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How to Write a PhD Thesis

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← [Spanish version: CÛmo escribir una tesis de doctorado](#)

← [French version: Comment rediger une thèse](#)

This guide to thesis writing gives some simple and practical advice on the problems of getting started, getting organized, dividing the huge task into less formidable pieces and working on those pieces. It also explains the practicalities of surviving the ordeal. It includes a suggested structure and a guide to what should go in each section. It was originally written for graduate students in physics, and most of the specific examples given are taken from that discipline. Nevertheless, the feedback from users indicates that it has been consulted and appreciated by graduate students in diverse fields in the sciences and humanities.

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Getting Started

When you are about to begin, writing a thesis seems a long, difficult task. That is because it is a long, difficult task. Fortunately, it will seem less daunting once you have a couple of chapters done. Towards the end, you will even find yourself enjoying it---an enjoyment based on satisfaction in the achievement, pleasure in the improvement in your technical writing, and of course the approaching end. Like many tasks, thesis writing usually seems worst before you begin, so let us look at how you should make a start.

An outline

First make up a thesis outline: several pages containing chapter headings, sub-headings, some figure titles (to indicate which results go where) and perhaps some other notes and comments. There is a section on chapter order and thesis structure at the end of this text. Once you have a list of chapters and, under each chapter heading, a reasonably complete list of things to be reported or explained, you have struck a great blow against writer's block. When you sit down to type, your aim is no longer a thesis---a daunting goal---but something simpler. Your new aim is just to write a paragraph or section about one of your subheadings. It helps to start with an easy one: this gets you into the habit of writing and gives you self-confidence. Often the Materials and Methods chapter is the easiest to write---just write down what you did; carefully, formally and in a logical order.

How do you make an outline of a chapter? For most of them, you might try the method that I use for writing papers, and which I learned from my thesis adviser: assemble all the figures that you will use in it and put them in the order that you would use if you were going to explain to someone what they all meant. You might as well rehearse explaining it to someone else---after all you will probably give several talks based on your thesis work. Once you have found the most logical order, note down the the key words of your explanation. These key words provide a skeleton for much of your chapter outline.

Once you have an outline, discuss it with your adviser. This step is important: s/he will have useful suggestions, but it also serves notice that s/he can expect a steady flow of chapter drafts that will make high priority demands on his/her time. Once you and your adviser have agreed on a logical structure, s/he will need a copy of this outline for reference when reading the chapters which you will probably present out of order. If you have a co-adviser, discuss the outline with him/her as well, and present all chapters to both advisers for comments.

Organisation

It is encouraging and helpful to start a filing system. Open a word-processor file for each chapter *and one for the references.* You can put notes in these files, as well as text. While doing something for Chapter n, you will think "Oh I must refer back to/discuss this in Chapter m" and so you put a note to do so in the file for Chapter m. Or you may think of something interesting or relevant for that chapter. When you come to work on Chapter m, the more such notes you have accumulated, the easier it will be to write.

Make a back-up of these files and do so every day at least (depending on the reliability of your computer and the age of your disk drive). Do not keep back-up disks close to the computer in case the hypothetical thief who fancies your computer decides that s/he could use some disks as well.

A simple way of making a remote back-up is to send it as an email attachment to a consenting email correspondent, preferably one in a different location. You could even send it to yourself if your server saves your mail (in some email packages like Eudora this is an optional setting). In either case, be careful to dispose of superseded versions so that you don't waste disk space, especially if you have bitmap images or other large files.

You should also have a physical filing system: a collection of folders with chapter numbers on them. This will make you feel good about getting started and also help clean up your desk. Your files will contain not just the plots of results and pages of calculations, but all sorts of old notes, references, calibration curves, suppliers' addresses, specifications, speculations, letters from colleagues etc., which will suddenly strike you as relevant to one chapter or other. Stick them in that folder. Then put all the folders in a box or a filing cabinet. As you write bits and pieces of text, place the hard copy, the figures etc in these folders as well. Touch them and feel their thickness from time to time---ah, the thesis is taking shape.

If any of your data exist only on paper, copy them and keep the copy in a different location. Consider making a copy of your lab book. This has another purpose beyond security: usually the lab book stays in the lab, but you may want a copy for your own future use. Further, scientific ethics require you to keep lab books and original data for at least ten years, and a copy is more likely to be found if two copies exist.

While you are getting organised, you should deal with any university paperwork. Examiners have to be nominated and they have to agree to serve. Various forms are required by your department and by the university administration. Make sure that the rate limiting step is your production of the thesis, and not some minor bureaucratic problem.

A note about word processors

Commercial word processors have gradually become bigger, slower, less reliable and harder to use as they acquire more features. This is a general feature of commerical software and an

important input to Moore's Law. If software and operating performance did not deteriorate, people would not need to buy new computers and profits would fall for makers of both hard- and soft-ware. Software vendors want it to look fancy and obvious in the demo, and they don't really care about its ease, speed and reliability to an expert user because the expert user has already bought it. For example, it is much faster to type equations and to do formatting with embedded commands because you use your fingers independently rather than your hand and because your fingers don't leave the keyboard. However, click-on menus, however slow and cumbersome, look easy to use in the shop.

LaTeX is powerful, elegant, reliable, fast and *free* from http://www.latex-project.org/ or http://www.miktex.org/. An alternative is to use old versions of commercial software. Word 5 allows equations to be typed without touching the mouse and is as fast in this respect as LaTeX. Sites exist to provide discontinued software to people who are interested in speed and reliability, but, not knowing the legality of what they do, I shaln't link to them.

A timetable

I strongly recommend sitting down with the adviser and making up a timetable for writing it: a list of dates for when you will give the first and second drafts of each chapter to your adviser(s). This structures your time and provides intermediate targets. If you merely aim "to have the whole thing done by (some distant date)", you can deceive yourself and procrastinate more easily. If you have told your adviser that you will deliver a first draft of chapter 3 on Wednesday, it focuses your attention.

You may want to make your timetable into a chart with items that you can check off as you have finished them. This is particularly useful towards the end of the thesis when you find there will be quite a few loose ends here and there.

Iterative solution

Whenever you sit down to write, it is very important to write *something*. So write something, even if it is just a set of notes or a few paragraphs of text that you would never show to anyone else. It would be nice if clear, precise prose leapt easily from the keyboard, but it usually does not. Most of us find it easier, however, to improve something that is already written than to produce text from nothing. So put down a draft (as rough as you like) for your own purposes, then clean it up for your adviser to read. Word-processors are wonderful in this regard: in the first draft you do not have to start at the beginning, you can leave gaps, you can put in little notes to yourself, and then you can clean it all up later.

Your adviser will expect to read each chapter in draft form. S/he will then return it to you with suggestions and comments. *Do not be upset if a chapter---especially the first one you write--- returns covered in red ink.* Your adviser will want your thesis to be as good as possible, because

his/her reputation as well as yours is affected. Scientific writing is a difficult art, and it takes a while to learn. As a consequence, there will be many ways in which your first draft can be improved. So take a positive attitude to all the scribbles with which your adviser decorates your text: each comment tells you a way in which you can make your thesis better.

As you write your thesis, your scientific writing is almost certain to improve. Even for native speakers of English who write very well in other styles, one notices an enormous improvement in the first drafts from the first to the last chapter written. The process of writing the thesis is like a course in scientific writing, and in that sense each chapter is like an assignment in which you are taught, but not assessed. Remember, only the final draft is assessed: the more comments your adviser adds to first or second draft, the better.

Before you submit a draft to your adviser, run a spell check so that s/he does not waste time on those. If you have any characteristic grammatical failings, check for them.

What is a thesis? For whom is it written? How should it be written?

Your thesis is a research report. The report concerns a problem or series of problems in your area of research and it should describe what was known about it previously, what you did towards solving it, what you think your results mean, and where or how further progress in the field can be made. Do not carry over your ideas from undergraduate assessment: a thesis is not an answer to an assignment question. One important difference is this: the reader of an assignment is usually the one who has set it. S/he already knows the answer (or one of the answers), not to mention the background, the literature, the assumptions and theories and the strengths and weaknesses of them. The readers of a thesis do not know what the "answer" is. If the thesis is for a PhD, the university requires that it make an original contribution to human knowledge: your research must discover something hitherto unknown.

Obviously your examiners will read the thesis. They will be experts in the general field of your thesis but, on the exact topic of your thesis, you are the world expert. Keep this in mind: you should write to make the topic clear to a reader who has not spent most of the last three years thinking about it.

Your thesis will also be used as a scientific report and consulted by future workers in your laboratory who will want to know, in detail, what you did. Theses are occasionally consulted by people from other institutions, and the library sends microfilm versions if requested (yes, still). More and more theses are now stored in an entirely digital form (i.e. the figures as well as the text are on a disk). A consequence of this is that your thesis can be consulted much more easily by researchers around the world. Write with these possibilities in mind.

It is often helpful to have someone other than your adviser(s) read some sections of the thesis, particularly the introduction and conclusion chapters. It may also be appropriate to ask other members of staff to read some sections of the thesis which they may find relevant or of interest, as they may be able to make valuable contributions. In either case, only give them revised versions, so that they do not waste time correcting your grammar, spelling, poor construction or presentation.

How much detail?

The short answer is: rather more than for a scientific paper. Once your thesis has been assessed and your friends have read the first three pages, the only further readers are likely to be people who are seriously doing research in just that area. For example, a future research student might be pursuing the same research and be interested to find out exactly what you did. ("Why doesn't the widget that Bloggs built for her project work any more? Where's the circuit diagram? I'll look up her thesis." "Blow's subroutine doesn't converge in my parameter space! I'll have to look up his thesis." "How did that group in Sydney manage to get that technique to work? I'll order a microfilm of that thesis they cited in their paper.") For important parts of apparatus, you should include workshop drawings, circuit diagrams and computer programs, usually as appendices. (By the way, the intelligible annotation of programs is about as frequent as porcine aviation, but it is far more desirable. You wrote that line of code for a reason: at the end of the line explain what the reason is.) You have probably read the theses of previous students in the lab where you are now working, so you probably know the advantages of a clearly explained, explicit thesis and/or the disadvantages of a vague one.

Make it clear what is yours

If you use a result, observation or generalisation that is not your own, you must usually state where in the scientific literature that result is reported. The only exceptions are cases where every researcher in the field already knows it: dynamics equations need not be followed by a citation of Newton, circuit analysis does not need a reference to Kirchoff. The importance of this practice in science is that it allows the reader to verify your starting position. Physics in particular is said to be a vertical science: results are built upon results which in turn are built upon results etc. Good referencing allows us to check the foundations of your additions to the structure of knowledge in the discipline, or at least to trace them back to a level which we judge to be reliable. Good referencing also tells the reader which parts of the thesis are descriptions of previous knowledge and which parts are your additions to that knowledge. In a thesis, written for the general reader who has little familiarity with the literature of the field, this should be especially clear. It may seem tempting to leave out a reference in the hope that a reader will think that a nice idea or an nice bit of analysis is yours. I advise against this gamble. The reader will probably think: "What a nice idea---I wonder if it's original?". The reader can probably find out via the library, the net or even just from a phone call.

If you are writing in the passive voice, you must be more careful about attribution than if you are writing in the active voice. "The sample was prepared by heating yttrium..." does not make it clear whether you did this or whether Acme Yttrium did it. "I prepared the sample..." is clear.

Style

The text must be clear. Good grammar and thoughtful writing will make the thesis easier to read. Scientific writing has to be a little formal---more formal than this text. Native English speakers should remember that scientific English is an international language. Slang and informal writing will be harder for a non-native speaker to understand.

Short, simple phrases and words are often better than long ones. Some politicians use "at this point in time" instead of "now" precisely because it takes longer to convey the same meaning. They do not care about elegance or efficient communication. You should. On the other hand, there will be times when you need a complicated sentence because the idea is complicated. If your primary statement requires several qualifications, each of these may need a subordinate clause: "When [qualification], and where [proviso], and if [condition] then [statement]". Some lengthy technical words will also be necessary in many theses, particularly in fields like biochemistry. Do not sacrifice accuracy for the sake of brevity. "Black is white" is simple and catchy. An advertising copy writer would love it. "Objects of very different albedo may be illuminated differently so as to produce similar reflected spectra" is longer and uses less common words, but, compared to the former example, it has the advantage of being true. The longer example would be fine in a physics thesis because English speaking physicists will not have trouble with the words. (A physicist who did not know all of those words would probably be glad to remedy the lacuna either from the context or by consulting a dictionary.)

Sometimes it is easier to present information and arguments as a series of numbered points, rather than as one or more long and awkward paragraphs. A list of points is usually easier to write. You should be careful not to use this presentation too much: your thesis must be a connected, convincing argument, not just a list of facts and observations.

One important stylistic choice is between the active voice and passive voice. The active voice ("I measured the frequency...") is simpler, and it makes clear what you did and what was done by others. The passive voice ("The frequency was measured...") makes it easier to write ungrammatical or awkward sentences. If you use the passive voice, be especially wary of dangling participles. For example, the sentence "After considering all of these possible materials, plutonium was selected" implicitly attributes consciousness to plutonium. This choice is a question of taste: I prefer the active because it is clearer, more logical and makes attribution simple. The only arguments I have ever heard for avoiding the active voice in a thesis are (i) many theses are written in the passive voice, and (ii) some very polite people find the use of "I" immodest. Use the first person singular, not plural, when reporting work that you did yourself: the editorial 'we' may suggest that you had help beyond that listed in your aknowledgements, or it may suggest that you are trying to share any blame. On the other hand, retain plural verbs for

"data": "data" is the plural of "datum", and lots of scientists like to preserve the distinction. Just say to yourself "one datum is ..", "these data are.." several times. An excellent and widely used reference for English grammar and style is *A Dictionary of Modern English Usage* by H.W. Fowler.

Presentation

There is no need for a thesis to be a masterpiece of desk-top publishing. Your time can be more productively spent improving the content than the appearance.

In many cases, a reasonably neat diagram can be drawn by hand faster than with a graphics package. Either is usually satisfactory. The computer-generated figure has the advantage that it can be stored in the text and transmitted electronically, but this advantage disappears if you are not going to store your thesis as a file for transmission. You can scan a hand drawn figure. As a one bit, moderate resolution graphic, it will probably not be huge, but it will still be bigger than a line drawing generated on a graphics package.

In general, students spend too much time on diagrams---time that could have been spent on examining the arguments, making the explanations clearer, thinking more about the significance and checking for errors in the algebra. The reason, of course, is that drawing is easier than thinking.

I do not think that there is a strong correlation (either way) between length and quality. There is no need to leave big gaps to make the thesis thicker. Readers will not appreciate large amounts of vague or unnecessary text.

Approaching the end

A deadline is very useful in some ways. You must hand in the thesis, even if you think that you need one more draft of that chapter, or someone else's comments on this section, or some other refinement. If you do not have a deadline, or if you are thinking about postponing it, please take note of this: *A thesis is a very large work. It cannot be made perfect in a finite time*. There will inevitably be things in it that you could have done better. There will be inevitably be some typos. Indeed, by some law related to Murphy's, you will discover one when you first flip open the bound copy. No matter how much you reflect and how many times you proof read it, there will be some things that could be improved. There is no point hoping that the examiners will not notice: many examiners feel obliged to find some examples of improvements (if not outright errors) just to show how thoroughly they have read it. So set yourself a deadline and stick to it. Make it as good as you can in that time, and then hand it in! (In retrospect, there was an advantage in writing a thesis in the days before word processors, spelling checkers and typing programs. Students often paid a typist to produce the final draft and could only afford to do that once.)

How many copies?

Talk to your adviser about this. As well as those for the examiners, the university libraries and yourself, you should make some distribution copies. These copies should be sent to other researchers who are working in your field so that:

❍ they can discover what marvellous work you have been doing before it appears in journals;

❍ they can look up the fine details of methods and results that will or have been published more briefly elsewhere;

❍ they can realise what an excellent researcher you are. This realisation could be useful if a post- doctoral position were available in their labs. soon after your submission, or if they were reviewers of your research/post-doctoral proposal. Even having your name in their bookcases might be an advantage.

Whatever the University's policy on single or double-sided copies, the distribution copies could be double-sided so that forests and postage accounts are not excessively depleted by the exercise. Your adviser could help you to make up a list of interested and/or potentially useful people for such a mailing list. Your adviser might also help by funding the copies and postage if they are not covered by your scholarship.

The following comment comes from Marilyn Ball of the Australian National University in Canberra: "When I finished writing my thesis, a postdoc wisely told me to give a copy to my parents. I would never have thought of doing that as I just couldn't imagine what they would do with it. I'm very glad to have taken that advice as my parents really appreciated receiving a copy and proudly displayed it for years. (My mother never finished high school and my father worked with trucks - he fixed 'em, built 'em, drove 'em, sold 'em and junked 'em. Nevertheless, they enjoyed having a copy of my thesis.)"

Personal

In the ideal situation, you will be able to spend a large part---perhaps a majority---of your time writing your thesis. This may be bad for your physical and mental health.

Typing

Set up your chair and computer properly. The Health Service, professional keyboard users or perhaps even the school safety officer will be able to supply charts showing recommended relative heights, healthy postures and also exercises that you should do if you spend a lot of time at the keyboard. These last are worthwhile insurance: you do not want the extra hassle of back or neck pain. Try to intersperse long sessions of typing with other tasks, such as reading, drawing, calculating, thinking or doing research.

If you do not touch type, you should learn to do so for the sake of your neck as well as for

productivity. There are several good software packages that teach touch typing interactively. If you use one for say 30 minutes a day for a couple of weeks, you will be able to touch type. By the time you finish the thesis, you will be able to touch type quickly and accurately and your six hour investment will have paid for itself. Be careful not to use the typing exercises as a displacement activity.

Exercise

Do not give up exercise for the interim. Lack of exercise makes you feel bad, and you do not need anything else making you feel bad while writing a thesis. 30-60 minutes of exercise per day is probably not time lost from your thesis: I find that if I do not get regular exercise, I sleep less soundly and longer. How about walking to work and home again? (Walk part of the way if your home is distant.) Many people opine that a walk helps them think, or clears the head. You may find that an occasional stroll improves your productivity.

Food

Do not forget to eat, and make an effort to eat healthy food. You should not lose fitness or risk illness at this critical time. Exercise is good for keeping you appetite at a healthy level. I know that you have little time for cooking, but keep a supply of fresh fruit, vegetables and bread. It takes less time to make a sandwich than to go to the local fast food outlet, and you will feel better afterwards.

Drugs

Thesis writers have a long tradition of using coffee as a stimulant and alcohol or marijuana as relaxants. (Use of alcohol and coffee is legal, use of marijuana is not.) Used in moderation, they do not seem to have ill effects on the quality of thesis produced. Excesses, however, are obviously counter-productive: several expressi and you will be buzzing too much to sit down and work; several drinks at night will slow you down next day.

Others

Other people will be sympathetic, but do not take them for granted. Spouses, lovers, family and friends should not be undervalued. Spend some time with them and, when you do, have a good time. Do not spend your time together complaining about your thesis: they already resent the thesis because it is keeping you away from them. If you can find another student writing a thesis, then you may find it therapeutic to complain to each other about advisers and difficulties. S/he need not be in the same discipline as you are.

Coda

Keep going---you're nearly there! Most PhDs will admit that there were times when we thought about reasons for not finishing. But it would be crazy to give up at the writing stage, after years of work on the research, and it would be something to regret for a long time.

Writing a thesis is tough work. One anonymous post doctoral researcher told me: "You should tell everyone that it's going to be unpleasant, that it will mess up their lives, that they will have to give up their friends and their social lives for a while. It's a tough period for almost every student." She's right: it is certainly hard work, it will be probably be stressful and you will have to adapt your rhythm to it. It is also an important rite of passage and the satisfaction you will feel afterwards is wonderful. On behalf of scholars everywhere, I wish you good luck!

A suggested thesis structure

The list of contents and chapter headings below is appropriate for some theses. In some cases, one or two of them may be irrelevant. Results and Discussion are usually combined in several chapters of a thesis. Think about the plan of chapters and decide what is best to report your work. Then make a list, in point form, of what will go in each chapter. Try to make this rather detailed, so that you end up with a list of points that corresponds to subsections or even to the paragraphs of your thesis. At this stage, think hard about the logic of the presentation: within chapters, it is often possible to present the ideas in different order, and not all arrangements will be equally easy to follow. If you make a plan of each chapter and section before you sit down to write, the result will probably be clearer and easier to read. It will also be easier to write.

Copyright waiver
> Your institution may have a form for this (UNSW does). In any case, this standard page gives the university library the right to publish the work, possibly by microfilm or some other medium. (At UNSW, the Postgraduate Student Office will give you a thesis pack with various guide-lines and rules about thesis format. Make sure that you consult that for its formal requirements, as well as this rather informal guide.)

Declaration
> Check the wording required by your institution, and whether there is a standard form. Many universities require something like: "I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person nor material which to a substantial extent has been accepted for the award of any other degree or diploma of the university or other institute of higher learning, except where due acknowledgement has been made in the text. (signature/name/date)"

Title page
> This may vary among institutions, but as an example: Title/author/"A thesis submitted for the degree of Doctor of Philosophy in the Faculty of Science/The University of New South Wales"/date.

Abstract

Of all your thesis, this part will be the most widely published and most read because it will be published in Dissertation Abstracts International. It is best written towards the end, but not at the very last minute because you will probably need several drafts. It should be a distillation of the thesis: a concise description of the problem(s) addressed, your method of solving it/them, your results and conclusions. An abstract must be self-contained. Usually they do not contain references. When a reference is necessary, its details should be included in the text of the abstract. Check the word limit.

Acknowledgements

Most thesis authors put in a page of thanks to those who have helped them in matters scientific, and also indirectly by providing such essentials as food, education, genes, money, help, advice, friendship etc. *If any of your work is collaborative, you should make it quite clear who did which sections.*

Table of contents

The introduction starts on page 1, the earlier pages should have roman numerals. It helps to have the subheadings of each chapter, as well as the chapter titles. Remember that the thesis may be used as a reference in the lab, so it helps to be able to find things easily.

Introduction

What is the topic and why is it important? State the problem(s) as simply as you can. Remember that you have been working on this project for a few years, so you will be very close to it. Try to step back mentally and take a broader view of the problem. How does it fit into the broader world of your discipline?

Especially in the introduction, do not overestimate the reader's familiarity with your topic. You are writing for researchers in the general area, but not all of them need be specialists in your particular topic. It may help to imagine such a person---think of some researcher whom you might have met at a conference for your subject, but who was working in a different area. S/he is intelligent, has the same general background, but knows little of the literature or tricks that apply to your particular topic.

The introduction should be interesting. If you bore the reader here, then you are unlikely to revive his/her interest in the materials and methods section. For the first paragraph or two, tradition permits prose that is less dry than the scientific norm. If want to wax lyrical about your topic, here is the place to do it. Try to make the reader want to read the kilogram of A4 that has arrived uninvited on his/her desk. Go to the library and read several thesis introductions. Did any make you want to read on? Which ones were boring?

This section might go through several drafts to make it read well and logically, while keeping it short. For this section, I think that it is a good idea to ask someone who is not a

specialist to read it and to comment. Is it an adequate introduction? Is it easy to follow? There is an argument for writing this section---or least making a major revision of it---towards the end of the thesis writing. Your introduction should tell where the thesis is going, and this may become clearer during the writing.

Literature review

Where did the problem come from? What is already known about this problem? What other methods have been tried to solve it?

Ideally, you will already have much of the hard work done, if you have been keeping up with the literature as you vowed to do three years ago, and if you have made notes about important papers over the years. If you have summarised those papers, then you have some good starting points for the review.

How many papers? How relevant do they have to be before you include them? Well, that is a matter of judgement. On the order of a hundred is reasonable, but it will depend on the field. You are the world expert on the (narrow) topic of your thesis: you must demonstrate this.

A political point: make sure that you do not omit relevant papers by researchers who are like to be your examiners, or by potential employers to whom you might be sending the thesis in the next year or two.

Middle chapters

In some theses, the middle chapters are the journal articles of which the student was major author. There are several disadvantages to this format.

One is that a thesis is both allowed and expected to have more detail than a journal article. For journal articles, one usually has to reduce the number of figures. In many cases, all of the interesting and relevant data can go in the thesis, and not just those which appeared in the journal. The degree of experimental detail is usually greater in a thesis. Relatively often a researcher requests a thesis in order to obtain more detail about how a study was performed.

Another disadvantage is that your journal articles may have some common material in the introduction and the "Materials and Methods" sections.

The exact structure in the middle chapters will vary among theses. In some theses, it is necessary to establish some theory, to describe the experimental techniques, then to report what was done on several different problems or different stages of the problem, and then finally to present a model or a new theory based on the new work. For such a thesis, the chapter headings might be: Theory, Materials and Methods, {first problem}, {second

problem}, {third problem}, {proposed theory/model} and then the conclusion chapter. For other theses, it might be appropriate to discuss different techniques in different chapters, rather than to have a single Materials and Methods chapter.

Here follow some comments on the elements Materials and Methods, Theory, Results and discussion which may or may not correspond to thesis chapters.

Materials and Methods

This varies enormously from thesis to thesis, and may be absent in theoretical theses. It should be possible for a competent researcher to reproduce exactly what you have done by following your description. There is a good chance that this test will be applied: sometime after you have left, another researcher will want to do a similar experiment either with your gear, or on a new set-up in a foreign country. Please write for the benefit of that researcher.

In some theses, particularly multi-disciplinary or developmental ones, there may be more than one such chapter. In this case, the different disciplines should be indicated in the chapter titles.

Theory

When you are reporting theoretical work that is not original, you will usually need to include sufficient material to allow the reader to understand the arguments used and their physical bases. Sometimes you will be able to present the theory *ab initio,* but you should not reproduce two pages of algebra that the reader could find in a standard text. Do not include theory that you are not going to relate to the work you have done.

When writing this section, concentrate at least as much on the physical arguments as on the equations. What do the equations mean? What are the important cases?

When you are reporting your own theoretical work, you must include rather more detail, but you should consider moving lengthy derivations to appendices. Think too about the order and style of presentation: the order in which you did the work may not be the clearest presentation.

Suspense is not necessary in reporting science: you should tell the reader where you are going before you start.

Results and discussion

The results and discussion are very often combined in theses. This is sensible because of the length of a thesis: you may have several chapters of results and, if you wait till they are all presented before you begin discussion, the reader may have difficulty remembering what you are talking about. The division of Results and Discussion material into chapters is usually best done according to subject matter.

Make sure that you have described the conditions which obtained for each set of results. What was held constant? What were the other relevant parameters? Make sure too that you have used appropriate statistical analyses. Where applicable, show measurement errors and standard errors on the graphs. Use appropriate statistical tests.

Take care plotting graphs. The origin and intercepts are often important so, unless the ranges of your data make it impractical, the zeros of one or both scales should usually appear on the graph. You should show error bars on the data, unless the errors are very small. For single measurements, the bars should be your best estimate of the experimental errors in each coordinate. For multiple measurements these should include the standard error in the data. The errors in different data are often different, so, where this is the case, regressions and fits should be weighted (i.e. they should minimize the sum of squares of the differences weighted inversely as the size of the errors.) (A common failing in many simple software packages that draw graphs and do regressions is that they do not treat errors adequately. UNSW student Mike Johnston has written a plotting routine that plots data with error bars and performs weighted least square regressions. It is at http://www.phys.unsw.edu.au/3rdyearlab/graphing/graph.html). You can just 'paste' your data into the input and it generates a .ps file of the graph.

In most cases, your results need discussion. What do they mean? How do they fit into the existing body of knowledge? Are they consistent with current theories? Do they give new insights? Do they suggest new theories or mechanisms?

Try to distance yourself from your usual perspective and look at your work. Do not just ask yourself what it means in terms of the orthodoxy of your own research group, but also how other people in the field might see it. Does it have any implications that do not relate to the questions that you set out to answer?

Final chapter, references and appendices

Conclusions and suggestions for further work

Your abstract should include your conclusions in very brief form, because it must also include some other material. A summary of conclusions is usually longer than the final section of the abstract, and you have the space to be more explicit and more careful with qualifications. You might find it helpful to put your conclusions in point form.

It is often the case with scientific investigations that more questions than answers are produced. Does your work suggest any interesting further avenues? Are there ways in which your work could be improved by future workers? What are the practical implications of your work?

This chapter should usually be reasonably short---a few pages perhaps. As with the

introduction, I think that it is a good idea to ask someone who is not a specialist to read this section and to comment.

References (See also under literature review)

It is tempting to omit the titles of the articles cited, and the university allows this, but think of all the times when you have seen a reference in a paper and gone to look it up only to find that it was not helpful after all.

Appendices

If there is material that should be in the thesis but which would break up the flow or bore the reader unbearably, include it as an appendix. Some things which are typically included in appendices are: important and original computer programs, data files that are too large to be represented simply in the results chapters, pictures or diagrams of results which are not important enough to keep in the main text.

Some sites with related material

How to survive a thesis defence

Research resources and links supplied by Deakin University

'Writing and presenting your thesis or dissertation' by Joseph Levine at Michigan State University, USA

Postgraduate Student Resources supplied by University of Canberra

A useful aid to surviving meetings with management

The National Association of Graduate - Professional Students (USA)

Some relevant texts

Stevens, K. and Asmar, C (1999) 'Doing postgraduate research in Australia'. Melbourne University Press, Melbourne ISBN 0 522 84880 X.

Phillips, E.M and Pugh, D.S. (1994) 'How to get a PhD : a handbook for students and their supervisors'. Open University Press, Buckingham, England

Tufte, E.R. (1983) 'The visual display of quantitative information'. Graphics Press, Cheshire, Conn.

Tufte, E.R. (1990) 'Envisioning information' Graphics Press, Cheshire, Conn.

Distribution

If you have found these documents useful, please feel free to pass the address or a hard copy to any other thesis writers or graduate student organisations. Please do not sell them, or use any of the contents without acknowledgement.

Suggestions, thanks and caveats

This document will be updated occasionally. If you have suggestions for inclusions, amendments

or other improvements, please send them. Do so after you have submitted the thesis---*do not use this invitation as a displacement activity.* I thank Marilyn Ball, Gary Bryant, Bill Whiten and J. Douglas, whose suggestions have been incorporated in this version. Substantial contributions will be acknowledged in future versions. I also take this opportunity to thank my own thesis advisers, Stjepan Marcelja and Jacob Israelachvili, for their help and friendship, and to thank the graduate students to whom I have had the pleasure to be an adviser, a colleague and a friend. Opinions expressed in these notes are mine and do not necessarily reflect the policy of the University of New South Wales or of the School of Physics.

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← Joe's scientific home page

← A list of educational links

← Joe's music page

How to survive a thesis defence

some notes by
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This document is an appendix to

 How to write a thesis

- The thesis defence or viva is like an examination in some ways. It is different in many ways, however. The chief difference is that *the candidate usually knows more about the syllabus than do the examiners*.

- Some questions will be sincere questions: the asker asks because s/he doesn't know and expects that the candidate will be able to rectify this. Students often expect questions to be difficult and attacking, and answer them accordingly. Often the questions will be much simpler than you expect.

- In a curious relativistic effect, time expands in the mind of the student. A few seconds pause to reflect before answering seems eminently reasonable to the panel, but to the defender it seems like minutes of mute failure. *Take your time*.

- For the same reason, let them take their time. Let them finish the question.

- The phrase "That's a good question" is exceedingly useful. It flatters the asker and may get him/her onside, or less offside; it gives you time to think; it implies that you have understood the question and assessed it already and that you have probably thought about it before. If necessary, it can be followed by the stalwart "Now the answer to that is not obvious/straightforward..." which has the same advantages.

- If the nightmare ever did come true, and some questioner found a question that put something in doubt... mind you this is thankfully very rare.... then what? Well the first thing would be to concede that the question imposes a serious limitation on the applicability of the work "Well you have identified a serious limitation in this technique, and the results have to be interpreted in the light of that observation". The questioner is then more likely to back off and even help answer it, whereas a straight denial may encourage him/her to pursue more ardently. Then go through the argument in detail - showing listeners how serious it is while giving yourself time to find flaws in

it or to limit the damage that will ensue. In the worst caese, one would then think of what can be saved. But all this is hypothetical because this won't happen.

- What usually happens is that the examiners have read the work perhaps twice, and looked closely at some parts that interested them most. These are usually the good bits. They are not out to fail you. *It is a lot more complicated to fail you than to pass you.* In general, they feel good about the idea of a new, fresh researcher coming into their area. You are no immediate threat to them. They have to show that they have read it and they have to give you the opportunity to show that you understand it (you do, of course). And they usually have a genuine interest in the work. Some of them may feel it is necessary to maintain their image as senior scholars and founts of wisdom. Judicious use of the "Good question", "Yes, you're right of course", "Good idea.." and "Thanks for that" will allow that with a minimum of fuss and a maximum of time for champagne drinking.

- If one of the examiners is a real ..., your thesis defence is probably not the best place and time in which to do anything about it, except perhaps for allowing him/her to demonstrate it clearly and thus to establish the support of the rest of the panel. If you want a major dispute, save it up for when you are on even ground, unless you are very very sure of yourself and think that you have nothing to lose.

- Be ready for a 'free kick'. It is relatively common that a panel will ask one (or more) questions that, whatever the actual wording may be, are essentially an invitation to you to tell them (briefly) what is important, new and good in your thesis. You ought not stumble at this stage, so you should rehearse this. You should be able to produce on demand (say) a one minute speech and a five minute speech, and be prepared to extend them if invited by further questions. Do not try to recite your abstract: written and spoken styles should be rather different. Rather, rehearse answers to the question: "What have you done that merits a PhD?".

- Read points i and ii again. Keep calm - and good luck!

Opinions expressed in these notes are mine and do not necessarily reflect the policy of the University of New South Wales or of the School of Physics.

[←] How to write a thesis

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[←] The University of New South Wales

[⌂] School of Physics

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Writing and Presenting Your Thesis or Dissertation

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We have a new address for the Thesis/Dissertation Guide!

http://www.LearnerAssociates.net/dissthes

Standby while we take you to the new address.
(Don't forget to bookmark the new location once you get there!)

(Last Updated:)

Writing and Presenting Your
Thesis or Dissertation

Click to Download Printable (.pdf) Version

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(Last Updated:)

Introduction

This guide has been created to assist my graduate students in thinking through the many aspects of crafting, implementing and defending a thesis or dissertation. It is my attempt to share some of the many ideas that have surfaced over the past few years that definitely make the task of finishing a graduate degree so much easier. (This Guide is a companion to the Guide for Writing a Funding Proposal.)

Usually a guide of this nature focuses on the actual implementation of the research. This is not the focus of this guide. Instead of examining such aspects as identifying appropriate sample size, field testing the instrument and selecting appropriate statistical tests, this guide looks at many of the quasi-political aspects of the process. Such topics as how to select a supportive committee, making a compelling presentation of your research outcomes and strategies for actually getting the paper written are discussed.

Of course, many of the ideas that are presented can be used successfully by other graduate students studying under the guidance of other advisers and from many different disciplines. *However, the use of this guide carries no guarantee - implied or otherwise.* When in doubt check with your adviser. Probably the best advice to start with is the idea of not trying to do your research entirely by yourself. Do it in conjunction with your adviser. Seek out his/her input and assistance. Stay in touch with your adviser so that both of you know what's happening. There's a much better chance of getting to the end of your project and with a smile on your face.

With this in mind, enjoy the guide. I hope it will help you finish your graduate degree in good shape. Good luck and good researching!

(NOTE: I have spent time reviewing a number of different books that are available to help in writing a thesis/dissertation. The quality of the books, as can be expected, varies greatly. Feel free to check out my [listing of books and my reactions to them].

Summary of Key Ideas in this Guide

The Thinking About It Stage

✔ 1. Be inclusive with your thinking.
✔ 2. Write down your ideas.
✔ 3. Don't be overly influenced by others-it's your research.
✔ 4. Try and set a realistic goal.
✔ 5. Set appropriate time lines.
✔ 6. Take a leave of absence when it will do the most good.
✔ 7. Try a preliminary study to help clarify your research.

Preparing The Proposal

✔ 8. Read other proposals.
✔ 9. Prepare a comprehensive review of the literature.
✔ 10. Photocopy relevant articles.
✔ 11. Proposal should be first 3 chapters of dissertation.
✔ 12. Focus your research.
✔ 13. Include a title on your proposal.
✔ 14. Organize around a set of questions.
✔ 15. Some considerations for designing your research:
    ✔ a. Design your research so the subjects benefit.
    ✔ b. Choose your methodology wisely.
    ✔ c. Consider combining methodologies.
    ✔ d. Carefully select location for your research.
    ✔ e. Avoid conducting research in conjunction with another agency.
✔ 16. Use your advisory committee well.
    ✔ a. Select faculty who will support you.
    ✔ b. Your major professor is your ally.
    ✔ c. Provide committee with well written proposal.
    ✔ d. Plan the proposal meeting well.

Writing The Thesis Or Dissertation

✔ [17. Begin writing with sections you know the best.](#)
✔ [18. Rewrite your proposal into dissertation sections.](#)
✔ [19. Use real names/places in early drafts of dissertation.](#)
✔ [20. Print each draft on a different color paper.](#)
✔ [21. Use hand drawings of graphics/tables for early drafts.](#)
✔ [22. Make your writing clear and unambiguous.](#)
✔ [23. Review other dissertations before you begin to write.](#)
✔ [24. Introduce tables in the text, present the table and then describe it.](#)
✔ [25. Use similar or parallel wording whenever possible.](#)
✔ [26. Let your Table of Contents help you improve your manuscript.](#)
✔ [27. Write real conclusions and implications - don't restate your findings.](#)
✔ [28. Make your Suggestions for Further Research meaningful.](#)
✔ [29. Chapter One should be written last.](#)

The Thesis/Dissertation Defense

✔ [30. Attend some defenses before it's your turn.](#)
✔ [31. Discuss your research with others.](#)
✔ [32. Don't circulate chapters to committee.](#)
✔ [33. The defense should be team effort - you and adviser.](#)
✔ [34. Don't be defensive at your defense.](#)
✔ [35. Organize your defense as an educational presentation.](#)
✔ [36. Consider tape recording your defense.](#)
✔ [37. Prepare an article on the outcomes of your research.](#)

THE "THINKING ABOUT IT" STAGE

The "thinking about it stage" is when you are finally faced with the reality of completing your degree. Usually the early phases of a graduate program proceed in clear and very structured ways. The beginning phases of a graduate program proceed in much the same manner as an undergraduate degree program. There are clear requirements and expectations, and the graduate student moves along, step by step, getting ever closer to the completion of the program. One day, however, the clear structure begins to diminish and now you're approaching the thesis/dissertation stage. This is a new and different time. These next steps are more and more defined by **you** and not your adviser, the program, or the department.

1. **Be inclusive with your thinking.**Don't try to eliminate ideas too quickly. Build on your ideas and see how many different research projects you can identify. Give yourself the luxury of being expansive in your thinking at this stage -- you won't be able to do this later on. Try and be creative.

2. **Write down your ideas.** This will allow you to revisit an idea later on. Or, you can modify and change an idea. If you don't write your ideas they tend to be in a continual state of change and you will probably have the feeling that you're not going anywhere. What a great feeling it is to be able to sit down and scan the many ideas you have been thinking about, if **they're written down.**

3. **Try not to be overly influenced at this time by what you feel others expect from you** (your colleagues, your profession, your academic department, etc.). You have a much better chance of selecting a topic that will be really of interest to you if it is your topic. This will be one of the few opportunities you may have in your professional life to focus in on a research topic that is really of your own choosing.

4. **Don't begin your thinking by assuming that your research will draw international attention to you!!** Instead, be realistic in setting your goal. Make sure your expectations are tempered by:

   ... the realization that you are fulfilling an academic requirement,

   ... the fact that the process of conducting the research may be just as important (or more important) than the outcomes of the research, and

   ... the idea that first and foremost the whole research project should be a learning experience for you.

If you can keep these ideas in mind while you're thinking through your research you stand an excellent chance of having your research project turn out well.

5. **Be realistic about the time that you're willing to commit to your research project.** If it's a 10 year project that you're thinking about admit it at the beginning and then decide whether or not you have 10 years to give to it. If the project you'd like to do is going to demand more time than you're willing to commit then you have a problem.

I know it's still early in your thinking but it's never too early to create a draft of a timeline. Try using the 6 Stages (see the next item) and put a start and a finish time for each. Post your timeline in a conspicuous place (above your computer monitor?) so that it continually reminds you how you're doing. Periodically update your timeline with new dates as needed. (*Thanks to a website visitor from Philadelphia for sharing this idea.*)

6. If you're going to ask for a leave of absence from your job while you're working on your research this isn't a good time to do it. Chances are you can do the "thinking about it" stage without a leave of absence. Assuming that there are six major phases that you will have during your research project,

probably **the best time to get the most from a leave of absence is during the fourth stage* - the writing stage.** This is the time when you really need to be thinking well. To be able to work at your writing in large blocks of time without interruptions is something really important. A leave of absence from your job can allow this to happen. A leave of absence from your job prior to this stage may not be a very efficient use of the valuable time away from your work.

      Stage 1 - Thinking About It

      Stage 2 - Preparing the Proposal

      Stage 3- Conducting the Research

      Stage 4- Writing the Research Paper*

      Stage 5- Sharing the Research Outcomes with Others

      Stage 6- Revising the Research Paper

✔ 7. It can be most helpful at this early stage to try a very **small preliminary research study** to test out some of your ideas to help you gain further confidence in what you'd like to do. The study can be as simple as conducting half a dozen informal interviews with no attempt to document what is said. The key is that it will give you a chance to get closer to your research and to test out whether or not you really are interested in the topic. And, you can do it before you have committed yourself to doing something you may not like. Take your time and try it first.

PREPARING THE PROPOSAL

Assuming you've done a good job of "thinking about" your research project, you're ready to actually prepare the proposal. A word of caution - those students who tend to have a problem in coming up with a viable proposal often are the ones that have tried to rush through the "thinking about it" part and move too quickly to trying to write the proposal. Here's a final check. Do each of these statements describe you? If they do you're ready to prepare your research proposal.

      I am **familiar** with other research that has been conducted in areas related to my research project.
            (____Yes, it's me)
            (____No, not me)

      I have a clear **understanding** of the steps that I will use in conducting my research.
            (____Yes, it's me)

(___No, not me)

I feel that I have the **ability** to get through each of the steps necessary to complete my research project.

  (___Yes, it's me)
  (___No, not me)

I know that I am **motivated** and have the **drive** to get through all of the steps in the research project.

  (___Yes, it's me)
  (___No, not me)

Okay, you're ready to write your research proposal. Here are some ideas to help with the task:

✔️ 8. **Read through someone else's research proposal.** Very often a real stumbling block is that we don't have an image in our mind of what the finished research proposal should look like. How has the other proposal been organized? What are the headings that have been used? Does the other proposal seem clear? Does it seem to suggest that the writer knows the subject area? Can I model my proposal after one of **the** ones that I've seen? If you can't readily find a proposal or two to look at, ask your adviser to see some. Chances are your adviser has a file drawer filled with them.

✔️ 9. Make sure your proposal has a **comprehensive review of the literature** included. Now this idea, at first thought, may not seem to make sense. I have heard many students tell me that "This is only the proposal. I'll do a complete literature search for the dissertation. I don't want to waste the time now." But, this is the time to do it. The rationale behind the literature review consists of an argument with two lines of analysis: 1) this research is needed, and 2) the methodology I have chosen is most appropriate for the question that is being asked. Now, why would you want to wait? Now is the time to get informed and to learn from others who have preceded you! If you wait until you are writing the dissertation it is too late. You've got to do it some time so you might as well get on with it and do it now. Plus, you will probably want to add to the literature review when you're writing the final dissertation. (*Thanks to a website visitor from Mobile, Alabama who helped to clarify this point.*)

✔️ 10. With the ready availability of photocopy machines you should be able to bypass many of the hardships that previous dissertation researchers had to deal with in developing their literature review. When you read something that is important to your study, **photocopy the relevant article or section.** Keep your photocopies organized according to categories and sections. And, most importantly, photocopy the bibliographic citation so that you can easily reference the material in your bibliography. Then, when you decide to sit down and actually write the literature review, bring out your photocopied sections, put them into logical and sequential order, and then begin your writing.

✔️ 11. What is a proposal anyway? **A good proposal should consist of the first three chapters of the dissertation.** It should begin with a statement of the problem/background information (typically Chapter I of the dissertation), then move on to a review of the literature (Chapter 2), and conclude with a

defining of the research methodology (Chapter 3). Of course, it should be written in a future tense since it is a proposal. To turn a good proposal into the first three chapters of the dissertation consists of changing the tense from future tense to past tense (from "This is what I would like to do" to "This is what I did") and making any changes based on the way you actually carried out the research when compared to how you proposed to do it. Often the intentions we state in our proposal turn out different in reality and we then have to make appropriate editorial changes to move it from proposal to dissertation.

✔ 12. **Focus your research very specifically.** Don't try to have your research cover too broad an area. Now you may think that this will distort what you want to do. This may be the case, but you will be able to do the project if it is narrowly defined. Usually a broadly defined project is not do-able. By defining too broadly it may sound better to you, but there is a great chance that it will be unmanageable as a research project. When you complete your research project it is important that you have something specific and definitive to say. This can be accommodated and enhanced by narrowly defining your project. Otherwise you may have only broadly based things to say about large areas that really provide little guidance to others that may follow you. Often the researcher finds that what he/she originally thought to be a good research project turns out to really be a *group* of research projects. Do one project for your dissertation and save the other projects for later in your career. Don't try to solve all of the problems in this one research project.

✔ 13. **Include a title on your proposal.** I'm amazed at how often the title is left for the end of the student's writing and then somehow forgotten when the proposal is prepared for the committee. A good proposal has a good title and it is the first thing to help the reader begin to understand the nature of your work. Use it wisely! Work on your title early in the process and revisit it often. It's easy for a reader to identify those proposals where the title has been focused upon by the student. Preparing a good title means:

...having the most important words appear toward the beginning of your title,

...limiting the use of ambiguous or confusing words,

..breaking your title up into a title and subtitle when you have too many words, and

...including key words that will help researchers in the future find your work.

✔ 14. It's important that your **research proposal be organized around a set of questions** that will guide your research. When selecting these guiding questions try to write them so that they frame your research and put it into perspective with other research. These questions must serve to establish the link between your research and other research that has preceded you. Your research questions should clearly show the relationship of your research to your field of study. Don't be carried away at this point and make your questions too narrow. You must start with broad relational questions.

A good question:

Do adult learners in a rural adult education setting have characteristics that are similar to adult learners in general ?

A poor question:

What are the characteristics of rural adult learners in an adult education program? (too narrow)

A poor question:

How can the XYZ Agency better serve rural adult learners? (not generalizable)

15. Now here are a few more ideas regarding the defining of your research project through your proposal.

a. Make sure that you will be **benefitting those who are participating in the research.** Don't only see the subjects as sources of data for you to analyze. Make sure you treat them as participants in the research. They have the right to understand what you are doing and you have a responsibility to share the findings with them for their reaction. Your research should not only empower you with new understandings but it should also empower those who are participating with you.

b. **Choose your methodology wisely.** Don't be too quick in running away from using a quantitative methodology because you fear the use of statistics. A qualitative approach to research can yield new and exciting understandings, but it should not be undertaken because of a fear of quantitative research. A well designed quantitative research study can often be accomplished in very clear and direct ways. A similar study of a qualitative nature usually requires considerably more time and a tremendous burden to create new paths for analysis where previously no path had existed. Choose your methodology wisely!

c. Sometimes a **combined methodology** makes the most sense. You can combine a qualitative preliminary study (to define your population more clearly, to develop your instrumentation more specifically or to establish hypotheses for investigation) with a quantitative main study to yield a research project that works well.

d. Deciding on **where you will conduct the research** is a major decision. If you are from another area of the country or a different country there is often an expectation that you will return to your "home" to conduct the research. This may yield more meaningful results, but it will also most likely create a situation whereby you are expected to fulfill other obligations while you are home. For many students the opportunity to conduct a research project away from home is an important one since they are able to better control many of the intervening variables that they can not control at home. Think carefully regarding your own situation before you make your decision.

✔ e. What if you have the opportunity for **conducting your research in conjunction with another agency or project** that is working in related areas. Should you do it? Sometimes this works well, but most often the dissertation researcher gives up valuable freedom to conduct the research project in conjunction with something else. **Make sure the trade-offs are in your favor.** It can be very disastrous to have the other project suddenly get off schedule and to find your own research project temporarily delayed. Or, you had tripled the size of your sample since the agency was willing to pay the cost of postage. They paid for the postage for the pre-questionnaire. Now they are unable to assist with postage for the post-questionnaire. What happens to your research? I usually find that the cost of conducting dissertation research is not prohibitive and the trade-offs to work in conjunction with another agency are not in favor of the researcher. Think twice before altering your project to accommodate someone else. Enjoy the power and the freedom to make your own decisions (and mistakes!) -- this is the way we learn!

✔ 16. Selecting and preparing your advisory committee to respond to your proposal should not be taken lightly. If you do your "homework" well **your advisory committee can be most helpful to you.** Try these ideas:

✔ a. If you are given the opportunity to select your dissertation committee do it wisely. Don't only focus on content experts. **Make sure you have selected faculty for your committee who are supportive of you** and are willing to assist you in successfully completing your research. You want a committee that you can ask for help and know that they will provide it for you. Don't forget, you can always access content experts who are not on your committee at any time during your research project.

✔ b. **Your major professor/adviser/chairperson is your ally.** When you go to the committee for reactions to your proposal make sure your major professor is fully supportive of you. Spend time with him/her before the meeting so that your plans are clear and you know you have full support. The proposal meeting should be seen as an opportunity for you and your major professor to seek the advice of the committee. Don't ever go into the proposal meeting with the feeling that it is you against them!

✔ c. **Provide the committee members with a well-written proposal** well in advance of the meeting. Make sure they have ample time to read the proposal.

✔ d. **Plan the proposal meeting well.** If graphic presentations are necessary to help the committee with understandings make sure you prepare them so they look good. A well planned meeting will help your committee understand that you are prepared to move forward with well planned research. Your presentation style at the meeting should not belittle your committee members (make it sound like you know they have read your proposal) but you should not assume too much (go through each of the details with an assumption that maybe one of the members skipped over that section).

WRITING THE THESIS OR DISSERTATION

Now this is the part we've been waiting for. I must assume that you have come up with a good idea for research, had your proposal approved, collected the data, conducted your analyses and now you're about to start writing the dissertation. If you've done the first steps well this part shouldn't be too bad. In fact it might even be enjoyable!

(NOTE: Periodically I receive requests for information on how to prepare a "thesis statement" rather than actually writing a thesis/dissertation. How To Write a Thesis Statement is an excellent website that clearly sets forth what a "thesis statement" is and how to actually prepare one.)

✔️ 17. The major myth in writing a dissertation is that you start writing at Chapter One and then finish your writing at Chapter Five. This is seldom the case. The most productive approach in writing the dissertation is to **begin writing those parts of the dissertation that you are most comfortable with.** Then move about in your writing by completing various sections as you think of them. At some point you will be able to spread out in front of you all of the sections that you have written. You will be able to sequence them in the best order and then see what is missing and should be added to the dissertation. This way seems to make sense and builds on those aspects of your study that are of most interest to you at any particular time. Go with what interests you, start your writing there, and then keep building!

(David Kraenzel - North Dakota State University - wrote in describing the "A to Z Method". Look at the first section of your paper. When you are ready go ahead and write it. If you are not ready, move section-by-section through your paper until you find a section where you have some input to make. Make your input and continue moving through the entire paper - from A to Z - writing and adding to those sections for which you have some input. Each time you work on your paper follow the same A to Z process. This will help you visualize the end product of your efforts from very early in your writing and each time you work on your paper you will be building the entire paper - from A to Z. *Thanks David!*)

✔️ 18. If you prepared a comprehensive proposal you will now be rewarded! Pull out the proposal and begin by checking your proposed research methodology. Change the tense from future tense to past tense and then make any additions or changes so that the methodology section truly reflects what you did. You have now been able to **change sections from the proposal to sections for the dissertation.** Move on to the Statement of the Problem and the Literature Review in the same manner.

✔️ 19. I must assume you're using some form of word processing on a computer to write your dissertation. (if you aren't, you've missed a major part of your doctoral preparation!) If your study has specific names of people, institutions and places that must be changed to provide anonymity don't do it too soon. Go ahead and **write your dissertation using the real names.** Then at the end of the writing stage you can easily have the computer make all of the appropriate name substitutions. If you make these substitutions too early it can really confuse your writing.

✔️ 20. As you get involved in the actual writing of your dissertation you will find that conservation of paper will begin to fade away as a concern. Just as soon as you print a draft of a chapter there will appear a variety of needed changes and before you know it another draft will be printed. And, it seems

almost impossible to throw away any of the drafts! After awhile it will become extremely difficult to remember which draft of your chapter you may be looking at. **Print each draft of your dissertation on a different color paper**. With the different colors of paper it will be easy to see which is the latest draft and you can quickly see which draft a committee member might be reading. (*Thanks to Michelle O'Malley at University of Florida for sharing this idea.*)

✔ 21. The one area where I would caution you about using a word processor is in the creation of elaborate graphs or tables. I've seen too many students spend too many hours in trying to use their word processor to create a graph that could have been done by hand in 15 minutes. So, the simple rule is to **use hand drawing for elaborate tables and graphs for the draft of your dissertation.** Make sure your committee can clearly understand your graph, but don't waste the time trying to make it perfect. After you defend your dissertation is the time to prepare the "perfect" looking graphs and tables.

✔ 22. Dissertation-style writing is not designed to be entertaining. **Dissertation writing should be clear and unambiguous.** To do this well you should prepare a list of key words that are important to your research and then your writing should use this set of key words throughout. There is nothing so frustrating to a reader as a manuscript that keeps using alternate words to mean the same thing. If you've decided that a key phrase for your research is "educational workshop", then **do not** try substituting other phrases like "in-service program", "learning workshop", "educational institute", or "educational program." Always stay with the same phrase - "educational workshop." It will be very clear to the reader exactly what you are referring to.

✔ 23. **Review two or three well organized and presented dissertations.** Examine their use of headings, overall style, typeface and organization. Use them as a model for the preparation of your own dissertation. In this way you will have an idea at the beginning of your writing what your finished dissertation will look like. A most helpful perspective!

✔ 24. A simple rule - if you are presenting information in the form of a table or graph **make sure you introduce the table or graph in your text.** And then, following the insertion of the table/graph, make sure you discuss it. If there is nothing to discuss then you may want to question even inserting it.

✔ 25. Another simple rule - **if you have a whole series of very similar tables try to use similar words in describing each.** Don't try and be creative and entertaining with your writing. If each introduction and discussion of the similar tables uses very similar wording then the reader can easily spot the differences in each table.

✔ 26. We are all familiar with how helpful the Table of Contents is to the reader. What we sometimes don't realize is that it is also invaluable to the writer. **Use the Table of Contents to help you improve your manuscript.** Use it to see if you've left something out, if you are presenting your sections in the most logical order, or if you need to make your wording a bit more clear. Thanks to the miracle of computer technology, you can easily copy/paste each of your headings from throughout your writing into the Table of Contents. Then sit back and see if the Table of Contents is clear and will make good sense to the reader. You will be amazed at how easy it will be to see areas that may need some more attention.

Don't wait until the end to do your Table of Contents. Do it early enough so you can benefit from the information it will provide to you.

✔️ 27. If you are including a Conclusions/Implications section in your dissertation **make sure you really present conclusions and implications.** Often the writer uses the conclusions/implications section to merely restate the research findings. Don't waste my time. I've already read the findings and now, at the Conclusion/Implication section, I want you to help me understand what it all means. This is a key section of the dissertation and is sometimes best done after you've had a few days to step away from your research and allow yourself to put your research into perspective. If you do this you will no doubt be able to draw a variety of insights that help link your research to other areas. I usually think of conclusions/implications as the "So what" statements. In other words, what are the key ideas that we can draw from your study to apply to my areas of concern.

✔️ 28. Potentially the silliest part of the dissertation is the Suggestions for Further Research section. This section is usually written at the very end of your writing project and little energy is left to make it very meaningful. The biggest problem with this section is that the suggestions are often ones that could have been made prior to you conducting your research. **Read and reread this section until you are sure that you have made suggestions that emanate from your experiences** in conducting the research and the findings that you have evolved. Make sure that your suggestions for further research serve to link your project with other projects in the future and provide a further opportunity for the reader to better understand what you have done.

✔️ 29. Now it's time to write the last chapter. But what chapter is the last one? My perception is that **the last chapter should be the first chapter.** I don't really mean this in the literal sense. Certainly you wrote Chapter One at the beginning of this whole process. Now, at the end, it's time to "rewrite" Chapter One. After you've had a chance to write your dissertation all the way to the end, the last thing you should do is turn back to Chapter One. Reread Chapter One carefully with the insight you now have from having completed Chapter Five. Does Chapter One clearly help the reader move in the direction of Chapter Five? Are important concepts that will be necessary for understanding Chapter Five presented in Chapter One?

THE THESIS/DISSERTATION DEFENSE

What a terrible name - a *dissertation defense*. It seems to suggest some sort of war that you're trying to win. And, of course, with four or five of them and only one of you it sounds like they may have won the war before the first battle is held. I wish they had called it a dissertation seminar or professional symposium. I think the name would have brought forward a much better picture of what should be expected at this meeting.

Regardless of what the meeting is called, try to remember that the purpose of the meeting is for you to show everyone how well you have done in the conducting of your research study and the preparation of your dissertation. In addition there should be a seminar atmosphere where the exchange of ideas is valued.

You are clearly the most knowledgeable person at this meeting when it comes to your subject. And, the members of your committee are there to hear from you and to help you better understand the very research that you have invested so much of yourself in for the past weeks. Their purpose is to help you finish your degree requirements. Of course other agenda often creep in. If that happens, try to stay on course and redirect the meeting to your agenda.

The following ideas should help you keep the meeting on your agenda.

✔ 30. The most obvious suggestion is the one seldom followed. Try to **attend one or more defenses prior to yours.** Find out which other students are defending their research and sit in on their defense. In many departments this is expected of all graduate students. If this is not the case for you, check with your adviser to see that you can get an invitation to attend some defenses.

At the defense try and keep your focus on the interactions that occur. Does the student seem relaxed? What strategies does the student use to keep relaxed? How does the student interact with the faculty? Does the student seem to be able to answer questions well? What would make the situation appear better? What things should you avoid? You can learn a lot from sitting in on such a meeting.

✔ 31. Find opportunities to **discuss your research with your friends and colleagues.** Listen carefully to their questions. See if you are able to present your research in a clear and coherent manner. Are there aspects of your research that are particularly confusing and need further explanation? Are there things that you forgot to say? Could you change the order of the information presented and have it become more understandable?

✔ 32. I hope you **don't try circulating chapters of your dissertation to your committee members as you are writing them.** I find this practice to be most annoying and one that creates considerable problems for the student. You must work closely with your dissertation director. He/she is the person you want to please. Develop a strategy with the dissertation director regarding how and when your writing should be shared. Only after your dissertation director approves of what you have done should you attempt to share it with the rest of the committee. And by then it's time for the defense. If you prematurely share sections of your writing with committee members you will probably find yourself in a situation where one committee member tells you to do one thing and another member says to do something else. What should you do? The best answer is not to get yourself into such a predicament. The committee meeting (the defense) allows the concerns of committee members to surface in a dialogical atmosphere where opposing views can be discussed and resolved.

✔ 33. It's important that you have the feeling when entering your defense that you **aren't doing it alone.** As was mentioned earlier, your major professor should be seen as an ally to you and "in your corner" at the defense. Don't forget, if you embarrass yourself at the defense you will also be embarrassing your dissertation director. So, give both of you a chance to guarantee there is no embarrassment. Meet together ahead of time and discuss the strategy you should use at the defense. Identify any possible problems that may occur and discuss ways that they should be dealt with. **Try and make the defense more of a team effort.**

✔ 34. **Don't be defensive at your defense** (this sounds confusing!). This is easy to say but sometimes hard to fulfill. You've just spent a considerable amount of time on your research and there is a strong tendency for YOU to want to defend everything you've done. However, the committee members bring a new perspective and may have some very good thoughts to share. Probably the easiest way to deal with new input is to say something like "Thank you so much for your idea. I will be giving it a lot of consideration." There, you've managed to diffuse a potentially explosive situation and not backed yourself or the committee member into a corner. Plus, you've not promised anything. Try and be politically astute at this time. Don't forget that your ultimate goal is to successfully complete your degree.

✔ 35. Probably the most disorganized defense I've attended is the one where the dissertation director began the meeting by saying, "You've all read the dissertation. What questions do you have for the student?" What a mess. Questions started to be asked that bounced the student around from one part of the dissertation to another. There was no semblance of order and the meeting almost lost control due to its lack of organization. At that time I vowed to protect my students from falling into such a trap by helping them **organize the defense as an educational presentation.**

Here's what we do:

> I ask the student to prepare a 20-25 minute presentation that reviews the entire study. This is done through the help of a series of 10-12 large pieces of paper, wall charts, that have been posted sequentially around the walls of the room. Each piece of paper contains key words regarding each of the different aspects of the study. Some pieces of paper contain information about the study setting, questions and methodology. Other pieces of paper present findings and finally there are those pieces that present the conclusions and implications. By preparing these wall charts ahead of time the student is able to relax during the presentation and use the pieces of paper as if they were a road map toward the goal. No matter how nervous you are you can always let the wall charts guide **YOU** through your presentation. Lettering is done with a dark marking pen and extra notes are included in very small printing with a pencil (that no one can really see). We've also tried it with overhead projected transparencies but it doesn't work as well. With the transparencies they're gone from view after a few seconds. The wall charts stay up for everyone to see and to help focus attention.

Following this structured presentation the committee begins to ask questions, but as can be expected the questions follow along with the wall charts and the whole discussion proceeds in an orderly manner. If guests are present at the defense, this form of presentation helps them also follow along and understand exactly what was accomplished through the research.

✔ 36. Consider **tape recording your defense.** Using a small portable recorder, record your entire presentation and also the questions and comments of the committee members. This helps in two ways. First, the student has documentation to assist in making suggested changes and corrections in the dissertation. The student can relax more and listen to what is being said by the committee members. The tape recorder is taking notes! Second, the student has a permanent record of his/her presentation of the

study. By keeping the paper charts and the tape together, they can be most useful for reviewing the research in future years when a request is made for a presentation. (Bring out the tape and the pieces of paper the night before your presentation and you can listen to *you* make the presentation. What a good way to review.)

Well that about does it. By following the above suggestions and ideas I hope it will be possible for you to finish your graduate degree program in a most timely and enjoyable manner. By looking ahead to the different aspects of this final part of your graduate study it becomes clear that you can do a number of things to insure your success. Good luck!

37. Oh, I almost forgot. There's one last thing. Get busy and **prepare an article or paper that shares the outcomes of your research.** There will be no better time to do this than now. Directly after your defense is when you know your study the best and you will be in the best position to put your thinking on paper. If you put this writing task off it will probably never get done. Capitalize on all of the investment you have made in your research and reap some additional benefit - start writing.

Click to Download Printable (.pdf) Version

Thinking About Buying a Book?

I have spent time identifying a number of different books that are available to help in writing a thesis/dissertation. The quality of the books, as can be expected, varies greatly. If you would like to see a **listing of the books I have identified and my reactions to them**, please click here.

A Handful of Worthwhile Bookmarks -

If I only had time to visit a single website for help with my thesis I'd probably go directly to the **Thesis Handbook** (http://www.tele.sunyit.edu/ThesisHandbook.html) maintained by the Telecommunications Program at SUNY Institute of Technology. Especially helpful are the accompanying Thesis Workbook and Frequently Asked Questions where you will find a wealth of clearly written and helpful information. (Selecting a topic; Developing a search strategy for going after relevant literature: Deciding which tense to use in your writing; etc.)

An extensive set of hints and ideas on how to improve your dissertation/thesis writing. **How To Write A Dissertation or Bedtime Reading For People Who Do Not Have Time To Sleep**

(**http://www.cs.purdue.edu/homes/dec/essay.dissertation.html**) lays out suggestion after suggestion in direct and non-confusing form. A great list to bring out after you've completed the first draft of your writing, are rather tired of your topic, and you are not sure where to begin your fine tuning.

✓ An excellent website with lots of highly specific information (especially if the focus of your work is in a scientific or technical area) has been developed by Joe Wolfe at The University of New South Wales (Australia). **How to Write a PhD Thesis** (**http://www.phys.unsw.edu.au/~jw/thesis.html**) provides a variety of very useful suggestions on how to get from the beginning to the end of your thesis project - and survive the process!

✓ Wouldn't it be great if there were a bunch of theses/dissertations available for reading right on the web? Well, there are some resources you should be aware of that will let you see what the finished product could look like. First, there is an **Experimental Digital Library of M.I.T. Theses** (**http://theses.mit.edu/**) which includes electronically-submitted theses. Next, you can always purchase a copy of most US dissertations/theses. These are available from UMI's website - **UMI's Online Dissertation Services** (**http://www.umi.com/hp/Products/Dissertations.html**). The University of Wisconsin has a site which lists **Sites with Full Text Access to Dissertations** (**http://www.library.wisc.edu/libraries/Memorial/elecdiss.htm#fulltext**). You should also be aware of the various Electronic Dissertation/Thesis (ETD) projects that are currently underway. A good access to this area is via the library at the University of Virginia which has a page dealing with **Electronic Theses and Dissertations in the Humanities** (**http://etext.virginia.edu/ETD/**).

✓ Another website that's worth visiting is maintained by Computer Science & Electrical Engineering at the University of Maryland Baltimore County and also the Computer Science Department at Indiana University-Bloomington. **How to Be a Good Graduate Student/Advisor** (**http://www.cs.indiana.edu/how.2b/how.2b.html**) "attempts to raise some issues that are important for graduate students to be successful and to get as much out of the process as possible, and for advisors who wish to help their students be successful."

✓ Prof. John W. Chinneck at Carleton University (Ottawa, Canada) has created a very practical and well written webpage on the preparation of your thesis. **How to Organize your Thesis** (**http://www.sce.carleton.ca/faculty/chinneck/thesis.html**) starts with a description of what graduate research/the graduate thesis is all about and then moves point-by-point through a "generic thesis skeleton".

✓ If you are in need of some gentle prodding and a bit of humor to go along with it, check out the **Dead Thesis Society** (**http://is2.dal.ca/~dts/**) - a support group for graduate students. Lots of well organized information that is moderated by Frank Elgar, a graduate student in Psychology at Dalhousie University in Halifax, Nova Scotia.

✓ Not sure of all the administrative steps at your university that are required to successfully complete a dissertation? Check out this well thought through PowerPoint presentation from **Pepperdine University's Dissertation Support Web Site** (**http://moon.pepperdine.edu/gsep/as/dissertation/dissertation-process/index.htm**). Everything seems

to be included from a definition of exactly what is a dissertation all the way to when you can start using the title of "Doctor."

✓ Feeling a bit lonesome in the process of writing your thesis or dissertation? Take a minute to find out who else has visited this website and read **what others have said about this Guide** (http://www.anrecs.msu.edu/dissthes/results.htm) and their own situation. It might just be reassuring!!

✓ And finally, when all else fails, you might want to see what other sites have included, on their website, a **link to this Thesis/Dissertation website**. These other sites often have a variety of additional resources to check out.

Your comments and suggestions for improving and extending this guide would be most welcome. Please click on the box (below) to send feedback about this website. Thank you!

Joe Levine

Dissertation/Thesis Guide Feedback

Website Awards

Want to recommend this website to a friend? Use this handy form.

Your friends name.   Your friends email address.

Your Name   Your Email Address

Postgraduate Student Resources

General Advice to Postgrads and Supervisors

🔴 How to Succeed in Postgraduate Study: A Guide for Students and Supervisors

A comprehensive guide written by Marie desJardins which makes good reading for anyone contemplating postgraduate study or postgraduate supervision. Adapted to an Australian context.

🔴 Gateway on Research Supervision

This gateway is a worldwide reference source on the practice of research degree supervision. It links to websites offering information, advice and support useful for new supervisors, experienced supervisors, policy makers and training personnel in all fields of study.

Effective Writing

🔴 Elements of Style by William Strunk

An excellent and well established guide to writing style, including grammar and punctuation. Immensely useful for those whose writing style has deteriorated through years of reading the scientific literature.

🔴 Notes on Writing Papers and Theses

A guide to writing scientific papers and theses by Ken Lertzman. It is very comprehensive and includes both elements of good writing style and structure of scientific reports.

🔴 Notes on Structuring a Scientific Paper

A more detailed text on writing a scientific paper, with a strong emphasis on structure -- what does and does not go into introductions, discussions etc.

🔴 Guide to Thesis Format

A detailed guide to formatting a thesis, specifically for students in Applied Ecology at the University of Canberra. It is designed, among other things, to constrain students in honours, masters and PhD from competing on matters of appearance rather than substance.

🔴 Research Theses -- An Examiner's Perpective

Text of a talk given to the University of Canberra Postgraduate on what examiners look for

when marking a thesis.
🔴 Internet Technical Writing Course Guide

Analysis

🔴 Introductory Statistics for Ecologists

An introduction to descriptive statistics, two-sample comparisons and analysis of variance using SAS for Windows. Self-evaluation is web-based.

Grantsmanship

🔴 Notes on Applying for a Grant

A blow by blow description on how to maximize the probability of success in applying for grants.

🔴 On the Art of Writing Proposals

Advice prepared by Adam Przeworski of New York University and Frank Salomon of the University of Wisconsin.

🔴 Winning Research Grants

Advice prepared by Sylvia S. Bienvenu and Becky Patterson, University of Wisconsin.

Seminars and Conference Presentations

🔴 Notes on Presenting a 12 minute Talk

Advice for preparing a short talk at a professional conference, where time is strictly limited.

Ethical Issues

🔴 Guidelines for Responsible Practice in Research

The University of Canberra's Policies on Scientific Ethics, modified from those provided by the NH&MRC and the AVCC.

🔴 Guidelines on Ethics and the Conduct of Research in Protected and other Environmentally Sensitive Areas

Produced by the Australian Science, Technology and Engineering Council (ASTEC).

🔴 Uniform Requirements for Manuscripts Submitted to Journals

Produced by the International Committee of Medical Journal editors, but of wider utility.

🔴 Guidelines for Use of Reptiles and Amphibians in Research

An ethical guide produced jointly by ASIH, the Herpetologists League and SSAR.

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Bullshit bingo

Do you keep falling asleep in meetings and seminars? What about those long and boring conference calls? Here is a way to change all that!

How to play: Check off each block when you hear these words during a meeting, seminar or phone call. When you get five blocks horizontally, vertically or diagonally, stand up and shout **Bullshit!**

synergy	strategic fit	gap analysis	best practice	bottom line
revisit	bandwidth	hardball	out of the loop	benchmark
value-added	proactive	win-win	think outside the box	fast track
result-driven	empower	knowledge base	total quality	touch base
mindset	client focus	ball park	game plan	leverage

Testimonials from satisfied players:

"I had only been in the meeting for five minutes when I won." -Jack W., Boston

"My attention span at meetings has improved dramatically." David D., Florida

"What a gas. Meetings will neverbe the same for me after my first win." Bill R. New York City

"The atmosphere was tense in the process meeting as fourteen of us waited for the fifth box." Ben G, Denver.

"The speaker was stunned as eight of us shouted 'bullshit' for the third time in two hours." Kathleen L., Atlanta
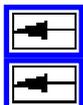
Comment rediger une thèse

[Joe Wolfe](#)
[Ecole de Physique](#)
[L'Université de Nouvelle-Galles du Sud](#)
Sydney 2052 Australie

◄ [Version anglaise: How to write a PhD thesis](#)
◄ [Version espagnole: Còmo escribir una tesis de doctorado](#)

Ce guide à la rédaction d'une thèse donne quelques conseils simples et pratiques: comment débuter, comment s'organiser, comment diviser la tâche énorme en morceaux moins effrayants et comment attaquer ces morceaux. Il donne également quelques indices pratiques pour survivre à l'épreuve. Une structure est suggérée et un guide de ce que l'on devrait mettre dans chaque section est proposé. Ce guide a été écrit d'abord pour les thésards en physique, et la plupart des exemples spécifiques donnés sont issus de cette discipline. Néanmoins, le retour des lecteurs indique qu'il a été consulté et apprécié par des étudiants dans divers domaines: dans les lettres aussi que dans les sciences.

- [Comment débuter](#)
    - [Un plan](#)
    - [L'organisation](#)
    - [Un horaire](#)
    - [Solution itérative](#)
- [Qu'est-ce qu'une thèse? Pour qui l'écrit-on? Comment devrait-elle être écrite?](#)
    - [Combien de détails?](#)
    - [Indiquez clairement ce qui est à vous](#)
    - [Syle](#)
    - [Présentation](#)
    - [Combien d'exemplaires?](#)
    - [Personnel](#)
    - [Coda](#)
- [Une structure de thèse](#)

- [Comment survivre à une soutenance de thèse](#)

Comment débuter

Au moment de commencer, la rédaction d'une thèse semble être une tâche longue et difficile. C'est parce que c'est une tâche longue et difficile. Heureusement, elle semblera moins intimidante après un ou deux chapitres. Vers la fin, vous y trouverez même du plaisir---un plaisir fondésur la satisfaction dans l'accomplissement et l'amélioration de votre rédaction scientifique, et bien sûr, le fait que vous vous approchez de la fin. Comme beaucoup de travaux, la rédaction d'une thèse semble le plus difficile avant d'avoir commencé. Allons donc faire les premiers pas.

Un plan

D'abord, faîtes un plan de thèse: plusieurs pages contenant des titres de chapitre, des rubriques, des titres de figure et de tables (pour indiquer quels résultats vont apparaître et où) et peut-être d'autres notes et commentaires qui vous viendront àl'esprit. Vous trouverez une section consacrée àla structure d'une thèse àla fin de ce texte. Une fois que vous avez une liste de chapitres et, sous chaque rubrique, une liste raisonnablement complète de choses àrapporter ou àexpliquer, vous avez déjàbriséune des barrières les plus difficiles. Quand vous vous asseyez pour taper, votre but n'est plus une thèse---but intimidant---mais quelque chose de plus simple. Votre nouveau but est simplement un paragraphe ou une section àpropos d'une de vos rubriques. Il est plus simple de commencer avec une section facile: ceci vous met dans le bain et vous donne confiance. Dans une thèse scientifique, le chapitre le plus facile àrédiger est souvent celui sur les matériaux et les méthodes---il s'agit simplement de noter--- soigneusement, formellement et dans un ordre logique---ce que vous avez fait.

Comment faire un plan de chapitre? Vous pourriez essayer la méthode que j'utilise pour un article scientifique, méthode que j'ai apprise de mon maître de thèse: assemblez toutes les figures que vous utiliserez dans le chapitre et mettez-les dans l'ordre que vous utiliseriez si vous alliez expliquer à quelqu'un ce qu'elles veulent dire. Vous pouvez aussi les préparer comme si vous alliez les expliquer oralement à un collègue---après tout vous présenterez probablement plusieurs exposés basés sur votre travail de thèse. Une fois que vous avez trouvé l'ordre le plus logique, notez les mots clés de votre explication. Ces mots clés fournissent un squelette pour votre plan de chapitre.

Une fois que vous avez établi un plan, *discutez-le avec votre maître de thèse.* Cette étape est importante: primo, il aura des suggestions utiles. Secundo, cette réunion lui signale qu'il doit s'attendre à voir arriver les chapitres, qui feront des demandes de priorité élevée sur son temps. Une fois que vous et votre maître de thèse êtes d'accord sur une structure logique, il conviendra de lui donner un exemplaire de ce plan pour l'aider à se retrouver dans le flot des chapitres puisque ceux-ci se présenteront dans le désordre. Si vous avez un deuxième maître de thèse, discutez le plan avec lui aussi, afin qu'il puisse vous faire ses commentaires.

Organisation

Il est encourageant et utile de commencer un système de classement. Ouvrez, dans votre logiciel de traitement de texte, un fichier différent pour chaque chapitre *et un pour les références.*Vous pouvez mettre des notes dans ces fichiers, aussi bien que du texte formel. En

rédigeant un paragraphe dans le cadre du chapitre X, il vous arrivera peut-être de penser ày faire référence dans le chapitre Y. Vous rédigerez donc une note dans ce dernier, afin de vous en souvenir le moment voulu. Ou bien, vous penserez àquelque chose d'intéressant ou relevant d'un autre chapitre. Plus vous aurez accumuléde telles notes, plus la rédaction de ce dernier en sera facilitée.

Faîtes une copie de sauvegarde de ces fichiers et renouvellez ces sauvegardes quotidiennement (selon la fiabilité de votre ordinateur et l'âge de votre disque dur). Ne gardez jamais le disque de sauvegarde près de l'ordinateur au cas où le voleur hypothétique qui aime votre ordinateur pensera aussi qu'il a besoin de quelques disques. C'est une bonne idée de faire une copie de sauvegarde géographiquement séparée de votre ordinateur. Par exemple, vous pourriez envoyer une copie de chaque chapitre, par email, à un collègue dans une autre institution. Vous pouvez aussi vous envoyer un exemplaire à vous même et le laisser au serveur, mais attention de ne pas depasser la limite de memoire qui vous est accordée.

Vous devriez avoir aussi un système de classement pour vos papiers: une collection de classeurs, un pour chaque chapitre. Cela vous fera du bien psychologiquement (ah, j'ai déjà commencé) et réglera aussi le bordel sur votre bureau. Vos classeurs doivent non seulement contenir les résultats et les pages de calculs, mais aussi toute sortes de vieilles notes, références, courbes de calibration, les adresses de fournisseurs, spécifications, spéculations, lettres des collègues: presque n'importe quoi qui vous semble pertinent à un chapitre, mettez-le dans le classeur. Quand vous avez rédigé un chapitre, mettez-le aussi dedans. Puis mettez tous les classeurs dans une boîte ou un gros classeur. Regardez la taille de cette boite de temps en temps: ah---la thèse prend forme!

Si vous avez des données qui n'existent que sur papier, copiez-les et gardez la copie dans un endroit différent. Faîtes aussi une copie de votre journal de laboratoire. Cette précaution est utile pour une seconde raison: après la thèse, le journal de laboratoire va rester dans le labo, mais vous pourriez vous-même être amené à en avoir besoin un jour. En plus, l'éthique scientifique exige que le laboratoire garde les données originales pour au moins dix années, et il est plus probable qu'une copie soit trouvée s'il en existe deux.

Lorsque vous êtes en train de vous organiser, vous devriez vous adresser à la bureaucratie universitaire. Les membres du jury de thèse doivent être nommés, invités etc., les formulaires exigés par votre département et par l'administration d'université doivent être remplis. Les conseils d'un thésard récemment diplomé seront également utiles.

Un horaire

Je recommande vivement une réunion avec votre maître de thèse afin d'établir un planning pour votre rédaction: une liste de dates où vous lui donnerez les premiers et deuxièmes jets de chaque chapitre. Ce planning structure votre temps et fournit des objectifs intermédiaires. Si vous avez l'intention "d'avoir fini la thèse entière avant" {une telle date distante}, vous pouvez tricher plus facilement. Par contre, sivous avez promis àvotre maître de thèse que vous lui donnerez un premier jet du chapitre 3 mercredi, votre attention sera concentrée sur la tache

immédiate.

Solution itérative

Chaque fois que vous vous asseyez pour écrire, il est très important d'écrire *quelque chose.* Donc écrivez quelque chose, même si ce n'est pas beau. Ce serait agréable si la prose lucide et précise sautait du clavier sans effort, mais ce n'est que très rarement le cas. Au contraire, la majoritéd'entre nous trouve plus facile d'améliorer un texte existant que de produire le texte lui-même, *ab initio.*Faites donc un premier jet (aussi rude que ce soit) pour vous, et puis polissez-le plusieurs fois avant de le donner àvotre maître de thèse. Les logiciels de traitement de texte sont merveilleux pour ça: dans un premier jet, vous n'êtes pas obligés de commencer au début, vous pouvez laisser des espaces, vous pouvez mettre des petites notes pour vous-même, et puis vous pouvez le transformer en texte lisible et polir l'ensemble plus tard.

Votre maître de thèse s'attendra à lire chaque chapitre sous forme d'ébauche. Il vous le rendra avec ses suggestions et commentaires. *Ne soyez pas déprimé si un chapitre---surtout le premier que vous lui donnez---revient couvert d'encre rouge.* Votre maître de thèse voudra que votre thèse soit aussi bonne que possible, parce que sa réputation aussi bien que la vôtre sera en jeu. L'écriture scientifique est un art difficile, et il faut du temps pour l'apprendre. Par conséquence, il y aura beaucoup de façons par lesquelles votre premier jet pourra être amélioré. Prenez donc une attitude positive à tous les gribouillages avec lesquels votre maître de thèse décore votre texte: chaque commentaire vous donne une possibilité d'améliorer votre document.

Pendant la rédaction de votre thèse, votre style d'écriture scientifique va certainement s'améliorer. Même ceux qui écrivent bien dans d'autres styles améliorent énormément leur écriture scientifique entre la première esquisse du chapitre rédigé en premier et le dernier jet du chapitre rédigé en dernier. Le processus de rédaction d'une thèse est comme un cours sur l'écriture scientifique, et dans ce sens chaque chapitre est comme un devoir dans lequel vous apprenez, sans recevoir une note. Souvenez-vous, ce n'est que la version finale et définitive qui compte: plus est grand le nombre de commentaires que fait votre maître de thèse, mieux c'est. Ceci dit, ne lui donnez jamais le premier jet!

Avant de soumettre un texte à votre maître de thèse, faites-le passer par un logiciel de correction d'orthographe afin qu'il puisse se concentrer sur les points importants. Si vous avez des défaillances grammaticales caractéristiques, ou une tendance à ajouter des phrases informelles, prêtez y une attention particulière avant de rendre votre travail.

Qu'est-ce qu'une thèse? Pour qui l'écrit-on? Comment devrait-elle être écrite?

Votre thèse est un rapport de recherche. Ce rapport concerne un problème ou une série de

problèmes dans une spécialité. Il devraient décrire ce qui était connu précédemment, ce que vous avez fait pour résoudre le(s) problème(s), ce que veulent dire vos résultats, les nouveaux problèmes soulevés par vos recherches, et comment ces nouveaux problèmes peuvent être résolus. Une thèse est très différente d'un devoir d'étudiant: le lecteur d'un devoir est d'habitude celui qui a poséla question. Il connaît déjàla réponse (ou une des réponses), sans parler de l'origine, la documentation, les suppositions et théories et les forces et faiblesses de celles-ci. Les lecteurs d'une thèse ne connaissent pas la "réponse". Dans le cas d'une thèse de doctorat, l'universitéexige un apport original àl'état des connaissances actuel.

Evidemment, votre thèse s'adresse en premier lieu aux membres de votre jury. Ce ront des experts du domaine scientifique dans le cadre duquel vous avez effectué s recherches. Mais *l'expert mondial concernant votre sujet, c'est vous*, ne l'oubliez jamais. Vos lecteurs n'auront probablement pas consacré leurs trois rnières années à ce sujet. Vous n'écrivez pas pour vous-même, mais pour eux, et tre exposé doit être suffisamment clair pour leur permettre de comprendre.

Votre thèse sera aussi utilisée comme un rapport scientifique et sera consultée par de futurs chercheurs dans votre laboratoire et ailleurs, qui voudront savoir, en détail, ce que vous avez fait. Les thèses sont parfois consultées par des personnes appartenant à d'autres institutions, et la bibliothèque envoie des copies à partir de la version sur microfilm (oui, toujours) à ceux qui les demandent. De plus en plus, les thèses sont entreposées sous une forme entièrement numérique (les figures aussi bien que le texte sous forme numérique). Une conséquence de ceci est que votre thèse peut être consultée facilement par les chercheurs du monde entier. Rédigez dans cette optique.

Il est souvent utile de demander à quelqu'un d'autre que votre maître de thèse de lire quelques sections de la thèse, en particulier l'introduction et la conclusion. Demandez aussi aux autres professeurs ou chercheurs de lire les sections de la thèse qu'ils peuvent trouver pertinentes ou d'intérêt, parce qu'ils peuvent être capable de faire des apports précieux. Dans les deux cas, ne leur soumettez que la version révisée, afin qu'ils ne gaspillent pas le temps à corriger votre grammaire, style ou présentation.

Combien de détails?

Plus que pour un article scientifique. Une fois votre thèse reliée et vos amis ayant lu les trois premières pages, il est probable que les seules personnes susceptibles de lire votre travail dans l'avenir soient celles qui effectuent des recherches sur ce sujet. Par exemple, un futur étudiant de recherche peut poursuivre la même recherche et sera intéresséàdécouvrir exactement ce que vous avez fait. ("Pourquoi ne fonctionne-t-il plus le machin qu'a construit Dupont? Où est le dessein du circuit? Je regarderai sa thèse." "l'algorithme de Durand ne converge pas dans mon espace paramétrique. Je dois chercher sa thèse." "Comment ce groupe a réussi àfaire marcher cette technique? Je demanderai un exemplaire de la thèse qu'ils ont citée dans leur article.") Pour des composants importants du matériel, vous devriez inclure des dessins d'atelier, les dessins de circuit que vous avez faits et le code des logiciels que vous avez écrits, souvent en forme d'annexes. (Lorsqu'on y est, l'annotation intelligible de code est rare, mais désirable.

Vous avez écrit cette ligne de code pour une raison: àla fin de la ligne expliquez la raison.) Vous avez déjàlu les thèses d'étudiants antérieurs dans le labo où vous êtes maintenant, donc vous savez déjàles avantages d'une thèse qui explique clairement, et/ou les inconvénients d'une thèse vague.

Indiquez clairement ce qui est à vous

Si vous utilisez un résultat, une observation ou une généralisation qui ne sont pas vôtre, vous devez indiquer où dans la littérature scientifique ce résultat est rapporté. Les seules exceptions sont des cas où chaque chercheur dans le champ le sait déjà: les équations de la dynamique peuvent être écrites sans citer Newton, l'analyse du circuit peut se passer d'une référence àKirchoff. La raison de cette obligation qui nous incombe en tant qu'écrivain en sciences est qu'elle permet au lecteur de vérifier la fondation scientifique de la recherche. La physique, dit-on, est une science verticale: les résultats sont construits àpartir des résultats qui, àleur tour, sont construits àpartir d'autres résultats. Des références exhaustives et précises nous permettent de vérifier les bases de chaque addition àla structure de la science, ou au moins de les retracer àun niveau que nous jugeons être fiable. Des références disent aussi au lecteur quelles parties de la thèse sont des descriptions de ce qu'on connaissait déjà, et quelles parties sont vos additions àcette connaissance. Dans une thèse, écrite pour un lecteur qui n'est pas forcement familier avec la littérature spécialisée de votre domaine, ce devrait être particulièrement clair. Il peut être tentant d'omettre une référence afin de faire croire aux lecteurs qu'une bonne idée ou un joli morceau d'analyse est vôtre. Je déconseille vivement de courir ce risque. Le lecteur pensera probablement: je me demande si cette idée est originale?" Le lecteur peut le savoir par une visite au web ou au bibliothèque, ou même par un coup de téléphone.

Je préfère la voix active pour une thèse, mais si vous écrivez dans la voix passive, soyez spécialement soigneux d'indiquer qui a fait quoi. "L'échantillon a été préparé en chauffant yttrium..." ne le rend pas clair si vous avez fait ceci ou si le fournisseur d'yttrium l'a fait. "J'ai préparé l'échantillon." est clair.

Style

Le style de votre thèse est important, mais si l'idée d'accepter les conseils d'un anglophone là-dessus vous gêne, passez tout de suite àla [rubrique prochaine](#).

Le texte doit être clair. Une thèse bien écrite sera plus facile à lire, ce qui vous apportera quelques avantages. L'écriture scientifique doit être un peu formelle---certainement plus formelle que le texte que vous lisez. N'oubliez pas que ceux qui lisent le français sont une minorité, et l'argot et la langue informelle seront plus difficile pour un lecteur non-francophone.

Des mots courts et des phrases simples sont généralement meilleurs. Pourtant, il arrivera que vous ayez besoin d'une phrase compliquée parce que l'idée est compliquée. Si votre déclaration fondamentale exige plusieurs qualifications, chacune de celles-ci peuvent avoir

besoin d'une phrase: " Quand [qualification], et où [stipulation], et si [condition] alors [déclaration]." Quelques mots techniques longues seront aussi nécessaires dans beaucoup de thèses, en particulier dans les domaines telle que la biochimie. Ne sacrifiez pas la vérité pour la brièveté. "Noir est blanc " est simple et frappant. Ça plaira à un écrivain de publicité. "Des objets dont les albédo sont très différents peuvent être éclairés différemment afin de produire de spectres de réflexion semblables" est plus compliqué et utilise des mots moins communs, mais en comparaison avec l'exemple précédent, a l'avantage d'être vrai. Le deuxième exemple irait très bien dans une thèse de physique parce qu'un physicien francophone n'aura pas de problème avec ces mots. (Un physicien qui ne connaitrait pas tous ces mots serait heureux de remédier à ses lacunes soit par le contexte, soit en consultant un dictionnaire.)

Quelquefois il est plus facile de présenter de l'information et des discussions par une série de points numérotés, plutôt que par un ou quelques paragraphes longs et maladroits. Une liste de points est souvent plus facile à écrire. Vous devriez pourtant être prudent de ne pas trop vous servir de cette présentation: votre thèse doit être une discussion persuasive, et non pas seulement une liste de faits et d'observations.

Un choix stylistique important est entre la voix active et voix passive. La voix active ("j'ai mesuré la fréquence...") est plus simple, et il rend tout de suite clair ce que vous avez fait et ce qui a été fait par des autres. La voix passive ("la fréquence a été mesurée...") rend plus faciles des phrases ambigües, incorrectes ou maladroites. Ce choix est une question de goût: Je préfère l'actif parce que c'est plus clair, plus logique et elle rend simple l'attribution. Les avantages cités pour la voix passive sont les suivants (i) beaucoup de thèses sont écrites dans la voix passive, et (ii) des gens très polis trouvent l'usage du "je" impudique.

Présentation

Il n'est pas nécessaire de transformer votre thèse en chef-d'oeuvre d'édition. Votre temps et énergie peuvent être plus effectivement dépensés àaméliorer le contenu que l'apparence.

Souvent, un diagramme clair et acceptable peut être desinné à la main plus rapidement qu'avec un logiciel graphique. Si vous allez poser la thèse en forme électronique, vous pouvez scanner la version faite à la main et, en noir et blanc, elle ne saura pas un fichier énorme.

En général, les étudiants passent trop de temps sur les diagrammes---temps qui aurait pu être passé en critiquant les discussions, en rendrant plus claires les explications, en cherchant des erreurs et en réfléchissant d'avantage sur la signification des résultats. La raison est que dessiner est plus facile que penser.

Les lecteurs ne sont pas impressionnés par une thèse qui est trop longue. Ils ne seront pas contents de devoir lire une grande quantité texte vague ou inutile.

La fin.

Une date limite est très utile pour plusieurs raisons. Vous devez rendre la thèse, même si vous

pensez que vous devriez faire encore un jet de ce chapitre, ou changer l'ordre de cette section, ou un autre raffinement quelconque. Si vous n'avez pas de date limite, ou si vous considérez de la remettre àplus tard, je vous prie de d'accepter qu'*une thèse est un travail aussi grand que vous ne pouvez pas la rendre parfaite dans une durée finie.*Il y aura inévitablement des choses que vous auriez pu faire mieux. Il y aura inévitablement quelques fautes. En effet, grâce àune loi proche àcelle de Murphy, vous en découvrirez un quand vous ouvrez la copie qui vient d'arriver du lieur. N'importe combien vous réfléchissez et combien de fautes vous y trouvez, il y aura quelques choses qui pourraient être améliorées. Inutile d'espérer que les examinateurs ne les remarqueront pas: beaucoup d'examinateurs se sentent obligés de trouver des exemples d'améliorations (sinon erreurs) seulement pour montrer qu'ils l'ont lue. Faites donc une date limite et respectez-la. Rendez la thèse aussi bonne que vous ne pouvez dans ce temps, et puis soumettez-la! (En réfléchissant, je vois un avantage pour les thèses rédigées avant les processe-textes. On payait un dactylographe pour la taper et on n'avait pas l'argent pour le faire plus qu'une fois.)

Combien d'exemplaires?

Discutez cette question avec votre maître de thèse. Pour les membres du jury, les bibliothèques d'universitéet pour vous bien sur. Mais vous devriez faire des exemplaires pour distribuer. Ces exemplaires devraient être envoyées aux autres chercheurs qui travaillent dans le champ afin que:

- ❍ ils peuvent découvrir quel travail merveilleux vous avez fait avant qu'il ne paraisse dans les journaux;
- ❍ ils peuvent voir les détails de méthodes et résultats qui vont été publiés plus brièvement ailleurs;
- ❍ ils peuvent se rendre compte que vous êtes un excellent chercheur.

Ces réalisations pourraient être utiles si une place apparaît dans leurs labos, ou si ils sont les lecteurs de votre proposition pour un contrat de recherche post-doctorale. Simplement avoir votre nom sur leurs étagères peut être un avantage.

Le commentaire suivant est de Marilyn Ball de l'Université Nationale Australienne à Canberra: " Quand j'avais fini ma thèse, un postdoc m'a sagement conseillé de donner un exemplaire à mes parents. Je n'aurais jamais pensé à faire ça, parce que je ne pouvais pas imaginer ce qu'ils en feraient. Je suis quand même heureuse d'avoir suivi son conseil, parce que mes parents ont vraiment apprécié d'en recevoir un exemplaire et l'ont montré fièrement pendant des années. (Ma mère n'avais jamais fini le lycée et mon père travaillais à construire et à réparer les camions. Néanmoins, ils étaient ravis d'avoir un exemplaire de ma thèse.)

Personnel

Dans la situation idéale, vous pourrez passer une grande partie---peut-être la majorité---de votre temps àla rédaction de votre thèse, ce qui peut être mauvais pour votre santéphysique et mentale.

Dactylographie

Orientez votre chaise et ordinateur correctement. Le service de santé de l'université ou les dactylographes professionnels pourront vous donner les conseils ou une affiche avec des hauteurs relatives racommandées, des allures saines et aussi des exercices que vous devriez faire si vous passez beaucoup de temps au clavier. C'est important: vous ne voudriez pas être embêté par les douleurs de dos ou de cou. Essayez de interrompre de longues séances au clavier avec d'autres tâches.

Si vous ne savez pas taper par touche, vous devriez l'apprendre aussi bien pour la productivité que pour la santé de votre cou. Il y a plusieurs bons logiciels qui vous enseignent la dactylographie interactivement. Si vous en utilisez un pour disons 30 minutes par jour pendant deux semaines, vous serez capable de taper par touche. D'ici jusque à la fin de la thèse, la vitesse d'écriture gagnée ainsi vous repayera plus que les dix heures investies avec le logiciel. Soyez prudent, pourtant, de ne pas utiliser les exercices de dactylographie pour éviter de travailler sur la thèse.

Exercice

Ne laissez pas tomber l'exercice physique pendant la rédaction. Le manque d'exercice vous fait sentir mal dans la peau, et vous n'avez pas besoin d'autre raisons pour sentir mal en rédigant une thèse. 30-60 minutes d'exercice par jour n'est pas temps de rédaction perdu: je trouve que si je ne fais pas d'exercice régulier, je dors moins bien et plus longtemps. Allez à la fac au pied, ou, si elle est loin, sortez du métro quelque stations avant. Beaucoup de gens remarquent qu'une promenade les aide à penser, ou éclaircit la tête. Vous pourriez trouver que des promenades de temps en temps améliorent votre productivité.

Nourriture

N'oubliez pas de manger, et fait un effort à manger de la nourriture saine. Vous ne devriez pas perdre la forme ou risquer une maladie à ce temps critique. L'exercice est bon pour vous donner de l'appétit. Évidemment vous avez peu de temps pour cuisiner, mais gardez un stock de fruits, de légumes et de pain. Il prend moins de temps pour faire un sandwich ou une salade que d'aller au fast food du coin, et vous sentirez meilleur après.

Produits psychoaffectifs

Les thesards ont une longue tradition de se servir du café comme stimulant et des boissons alcoolisées ou le marijuana comme relaxants. Usagé en modération ne semble pas avoir d'effets negatifs sur la qualité de thèse produite. Cependant, les excès reduisent évidemment la productivité: plusieurs cafés doubles et vous volerez trop pour s'asseoir et écrire; plusieurs digestifs le soir vous ralentirent le lendemain.

Les autres

Les autres compatiront avec vous, mais ne les oubliez pas. Époux, amants, famille et copains ne devraient pas être sous-estimés. Passez du temps avec eux et, en faisant, amusez-vous bien. Ne passez pas votre temps ensemble à vous plaindre au sujet de votre thèse: ils s'offensent déjà de la thèse parce qu'elle vous sépare d'eux. Si vous

pouvez trouver un autre thésard, pas forcement dans la même discipline, ça pouvait être thérapeutique de se plaindre à l'un l'autre au sujet des maîtres de thèse et des difficultés.

Coda

Rédiger une thèse est du travail dur. Un postdoc anonyme m'a dit: "Vous devriez leur dire qu'il va être désagréable, qu'il bouleversera leurs vies, qu'ils devront laisser tomber leurs amis et leurs vies sociales pendant quelques temps. C'est une période dure pour presque chaque étudiant." Elle a raison: c'est du travail certainement dur, ce sera probablement stressant et vous devez y adapter votre rythme àlui. C'est aussi un rite de passage important. De la part de savants partout, je vous souhaite 'merde' pour la thèse!

Une structure suggérée

La table des matières et titres du chapitre ci-dessous n'est qu'une suggestion. Dans quelques cas, un ou deux de ces rubriques peuvent être sans rapport pour votre thèse. Les chapitres de résultats et discussion sont souvent comblés dans plusieurs chapitres. Réfléchissez au plan de chapitres et décidez ce qui est le meilleur pour rapporter votre travail. Puis faîtes un liste de rubriques qui indiquera ce que vous allez mettre dans chaque chapitre. Essayez de faire ce liste en détail, afin que vous finirez avec une liste de points qui correspondent aux subdivisions ou même aux paragraphes de votre thèse. A cette étape, pensez soigneusement au sujet de la logique de la présentation: dans chaque chapitre, il est souvent possible àprésenter les idées dans des ordres différents, et ces versions différentes ne seront pas également faciles àsuivre. Si vous faites un plan de chaque chapitre et section avant de commencer àrédiger, le résultat sera probablement plus clair et plus facile àlire. Ce sera aussi plus facile àécrire.

Pages introductoires

Dans la version originale de ce document, je donne un liste de pages introductrices selon les règles et traditions des universités anglophones. Pour une thèse française, je vous conseille de demander au bureau d'études doctorales de votre institution s'ils ont des règles, et aussi de regarder des exemples de thèses récentes qui n'ont pas subi de problèmes bureaucratiques. D'habitude, une thèse française a une page de titre qui présente:

le nom de l'institution
le type de thèse
la spécialité
le nom du doctorant
le titre de la thèse
la date de la soutenance
les noms des membres du jury, avec le président et le(s) rapporteur(s) indiqués.

Elle est suivie par une page (facultative) de remerciements, une table de matières, et puis les chapitres de la thèse. Le résumé, en français et en anglais, se trouve à la fin. Je discute le résumé avant de passer aux autres composants de la thèse dans l'ordre normal.

Résumé

De toute votre thèse, cette partie sera celle qui aura le publique le plus grand. Il est mieux de l'écrire vers la fin, mais pas au à la dernière minute parce que vous aurez besoin d'en faire plusieurs jets. En plus, le résumé a une telle importance que ça vaut vraiment la peine de demander à un collègue ou copain anglophone d'éditer votre version. Le résumé devrait être une distillation de la thèse: une description concise du problème(s) adressé(s), votre méthode de le(s) résoudre, vos résultats et conclusions. Un résumé doit être indépendant. D'habitude il ne contient pas de références. Quand une référence est nécessaire, ses détails devraient être inclus dans le texte du résumé. Vérifiez la limite de longueur avec votre fac.

Remerciements

La plupart de thésards mettent, dans une page, leurs remerciements à ceux qui les ont aidés directement dans des matières scientifiques, et aussi à ceux qui les ont aidés indirectement en fournissant de telles qualités indispensables comme la nourriture, l'éducation, la patrimoine génétique, le support financier, de l'aide, du conseil, de l'amitié etc. *Si une partie de votre travail est une collaboration, vous devez indiquer clairement qui a fait quelles parties du travail.*

La table de matières

Le chapitre d'introduction commence sur la page 1. Si vous voudriez numéroter les pages précédentes, faîtes-le avec des chiffres romains. Il est très utile de mettre les rubriques de sousdivisions de chaque chapitre, aussi bien que les titres du chapitre. Souvenez-vous que la thèse peut être utilisée comme une référence dans le labo, donc il est important de pouvoir y trouver facilement ce qu'on y cherche.

Introduction

Quel est le sujet et pourquoi est-il important? Expliquez le(s) problème(s) aussi simplement que vous ne pouvez. Souvenez-vous que vous avez travaillé sur ce projet pour quelques années, donc vous le connaissez très bien. Essayez de reculer mentalement et de prendre une vue plus générale du problème. Quel est le rapport de votre problème avec les grandes thèmes de votre discipline?

Surtout dans l'introduction, *ne surestimez pas la familiarité du lecteur avec votre sujet.* Vous écrivez pour les experts dans votre discipline, mais ils ne sont pas spécialistes dans votre sujet particulier. Il est utile d'imaginer une personne particulière---pensez à un collègue que vous avez peut-être rencontré à une conférence pour votre discipline, mais qui travaillait dans une domaine différente. Elle est intelligente, elle a la même formation générale, mais elle connaît peu la littérature ou les techniques spécifiques de votre sujet particulier.

L'introduction doit être intéressante. Si le lecteur la trouve fatiguante, il est improbable que vous ranimerez son intérêt dans le chapitre de matières et méthodes. Pour le premier paragraphe ou deux, la tradition autorise une langue qui est moins sèche que la

norme scientifique. J'espère que votre sujet vous inspire toujours, et voilà l'endroit pour en profiter. Essayez de inspirer le lecteur de vouloir lire le kilogramme d'A4 qui est arrivé sur son bureau. Allez à la bibliothèque et lisez les introductions de plusieurs thèses. Y en avait-il certaines qui vous ont donné le désir d'en lire d'avantage? Y en avait-il d'autres qui étaient ennuyeux?

Ce chapitre va probablement passer par plusieurs jets, pour qu'il puisse être simple, logique, court et intéressant à la fois. Pour ce chapitre, je trouve qu'il est utile de demander à quelqu'un qui n'est pas spécialiste de le lire et d'y faire des critiques. Est-ce que c'est une introduction suffisante? Est-il facile de suivre? Il y a des arguments pour rédiger ce chapitre---ou au moins pour en faire une révision majeure---vers la fin de la rédaction de la thèse. Votre introduction devrait dire où la thèse se dirige, ce qui deviendra plus clair pendant la rédaction. En plus, ce chapitre a besoin de tout ce que vous allez apprendre au sujet de la rédaction scientifique.

Revue de la Littérature

D'où vient ce problème? Qu'est-ce qu'on en sait déjà su au sujet? Quelles sont des autres méthodes qu'on a essayées pour le résoudre?

En principe, vous aurez déjà fait beaucoup de travail dur, si vous avez bien regardé le journaux du sujet comme vous vous avez promis à faire il y a trois années. Si vous en avez déjà résumé les papiers importants pour vous, vous avez un bon point de départ pour la revue.

Combien d'articles à citer? A quel point doivent-ils être pertinents pour être inclus? C'est une question difficile. Une centaine est raisonnable pour beaucoup de thèses, mais il dépend du champ. Vous êtes l'expert mondial sur le sujet (étroit) de votre thèse: vous devez démontrer ceci dans votre revue.

Un point rudement politique: n'oubliez pas de citer des articles pertinents publiés par les membres de votre jury, ou par les chefs de labo à qui vous pouvez envoyer un exemplaire de la thèse dans l'année prochaine.

Les chapitres du milieu

Dans certaines thèses, les chapitres du milieu sont simplement les articles du journal dont le candidat était l'auteur principal. Il y a plusieurs raisons d'éviter ce format.

Une des raisons est que, dans une thèse, il est permis et attendu que le niveau de détail soit plus profond que celui d'un article dans une revue scientifique. Pour des publications, on est d'habitude obligé de réduire le nombre de courbes. Dans beaucoup de cas, toutes les données et des cas intéressants peuvent être inclus dans la thèse, et pas simplement celles qui sont déjà parues dans le journal. Le détail expérimental est plus explicite dans une thèse. Relativement souvent, un chercheur demande un exemplaire d'une thèse afin d'avoir d'avantage de détail sur la façon dans laquelle

l'étude a été faite.

Une autre raison est qu'il y aura probablement de la matière en commun parmi les sections 'Matières et méthodes" de vos publications.

La structure exacte des chapitres de milieu variera de thèse en thèse. Souvent dans une thèse, il est nécessaire d'établir un fond théorique, de décrire les techniques expérimentales, et puis de rapporter ce qui a été fait sur plusieurs problèmes différents ou des étapes différentes du problème, et puis finalement de présenter un modèle ou une nouvelle théorie basé sur le nouveau travail. Pour une telle thèse, les titres de chapitre peuvent être: Théorie, Matières et Méthodes, {premier problème}, {seconde problème}, {troisième problème}, {théorie ou modèle proposé} et puis le chapitre de conclusion. Pour d'autres thèses, ce serait plus logique de discuter des techniques différentes dans des chapitres différents, plutôt qu'avoir un seul chapitre de matières et méthodes. Voici donc quelques commentaires sur les éléments de matières et méthodes, théorie, résultats et discussion, qui ne vont pas toujours correspondent chacun a un chapitre.

Matières et Méthodes

Ce chapitre varie énormément de thèse en thèse, et peut être absent dans une thèse théorique. Le principe est simple: il devrait être possible pour un chercheur compétent, suivant votre description, de reproduire exactement ce que vous avez fait. Il est bien probable que cette épreuve sera mise en route: un jour après que vous soyez parti, un autre chercheur voudra faire une expérience semblable, ou dans le même labo et avec votre appareil, ou indépendamment ailleurs. S'il vous plaît, rédiger ce chapitre pour rendre facile la tache de ce chercheur.

Dans certaines thèses, en particulier des thèse pluridisciplinaires ou de recherche appliquée, on peut avoir plusieurs tels chapitres. Dans ce cas, les disciplines différentes devraient être indiquées dans les titres de chapitre.

Théorie

Quand vous rapportez une analyse théorique qui n'est pas original, vous devriez y mettre matière suffisante pour permettre au lecteur de comprendre le développement et ses bases physiques. Parfois vous allez présenter la théorie *ab initio* mais vous ne devez pas reproduire deux pages d'algèbre que le lecteur pourrait trouver dans un texte standard. Ne mettez pas de la théorie qui n'a pas de rapport avec le travail que vous avez fait.

En rédigeant la section théorie, pensez au moins aussi aux discussions physiques comme qu'aux équations. Que veulent dire ces équations? Quels sont les cas importants?

Quand vous rapportez votre propre travail théorique, vous devez mettre plus de détail, mais considérez placer de longues dérivations aux annexes. Pensez aussi à l'ordre plus

logique et au style de présentation: l'ordre dans lequel vous avez fait le travail n'est pas toujours le plus clair pour la présentation.

Le suspens n'est pas nécessaire pour rapporter la science: vous devriez dire au lecteur où vous allez le conduire avant que vous ne commenciez. (Et bien sûr, vous pouvez lui dire après ou vous l'avez amené.)

Résultats et discussion

Des sections de résultats et discussion sont souvent mis dans plusieurs chapitres d'une thèse. Cette pratique est raccommandée à cause de la longueur d'une thèse: vous pouvez avoir plusieurs chapitres de résultats et, si vous attendez jusqu'à ce qu'ils soient tous présentés avant de les discuter, le lecteur risque d'avoir oublié le sujet dont vous parlez.

Faites attention que vous avez décrit les conditions sous lesquelles vous avez obtenu chaque série de résultats. Quels paramètres ont été tenus constants? Quels étaient les valeurs des autres paramètres pertinents? Montrez les erreurs de mesure et servez-vous des épreuves statistiques appropriés aux comparaisons et aux analyses que vous faites.

Faites attention aussi avec vos courbes. L'origine et l'intercepte sont souvent importants donc, à moins que l'échelle de vos axes et la gamme de vos données le rendent impossible, les zéros des deux axes (ou d'une axe) devraient paraître sur la courbe. Vous devriez montrer des barres d'erreur sur chaque donnée, à moins que les erreurs soient très petites. Pour une mesure seule, la barre devrait être votre évaluation des erreurs expérimentales dans chaque coordonnée. Pour mesures multiples, les barres devraient inclure l'erreur type. ?? (standard error?) Dans un ensemble de données, les erreurs peuvent être très variables, donc, où c'est le cas, vos régressions doivent être faites en minimisant la somme de carrés du rapport de la différence pour chaque point à son erreur. C'est une lacune dans beaucoup de logiciels de manipulation de données et de courbes. Mike Johnston, étudiant à UNSW, a écrit un logiciel qui fait des courbes avec de telles régressions. Il se trouve à www.phys.unsw.edu.au/3rdyearlab/graphing/graph.html.

Dans la plupart des cas, vos résultats ont besoin de discussion. Qu'est-ce qu'ils signifient? Quelle contribution font-ils à la connaissance humaine? Sont-ils en accords avec les théories courantes? Donnent-ils de nouveaux perspectives? Suggèrent-ils de nouvelles théories ou mécanismes?

Essayez de vous éloigner de votre perspective habituelle et regardez votre travail comme de loin. Ne vous demandez pas simplement ce qu'il veut dire selon l'orthodoxie de votre propre groupe de recherche, mais aussi comme d'autres gens dans le champ--- ou même des non-spécialistes---peuvent le voir. A-t-il des implications qui n'ont pas de rapport avec les questions sur lesquelles vous avez commencé?

Chapitre final, références et annexes

Conclusions

Vos conclusions vont apparaître dans votre résumé mais dans très brève forme, parce qu'il doit inclure aussi d'autre matière. Un résumé de conclusions peut être plus longue que la conclusion du résumé, et vous avez donc l'espace d'être plus explicite et plus prudent avec les qualifications. Vous pouvez le trouver utile de mettre vos conclusions dans un liste de points.

Il est souvent le cas qu'une enquête scientifique livre plus de questions que de réponses. Votre travail suggère-t-il des questions supplémentaires intéressantes? En quelle façon peut-on améliorer une étude comme le votre dans l'avenir? Quelles sont les implications pratiques de votre travail?

Ce chapitre devrait être raisonnablement court---peut-être quelques pages. Comme avec l'introduction, je pense que c'est une bonne idée de demander à un non-spécialiste de le lire et d'y faire des critiques.

Références (voir aussi Revue de littérature)

Vous serez probablement tenté d'omettre les titres des articles cité, et l'université autorise cette pratique, mais pensez à tous les fois quand vous avez cherché une référence pour trouver, simplement en regardant son titre, que ce n'était pas utile après tout.

Annexes

S'il y a du matériel que devrait être dans la thèse mais qui romprait le fil ou qui ennuierait le lecteur insupportablement, mettez-le dans une annexe. Typiquement, les annexes contiennent: logiciels importants et originaux, dossiers de données qui sont trop grands à être mis dans les chapitres des résultats, courbes ou tables de données de résultats qui ne sont pas suffisamment importantes pour garder dans le texte principal.

Distribution

Si vous avez trouvéutiles ces documents, je vous invite àdonner ou l'adresse ou un exemplaire impriméàvos collègues thésards ou aux organisations d'étudiants. Je vous prie de ne pas les vendre ni d'utiliser le contenu sans citer l'auteur.

Suggestions, remerciements et avertissements

Ce document sera révisé de temps en temps. Si vous avez des suggestions pour l'améliorer, envoyez-les s'il vous plaît. Mais faites-le après la soutenance: *n'utilisez pas cette invitation pour prolonger le temps avant d'écrire.* Je remercie Marilyn Ball, Gary Bryant et Bill Whiten, dont les suggestions ont été incorporées dans cette version. Je remercie aussi Nathalie Henrich et Marc et Blandine Jaeger qui ont trouvé le temps de lire ce document et corriger les fautes de français les plus sérieuses. Les contributions importantes seront reconnues dans de futures versions. Je profite aussi de cette occasion à remercier mes propres maîtres de thèse, Stjepan Marcelja et Jacob Israelachvili, pour leur aide et leur amitié, et pour remercier mes propres

thésards avec qui j'ai eu le plaisir d'être collègue et copain. Les opinions exprimées dans ces notes sont les mien et non pas celles de l'Université de Nouvelle Galles du Sud ni de l'Ecole de Physique.

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Music Acoustics Group / School of Physics / The University of New South Wales

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D'autres sites utiles

Comment survivre à une soutenance

Research resources and linksde Deakin University

"Writing and presenting your thesis or dissertation"de Joseph Levine àMichigan State University, USA

"Postgraduate Student Resources"de l'University of Canberra

The National Association of Graduate---Professional Students(USA)

Le Guilde des doctorants

Quelques bouquins

Stevens, K. and Asmar, C (1999) 'Doing postgraduate research in Australia'. Melbourne University Press, Melbourne ISBN 0 522 84880 X.

Phillips, E.M and Pugh, D.S. (1994) 'How to get a PhD : a handbook for students and their supervisors'. Open University Press, Buckingham, England

Tufte, E.R. (1983) 'The visual display of quantitative information'. Graphics Press, Cheshire, Conn.

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OVERVIEW   RESEARCH   COURSES   STAFF   RESEARCH INSTITUTE   NEWS AND EVENTS

How to Succeed in Postgraduate Study

Marie desJardins [marie@erg.sri.com]

Abstract:

This paper attempts to raise some issues that are important for postgraduate students to be successful and to get as much out of the process as possible, and for supervisors who wish to help their students be successful. The intent is not to provide prescriptive advice -- no formulas for finishing a thesis or twelve-step programs for becoming a better supervisor are given -- but to raise awareness on both sides of the supervisor-student relationship as to what the expectations are and should be for this relationship, what a postgraduate student should expect to accomplish, common problems, and where to go if the supervisor is not forthcoming.

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GUIDE FOR WRITING A FUNDING PROPOSAL

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(Last Updated:)

This **Guide for Writing a Funding Proposal** was created to help empower people to be successful in gaining funds for projects that provide worthwhile social service. A major theme that runs throughout the **Guide** is a concern for the development of meaningful cooperative relationships - with funding agencies, with community organizations, and with the people you are serving - as a basis for the development of strong fundable initiatives. The **Guide** is built on the assumption that it is through collaboration and participation at all levels that long term change can be affected.

To make this **Guide** as useful as possible, all suggestions have been carefully reviewed with a concern that they be easy to implement and can have the greatest positive effect on the creation of a funding proposal. (This is the same design concern that I used for the creation of the companion guide for graduate students - **Guide for Writing and Presenting Your Thesis or Dissertation**). Long orations are minimized and suggestions are presented in a direct and clear manner. Actual proposal examples are included so that you can easily see the different suggestions demonstrated.

As you are going through this **Guide** you will probably see things that aren't clear, need fixing, or should be further clarified. Please send them along and I will do my best to improve the **Guide** based upon your ideas. I try to make major revisions in the Guide at least 2-3 times each year. Your suggestions on how to improve this **Guide** will be most appreciated

And finally, I receive many requests asking me to recommend a book or two that would be helpful in writing a good proposal. I've started to create such a listing of books I've identified and my review of each of them. Feel free to check out my **Selection of Books to Help with the Preparation of a Funding Proposal**.

Enjoy using this **Guide** and I hope it brings you good luck as you seek funding for your ideas!

Joe Levine (levine@msu.edu)

Proposal Section		
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Teaching At a Distance: From Concept to Practice

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How to Succeed in Postgraduate Study

Introduction

Marie desJardins

This article originated with a discussion I had with several women academics about the problems women face in undertaking postgraduate study, and how more women could be encouraged to undertake postgraduate study in computer science. Eventually, the conversation turned to the question of what these women could do in their interactions with women students to support and encourage them. I volunteered that over the course of my postgraduate career I had collected a variety of papers and email discussions about how to be a good supervisor, how to get through a postgraduate program, and issues facing women. They were eager to get this material, and I told them I would sort through it when I got a chance.

After mentioning this project to a number of people, both postgraduate students and staff -- all of whom expressed an interest in anything I could give them -- I realized two things: first, the issues that we were talking about really were not just women's issues but were of interest to all postgraduate students, and to all caring supervisors. Second, in order to disseminate the information I had collected (and was starting to collect from others) it seemed to make more sense to compile a bibliography, and write a paper that would summarize the most useful advice and suggestions I had collected.

I solicited inputs from friends and colleagues via mailing lists and Internet bulletin boards, and collected almost an overwhelming amount of information. Sorting through it and attempting to distill the collective wisdom of dozens of articles and hundreds of email messages has not been an easy task, but I hope that the results provide a useful resource for postgraduate students and supervisors alike. The advice I give here is directed towards Ph.D. students in computer science and their supervisors, since that is my background, but I believe that much of it applies to postgraduate students in other areas as well.

In my experience, the two main things that make postgraduate study hard are the unstructured nature of the process, and the lack of information about what you should spend your time on. I hope that this article will provide information for both postgraduate students and supervisors that will

help make the process less painful. I want to emphasize that postgraduate study is not easy, and these suggestions will not always be easy or even possible to follow (and they may not even be the ideal goal for you, personally, to strive for). You shouldn't let that discourage you: start small, think big, and keep yourself focused on your ultimate goal, which shouldn't just be to get through your postgraduate program, but to enjoy yourself, make progress towards being able to do what you want to do with your life, and learn something in the process.

I owe a debt of gratitude to David Chapman, whose paper [4] was an invaluable reference for me not only during the writing of this article, but during my postgraduate studies as well.

The goals of this article are to raise awareness of the need for a healthy and interactive postgraduate student-supervisor relationship, to provide pointers and guidance for both supervisors and postgraduate students in navigating the maze of a doctoral degree, and to give references and resources for those who hope to learn more.

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How to Succeed in Postgraduate Study

Before You Start

by Marie desJardins

Many headaches can be avoided by doing some advance planning. First, why undertake postgraduate study at all? The usual reasons given are that a Ph.D. is required or preferred for some jobs, especially research and academic positions; that it gives you a chance to learn a great deal about a specific area; and that it provides an opportunity to develop ideas and perform original research. Wanting to delay your job hunt is probably not a good enough reason. Over the past decade, research and academic positions have become more difficult to find, and many recent Ph.D.s end up "killing time" in a series of postdoctoral positions, or taking non-research jobs. Having a Ph.D. is not a guarantee of finding a better job in and of itself! In addition, postgraduate study is a lot of work and requires strong motivation and focus. You have to really want to be there to make it through.

It helps to have a good idea of what area you want to specialize in, and preferably a couple of particular research projects you might like to work on, although many postgraduate students change their minds about research projects and even specialization field after they start school. Look for books and current journals and conference proceedings in your area, and read through them to get an idea of who's doing what where. (You'll be doing a *lot* of reading once you start your postgraduate studies, so you might as well get used to it.) This is where supervisors first enter the scene: staff members ought to be willing to talk to undergraduates and help them find out more about research areas and suitable departments in which to study. Try to get involved in research: ask members of academic staff and TAs (teaching assistants) whether they need someone to work on an ongoing project, or start an independent research project, with guidance from a staff member.

Contact members of academic staff and postgraduate students at the schools you're interested in. Tell them about your background and interests and ask them what research projects they're working on. A good way to do this is via electronic mail if possible -- email is much easier and quicker to respond to than a paper letter. A good supervisor will be willing to answer these kinds of inquiries (although if they're busy they may give you only a brief answer or point you towards a postgraduate student -- you'll have to

use your intuition to decide whether they're brushing you off or just busy). If you can't get any answer at all, consider that that individual might not end up being a very accessible supervisor. Asking these questions will help you narrow down your choices and may increase your chances of admission if the academics you contact become interested in working with you.

Your best bet is to find a school where there are at least two staff members you'd be interested in working with. That way, if one doesn't work out, or is too busy to take on a new student, you have a fallback position. Breadth of the postgraduate program (i.e., high-quality staff in a broad range of subareas) is also a good thing to look for in a department, especially if you're not entirely certain what you want to specialize in.

It's also important to most people to feel comfortable with the community of postgraduate students. It pays to talk to some of the postgraduate students (both junior and senior) to find out how they like it, which supervisors are good, and what kinds of support (financial and psychological) are available. Because there are so many students applying to each school, even highly qualified applicants are often rejected. You should apply to a range of programs -- and don't take it personally if you do get rejected by some of them.

You can increase your chances of getting into a postgraduate program by developing good relationships with your professors, lecturers and work managers (this is very important for getting good recommendations), working on a research project, having a clear sense of what you want to work on (although it's always all right to change your mind later), having a broad background in your field and in related fields (for example, psychology classes are useful for AI students) and getting good grades (especially in upper division classes in your area of interest). Also, it's a good idea to start thinking early about sources of funding: apply for a scholarship, for example.

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How to Succeed in Postgraduate Study

The Daily Grind

by Marie desJardins

Being a good researcher involves more than "merely" coming up with brilliant ideas and implementing them. Most researchers spend the majority of their time reading papers, discussing ideas with colleagues, writing and revising papers, staring blankly into space -- and, of course, having brilliant ideas and implementing them.

Later I discuss the process and importance of becoming part of a larger research community, which is a critical aspect of being a successful researcher. This section contains ideas on keeping track of where you're going, and where you've been, with your research, staying motivated, and how to spend your time wisely.

Keeping a journal of your research activities and ideas is very useful. Write down speculations, interesting problems, possible solutions, random ideas, references to look up, notes on papers you've read, outlines of papers to write, and interesting quotes. Read back through it periodically. You'll notice that the bits of random thoughts start to come together and form a pattern, often turning into a research project or even a thesis topic. I was surprised, looking back through my journal as I was finishing up my thesis, how early and often similar ideas had cropped up in my thinking, and how they gradually evolved into a dissertation.

You'll have to read a lot of technical papers to become familiar with any field, and to stay current once you've caught up. You may find yourself spending over half of your time reading, especially at the beginning. This is normal. It's also normal to be overwhelmed by the amount of reading you think you "should" do. Try to remember that it's impossible to read everything that might be relevant: instead, read selectively. When you first start reading up on a new field, ask your supervisor or a fellow student what the most useful journals and conference proceedings are in your field, and ask for a list of seminal or "classic" papers that you should definitely read. For AI researchers, a useful (if slightly outdated) starting point is Agre's [1] summary of basic AI references. Similar documents may exist for other research areas -- ask around, and cruise the information superhighway. Start with these papers and the last few years of journals and proceedings.

Before bothering to read *any* paper, make sure it's worth it. Scan the title, then the abstract, then -- if you haven't completely lost interest already -- glance at the introduction and conclusions. (Of course, if your supervisor tells you that this is an important paper, skip this preliminary step and jump right in!) Before you try to get all of the nitty-gritty details of the paper, skim the whole thing, and try to get a feel for the most important points. If it still seems worthwhile and relevant, go back and read the whole thing. Many people find it useful to take notes while they read. Even if you don't go back later and reread them, it helps to focus your attention and forces you to summarize as you read. And if you do need to refresh your memory later, rereading your notes is much easier and faster than reading the whole paper.

A few other points to keep in mind as you read and evaluate papers:

- Make sure the ideas described really worked (as opposed to just being theoretically valid, or tested on a few toy examples).
- Try to get past buzzwords: they may sound good, but not mean much. Is there substance and an interesting idea underneath the jargon?
- To really understand a paper, you have to understand the motivations for the problem posed, the choices made in finding a solution, the assumptions behind the solution, whether the assumptions are realistic and whether they can be removed without invalidating the approach, future directions for research, what was actually accomplished or implemented, the validity (or lack thereof) of the theoretical justifications or empirical demonstrations, and the potential for extending and scaling the algorithm up.

Keep the papers you read filed away so you can find them again later, and set up an online bibliography (BibTeX is a popular format, but anything consistent will do). I find it useful to add extra fields for keywords, the location of the paper (if you borrowed the reference from the library or a friend), and a short summary of particularly interesting papers. This bibliography will be useful for later reference, for writing your dissertation, and for sharing with other postgraduate students (and eventually, perhaps, supervising).

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RESEARCH

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Preparing a Grant Application

Applying for a grant is a time consuming process. The central idea must be formulated, articulated and refined. Consultation with peers is often required, and the implementation of the idea must be fully thought out and costed. A little politicking may be necessary, and in some cases approval must be sought from the host institution before the application can be submitted. Do not underestimate the lead time required to properly prepare a grant proposal.

Some people will tell you that applying for grants is like the lottery. You win some, you lose some. You will hear stories of people labouring for weeks over a proposal, only to have it rejected, while the proposal they knocked up in a few days delivers the goods. Even if the lottery mentality is true, your objective in dedicating time to proposal writing is to maximize the probability of success.

Other benefits flow from the effort put into preparing the grant application. Grant writing yields a well considered and externally evaluated plan for your future work. It is a requirement that commits you to the planning process, even though your commitment to the letter of the plan may change in time. The effort expended on planning the initial proposal will pay back many times over during execution of the research.

Here is some advice that may increase your success rate in securing the necessary funding for your research.

Formulate a Novel Idea

Decide early whether you have or can formulate a project with a good chance of success -- you need to come up with a good and saleable idea that fits within the broad scope outlined by the granting body. The Australian Research Council advise that to be successful in a competitive

atmosphere, where the difference between "just funded" and "just not funded" is slight, it is necessary to generate novel ideas of general importance and interest, and to design exciting approaches to evaluating their success.

Without a good idea, properly articulated and within the scope outlined by the granting body, the proposal will almost certainly fail.

Involve Others in Refining the Idea

Assuming that you are in an active and collegeate research environment, you should meet and refine the idea. Brainstorm. Do not let the urge to get started with writing interfre with the overall planning and development of the central idea. Be responsive to alternate points of view and criticisms -- try not to let defensiveness block the input of good suggestions. Where appropriate, circulate and discuss the proposal in a braoder group -- start with sympathetic colleagues, but then move on to more critical peers.

Read the Guidelines Thoroughly

It is essential that your proposal falls within the bounds of what the granting body is willing to fund. You need to read the guidelines to gain an appreciation of the general aspects of the grants scheme -- how it came about, in what political context, what are the scope and objectives of the scheme, what sort of proposals is the granting body expecting.

Analyse the Selection Criteria

Go through the selection criteria and highlight key statements. Tease out a list of statements, each containing a single idea so that they can be later addressed individually.

Recognise that selection criteria are not always explicitly stated under the heading *Selection Criteria*, a section which sometimes serves principally as a guide to structuring the application. Go through the entire guidelines and highlight any statement relevant to the selection committee's perceptions of a successful application.

Recognize that selection committees often have hidden selection criteria -- I am not sure why this comes about, but I suspect it is because of the difficulties of formulating selection criteria in the absence of knowledge of the field of applicants, or it may be that the commitee wishes subconciously to retain flexibility in its decisions. New Scientist (November 13, 1993) acknowledges that there are typically two types of applicant -- those with and those without contacts in the granting body. The former group receives additional information on the selection process and criteria that will be applied in practice.

If you do not have such contacts, you can partially overcome the deficiency by obtaining documents outlining feedback given to institutions or individual applicants on previous rounds. Obtain written statements or attend talks given by the committee chairperson. Check to see if the guidelines have changed since last year. If they have, it is for a reason, and the regions of the document changed may provide insight into the committee's priorities.

Address the Selection Criteria

Brainstorm with other members of the team on how the proposed project meets, and can be improved to meet the selection criteria. Focus on outcomes, because these are usually more concrete and measurable. You will be surprised what a group of people can come up with on points of strength of a proposal with respect to the selection criteria.

Write the Application

Carefully structure the application so that its performance can be clearly gauged against the selection criteria. Follow strictly the guidelins on format and structure provided by the granting body. Remember, the committee may have hundreds of applications to consider and a quick assessment of whether your proposal gets by the first cut, usually based on a spreadsheet of applications versus selection criteria, is all that you can expect. Make the assessment as painless as possible for the selection panel. Be sure to use a copy of the application form, so as not to neglect some key piece of information.

Circulate the draft for comment by central players and, if possible, one or two applicants who were successful in previous rounds.

Redraft the application and put the draft aside for a couple of weeks.

Mock Assessment

Stand back from the application. Put yourself in the position of the selection committee.

- Is the application free of specialist jargon, and readily understandable by a non-expert committee -- know your audience. If there is a general panel and an expert panel, this task is made all that more difficult -- you must address the information requirements of both without losing the comprehension of either.
- How does the application perform against the selection criteria, both explicit and implicit?
- What are the weaknesses of the application, and have they been addressed to minimize their impact on the likely success of the

application?

- Does the application exude vitality and energy? Can it be seen from the style and tone of the application that the proponents are fully committed to and excited by the prospects of undertaking the project? Has the work started? A start on the project is a good indication of committment.
- Is the budget fully justified and are all items listed acceptable to the granting body? It is not sufficient to justify an item by indicating its cost. You must demonstrate how the item is essential to satisfactory progress in meeting the project objectives.

Additional Considerations

Are there any general statements by government that indicate the importance of the broad field of endeavour in government thinking? Are there any statements made by your host institution that establish the importance of the boad field of endeavour in the institution's plans and directions, and the institution's committment to support research of the kind proposed?

Submission

Redraft and submit the proposal.

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