THE END IS IN SIGHT ...

MARTIN PERGLER

You have proven the Main Theorem of your future dissertation. Congratulations. Or perhaps you aren't quite there yet, but wonder what will happen when you are. What will you need to do and when?

Hopefully, this text will become a collaborative effort through which each class of graduating students (perhaps with the assistance of interested faculty) distills old and new wisdom to help make the process as smooth as possible for those who graduating the following year. At the moment, it is just megalomaniacal ravings of one graduating student, intended to provoke discussion.

The central thesis is that the dissertation-writing and job-hunting process is much smoother if you get organized about one year before the date you wish to graduate. It is at least technically feasible to prove a Theorem in March, write it up as a brilliant 15 page paper in April, defend in May, find a last-minute job (academic or non-academic) in June, and start the job in August. But unless you are Euler reincarnated that approach will be painful and risky, and even then this text may still be a useful checklist of things not to forget.

A general warning: at the time of writing, there are proposals under discussion to reform the graduate program. This may of course affect these words of wisdom. Even without that, everything in this text may well be wrong, inappropriate, or irrelevant, in your specific case. In particular, the official deadlines for Everything need to be checked in the official places and should not be taken as accurate in this text.

1. WHAT YOU IDEALLY SHOULD HAVE ALREADY DONE

The following are some things you would ideally already have done while working on your research, or be in the process of doing. If you haven't yet, it is not a tragedy, but mend your ways.

1.1. **Read math and get to know mathematicians.** It is easy to concentrate your reading merely on the details you need at each step of the proof of your Theorem. While this is important, continue to read as widely as possible in your field. Learn who are the important people in your field, which universities they are at, and whether they are good people to work with as a postdoc. Go to talks, as well as to lunches and dinners with visiting speakers. These people will soon be your colleagues.

Ask your advisor (and others) for which people specifically do stuff related to your work and look up their recent papers, even if it is not 100% directly relevant to your thesis problem.

Go to summer schools and courses; when the opportunity presents itself, go to conferences.

1.2. **Language exam.** If you have another language exam to do, try to do it soon.

1.3. **Learn LaTeX.** For better or worse, LaTeX2ε is the format you will write your future papers in, as well as the most convenient format to write your dissertation. It will also useful for writing other mathematical texts, for instance exams for the classes you are teaching. Learn it well. You don't have to become a LaTeX wizard, but you should learn about text markup (sectioning and title pages), automated cross-referencing (`\ref` and `\label`), and BibTeX (automated management of citations and bibliographies). This will save you considerable time in both writing up your results and in your future professional career. TeX (even with AMSTeX) is not enough; you need LaTeX.

Date: April 13, 2000. **DRAFT**.

1.4. **Organize your scratch work.** Learn to label and file away your calculations for future reference. Don't just write on scratch paper and throw it away a week later, since there is sure to be some calculation you discard, and then realize you need it 6 months later. Some people start writing everything in a series of black lab books. Others keep 3 ring binders. Do something.

1.5. **"Student" to "professional mathematician".** Some of the recommendations above are merely special cases of something general that has been happening to you gradually: you are progressing from "student" (who hands in assignments, writes exams, and otherwise follows instructions) to "professional mathematician" (who self-directs a career involving teaching, research, and who knows what else). At this stage, some of that progression is happening naturally, some with your advisor's prodding, and for some you have to take the initiative yourself.

In particular, at some point in your graduate student career you need to start becoming aware of the dynamics of your field: not only what are interesting problems, but also who is important, whether there are any long-standing conflicts or schisms, and other issues you will have to deal with it when you become a "colleague".

2. Writing up your result

2.1. **Getting it down on paper.** As soon as you have Proved Something, your advisor will probably encourage you to get it down on paper in some rough form or other. This is a good idea for several reasons.

1. It makes it clear to both you and your advisor exactly what you have proved, and what the ingredients are. There may very well be many parts where you will presently leave out details, even quite substantial ones, but this is a way to see whether it all hangs together, and to get organized for filling the gaps in.
2. It provides a basis for discussion between you and your advisor. In particular, this is the time to verify with your advisor whether this is truly "enough" to graduate with, or what else you need to do. It is understandable that advisors hesitate to say "you are done" for fear that you will henceforth laze around, but it is important to agree on whether you have a solid result (which you will hopefully continue to refine and generalize), or if you so far have an intriguing little fact which will become an appendix to your real dissertation.
3. It documents what you have done and provides something you can discuss with other mathematicians. But be sure to check with your advisor before sending it out to others; don't hand out anything half-baked, incorrect, or otherwise inappropriate.
4. It makes you feel good and productive.

2.2. **Mechanics.** Use LaTeX. Though you may edit and expand it beyond recognition, your rough write-up will become the kernel of your dissertation, research summary, and one or more preprints; these will usually be in LaTeX, so start right. See §1.3.

Put in citations and references right from the start when you happen to stumble across them. It will save you the trouble of madly looking for them later. Use BibTeX or something similar to handle bibliographies so you don't have to retype the entries 5 times before you graduate and another 20 times later in your career.

2.3. **Research summary and proposal.** You will need a 3–5 page research summary and proposal for fellowship grants and job applications. This needs to indicate a solid understanding of where your results fit into the field and why they are interesting (which is something you have to internalize anyway) and what you can do next. It is worthwhile to start writing this early and to do it carefully, because (a) you learn a lot from doing it, and (b) it means you are close to ready if you unexpectedly stumble across a deadline.

2.4. **Preprints and publications.** People with accepted preprints in top journals get top jobs much more easily. People with publications in any journals have better CVs at the very least. But many (if not most) students get perfectly good first jobs without any accepted publications, merely on the basis of their research summary and their letters of recommendation. Discuss this with people in your field; publish, but don't publish something mediocre too soon if it can become an *Annals* paper the year after you graduate.

Subsidiary results may make good papers, even before you have quite finished your main writeup.

Be aware that many journals have many-month backlogs for even considering your preprint, much less publishing it. Depending on the circumstances, it may affect your choice of journal to submit to, or even whether to submit at this time at all.

There are various electronic e-print servers where you can deposit your preprint. I don't know enough about this. This depends highly on the field. HELP!

2.5. **Conferences and talks.** Now that you have a written-up, solid result (even if a few *clearly minor* details are still missing), you should start considering more emphatically attending special sessions at conferences and giving talks. Money for travel expenses may be available from the department, from some faculty member vaguely in your field with a large research grant, or from the conference organizers.

The prestige of the U of C is such that you do not need to give talks merely so your CV looks better. So give talks at special sessions in your field where people will get to know you, not at random conferences where no one cares about you.

2.6. **There is a hole in my proof.** You, your advisor, or someone else may find a hole in your proof, generally right before a deadline. This is serious, but not deadly; it happens surprisingly often. Even if the hole appears quite severe, realize that you are now much more experienced a mathematician (relatively speaking ...) then you were a year ago, and even if substantial parts of your argument require reworking you will be able to do this much faster than the original proof.

Some people's final dissertations contain substantially different results than originally planned. Sometimes they are worse results, sometimes better ones.

3. THE ACADEMIC JOB HUNT

Jobs generally start in the fall or late summer, so you will need to graduate in August or preferably June and have started the application process the previous fall. Terminology gets confusing. You will be applying for some combination of

1. Postdoctoral positions. These are 2–3 year positions at fairly presitigious research universities for recent Ph.D.'s who will work cooperatively with a more senior faculty member. Unlike in the sciences, math postdocs generally do involve teaching (though often not a full load), and may be called Instructorships or Assistant Professorships, often with the name of a famous mathematician attached.
2. Postdoctoral fellowships, which provide funding for a central source to let you work with someone. The most important ones are NSF fellowships, which generally are combined with a postdoctoral position at a specific university to make it last longer or reduce the teaching load.
3. Teaching positions at liberal arts colleges. These are often but not necessarily tenure track, for those who have decided their main interest is in teaching undergraduates. You continue to be expected to do some research, but your teaching performance is much more important.
4. Tenure-track positions, also called assistant professorships, but not specifically teaching-oriented. Many people avoid these at this stage since you are unlikely to gave the credentials to get a really good one, nor sufficient knowledge to know where you want to go.

5. Visiting positions, generally sabbatical replacement at a small university. Few students from our department take these positions.

This text concentrates on the first 3 categories.

3.1. **How to find out about positions.** The primary source is the AMS web site, `www.ams.org`, which maintains an online database. The department also maintains a paper listing of jobs in a binder. The symmetric difference of these two listings is a set with small positive measure. Jobs start appearing in late summer, but postdoc listings may not be complete until November and teaching jobs until January.

3.2. **Deadlines.** Postdoc jobs generally have application deadlines between Dec. 1 and Jan. 1. Tenure track jobs often have earlier deadlines. The NSF deadline is in October. If you were nominated for a Sloan fellowship, the deadline was the *previous* March. Teaching position deadlines vary. Visiting positions may only be announced (and have deadlines) well into the winter and spring.

3.3. **Applying for positions.** Fortunately, most jobs require the same paperwork.

1. A cover letter. For postdoc jobs, this is largely a formality. For teaching jobs, it is very important and needs to be specifically tailored to each college.
2. An academic CV
3. A research summary (see §2.3)
4. 4 letters of recommendation (see §3.4)
5. A one-page teaching statement; crucial for teaching jobs. Required for many research jobs with some teaching. If you don't know anything about calculus reform, learn enough not to step on anyone's toes.
6. An AMS cover sheet. For some places, you will have to fill out a special form on paper or online.

There are LaTeX macros and mail merge templates to facilitate doing all this. They work but are a mess and someone should rewrite them. Updating the addresses in the database is a good collaborative project each year.

Many people end up applying for 70–100 of jobs. Our department will not pay for postage or supplies. It would save you a bit (but not much) time, and job committees lots of time, if you do not apply to jobs you would not take or to which you are obviously not suited. That being said, many departments do not make it easy to decide whether this is the case because of poor information availability, and some change their mind about specializations part way through the process. People applying primarily for teaching jobs apply to fewer places, since there are fewer jobs, and since you need to do much more customization.

You will most likely get a postdoc at a place with a clear possible collaborator for your future work.

3.4. **Letters of recommendation.** You will generally need 4 letters of recommendation for any sort of academic job. One is from your advisor, 2 other mathematicians familiar with your work, and one from Diane Herrmann with regards to teaching.

The prestige of your writers and the strength of the letter they write is perhaps the single most important factor in your job search. Make the choice carefully and get to know potential recommenders early.

Recommenders will write a general letter which they will give to Laurie, who will copy and send to all your universities. You will provide her with mailing labels. Generally at least one of your writers will need to be reminded several times by you and Laurie to write the letter. Letters a short while after a job deadline are generally not a problem. Late applications from you are a problem.

Diane Herrmann likes to be asked for letters the June of the year before you graduate, so she can write it over the summer.

3.5. **Sending preprints and approaching collaborators.** Most places will not ask for preprints with your application, and if you send one will likely lose it. On the other hand, many advisors advocate writing a separate letter to (often pretty widely) selected faculty members in your field at departments you have applied to and sending them preprints. One approach is to do this in early January so those faculty members can pop right into the job committee office and tell them to yank out your application for special consideration. Your advisor will help you identify appropriate people, and may approach some on your behalf.

HELP!

3.6. **Special concerns for those applying for teaching jobs.**

3.7. **Special concerns for women.** Pointer to info somewhere, or does anyone want to say anything? HELP!

HELP!

3.8. **The two-body problem.**

3.9. **Special concerns for international students applying for jobs in the US.** To be written.

3.10. **Special concerns for those applying for jobs outside of the US.** The Canadian Math Society maintains a better list of jobs in Canadian universities than does the AMS. Most Canadian jobs give strong preference to Canadian citizens, but not all. more stuff, anyone ... HELP!

3.11. **Special concerns for those with young advisors.** Be aware that some young advisors do not have the prestige to write letters of recommendation which are very strong, or the experience in wording them well, or the contacts to act on your behalf to get you a good job. This does not mean they are not good advisors, but it does mean you should make sure you have a more senior "second reader" who can add his weight on your behalf.

3.12. **Getting and taking the job.** NSFs are announced in late January, and 1st round postdoc jobs at about the same time with a uniform acceptance deadline in early February. Often a handful of people get the bulk of the job offers several times over at this stage. As these people send in their refusals and other overwhelmed departments get their act together, job offers to a wider pool proceed steadily into March.

You generally first get an offer by phone or email, with 1 or 2 weeks to think it over. This can be tricky, since you don't know whether to take it or hope for something better. You can ask places you are interested in to tell you where you stand if you haven't heard from them.

You will generally not have to do interviews or attend the joint AMS-MAA meetings in January, for postdocs jobs; you will for teaching jobs.

People have gotten very decent job offers well into April. But if you have not received nibbles by the end of February, enlist your advisor's (or a more senior faculty member's) help. There are generally departments scrambling to fill jobs well into June, but they often aren't very good jobs.

4. THE DEFENSE AND SUBMITTING THE DISSERATION

yet to be written HELP!

5. NONACADEMIC CAREERS

yet to be written

6. A LEISURELY CALENDAR

HELP!

Date		Deadlines	Suggested
Mar	$n-1$	Sloan (if nominated)	
Apr	$n-1$		Know you'll finish; conferences.
			Learn about nonacad. jobs?.
Jun	$n-1$	Ask Diane for letter of rec.	
summer			Get most of write-up finished
			Decide good places/collaborators
Oct	$n-1$	NSF appl. due	Try to write application texts
		Appl. for some nonacad. jobs due	
		Ask for other letters of rec	
Nov	$n-1$		Make database of jobs.
Dec	$n-1$	Most job appl deadlines.	Polish write-up
Jan	n		Send out preprints
Feb	n		Job offers start
Mar	n	Decide June/Aug grad.	
Apr	n		Schedule defense
			Draft of diss. to thesis office (June)
May	n	Defend.	
		Submit diss. and paperwork	
Jun	n	Get degree	
summer		adjust above for Aug grad.	

E-mail address: pergler@math.uchicago.edu