How to survive as a grad student

Commentary (SCS CMU ca. 1996) David Redish

The David Dill email message (aka the DDD, David Dill Document) is more than a decade old, and although most of the advice is still relevant, some things have changed. Over the years, I have noticed that some of the advice in the DDD is kind of cryptic, and although it covers the critically important issues in choosing an advisor, the DDD does not touch on some other equally important issues. I've therefore tried to collect and summarize the advice that has accrued (from myself and others) to the DDD over the years. Since not all SCS students agree with all the advice, I've written this as commentary. I've separated this document into four sections "Advisors", "Research", "Black Friday", and "What to do if you run into trouble".

Advisors

The DDD is correct that the most important decision you will make in the next five to ten years is your choice of a graduate advisor. It may well be one of the most important in your life. Traditionally SCS calls it a "marriage", and the term is actually a surprisingly good one. Everything you do work-wise for the next five to ten years will be a negotiation between you and your advisor.

The choice of advisor can mean the difference between breezing through graduate school and frustration, wasted time, or even involuntary departure from the PhD program. A good advisor can help you get a great job, but bad blood with a bad advisor can make it hard to publish even after you leave CMU (with or without your degree).

However, I don't want to give the impression that mistakes mean the end of the line. A lot of first years get the impression that they get one chance to make the right choice about advisor. I think that everyone should take stock of their situation at their *second* IC. By the time your second IC comes around, you've seen the department, you have an idea if your advisor is working out or not, and you have an idea of the other choices. Most importantly, you'll have worked with your advisor for a year. A lot of second years are scared to start over, they feel that they've lost a year. But of course, you haven't lost a year. You've passed a few classes, you've done some research, and you've learned about how the department works. You're going to be here a long time (the average *really* is 6.5 years), you've got the time. So if this is your second IC, take another look at the DDD and see how well you feel about your situation. (See also *Switching Advisors*, below.)

The most important advice about choosing an advisor is to talk to people. Talk to the potential advisor (PA). Talk to older students. In particular talk to the

PA's other students and talk to students that have left the PA (whether they've switched advisors or graduated or even left the PhD program). You can get a list of the advisor's students from Sharon (Burks). Talk to them to get the names of students who are no longer with the advisor. You have a few weeks to make this decision; take the time to do the research. Remember, marriage is a big step.

How to choose an advisor

The questions that the DDD lists are still the crucial questions. I'll go through all of them here and add my comments to each. Remember that most of the questions are about style; they don't have right or wrong answers. You may prefer an advisor with one style while another person may prefer an advisor with another. I had an officemate who met with her advisor about twice a semester. I meet with my advisor every week. Both of us are happy with the arrangement. Whether the answer is good or bad depends on your personality, but if you don't know the answer, the odds are definitely against you.

1. Does the PA (potential advisor) want students? (or more students?) Does the PA already have too many students?

   Some faculty are always happy to take on additional students (more students means more work means more papers), but they may already have more than they can handle. Ask the PA's current students how much guidance they get from the PA. Sometimes faculty can be out of touch with their own students (this is disastrous -- don't let it happen to you!).

2. Does the PA have research interests in common with you?

   Some people suggest that it is critically important to choose a topic that will sustain your interest over six years, but don't go with a PA because that PA is the only person working in your area. Sometimes a PA may be able to find a connection between your area and theirs.

   I think that this question is generally overrated in importance. (It's also the one that every incoming first-year thinks about.) Remember that faculty are people too. They get excited about new topics and do change their research paths. For example, my advisor and I switched research areas drastically six months after I arrived. (We were doing standard AI and switched to neuroscience. We ended up taking Neuro I and Neuro III together.)

   The important point here is not to depend on your advisor changing topics. You and your advisor should be able to find a starting project that you are both excited about. If you are both flexible about topic, you'll find a good compromise that interests you both. I think that if you agree

on what the important questions are, then you should be fine. By this I mean questions on the order of "How does the brain work?" or "How can we make a well-typed language usable in real applications?"

3. Are the PA's students generally successful? Do they complete their degrees or have most left the program before doing so? Have recent students, who may not have finished, produced good research and papers? Do students stick with the PA or do they change advisors?

4. Does the PA generally keep commitments?

An advisor that does not keep appointments or does not read papers in a timely manner can make your life very difficult and frustrating (that's an understatement). An advisor that doesn't show up to Black Friday means that if anything goes wrong (even remotely wrong) you might not have anyone to argue that you shouldn't be kicked out of the PhD program.

Ask other students about this. Advisors who fail to meet their commitments are less rare than we would like.

5. Is the advisor going to be around for a while?

Many of our top faculty have recently gone to industry. Others have left to start up their own companies. Often, the offer and the decision are very sudden, but don't be afraid to ask the PA whether they expect to still be here in five years.

Watch out also for faculty who are up for tenure soon. Generally SCS awards tenure for junior faculty, but if they don't then the PA may leave for another department that will give them tenure. Again, ask.

6. How long as the PA been here?

More established faculty (often) know their way around the department and have the benefit of experience in directing their students. They are also often higher ranking in the politics of the field, which means it may be easier to get your papers published or your work recognized. But they often also have more students and more responsibilities and less time for you.

Less established (younger) faculty have fewer commitments, fewer projects, and more time for you, but they also may not know all the ins and outs of the department, may be less high ranking in their field, and may have a harder time getting recognized.

Watch out also for the "eager young faculty" (where young faculty work themselves and their students as hard as possible in order to make a name for themselves and to make tenure) and for the "fossilized older faculty" (where older faculty continue to work on projects that are very out of date and may not know all of the current work in the field) phenomena. Note that this is very dependent on personality. If you like working really hard, an eager young faculty can be a great opportunity. Similarly, if you have enough independence to make sure that your work is current and interesting, then even fossilized older faculty can be very good advisors.

7. What is the PA's publication record? What's the co-author deal?

Read some of the PA's papers. An important question you may not have had to consider before is the authorship deal. Who gets to be first author on a paper? Who gets to be a co-author on a paper? Does the PA's name have to be on every paper you write?

Don't be afraid to ask about this directly. Most faculty have explicit policies that they follow about this.

8. Does the PA's research style agree with yours? Do you agree about what constitutes a good research result?

Realize that you may be wrong about what constitutes a good research result. Realize also that your (or the PA's) style may change. This is a topic to keep in mind throughout your graduate career. Often people don't realize there's an incompatibility until it's too late.

9. How independent should you be? Will you want to work on your own project? Or on a project the PA gives you? Will the PA be willing to stretch a bit to accommodate your interests?

This relates to how often you and your advisor will want to meet. An important question to ask yourself is whether you are motivated enough to **be** independent.

10. How much will the PA pressure you?

This is very important. Writing a thesis is nothing like writing an essay or a term paper. You **will** run into problems. Do you need deadlines? Do you prefer to work on your own? Do you like to talk about projects that are half-finished? Do you like to think aloud with a sounding board to bounce possibly crazy ideas off of? Or do you prefer not to show anything to anyone until it is done? What matters is that you and your advisor can work together. This may not be something you can

determine before you've worked with someone for a while, but if this is your second IC, this may be a good question to reassess.

11. What expectations does the PA have about relative accomplishments in the first few years?

Does the PA expect you to have done real research? Does the PA expect you to finish courses? Don't be afraid to ask.

Make sure you think the PA's goals are realistic. The best way to determine this is to ask the PA's students. They've (presumably) survived their first few years. Did they feel the PA was realistic about the requirements?

12. What pre-reqs are required? Do you have them? Will the PA help you get them if you don't?

Some faculty require extensive background knowledge in order to work on a project. Others don't. Make sure that if you need background knowledge you don't have then the PA is willing to spend the time to bring you up to speed.

13. What is the funding situation?

CMU-SCS has tried hard to maintain the illusion that funding plays no part in the student-advisor marriage process, but this is not entirely true. An advisor's funding certainly determines whether you get a better workstation or the opportunity to attend more conferences.

14. I'd also add an additional question: Do you want to work on a large project or a small one?

Large projects have the advantage that there are lots of other people to bring you up to speed and to support you. Working on large projects usually means you don't have to write all of your own support code, but it also usually means you will have to write and maintain support code for others. Working on a small project gives you more flexibility, but also means you have to do everything yourself.

Finally, I'd like to point out that faculty are people too. They have good days and bad days, personality flaws and wonderful aspects, they change, they learn, and sometimes they have personal problems. If your advisor is going through a divorce or is in a fight with another faculty about a patent or has had a loss in the family or something like that they might not deal with you as well or as patiently as they might on other days. Realize that just because your advisor is

(probably) older than you, knows more about your field than you, and knows more about the department than you, your advisor is not perfect.

However, this doesn't mean you can ignore your advisor if you disagree. If you disagree scientifically, take the time to go back and prove your advisor's idea is wrong, you may be surprised. If you disagree about something else (the department, conferences, politics, etc.), either work it out or see *Switching advisors*, below. Remember that your advisor can ruin your life if they want to. They usually don't -- putting out good students is a great way to get respect in a field. They want you to succeed, but keep an eye out to make sure that things don't get ugly. (See *What to do if you run into trouble*, and *Switching advisors*, below.)

Switching advisors

If you do run into trouble with your advisor, you can always switch advisors. Not enough people realize this. I think that everyone should review their advisor situation at the beginning of their second year. (Actually, it's a good idea to review it every IC.)

Switching advisors is a lot easier than many people think. You don't need to worry about losing your funding or your office or your grant. All you have to do is go tell Sharon Burks that you are changing advisors. Often the hardest thing about switching advisors is realizing that you need to change.

If you are having trouble with your advisor and are not sure whether you should change or not, talk to Sharon or to Jeanette Wing or to another faculty member. Be careful! If you do have a serious problem with your advisor and don't catch it early enough, you may find yourself out on the street. (See *What to do if you run into trouble* below.)

But (!) don't do anything behind anybody's back. Make sure that you've talked to your new advisor. Make sure that you've talked to your old advisor. And most importantly, make sure that someone will be in your corner on Black Friday. (See *Black Friday* below.)

It's also a good idea to know why you feel you need to switch advisors. Is it a personality or style conflict? Is it a change of research interests (either yours or the advisors)? Is it that the novelty of the research has worn off? Ask yourself if changing advisors will solve the problem.

Think about the option of adding a second advisor. That way if you need to undo the change, you can.

Multiple Advisors

This brings us to the question of having multiple advisors. Having multiple advisors allows you to span disciplines, to combine senior and junior faculty, and perhaps to make it more possible to get funding while working in an area that doesn't get a lot of funding. But there are negatives as well. Both advisors may blow you off expecting the other to deal with you, or both may expect 75-100% of your time. They may pull you in different, incompatible directions.

Whatever happens, make sure they communicate with you and with each other. Make sure that they **both** know what you are doing. Make sure that come Black Friday, one or both of them will be able to defend you to the other faculty.

Going outside CS for an advisor

CMU CS spans disciplines ranging from programming languages to parallel hardware to neuroscience, but sometimes the best advisor for you is not in the CS department. The advisor must have a courtesy appointment in CS, but there are faculty in psychology, robotics, and GSIA with appointments in CS. Although this may allow you to get closer to your own interests, be careful to make sure that someone is at Black Friday to defend you, and make sure that the advisor knows the ins and outs of CS. Generally, if you are going to go outside CS for an advisor, it is a good idea to have two advisors; a second advisor in CS allows you to have an advisor who is deeply involved in CS, who can advise about classes to take, and who can defend you at Black Friday.

Research

The balance between research and classes is simple: classes are unimportant, research matters. The only reason there are classes in CS at all is because we would be embarrassed if you graduated without having some background in the core areas. The problem is that (1) many of you know how to take classes, (2) classes are easy, and (3) classwork expands to fill your time. Realize that every day you are taking classes, you will face one of two possible questions: either "Do I do this exciting research and do just enough to get by in this class or waste my time doing extra work for this class?" or "Do I bang my head against this wall not getting anything done or do I do this classwork in which I at least know what to do?" Try to be asking yourself the former, not the latter question; you'll finish your degree faster.

I personally suggest starting with research, but your advisor may be different. You should talk to your advisor about what the right way to start is. Some advisors are perfectly happy to have a student take a semester to do research and take no classes (I did this my second semester), others insist on finishing classes as soon as possible. Realize, however, that come Black Friday if you've passed two classes, it will be very easy for your advisor to defend you. If you

haven't taken any classes, you need to be very sure that your advisor is willing to (and can) stand up for you at Black Friday. (See *Black Friday* below.)

In any case, remember that extra work for a class counts for nothing. You may learn something, and you may find very interesting new topics to look into (both of which can lead to new research topics which is good), but when the faculty sit in judgment on Black Friday, all they want to know about your classes is did you pass or not. Extra work on research gets you publications and moves you towards your thesis. Don't spend any more time on classes than you have to. But don't blow off the classes. You may find them harder than the undergrad classes you've seen already. Many of us needed study groups to pass some of the quals.

It is, however, very hard to learn to do research, especially if you've never done research before. The questions are intangible. There's no right answer. There's no one laying the problem out for you. You won't know when you're finished. You won't even know if the problem is solvable until you've solved it. And even then it's very hard to be sure you're right.

Realize, however, that one of the things your advisor will almost certainly be good at is research. Your advisor will probably be very good at helping you find a good project to start with. Along with your advisor, set yourself some specific goals. Start with a small project. Look at the IC mini-symposium for good examples of 1-2 year projects. Plan to participate in the IC mini-symposium after your first or second year. Once you've got one research project under your belt, the others will be easier.

Presenting your work

Many people don't realize how much of academia is presenting the work you do. CMU SCS gives you lots of opportunities to learn to do this, and it looks good on your Black Friday letter (presenting talks goes under "Skills" and is an important part of your graduate education). These opportunities range from the IC mini-symposium (mentioned above) to internal seminars (most groups have very informal weekly seminars -- go to them, present at them, it's a friendly audience!) and tech reports (your advisor will know when to put out a tech report) to conferences, workshops, and journal articles.

Use the low-key informal sessions to practice for outside talks and use them as short-term goals. Being forced to lay everything out clearly and concisely is an excellent way to move your research forward. Additionally, the questions and criticism you get will help you. If you've never given talks before, start with the mini-symposium and the informal internal seminars -- these will usually be in front of a friendly audience. But by the time you're in your third or fourth year, you should be ready to go to conferences and present your work there. But

again, ask your advisor for help here. This is what they're good at (if they weren't, they never would have gotten a faculty position).

Black Friday

By now, you will probably have heard all about Black Friday. So rather than discuss what it is (you can always look in the PhD document for that information), I'm going to tell you how to survive it. Have someone in your corner. That's so important I'm going to repeat it.

Have someone in your corner to defend you at Black Friday.

Usually this person will be your advisor, but if your advisor can't (or won't) be at Black Friday, make sure someone else will be. If you TA'd that semester, talk to the faculty you TA'd for. If you did work with another faculty, talk to that person.

You also need to make sure that your advisor knows what you did during the past semester. The Black Friday form that Sharon asks everyone to fill out each semester is useful, but make sure that your advisor knows what's on the form. (A copy is sent to your advisor, but make sure that your advisor has read it.) Also, make sure that you write down **everything** that the faculty needs to know on that form.

The Black Friday letter code

I'm going to pass on a secret. There is no code. With very few exceptions, your advisor writes your Black Friday letter. If you don't understand your letter or if it isn't what you expected, go talk to your advisor about it. If you can't talk to your advisor about it, then see *Switching advisors*, above.

What to do if you run into trouble

You will have problems. You'll probably be shocked when it happens.

If you have a problem (failing a qual, having problems with your advisor, finding out that your thesis topic has been/is about to be scooped, etc.), CS has enough of a support structure to catch you and make sure you work through it. The support structure is there, but you have to find it, or it might not catch you.

Usually your advisor can help you. (That's their role.) Start there. But sometimes the problem is with your advisor. If you can't talk to your advisor, there are other options.

If you run into trouble with your advisor, you will need help and the key to help is other people (particularly other faculty). Talk to other faculty besides your

advisor, talk to older students, even if just to your office mates. Talk to them *before* you have any problems. The most important thing to do is to make sure you know other people in the department and to have your support structure in place *before* you need it. Don't hide in your office doing nothing but work.

If you do run into trouble, there are a lot of people to go to: Sharon Burks can solve almost anything :). She's very busy, but don't be afraid to go talk to her if you have a problem. Jeanette Wing is the current graduate student advisor, she has office hours regularly. There is now a student ombudsman who's job it is to listen to problems and help. All of these people are happy to keep things confidential, but make sure you mention to them that you want your discussion to be confidential if you do.

And don't forget that older students are a great resource for this kind of thing. Even if an n^{th} year isn't the specific right person to talk to, they've been around and will know who is. Don't be afraid to go up to an older student, introduce yourself, and ask for help. (Office mates are a good resource here too.) Many faculty are also willing to help and may know who to go to or how to get out of a fix.

Be Proactive

Perhaps the most important advice I can give about is that you have to watch out for yourself. You should know what your Black Friday letter will say before you get it. If it's going to be bad, make sure that you've started working on fixing it before it arrives.

But in order to not get a bad Black Friday letter, make sure you have some faculty to defend you at Black Friday. Your advisor should be there to defend you, but if not (if your advisor won't be there or if your advisor isn't going to defend you), make sure that someone else will.

Finally, I want to point out that we all run into problems at some point or another. None of us breezed through this, even those of us who thought we would. There is a CMU counseling center (cost is negotiable and it is completely confidential), but there is also a large support structure in CS itself. Talk to the older students, talk to other students in your class. You can graduate; you would never have been accepted if the faculty didn't expect you could.

David Redish

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This commentary is based on my own experience from 5 years as a graduate student here, from talking to other students, and from the previous "How to survive as a graduate student" seminars run every IC. It draws text from David

Dill's "How to choose an advisor" email message (1985) which progressed to become a document and then an IC talk "How to survive as a graduate student" presented (in my lifetime) by Benjamin Pierce, Jay Sipelstein, and Jonathon Shewchuk. It draws text from their slides as well. I also want to acknowledge Karen Haigh, Angela Kennedy and Brian Noble for their comments.