Crossroads
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How to Succeed in Graduate School: A Guide for Students and Advisors

Part II of II

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*This is the second of a two part article on how to succeed in graduate school. The **first part** of this article discussed getting into graduate school, doing research, finding an advisor, writing a thesis, and getting financial support. In this issue Marie desJardins discusses actions graduate students can take to become part of the research community, provides some advice for advisors, addresses some issues unique to female graduate students, and gives some advice on how to balance work and play while in graduate school.*

Becoming Part of the Research Community

One of the most important jobs of a graduate student is to become established as part of the research community. Your advisor can help with this process by funding conference travel, encouraging you to publish research results early, collaborating on joint publications, introducing you to colleagues, and promoting your work.

In turn, you can make yourself more visible by participating in conferences and workshops, publishing papers on your work, and meeting and maintaining contact with colleagues.

Attending Conferences

Attending conferences and workshops is valuable whether you present a paper or not.

Some of the reasons to do so are:

- You'll meet people and have a chance to discuss your ideas and to hear theirs.
- You'll get a good sense of what the current state of research is, and will learn more about how to write conference papers and give talks (sometimes by counterexample).
- You'll probably realize that your ideas are more significant, relatively speaking, than you thought. A common reaction is ``I could write a better paper than this!''

If you're giving a talk you'll gain even more visibility, and will have an opportunity to make an impression on other researchers. Some tips for preparing your talk to make this impression as positive as possible:

- Give a practice talk, especially if you tend to get stage fright. Be sure to invite people who will give you constructive, but useful, feedback.
- Make sure your talk fits in the time slot allocated. There's nothing worse than a speaker who rushes through the last ten slides, or skips from the middle of the talk to the conclusion. A good rule is to allocate 2-3 minutes per slide.
- It's better to be somewhat abstract than to get bogged down in technical details - but be sure you give enough detail to make a convincing case. Your paper should fill in the missing details, so that people can read it to get a more in-depth understanding. Know your audience: you'll have to give more background to a general audience, and more technical detail to audiences that are very familiar with the field of research you're discussing.
- Use examples and pictures to illustrate and clarify your ideas.
- Learn by observation: try to imitate qualities of talks that you like and avoid things that other speakers do that bother you.
- Talk about your ideas informally whenever you get the chance, so that the talk will come more naturally and, hopefully, you'll have a chance to respond to and think about questions that might get asked at the talk.
- Make sure your slides are readable and as simple as possible. Never put up a slide with tiny text and say ``I know you can't read this, but...''
- Try to relax. Don't read from a script or word-for-word from your slides, and don't talk too fast. Be confident: you know more about your work (flaws and all) than anyone else.

Parberry **[20]** contains some more suggestions for organizing and presenting a talk,

directed at theoretical computer scientists.

Publishing Papers

Publishing your ideas is important for several reasons: it gives you a source of feedback from people who read your papers; it establishes you as a member of the research community (useful for getting a job down the line); and it forces you to clarify your ideas and to fit them in the context of the current state of research in your field.

There are two key properties of a good paper: significant content -- original, important ideas that are well developed and tested -- and good writing style. The degree to which the paper's content has to be ``significant'' depends on where you're submitting it. Preliminary ideas and work in progress are more suitable for a workshop or symposium; well-developed, extensively tested ideas are more appropriate for a journal. One way to decide where your paper should be submitted is to read papers in potentially appropriate publications (e.g., last year's conference proceedings and current journal issues). Another method is to show a draft or outline of the paper to your advisor or other colleagues and ask their advice.

If you have a great idea, but present it poorly, your paper probably won't be accepted. Be sure you know what the point of the paper is and state it clearly and repeatedly. The same goes for the key technical ideas. Don't make the readers work to figure out what's important -- tell them explicitly. Otherwise, they might get it wrong, if they bother to finish reading the paper at all. State the problem you're addressing, why it's important, how you're solving it, what results you have, how other researchers have addressed the same or similar problems, and why your method is different or better.

Write for the audience that you expect to read the paper, just as you would plan a talk. Give more background for general audiences, less background and more technical detail for specialized audiences. Use a running example if possible, especially if your paper is dense with equations and algorithms.

Don't try to put every idea in your thesis into one conference paper. Break it down into pieces, or write one or two longer journal articles.

As you refine your ideas, you can republish in new forms, but be sure you're adding new material, not just rehashing the same ideas. Some papers start as short workshop papers, evolve into conference papers, and eventually -- with the addition of detailed

empirical results or formal proofs -- become journal articles. It's usually okay to publish the same or substantially similar papers in multiple workshops, but papers for conferences and journals generally have to be original, unpublished work.

It is critical that any paper you plan to submit be read by someone else first, if only to check for typos, grammatical errors, and style. A good reviewer will give you feedback on the organization and content of the paper as well. The more tightly refereed the publication you're submitting to, the more trouble you should go to in order to have it pre-reviewed. For a workshop paper, having your advisor read it over (assuming you can convince them to do so!) is probably enough. For a refereed conference, have one or two other graduate students read it as well. For a journal paper, you should probably find researchers who are active in the field, preferably at other institutions (to give breadth), read it over and give you comments. This is where the network of colleagues you should build comes in handy.

If you go through multiple revisions of a paper, don't expect the same person (even -- perhaps especially -- your advisor) to keep reading new drafts. You should only give a revised draft to your advisor or another reviewer if the paper has changed substantially and she has said that she is willing to reread it.

If your paper is rejected, keep trying! Take the reviews to heart and try to rewrite the paper, addressing the reviewer's comments. You'll get more substantial and useful reviews from journals than conferences or workshops. Often a journal paper will be returned for revisions; usually a conference paper will just be accepted or rejected outright. After reading the review the first time, put it aside. Come back to it later, reading the paper closely to decide whether the criticisms were valid and how you can address them.

You will often find that reviewers make criticisms that are off-target because they misinterpreted some aspect of your paper, or just because they're lazy. If so, don't let it get to you - just rewrite that part of your paper more clearly so that the same misunderstanding won't happen again. It's frustrating to have a paper rejected because of a misunderstanding, but at least it's something you can fix. On the other hand, criticisms of the content of the paper may require more substantial revisions -- rethinking your ideas, running more tests, or reworking an analysis. (On the gripping hand, sometimes a paper is rejected for neither of these reasons, but because of politics: somebody on the reviewing committee dislikes your topic, your advisor, your writing style, or even you personally for some reason. This is all the more reason to try

resubmitting to a different conference or journal!)

Networking

One of the most important skills you should be learning in graduate school is how to ``network.'' Breaking into the research community requires attending conferences, meeting established researchers, and making yourself known. Networking *is* a learned skill, so you shouldn't expect to be an expert at it immediately; but it is also a skill that you can, and should, learn in order to be a successful member of the research community.

Going to conferences and standing in the corner is not enough. Especially if you're not normally an outgoing person, you have to make a conscious effort to meet and build relationships with other researchers. Presenting papers is a good way to do this, since people will often approach you to discuss your presentation. Introducing yourself to people whose presentations you found interesting, and asking a relevant question or describing related research you're doing, is also a good way to meet people. Sometimes it's easier to meet other graduate students than senior researchers -- this is fine, since those graduate students will provide contacts to the senior people they know, and someday they'll be senior people themselves (as will you)!

You should talk about your research interests every chance you get. (But also be sure to spend some time listening: you'll learn more this way, and people will feel that your conversations are a two-way street.) Have summaries of various lengths and levels of detail of your work mentally prepared, so that you can intelligently and clearly answer the inevitable ``So what are you working on?''. If someone expresses an interest in your work, follow up! Send them email talking about new ideas or asking questions; send them drafts of papers; ask them for drafts of their papers and send them comments. (If you do this, they'll be sure to remember you!) Bring business cards with your email address to conferences to help new acquaintances jog their memory.

To maintain the relationships you form, use email and re-establishing contact at each workshop or conference you attend. If you work at it, and use your initial acquaintances to meet new people, you'll find that your ``network'' grows rapidly. (Agre **[1]** has some excellent suggestions for networking on the Internet.)

Sometimes these contacts will grow into opportunities to do collaborative research. Seize these: you will meet more people, often become exposed to new methods of

doing research or new subfields within your research area, and the responsibility you feel towards your collaborator may give you more of an incentive to stay motivated and keep accomplishing something.

Other professional activities can bring you into the research network as well: volunteer for program committees, send your resume to a book review editor, offer to give seminars at other universities, write conference and workshop papers and send them to people you've met or would like to meet, or organize a workshop on your subfield at a larger conference. Summer internships at research laboratories or even other universities is a good way to get an idea of what the ``real world'' of research is like, to meet more new colleagues, and to get a different perspective on research problems in your field.

Mentoring junior graduate students and undergraduates is a good investment in the long run (besides providing them a valuable service and making you feel useful and knowledgeable).

Finding specific mentors can be very useful. Especially if you feel that you are isolated at your institution, having a colleague at another institution who can give you advice, feedback on drafts of papers, and suggestions for research directions can be extremely valuable.

Advice for Advisors

In order to be a good advisor, you have to relate to your graduate students as individuals, not just as anonymous research assistants or tickets to tenure and co-authored publications. Work with all of your graduate students, not just those whom you feel most comfortable with, or who are interested in the problems you're most excited about. Try to get to know your students personally and professionally. Help them to identify their strengths and weaknesses, to build on the former, and to work on overcoming the latter. Give them honest evaluations of their work and performance: don't just assume that they know how they're doing and what you think of them.

Read this paper and others like it with an eye towards discovering which aspects of the graduate experience your students may be having trouble with or may not realize the importance of. Try to see the experience from their perspective, which will be different for each student, because each student has a different background and different

talents and goals.

The roles of an advisor include:

- Guiding students' research: help them to select a topic, write a research proposal, perform the research, evaluate it critically, and write the dissertation.
- Getting them involved in the wider research community: introducing them to colleagues, collaborating on research projects with them, funding conference travel, encouraging them to publish papers, nominating them for awards and prizes.
- Finding financial support: providing research assistantships or helping them to find fellowships, and finding summer positions.
- Finding a position after graduation: helping them to find and apply for postdoctoral positions, faculty positions, and jobs in industry; supporting their applications with strong recommendations; and helping them to make contacts.

Although guiding your students' research is normally viewed as the central task of an advisor, the other roles are also critical to their long-term success. The beginning of this article contains advice, for students, on networking. You can help them in this process by funding and encouraging travel to conferences and paper publication, and by introducing them and talking about their research to colleagues. Nigel Ward's useful tips on what *not* to do are included as an appendix to this paper. A book that was suggested to me is **[21]**, but I haven't actually seen it so I can't recommend it personally.

Interacting With Students

Especially for a new advisor, setting the right tone for student interactions is a difficult task. Different students respond best to different approaches - and, of course, different advisors have different personal styles. Some of the tradeoffs that have to be made in each advisor-student relationship are:

- Amount of direction: self-directed/hands-off versus ``spoon-feeding'' topics and research projects.
- Personal interactions and psychological support: do they want advice on career, family, and the like? Are you willing and able to give it or to find someone else to advise them?
- Amount and type of criticism: general directions versus specific suggestions for

improvement.
- Frequency of interaction: daily versus once a semester.

It helps to establish regular meeting times and to discuss expectations (both yours and your students') about what can and should be accomplished during these meetings. Encourage them to develop relationships with other faculty members, students, and colleagues, to get a different perspective and to get feedback you may not be able to give.

To improve the atmosphere of your interactions:

- Meet over lunch or coffee to make interactions more relaxed and less stressful.
- Strive to maintain an open, honest relationship. Respect your students as colleagues.
- Tell them if you think they're asking for too much or too little time or guidance.

Advisors should be aware of both long-term and short-term needs. What should the student's goals over the next few years be? Help your student identify ways that the two of you -- as a team -- can meet these goals. Advise the student on the criteria for a successful qualifying exam, thesis proposal, and dissertation. Help prepare the student for a future research career.

In the short term, a good advisor will work with students to set priorities and to find a balance between doing research, reading, writing, satisfying TA and RA duties, publishing, and course work. Although advisors may not be able to give advice on all administrative aspects of graduate school, they should at least know the appropriate people to refer students to for assistance with degree requirements, funding, and so on.

When you meet with your students, pay attention to them. Try to help them to identify their interests, concerns, and goals, not just how they can meet what *you* see as good interests, concerns, and goals. Know what they're working on, and what you discussed last time. Take notes during meetings and review them if necessary.

Give them productive feedback, not just a noncommittal ``OK, sure'' or a destructive ``Why on earth do you want to do that?''. Remember that your students are still learning. If you tell them that a problem in which they're interested has already been explored by Professor X, make sure you follow up with a reference to which they have access. At the next meeting, discuss whether the problem remains a worthwhile area

to explore and whether there are new open issues raised by Professor X's work.

When reviewing a student's paper or proposal, write comments on the paper itself: verbal comments aren't as useful. Give the feedback promptly, otherwise it won't be much help. See the section on feedback for suggestions about giving useful comments. Don't just wait until they hand you something to read: insist on written drafts of proposals, papers, etc. Help them develop their rough ideas into publishable papers. Give them specific, concrete suggestions for what to do next, especially if they seem to be floundering or making little progress.

Advisor-student relationships can break down if the advisor is setting goals that are too high or too low, or if the advisor is exploiting the student to meet the advisor's needs (getting a promotion, increasing the advisor's publication record, doing the advisor's research), not the student's. Fortunately, the student's and advisor's needs in most of these cases are not conflicting.

Encourage your students to choose a topic that you're *both* interested in and knowledgeable about (or very interested in learning more about). Make sure that they have the appropriate background to understand the problem, and that the methodology and solution they identify are appropriate and realistic. Give them pointers to useful references and help them find them (this can be a mysterious, difficult process for graduate students). Make sure they're aware of other researchers and labs who are doing similar work, and if possible, arrange for them to visit these labs or meet the researchers at seminars or conferences.

Women faculty often feel obligated to mentor every woman student in the department, attend every committee meeting, and get involved in every debate, whether they want to or not. While you can't solve all of the problems in the world, you can at least make a difference by giving other women (and men, for that matter) the sense that you do care, and that you think women's issues are important, even if you don't have time (or the inclination) to get involved with every problem.

Social Aspects of Advising

The relationships you develop with your students will vary. With some, the relationship will be purely professional; with others, you may become closer friends. As an advisor, it is your responsibility to ensure that your position of authority over the student is never abused. As mentioned previously, graduate students should not be used as a

means to a promotion or a better publication record. These will be side effects of good work in conjunction with your students, but should not be the goal of your relationship.

Because you are in a position of authority over your students, you must make sure that you both know where the boundaries are. For example, getting a student to help you move some furniture is usually quite easy if you're doing a good job as an advisor, since they feel indebted to you for your advice and support. This isn't a problem in and of itself. However, using explicit or implicit threats to force the student to help you out is a severe violation of professional ethics. Your students are also your colleagues, and should be treated as such. A good question to ask yourself before asking a student for a favor is whether you would feel comfortable asking the head of your department for the same favor. If the answer to this question is ``no,'' then you may be exploiting your position and abusing your relationship, and you should seriously reconsider your motivations and behavior.

In my opinion, it is never appropriate to develop an intimate relationship with one of your own students. If this should happen, you should not continue to advise them (whether the relationship continues or not). Not only would this be a clear case of sexual harassment, but your judgment about the student's professional life cannot be objectively separated from personal feelings in a close relationship.

Dating students (or even asking them out where the implication of a romantic relationship may exist) is a bad idea, even if the student is not one of your advisees. They are bound to feel intimidated and uncomfortable, and at many universities this violates the sexual harassment policy.

Read your university's policy on harassment, and err on the side of conservatism when in doubt, for your sake and the student's.

All Work and No Play…

Finding a balance between work, play, and other activities isn't easy. Different people will give you very different advice. Some people say you should be spending eighty or ninety percent of your waking hours working on your thesis. Others (myself included) think that this is unrealistic and unhealthy, and that it's important for your mental and physical health to have other active interests.

If you have a family, you will have to balance your priorities even more carefully.

Graduate school isn't worth risking your personal relationships over; be sure that you save time and energy to focus on the people who matter to you.

One of the keys to balancing your life is to develop a schedule that's more or less consistent. You may decide that you will only work during the days, and that evenings are for your hobbies. Or you might decide that afternoons are for socializing and exercising, and work late at night. I decided very early on in graduate school that weekends were for me, not my thesis, and I think it helped me to stay sane.

Many graduate students hit the doldrums around the end of the second or beginning of the third year, when they're finishing up their course work and trying to focus in on a thesis topic. Sometimes this process can take quite a while. Try to find useful, enjoyable activities that can take your mind off of the thesis: sing in a choir, learn a foreign language, study the history of ancient Greece, garden, or knit. If you schedule regular activities (rehearsals, tennis lessons), you will probably find it easier to avoid drifting aimlessly from day to day.

In the final push to finish your thesis, though, you will almost certainly have less time for social activities than you used to. Your friends may start to make you feel guilty, whether they intend to or not. Warn them in advance that you expect to turn down lots of invitations, and it's nothing personal -- you need to focus on your thesis for a while. Then you'll be all done and free as a bird! (Until the next phase of your life starts...)

Issues for Women

Although this paper started out from a discussion about the problems women face in graduate school, it has evolved into something that I think is relevant for everyone, not just women. This is not to say, however, that there aren't special problems faced by women.

In many cases, women and men face the same obstacles in graduate school, but react differently to them. For women, the additional factors that are sometimes (but not always) present include isolation, low self-esteem, harassment and discrimination, unusual time pressures arising from family responsibilities, lack of a support network, and lack of relevant experience. Having an unsupportive advisor can thus become much more of a problem for women than for men. I hope that to some extent, this paper will help both women and advisors of women to provide the supportive, positive environment that all graduate students deserve.

Part of the reason that I changed the focus of the paper is that there have been many articles written recently on the subject of women scientists and women graduate students. These include **[27][17][19][22][13][15][14][28][26]**. McKay **[18]** talks about issues relevant for minority faculty members, many of which pertain to minority graduate students. The *systers* mailing list is an electronic resource for women in computer science; send e-mail to `systers-request@pa.dec.com` for more information.

On Finishing

Despite how difficult graduate school can be at times, the benefits are significant. Of course, you'll learn useful professional skills like doing research, formulating problems and critically evaluating alternative solutions, giving written and oral presentations of your work, and interacting with other researchers. But graduate school -- and in particular the process of formulating, researching, and writing a dissertation -- gives you confidence in your ability to tackle hard problems and to become an expert in a new field. A fellow Ph.D. put it much better than I can:

> ...it isn't just that I can write technical things and I can talk to other researchers with confidence -- I can talk to almost any authority figure with confidence. Partly this is because I now know what it is to be an expert in something, and although I respect other peoples' expertise in their areas of specialization, I also know that I'm just as respectable and they (usually) aren't any more so than I. I also think I can write about things in other areas, provided I've done my homework and learned the area. I feel empowered! And I would never have gotten this from a CS programming job or even a masters degree.

Of course, there are also the incalculable benefits of finishing the dissertation. Even though it can leave you at loose ends (what will you do with your weekends, now that you no longer have to work on your thesis?) there's often a feeling of euphoria, heightened by exhaustion, when you finally hand in your thesis. As the person quoted above put it:

> I think an oft-noted bad thing about finishing is adjusting to no longer having a long term, ever-elusive goal. But now that five months have gone by, I find I'm much more efficient in my work because I no longer have

that awful weight hanging by a thread over my head, and much happier, more relaxed, more light-hearted.

Conclusions

In addition to the papers I have cited directly in the article, I found a variety of other resources to be useful, and have included them in the References section.

The UC Berkeley *Graduate* is a newsletter published by the UC Berkeley Graduate Division with articles of general interest to graduate students. I found this publication very informative both during graduate school and while writing this article. A number of particularly interesting articles are included in the References section.

Several articles (**[4][2][3]**) give general advice on graduate school and doing research. Guidelines and suggestions for reviewing papers are given in **[24]** and **[23]**.

A number of articles on writing proposals and successfully applying for research grants are available (**[16][29][30][25]**). The topic of how to find a job, and how to prepare for the job search during graduate school, is the topic of **[12]**.

Graduate school is not an easy process, and too many students are thwarted and intimidated by unsupportive or unskilled advisors, lack of knowledge about what graduate school is all about, inflexible bureaucracies, and a myriad of other obstacles. I have tried to give advice that graduate students and caring advisors can use to lessen some of these obstacles.

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How to be a Terrible Thesis Advisor

by Nigel Ward (a young faculty member and advisor who hopes others can learn from his mistakes)

- Assign students thesis topics based on the section headings in your grant proposal, or on the boxes of the flowchart for your master plan.
- When someone brings up a research paper, tell anecdotes about the author, his or her advisor, and his or her colleagues. This will impress [on] students that who you know is more important than what you do.
- When laying out your laboratory, give first priority to minimizing the cost of cable, last priority to good workplaces for students, and no priority to fostering interaction among students.
- Read your students' papers at most once.
- When honest differences of opinion arise, paper them over with words. For example, say ``Well, we could talk about this forever, but I think we're all working towards the same basic idea, let's call it a `neologistic/noetic knowledge representation'. Now let's move on.''
- Regarding other schools of thought, make sure students know just enough to be able to point out the ``fatal flaws'' in each, and so can be good foot soldiers in the crusade for your own approach. A useful phrase is ``Why do you want to waste your time reading that?''
- Never visit the laboratory; learn about students' work only from what they tell you.
- Define your research aims with catch phrases (``dynamic X,'' ``emergent Y,'' ``the Z problem,'' etc.).
- Have students handle computer system administration, and let them think it counts as research.
- Mumble.
- Assign older students to guide the younger ones.
- Involve students in decision-making for unimportant things. For example, you can easily wile away an hour of seminar deciding who should be discussion leader for what chapter of the reading.
- Share your most trivial thoughts with your students. Better yet, bring them up as seminar discussion topics (``In the shower this morning, it struck me that whitespace is really important. Let's think about whitespace from an AI perspective'').

- Avoid conflicts with your students; in particular, don't be too demanding.
- If a student reveals that he is confused about what counts as meaningful research, ridicule him.
- Take no interest in what courses your students are taking.
- Pick up ideas from going to conferences, then bring them up in seminar without explaining from whom you got them or explaining the context in which they arose.
- Plan for research seminars to last at least two hours.
- Avoid meeting with students individually. Do all advising out in public, at seminars.
- Never go near the laboratory in the evenings or on weekends.
- Always come unprepared for seminars; you're smart enough to fake it.
- Never do any programming yourself. After all, you went through that once, and now you're an ideas man (or woman).
- Let your students see you rushing to meet deadlines.
- Avoid critical discussions of research strategy. A useful phrase is ``We'll do it this way. Why? Because I'm the professor and you're a student.''
- Expect nothing much from your students, and subtly let them know this.
- Give all your students the same research topic, but with slightly different names. If this is the same topic as your own dissertation topic, all the better.
- Let your students see your grant proposals and learn the art of doublethink.
- Enforce disciplinary boundaries. For example, say, ``That sounds like the sort of thing that people in software engineering would work on, so let's leave that topic alone,'' or ``Why do you want to worry about that? That's a software engineering issue.''
- Never suggest that your students contact other professors or other researchers.
- Let your students submit articles to third-rate journals.
- If a student's work is not giving the results expected, belittle her.
- Encourage your students to work on fashionable problems.
- State your opinions loudly and frequently, so your students know what to write in their theses.

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