into the Peace Corps, or travel. Perhaps most importantly, taking some time off will let you do all those things you did not get to do as an undergraduate, like have fun on a weeknight. In most cases, a year or two off will not hurt your application, as long as you can show that you used your time productively and that the additional experiences, whatever they were, made you a better candidate for grad school.

Also be aware that it is sometimes possible to apply for spring admission to a graduate program. The deadlines will be earlier than the deadlines for fall admission, so check this out carefully. It will also help a lot to have a contact person in your department of choice who can guide you through the application process.

If you get through the process of applying and then realize you need time off, it's not too late. It is often possible to defer enrollment for six months or a year. Fellowships can be more difficult to transfer from year to year, however, so make sure you understand the consequences of this decision and weigh them against what you will gain in your year off.

If you do decide to take a year off you can take your GRE and get your letters of recommendation before you leave. That way your physics knowledge will be fresh for the exams and you'll be able to talk directly with your letter writers. The department has a letter service in which they will file your letters of recommendation until you request them. Talk to Claudia to find out details.

3 Where to Apply?

Once you get to this step you know you want a Ph.D. and need to decide where to apply. It will cost up to 100 dollars per school to apply and several hours to put together the application, so applying to more than a handful (5-8) is usually not practical. Now is the time to think about what you want to study and in what sort of environment. Here is a partial list of good questions to ask yourself.

1. What do you want to study?

2. How sure are you that this is what you want to study?
3. Have you tried anything else?
4. Do you need to be applying to Astronomy, Atmospheric Science, Geology, Material Science, Planetary Science, Physics or Applied Physics departments?
5. Do you want a big department or a small department?
6. Is location important to you?
7. Do you want a competitive environment?
8. Is there anyone in particular you want to work with?

It is important to apply to departments that will fit your needs, not just the most prestigious programs. Be careful not to limit yourself to just physics departments; your area of interest might fall into another department, depending on the school. It is also important to really think about what you want to do. It is okay if you are not sure or not completely sure, as this may actually help you chose between schools.

Choosing where to apply is an area where advice from your professors and mentors can really help. Talk to people you feel comfortable with, tell them what you want to study, and ask them which schools they think would be good matches for you. They may know a particular person you should talk to at a given school. You can also find out whether there are local experts here at Berkeley in your topic of choice; these people will also be able to give you good advice about where to apply.

3.1 Differences between Departments

You can look at the U.S. News and World Report grad school rankings to see how the different departments rate, but that will not give you the whole picture. Sometimes the best person or research group in a field will be at Podunk State, so you will need to do some research and talk to people in the field as described above. The top few departments (such as Berkeley, Harvard, MIT, Caltech, Stanford, Princeton, ...) are more difficult to get into, but if you are unsure of what you want to do you will generally have more options at large prestigious schools. But don't get the idea that these are the

ONLY places to get a good graduate education. There are lots of excellent research institutions aside from those big-name schools. The university name on your degree will count for something, but ultimately your own research work and experience is what will propel your career. Finally, you will be at your graduate institution for 5 years or more, so location and environment need to be factored into your decision. For example, if you hate snow, you should think real hard about heading to Boston. But keep an open mind about places you've never been!

Rankings based on detailed student surveys:

<http://survey.nagps.org>

Rankings from US News and World Report:

http://www.usnews.com/usnews/edu/grad/rankings/phdsci/phdsciindex_brief.php

Rankings from the National Research Council:

http://books.nap.edu/html/researchdoc/appendix_p.html

Resources for choosing a graduate program from the American Institute of Physics:

<http://www.gradschoolshopper.com/>

Many programs only admit a handful of students per year, so to some extent this is a statistical game. You should apply to enough schools to give yourself a good random chance of getting in somewhere. Many people also advise including at least one “long shot” school (a big name like Caltech or MIT) and at least one “backup” school (a solid program that you're pretty sure you can get into) on your list. If you don't get in anywhere or don't get any offers you like, you can always take a year off and try again next time around. Sometimes if you get on a “short list” but don't get an offer, the school will give you priority in the next admissions cycle.

4 Fellowships

Applying for fellowships is very similar to applying to another graduate school. Having a fellowship gives you a freedom to choose who you will work for and when you have to start working. It might also get you out of teaching for the first couple of years of grad school. These are usually quite prestigious, so it's well worth putting in the effort to apply. The two big ones are the NSF and the Hertz; they have no restrictions on what type of science or work you will have to do. Fellowships of various types are also offered by the

Department of Defense, Lucent Technologies, and other organizations. Note that you will often have to write a research proposal for the application, so read the application requirements carefully. If you do need to write a proposal, allow extra time for this and be sure to get advice from professors or research advisors. Give them a copy of your proposal and ask them to critique it. Writing a research proposal is different from probably any sort of writing you have done before, so go ask the experts for help!

The Graduate Fellowship Office

(http://www.grad.berkeley.edu/financial/fellowships_office.shtml) is an invaluable resource for finding fellowships to apply for and help for you applications. They run very informative workshops for the NSF and Fulbright, and retain on file copies of successful applications. You can additionally make an appointment with a counselor to review your applications. You can visit them if you are applying for any fellowship for graduate study, whether or not you are a graduate student.

There may also be fellowships offered by the individual schools. Talk to other students and see what fellowships they're applying for. Talk to your undergraduate adviser or the physics or astronomy offices to see what opportunities they know about. Surf the Internet. Be aware that some fellowships may restrict you from having any other income while you're a fellow (this happened to a friend of mine who ended up making less than the other students and couldn't supplement his income with teaching). However, the prestige factor is also important, and may outweigh this factor – having a big fellowship definitely looks good on your resume, and can lead to future opportunities.

5 The Time Line

This is the nuts and bolts of what needs to get done and when. You should of course check with the schools themselves to make sure they have no additional requirements. They should have a link off their website outlining the requirements. Applications are due from the beginning of November to the end of January.

5.1 Exams

There are two exams you may need to take: the general GRE and the physics GRE. The general GRE is required by Astronomy, Physics, and EPS departments. The Physics GRE is required at only Astronomy and Physics departments. Again, check with the individual departments to make sure you know what they require.

Information about these tests can be found on-line at:
<http://www.gre.org>

5.1.1 The General GRE

The general GRE can be taken any time. It is a computer-based test that has three sections: vocabulary, basic mathematics, and analytical writing. To sign up, call a local testing facility and make an appointment. It is best to get this out of the way during the summer before you are planning to apply to grad school. To study, buy a book with the CD-ROM. Use the CD to get yourself used to the computer format, review all that geometry you have forgotten, and practice writing an essay. Doing well on this exam makes an application look better (some people see a link between GRE verbal skills and success in physics/astronomy grad school), but it is not the most important part of your application.

5.1.2 The Physics GRE

The physics GRE is given three times each year: in April, November, and December. Depending on the school, this test can be very important. It consists of 100 multiple-choice questions in three hours, which means it is a speed physics exam. You will need to take time to get used to the format and study the material. It is 80 percent introductory material (Physics 7A-7C level), 15 percent more advanced physics (basic ideas from 105, 137, 112), and 5 percent random physics trivia from specific subjects that you either know or you don't. If you have difficulty taking exams and it would increase your confidence to take the test multiple times, take the April exam as a first try. Otherwise, starting in the beginning of September, take 2-3 hours a week and start reviewing for the November exam. Only take the December exam if you really must, because during that time you will be finishing the applications and taking finals. It is possible to take the general and the physics GRE's on the same day, but this is NOT recommended. The department or the

Physics Scholars Program usually organizes a series of GRE review sessions, so ask Claudia about this. There is an official ETS book of tests for studying (SPS has lots of copies). There is also a thicker pink book, but this does not reflect what you will be tested on. If you really need more practice, I would recommend doing problems from the back of your introductory physics textbook.

There is lots of discussion about how important your physics GRE scores really are. Obviously, it's good if you do well. If you don't do so well, it may not be the end of the world, especially if the rest of your application is strong. Admissions committees realize that the GRE isn't very much like the real world. However, if you think you can improve your score, it may be a good idea to take the test again. You can choose which scores to send to your schools.

5.2 Statement of Purpose

Every school is going to ask you to write a statement of purpose. Remember that you are applying to graduate school in the physical sciences, not a creative writing program, so there is no need for cute stories of stargazing with your mother. You're trying to make yourself stand out, and to convince a bunch of scientists that you're qualified to become one of them. Include technical details about your research experience, play up any publications or conferences attended, and show that you have thought seriously about what kind of work you might be interested in doing. It's okay if you're not sure, but it's better in that case to mention a larger field (e.g., stellar astronomy or high-energy physics) than to say "I have no idea." Pick an area or two of ongoing research that you find interesting and talk about why it is interesting to you. No one's going to hold you to it later.

Since you are trying to convince your readers that you would improve their department, don't be afraid to brag. Make sure to include all research and teaching experience, and emphasize skills such as programming and electronics. If you have taken advanced lab classes (Physics 111 or Astro 120-122 for example), you should include those experiences too, because they are classes unique to Berkeley. Also mention any organizations you have been active in (such as SWPS, SPS, PSP, or other campus groups) and any outreach you have done: this shows you have interest in the department as a whole.

Start working on your statement over the summer and get people to read it. Any graduate student friends would be more than happy to help. If you

want more input, contact one of the SWPS coordinators and we will find a graduate student to review it for you. Also ask professors you like and trust; they know from experience what departments are looking for.

5.3 Letters of Recommendation

Most schools require three letters and NSF requires four. You will need at least one from a research adviser and at least one from someone you took a class with. These are probably the most important part of your application, so choose your recommenders carefully! Make a list of anyone who could write you a letter (everyone you have done physics- related work for or taken a class from). Choose your 4 most likely candidates and then go and talk with them about applying to graduate school. Tell them what you want to study and try to get a feel for whether they will write you a good letter. If you think they can, then ask them whether they would recommend you for grad school. They should be honest with you. Don't be upset if they say they aren't comfortable doing this; it usually just means they don't feel they know you well enough. Your best letters will come from people who know you and your work very well, so try someone you're more familiar with. It's okay to ask a grad student or postdoc if you have worked closely with him or her (i.e., don't just ask your GSI), but most of the letters should be from professors or scientists. Professors are best because they read applications all the time and know what is important in a recommendation. Don't forget your REU adviser or collaborators at other institutions!

You should start working on identifying recommenders at the beginning of September, and get the necessary information to your chosen people by the beginning of October. There will be forms for the recommenders to fill out, either paper or online. If anything needs to be sent in, make sure to include stamped and addressed envelopes. Some reviewers don't like online forms, so find out if there are paper alternatives. I would highly recommend making folders or packets for your recommenders. Include the list of schools and due dates, any forms, your transcript, your statement of purpose and a simple resume (including extracurricular activities). Your professors are probably writing multiple letters at this time of year, so some inspirational material will be useful to them. A week or so before the due date, email your recommenders to make sure everything is going well. After the due date, contact your schools to make sure everything got there. If you are missing something, then go talk to your recommender again, but don't worry: schools

understand that professors get busy, so the due dates for letters are often somewhat soft. In some cases, the recommender can email the text of the letter to the department, and then send the signed hard copy later. Don't forget to write thank-you notes to your recommenders! It will make them feel appreciated, and they'll be more likely to do you favors in the future.

5.4 Transcripts and Scores

To get transcripts you need to go to Sproul Hall and order them. There are several options with different delivery times and prices. Try to order these sometime in October, before they get too crazy down there.

This is the website where the registrar explains the details:

<http://registrar.berkeley.edu/Records/transcripts.html>

The GRE website has directions for sending your scores to your chosen schools. It is possible to send scores to four institutions at the same time you receive the scores, but if you take more exams later, you will have to send out those scores later as well. To save money, don't send any scores before you've taken all your exams. The beginning of December is probably the earliest you can do this.

5.5 Applications

Now is time to fill in your name, address, and all those vital statistics. Most schools do this online now, but some still like the paper copies. Go online in the beginning of September and find out what each school requires you to do, when it's due, and whether it can be submitted online. It might help to make yourself a list or calendar of all the things you need to get done. Try not to work right up to the deadlines. This will make your life less stressful and give you some wiggle room in case something doesn't go as planned.

6 Oh Dear, Where Will You Go?

Congratulations! You have finished applying to graduate school. Now you can relax for a little while. Some schools will send you email acceptances before the end of winter break. In general, the first round of acceptances are in by the end of February and the second round by the middle of March. You generally have to decide where you are going by April 15th.

Most places will pay for you to come visit the department for a few days. Depending on how many places you have to visit, you might try to combine them all into one trip to minimize the amount of time you're away. It's best not to visit a campus during their spring break or on a weekend; try to include at least a day or two of regular school so you can really get a feel for what the environment is normally like. Make yourself a little checklist of things you want to find out so you don't forget: this will include things like do the grad students get paid enough, when the exams are and what they consist of, how many people pass the exams, how many people drop out of the program, what kinds of jobs people get when they leave, where people live in town and what they pay for rent, what the climate is like for women in the department, what opportunities there are for telescope time/travel/collaborations with other institutions, whether people can gracefully switch advisers or research projects if necessary, how much teaching people normally do, how many people will be in your class, etc. Probably the most important thing to do on a visit is talk to the grad students. Stay with one of them if it's offered – this will give you a really good idea of what their lives are like. See if they like each other and their professors. See if they feel over stressed or under-appreciated. See if the environment in the department is positive and comfortable (I'd say this is even more important than the climate of the city itself). If you have a two-body problem, see if the department can do anything to help your partner find a job nearby. Remember: you will spend many years of your life in grad school. You will learn best and do your best work if you are comfortable, both in your department and in your larger environment.

There are lots of other good resources online for questions to ask when visiting a school; try these links:

<http://spider.ipac.caltech.edu/staff/rebull/goodquestions.html>

http://www.ociw.edu/~jrigby/gschool/jrr_ques.html

<http://www.astro.umd.edu/~kartik/questions.html>

Also remember that on your campus visit you'll be spending lots of time talking to professors about their research; it's probably worth while to look up some of the recent research of people whose work you find interesting. That way you can talk intelligently to them about it. Try not to be too nervous – keep in mind that you're auditioning them more than they're auditioning you. You've already been admitted, and they're not going to revoke that

offer. Now THEY have to convince YOU that you want to go to school there. Finally, remember that there are lots of good schools. You shouldn't automatically pick the one that's the BEST by some standard of prestige; instead you're looking for the best fit for you: the place where you will feel most comfortable and that will allow you the best opportunities to get the kind of education you want. Don't hesitate to ask for as much input and advice as you need from your local professors and mentors.

7 More Useful Links

Applying to Astronomy Grad School

<http://www.ociw.edu/~jrigby/gschool/>

How to Be a Good Graduate Student (includes application advice)

<http://www.cs.indiana.edu/how.2b/how.2b.html>

Getting In To Grad School: An Applicant's Guide to Graduate School Admissions

<http://www.gettingintogradschool.com>

(click on "Online Version" on the left menu)

Graduate Student Resources Page (includes application advice)

<http://www-personal.umich.edu/~danhorn/graduate.html>