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PREPARING YOUR THESIS

Suggestions for Higher Degree candidates

Compiled by J.M. PRATT
Professor of Inorganic Chemistry

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A. What is the aim of the thesis?

Your thesis will probably represent your first personal contribution to scientific knowledge and your first serious attempt at scholarly writing. It will have several aims and uses, but in all of these its scientific value is paramount. You will want to produce something to be proud of for years to come - from its scientific content and good style to the appearance of the binding and lettering. You, your supervisor and other members of the research team will use it as a source of data for writing up papers for publication and as background material for further research. Once it is placed on the shelves of the University Library it can be borrowed by outsiders and, in effect, becomes a scientific publication - a permanent memorial to your ability (or otherwise) as a scientist and writer. It should be a challenge to write and a pleasure to read.

The immediate aim, however, is to convince the examiners that you have made a sufficiently worthwhile contribution to research for them to recommend the award of the degree. So treat the writing of your thesis partly as a public relations exercise; look at it from the point of view of the customer (i.e. the examiner), the job he has to do and how he does it, and apply some psychology! Remember that, although the examiner will be a competent scientist, he will almost certainly not be an expert in your particular field.

N.B. The following notes were written with the Ph.D. thesis in mind but, with some difference in emphasis, are also applicable to the M.Sc. thesis.

B. How do the examiners examine?

The examiner will be asked both to give a general report and to answer specific questions on, for example, evidence of acquaintance with methods of research, whether the results are original and publishable, and 'presentation' including literary style; you can see a copy of the form which is sent to the examiners, at the Faculty Office. To do this he may:

1. Read the abstract, followed by the first and last chapters, in order to get the general picture (hence their importance in creating the best possible 'first impression').
2. Next read through the whole thesis, looking carefully at its scientific content and getting a feel for 'presentation' in its broadest sense.
3. Then check particular items both at the strategic level (in particular, the development of your main themes from raw experimental data through to final conclusions) and at the more tactical level (e.g., do you use the conventional symbols and units).
4. Sit back and mull over your results, perhaps read a few relevant papers, try to put your thesis into perspective, and decide on its weak and strong points.
5. Finally, write the report which may range from a single, short and very laudatory paragraph to 4-5 pages of reasoned argument with examples, where the poor examiner has to grit his teeth and explain his reasons for failing or barely passing the candidate.

C. Content and presentation

Writing a thesis is a formidable undertaking. It helps to have some idea of the ingredients required to make a good thesis, and to begin thinking how they apply in your particular case.

Writing the thesis can be considered from the two separate aspects of:

1. The Content, where the aims are (a) to transmit a certain number of facts and ideas (sufficient in quantity and quality for the degree in question) and (b) to convince the reader of the correctness and significance of your results and conclusions.
2. The Presentation, which covers everything from (a) the more tactical level (e.g., freedom from spelling and typing errors; conventions in lay-out, references, tables, symbols, etc.) through

(b) the writing of good English (with emphasis on simplicity and clarity) to (c) the more strategic considerations of selecting your material and structuring your thesis to achieve maximum impact and acceptance for your results and ideas - and at the same time to keep the examiners happy by making it easier for them to do their job.

Never underestimate the importance of the presentation. No thesis with inadequate content will be accepted, however good the presentation; but many theses, where the content is adequate, are dragged down into the borderline category by poor presentation. There are many sources (including the Faculty's 'Style guide for theses and dissertations') to help with 2a and 2b; for conventions regarding symbols, tabulation of data, etc. in your own particular subject, you should refer to other theses and to the leading journals in that subject area. Here we focus attention on the overlapping topics of (1) content and (2c) the selection and organisation of material.

D. What do examiners look for under "Content"?

They will want to be convinced that you have:

1. Acquired a feel for the state of development of your chosen field, what is proven or merely assumed, and which are the main questions waiting to be answered (hence the importance of the literature survey).
2. Selected a topic which is suitable (i.e. not too trivial, extensive or intractable) at the present state of development and, if there is more than one possible approach, have justified your choice of approach.
3. Understood the basis, limitations and assumptions of any techniques used (instrumental, mathematical, taxonomic, etc.) and hence the validity of the data produced.
4. Obtained results which are reliable, not vitiated by too many variables or unknowns, adequate in both quantity and quality, and form a reasonably coherent whole.

5. Made generalisations and drawn conclusions which are soundly based on your own experimental findings, discussed in relation to prevailing ideas and dogma, and represent a significant contribution to the field.
6. Not left any obvious and unexplained gaps - in techniques to be used, experiments to be done, deductions to be drawn, or references to be made to related work.
7. Adopted an approach which adequately reflects what is commonly called the 'scientific method'.
Make sure that the evidence is there and will be noticed by the busy examiner.

E. How can one improve the presentation?

The key points are careful selection and organisation of your most important material, elimination of unnecessary material, a good functional linking together of the different parts, and clear and concise writing; otherwise the reader may lose the thread or simply get bored. More specifically:

1. Limit your thesis as severely as possible, aiming at about 100 pages for a Ph D thesis in mathematics and about 200 pages for a Ph D thesis in other subjects.
2. Don't feel that you must include all your material. Select the most important results and support them with the minimum amount of detail, qualifications and discussion to build up a strong case without, of course, omitting any results which may seriously conflict with your conclusions. Don't blunt their impact by including irrelevant material, and don't worry if you leave out up to 50% of your research results. Do, however, make sure that you have included (a) sufficient experimental detail for someone else to obtain the same results, (b) sufficient background information (e.g., on techniques) for the reader himself to understand and also to realise that you understand, and (c) sufficient discussion of complications (e.g., experimental difficulties) for the reader to be convinced of the reliability of your results.

3. Arrange your chapters and sections in the sequence which appears most logical at the end of your research and let the thesis develop like a good detective story, leading up to a successful dénouement or synthesis towards the end of the final chapter. Don't assume that you have to present your results in the order in which they were obtained. Include a brief outline in the Introductory chapter of the organisation of your remaining chapters.
4. Don't aim to give equal coverage (i.e. pages of thesis per days of research) to those parts which you have selected. Six months' work may best be summarised in one table on one page. Do, however, try to convey some idea of the experimental difficulties and the time spent in developing techniques, etc.
5. Distinguish clearly (a) your results from other people's results, and (b) your actual results from your conclusions and generalisations.
6. Gather the main experimental results of each chapter into a summary at the end of that chapter, and then link the summaries at the end of each chapter to the final chapter, so that the examiner can easily trace your arguments backwards and forwards. Make sure that the discussion and conclusions in the final chapter dovetail into the aims of the thesis, as stated in the first chapter.
7. Save space and ensure a fairly uninterrupted flow of the text by, for example, relegating much of the raw experimental data to an appendix, minimising the number and size of tables and figures (and, if possible, don't require the reader to turn the book through 90°), being parsimonious in the use of sub-sections, and including only those literature references which are directly relevant.
8. Provide explanations and definitions for your terms, abbreviations, symbols, etc., which are adequate for the non-expert and easily located by the reader.
9. Include good cross-references, especially between the text and the appendices.

10. Pay particular attention to the abstract. You depend on it to give you the best possible 'first impression', and remember that from now on the abstract is stored in an information retrieval system, for all the world and all posterity to read! It should indicate the area chosen and the approach adopted and should summarise the main findings (in \leq 350 words for Ph.D., \leq 150 for M.Sc.). Too often the findings are given in the form of vague generalisations, from which the reader cannot judge their possible interest. Make sure that you include sufficient specific detail to convince the reader that your findings are interesting and your thesis worth reading.

Tips on the actual drafting of the thesis

1. Start by deciding which are to be the most important results, themes and conclusions of your thesis; then rough out in note form the synthesis and conclusions (for the final chapter) and the aims of the thesis (for the first chapter). This will help you to decide, after a great deal of painful rethinking, the lay-out of the thesis and which results to include or exclude. Don't necessarily start with the Introduction and work methodically through to the final chapter.

2. At the same time collect all the necessary results and observations (together with essential data on conditions, etc.) and present them in the most concise and convenient tabular and/or graphical form for easy checking by you and your supervisor. Cross-check between experiments; see if the results support the points which you thought you had established. You will probably find awkward gaps and inconsistencies or even detect new patterns or correlations. You cannot decide on the contents of the chapters of the chapters until you are sure of your results, arguments and conclusions. The sooner you can find and fill any such gaps in the data, the better.

Expect to have to do a few more experiments, etc. in order to check a point or to round off a section.

Don't expect to hit on the final order of chapters and sections, let alone the final polished prose, at the first attempt. So don't spend much time at an early stage writing good prose. Leave items in note form, which are also easier to check, as long as possible.

5. When you start writing the prose version, don't waste hours agonising over some particular sentence; just write something. Keep writing, editing and re-writing.
6. Since your mind will be working on your thesis even when you are far from your desk, always have a piece of paper handy for jotting down any inspired idea or felicitous phrase.
7. Manuscripts can be mislaid, stolen or even destroyed; so, when each chapter or section reaches a reasonably advanced stage, make a second copy and keep it separate from the first.
8. List the references (though not with their final numbering) as you go along; you may think that you will remember the paper, but you won't. To avoid possible embarrassment when using a personal pronoun, check that a "he" is not, in fact a "she".
9. When the going gets heavy, remember Oscar Wilde who said 'This morning I took out a comma and this afternoon I put it in again'.
- G. Role of the supervisor
1. You can expect your supervisor to give you general guidance on drafting your thesis, to discuss the main arguments and conclusions, and to read at least one full draft of the thesis.
2. You should not expect him to read more than two drafts or to check for spelling and typing errors, correctness of data and references, and good English; ask your friends to proof-read and offer constructive criticism.
3. You (not the supervisor) are responsible for producing the thesis, though your supervisor will have to declare whether it was submitted with his approval or not.
4. Arrange with your supervisor the stages at which he will read and discuss your draft(s), otherwise you may waste a great deal of time.

*Before writing - looking at several theses in your subject.

After writing - check everything, check and check again.