Dissertation guidebook

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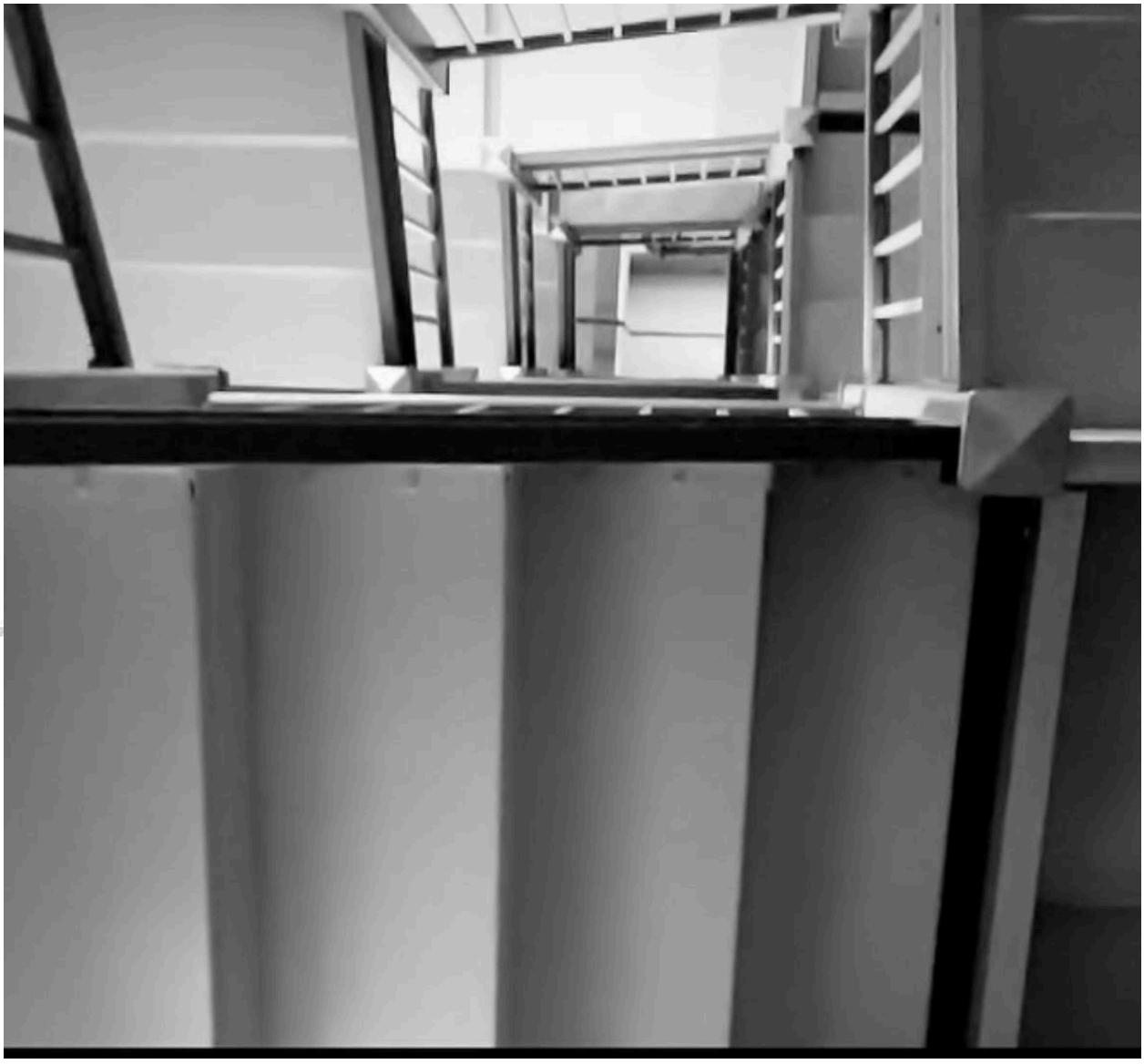

Table of Contents

(TOC, because we can't get enough abbreviations)

Prologue

Writing a PhD dissertation is an incredibly ambitious adventure. Much like any intriguing or worthwhile endeavors one chooses to pursue while alive, completing a dissertation is difficult for many reasons, but resolution of these difficulties is beneficial for many students including myself. Thus I have decided to note for me and others in the future what I have learned about my own writing process. I possess a strange form of memory that requires a trusted document that can be can refer back to and is maintained well enough that I trust it is accurate.The aim of this document guidebook is to aid in my goals to finish my PhD and if n possible others in the future. I will discuss here formatting rules, tips and tricks first.

You will find below an outline which seems out of place but is the first step to formatting in both google docs and abstractly if one can parse patterns meaningful to their own needs (figure 1) This document will contain additional parts regarding expected content for each dissertation chapter, steps I took to approach each challenge I learned from. These lessons will be expressed in an

assessment of tools for workflows to describe strategies used to approach each method. I will describe my own success and failures using each tool, and corresponding user experiences

It is my opinion that if I am struggling this much with tool use that others are too, that sharing information, strategies, and tools, in reality is much more beneficial for each individual and the group. It is my experience that it is assumed that every student will know how to do what is considered "basic" skills like how to use the settings in google docs. This assumption is sometimes untrue for first gen students and I hope I can convince you that the reality is that is is easier to pass information to first generation students and allow for diverse skills to develop while learning basic somewhat arbitrary rules which have impaired learning ability despite being easy to explain or provide tools to those who did not have this information.

As an example of this I will outline below what the sheridan writing center taught to do first with respect to outlining and formatting title and subsections to standardize easily across a long document.this will be used to create a table of contents later in the process. .

Title

Heading 1

Heading 2

Heading 3

Heading 4

Heading 5

Heading 6

Subtitle

Normal text.

Find the rules regarding font for dissertation formatting as it may indicate font size may be 10-12. Format of paragraphs, which are text blocks containing introductory sentences followed by the main point of the paragraph followed by a transition sentence at minimum. Additionally , the transition sentence should link the first sentence, the second sentence and finally the next paragraph.

The above paragraph is my setting for normal text in google docs ideally I

would write these out over time and fill them in to collage them across 5 years of working in a lab, While this may seem tedious, it is essential for not losing track of 200 pages as it allows you to generated a table of contents in google docs. To set each heading click on the format button and change font type to title, headings etc and change the settings for each to your needs. To generate a table of contents go to Now that the general most base framework is established I will discuss my approach to specific tools and strategies used currently by me or tried and not used, and not tried at all.to create .

Chapter 1. Getting started

1.1: Determine the dissertation guidelines from the graduate school

The doctoral dissertation and all of the associated forms and documents related to the completion of a Ph.D. must be submitted to the Graduate School by the deadlines listed above; no extensions will be granted. See Submission of the Final Copy for important clarifications regarding the final submission process. You may find this on your school's graduate school FAQ page. If not, email someone listed, this may take an extraordinarily unbelievable amount of time, so sooner is better than later. Save. Your. Receipts.

1.2 The Final Examination or Defense

The final examination or defense must be scheduled by the candidate at the convenience of the readers. At least two weeks prior to the final examination or defense, candidates must provide the department manager with the appropriate dissertation defense information so the Dissertation Defense Information Form can be completed and returned to the Graduate School. Dissertation Defense

1.3 Deadlines

As of 2024 submission for Students there are multiple deadlines for submission: examples below. CHECK YOUR DEADLINES ASAP. Recently I learned that one can use the word Due Date to mean flexible and Deadline to be inflexible. Be incredibly explicit to anyone with whom you've discussed these topics with and maintain documentation of anything and everything regarding this topic.

For spring graduation: April 1st

Fall graduation: July 1, 2014

Chapter 2: The Manuscript Format

(the hand write! haha)

The doctoral dissertation and all of the associated forms and documents related to the completion of a Ph.D. must be submitted to the Graduate School by the deadlines listed above; no extensions will be granted. See graduate school website for details regarding who to submit to electronically under: Submission of the Final Copy for important clarifications regarding the final submission process. The manuscript should include the following which I will go over in more depth following:

2.1 Frontmatter:

Title page (do not number, but include as a "page" for pagination)

Copyright Page (do not number but include as a "page" for pagination.

Signature Page (iii) (number with roman numerals all lowercase starting at iii due to "pagination"

Curriculum Vitae* (iv)

Preface and Acknowledgments (v)

Table of Contents (vi)

List of Tables vii List of Illustrations (viii)

Pages with arabic numerals begin with chapter 1 and onwards.

Should any element of the preliminary pages be longer than one page, number the pages consecutively. The preliminary pages should appear in this order but not necessarily with the page numbers shown above. The dissertation

proper (including introduction, main body of the text, illustrations, appendices, and bibliography) is numbered using Arabic numerals. The numbering begins with "1" and runs consecutively to the end. Do not place headers on each page. Use them only as appropriate to indicate major sections of the thesis (e.g., INTRODUCTION, CHAPTER 1, BIBLIOGRAPHY). They should be centered and placed two inches from the top of the paper in uppercase type.

2.2 Type and spacing

Standard typeface

These include arial and times new roman set to print at 10-, 11-, or 12-point font are acceptable. All text should be double-spaced, except for

block quotations- do not know what these are

Captions- assuming these are for figure legends

Long headings- do not know what these are for beyond headings that are too long to fit within the width of the page, do not want orphan (or spaced apart) lines.

Footnotes: I have not personally seen many footnotes but these are something one can discuss with the committee. All these should be single-spaced with a blank line between items.

2.3 Page numbers

For the title and copyright pages do not number them, but assign numbers so that the pagination (Never heard of this word but assuming it means the “meta page number” can be found). The next pages are preliminary pages, otherwise

referred to as “the front matter” The front matter includes the CV[1] (curriculum vitae) Each page, including blank ones, must have a number. The number should not appear on the title page or the copyright page but, these pages are assigned numbers and are included in the pagination.

Preliminary pages (i.e. frontmatter) are numbered with lower case roman numerals, centered at the foot of the page, three-fourths of an inch from the bottom edge. The title page counts as page i but the number does not appear on the page. The remainder of the dissertation is numbered with Arabic numerals beginning with 1.

2.4 The Formatting

Most dissertations consist of preliminary pages which are numbered using Roman numerals, and the dissertation proper which is numbered using Arabic numerals. The preliminary pages must appear in the following order:

2.5 Title Page (do not number)

A title page example for my thesis is just a page with the title of my dissertation (please see Figure 1) (not yet completed) and includes:

First line:

the title in 24 sized font THE TITLE SHOULD BE IN ALL CAPITAL LETTERS.

To do this easily in google docs go the format button in the top bar of the

[1] The root word of Curriculum stems from latin, currere, which means “to run a course” whereas Vitae means “Life” so it really means “a course of life”

document.

Select the “text” option (it has a bolded B, if on a Windows can hold down ctl “B” to bold and unbold text, something I learned just this year! Applies to italics ctl “I”) next to it From this menu,

select from three options: lowercase, UPPERCASE, or Title Case for highlighted text (in this case the title line).

Second line:

“By” in 20pt font

Third Line:

your name in 20pt font

Fourth line:

Degree, (B.A., or B.S. or MSc., or BSc), institute of undergraduate studies, and year of completion (i.e. graduation). In 20 pt font

Fifth line:

Blank

Sixth line:

Blank

*Note: blank space is not indicated in the formatting rules from Brown’s website, for me it was dependent on the paragraph line spacing. 1-4 lines of blank space seems to be appropriate from what I can garner.

7th line:

Thesis

8-11th line:

Submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the Department of Pathobiology at Brown University.

12th line:

PROVIDENCE, RHODE ISLAND.

13th line:

Month of Graduation, Year of Graduation.

Example: May, 2024.

2.6 Copyright Page (do not number)

This page is an indication that you are the author of this thesis, and is copyrighted. Personally I had no idea what this was and am still unclear as to what it means, but I will provide the formatting for it. This should be the second page of the thesis manuscript please see Figure 2. The copyright symbol (C) will turn into © if you leave out or delete the spaces between the parenthesis and the C. Be aware that this is annoying for figure legends. I am unsure if others have a way of turning this feature off once this portion is complete but I am sure there is a way. Google will be your friend for this type of "turn off auto-formatting for copyright symbol".

2.7 The Signature Page (page number should be iii)

In addition to the electronic submission, all Ph.D. candidates are required to submit their signature page to the Graduate School, which may be sent

electronically. Samples are available online, by request I believe. Note that: The signature page should bear the signatures of the dissertation director and all readers. The typed names of the director and readers must appear under their signature lines. Electronic signatures are acceptable. An unsigned copy of the signature page should be uploaded to the ETD system (ETD= Electronic T? D?). Some schools provide the opportunity to upload the thesis to ProQuest. I had no idea what this was and still struggle to understand what it means. However, apparently it will be available to the public and you can efficiently print out your dissertation hard copy (which I hope to do in the near future as of today November 3rd 2024.)

2.8 Curriculum Vitae* (iv)

The curriculum vitae is a statement giving a short biography of the candidate, including institutions attended, degrees and honors, titles of publications, teaching or professional experience, and other pertinent information. Please do not include date or place of birth or phone numbers. Ask your advisor or committee how this should look given experiences are quite different across individuals and departments.

2.9 Prefaces and Acknowledgements (v)

Should be about 1 page

2.10 Table of Contents (vi)

Generate this last when setting up a document, but once some outlining

has been done it is a really good idea to set this up for a doc with writing and a doc with images/tables. Figure docs such as these should have one figure or table per page with breaks in them for drafts or if using overleaf uploaded into the "images" section of the template, upon reflection PowerPoint may also be a good way to keep your figures just make sure to keep these organized in some way as the documents slow infinitely as more rich images are added. Prior I have used an excel spreadsheet to keep track of metadata regarding data organization - mostly with columns for date of experiment, name of experiment, iteration, samples used, and result(not more than a sentence), which would correspond to three other documents:

A folder of Raw data labeled 20XX-XX-XX) or (20240607) with no dashes whatever you prefer corresponding (example: flow data from an experiment should be labeled as such)

An excel or spreadsheet of quantified data labeled 20XX-XX-XX) or (20240607) with labeled experiment, for example: 20240607-a6KO-validation. This spreadsheet would include a table with samples consistently labeled a6KO-1 For the first sample, a6KO-2 etc have relevant quantifiable values for generating plots or tables, and relevant materials (for example machine used, settings(voltages for example), antibodies (clone and color and company and batch), amount used of antibody, and samples with controls on one page of the spreadsheet. The next page would be labeled analysis and include relevant analysis from other programs usually, Flowjo and matlab being examples. Finally

a notes column for any divergences including errors (you will thank yourself) or issues encountered with operations of experiment.

A PowerPoint labeled with the same date (20XX-XX-XX) or (20240607) with no dashes whatever you prefer with corresponding graphs generated from collected data, each notes page should include relevant writing whether that be a figure legend or notes about potential troubleshooting ideas or conceptual ideas worth noting. I like to separate by experiment specifically. I include figures and notes from other papers which I was reading at the time of experiment and label all citations needed. I go back to add to these sections as necessary.

Now with the meta document, figures document, table document, and raw data folder it will be incredibly helpful for pulling relevant information from the meta doc and communicating findings. It might take a while to figure out how to best do this so don't panic and have fun. Note: i am super color driven when it comes to this process so i also begin by color labels for different experiments and samples. Pick a palet and stick with it, gray or black for controls. Hashed or clear or filled. Remember all colors can and should be able to be grayscale for the most part.

There are tools in google docs and in adobe to generate a table of contents.

At the beginning of your document In google docs go to the tab at the top bar “Insert” select at the bottom “table of contents” This table of contents is fully editable and linked so that you can jump around in your document. The final table

of contents and page numbers should be generated in adobe at the end of the writing process or in google docs.

2.11 List of tables (vii)

Insert a page break or section break when adding figures and tables. For these I prefer to have them in a second document and paste them in later as the document grows this will save rendering time by a lot. It is also good practice to organize these things as they can always be deleted but harder to find. Tables should have the title at the top (not like figure legends) and should be labeled according to the chapter: table 1.1, table 2.1 for example.

2.12 List of illustrations (figures) (viii)

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For these I prefer to have them in a second document and paste them in later as the document grows this will save rendering time by a lot. It is also good practice to organize these things as they can always be deleted but harder to find. Writing this dissertation like this from the start would have potentially given me better structure for actually doing the research and publishing. Thus to complete 2 tasks with one action, write these like you are already writing them for your thesis. A live document can be helpful. These go at the end of each chapter.

2.13 Communication Note (not required, just thoughts)

Communication is key and an area of improvement for me personally, so having a pipeline of operations like this is incredibly helpful for the sake of those I

work with and collaborate with or just wish to discuss ideas with, or just even my own mental organization of complex jargon that's required to be known. Many can attest to this becoming more of a hindrance the longer in academia as so many rules exist for how to format genes or proteins across fields.https://podcasts.apple.com/us/podcast/night-science/id1563415749?i=1000656883905 this podcast episode from Night Science explains the emotional rollercoaster of grad school from the perspective of a systems immunobiologist discussing things like creative problem selection obsession impairing progress, how language and science and art are linked in her perspective as a systems professor at Harvard, covers feelings of despair when wanting to give up but how it's a good sign bc it's what it looks like doing science at the edge.

Taking a break or incubation is real! It's how I finally got a 4 year long troubleshooting suppression assay to work under the instruction of a senior research associate at ucsf who demanded I take a two week break without thinking about the problem and it just worked! I couldn't believe it. It's magic. One of my biggest areas of improvement has been asking for help when I needed it for even simple things because I either didn't even know I could (never crossed my mind) or felt it would be a burden to ask. I wish I could explain this better but I suspect it's just a mannerism developed or innate.

I remember once talking with a good friend who said “I assume no news is good news” and it dawned on me that our different manners of thinking about this concept of whether no news is good or not was being judged on an axis less

helpful for assessing if someone needs help. For both, the signal is the expression of news and the output being good or bad. This is a false axis precisely because we both have a different way of thinking: one in which saying something signals for action, the other of which not saying something is a signal for action.

Neither is, in my opinion, good or bad, in some ways that seems nonsensical to me personally now that I think about how I felt initially a bit offended or defensive. So in this sense, the portion of the communication cascade which gets perturbed for many could be resolved by establishing regularly expected news delivery of some sort and ways of expressing progress that's super operational for when times get tough and language may get hard because of tiredness or frustration or even just another email you really hoped to not have to open, so that you can still easily send off the minimum required for your team and advisor to be able to assess will be invaluable for all. Sometimes there isn't enough time to be completely composed and sometimes science is super tedious and laborious, and unexpected (remember to take experimental expected time and multiply that by 3.5 to get a better idea of how long it will take), and can be incredibly taxing but often so rewarding in terms of richness of being able to think freely.

2.14 Communication and organization.

Inherently, clear organization which can be easily accessed and understood by both advisor and advisee organized either by the advisor if they have a pipeline set up they work under and works for you. (I now don't know if I might like my

advisor's methods of organizing super classically and simply: folders for month and date and within them daily notes and relevant attachments compared to my old meta excel sheet. I don't know which I prefer at all! But importantly both work for me. I just wish I had realized this sooner.

I don't know how advisors feel about potentially sharing some of their methods but it can really help to see how others organize their data and relevant modalities of collecting and storing information. It's not unlikely that everyone would learn something if this was presented akin to faculty on parade even just to validate someone's way of thinking so they can learn how to best adjust to their labs pipeline as other PIs and students may have struggled with similar communication differences.

Put simply: sharing the process of writing a thesis, essentially three "papers" of different genres: review, primary, and review/perspectives/future directions, using unique diverse roadmaps to get there will increase fitness of the group through increased traits to adapt. These details ultimately manifest in a manuscript. It helped to see multiple ways of note taking and data organization and I have been so lucky honestly to have been mentored by so many here even if it meant switching labs because I learned a many ways of organizing, writing techniques, how to cope with setbacks, all different and some which I was capable of and others I was not. But finding the ones I was compatible with for different aspects, for example an advisor who crafts papers using similar techniques as myself which is very oddly low in probability seemingly given the operational

flow of it, but without this validation of it being ok to learn and write this way I may have not gotten to this point.

If folks could share these methods more even in a seminar or teaching way maybe that could help somehow for students to know who to go to for when they need a person who can provide whatever ineffable ways of perceiving and interpreting data can help with motivation due to this validation of methods being worthwhile to pursue. Additionally I absorbed tips and tricks for how I can empty my own mind from this individual in terms of being overloaded with ideas, just from seeing how they did that for themselves in PowerPoint format, like a collage while also being a hoarder of sentences and ideas meaningful to our process for whatever reason.

Obviously this is specific, but this is my point, it is nearly impossible to expect that one individual could fulfill that role for another let alone an entire group of students. Is it possible or even something professors would be open sharing with students? Not that they have to! But if they were open to that (not even to be an official mentor but just to demonstrate the diversity of approaching research and success in academia) I think this could be really fun for both students and faculty who wanted to participate.

2.15 Graphs.

Graphs may be put on cross-section pages

Programs I've used to generate graphs:

Excel. Before I understood who to email for a PRISM license which I learned from another student who told me the email of the admin who provided licenses to students(this was in 2018), I used excel. I use excel for all data tables and generating graphs is easy, for the most part. One can generate dot plots, add lines to this for a histogram, add shading, create bar and whisker plots (akin to violin plots), and many more for whatever data set you're interested in. A great first pass at data visualization is through excel regardless in my opinion. Also most graphs can be generated simply for what I've seen and the downsides are that sometimes excel formats things in a super frustrating way for me. I'm known for breaking excel a lot for no known reason so that might just be me. I am beginning to appreciate it more the longer I am in science. All graphs should be able to be greyscale so excel provides this easily and in the styles pane “quick styles” one can adjust color. Stats can also be performed but I have not ventured here as excel and I are not yet close friends.

PRISM- made for biomed work for the most part. Ask your advisor about licensing. I cannot express how much PRISM has been essential from my entire time since being in the Bluestone lab till now how helpful this program is in teaching basic stats at the same time as generating graphs linked with tables and stats. Making graphs beautiful and adding correct stats is perfect in this program for a grad student in my opinion. It lacks the power for some bigger data sets and doesn't have linear regression as far as I'm aware of, but it has rmANOVA.

Matlab- for everything else there's matlab which now has a linear

regression package (yay!!!)

ImageJ for imaging figures I'm not as familiar with but I know it's what people ultimately use.

R - you can make so very many things in R, but be aware that it is so open source that many packages will never be updated, and you'll have to go to github and sort through updated source packages that were not annotated as such in the original code. Until you get to the point where you can recognize the syntax of the language, and maybe even the context, I'd HIGHLY encourage starting with a guided coding analysis such as MATLAB (while you have it free!) or PRISM.

2.16 Dating the Dissertation

Because degrees are conferred three times during the calendar year, the title page and abstract of a dissertation completed at any point during the academic year must be dated on the date the degree is conferred.

Chapter 3: The Manuscript

3.1 The Abstract

"The dissertation must be accompanied by an abstract. The abstract should, in a concise manner, present the problem of the dissertation, discuss the materials and procedure or methods used, and state the results or conclusions. Mathematical formulas, diagrams, and other illustrative materials should be avoided. The abstract should not be part of the dissertation itself nor should it be included in the table of contents. It should be headed as follows:"

Abstract of (TITLE OF DISSERTATION), by (AUTHOR'S NAME),

Ph.D., Brown University, May (YEAR IN WHICH DEGREE IS TO BE AWARDED).

3.2 The Dissertation

“The dissertation proper (including introduction, main body of the text, illustrations, appendices, and bibliography) is numbered using Arabic numerals. The numbering begins with "1" and runs consecutively to the end.”

Headings for the major sections of your manuscript (i.e. dissertation) should be at the very minimum the following They should be centered and placed two inches from the top of the paper in uppercase type.

3.3 Introduction/Prologue

INTRODUCTION (in our case Prologue)

This section for me was incredibly important, it allowed me to frame the dissertation in the same way most philosophers frame their theses in reality. Take for example, the introduction to one of my favorite philosophical texts on immunology Dr. Thomas Pradeu’s Theory of the Self linked here: https://www.google.com/books/edition/The_Limits_of_the_Self/c016CuJ8r-gC?hl=en&gbpv=1&pg=PA1&printsec=frontcover. Pradeu takes advantage of the fact that the reader will be engaging with this text first, if the reader is truly interested in what the author is trying to convey. I find these to be absolutely essential for orienting the reader to have the capacity to understand my, or any other author’s, agenda.

Every single human being has an agenda, whether you are aware of it or

not is up to how you choose to use your freedom to think. Now that I have had several months to reflect, this is my absolute favorite part of my thesis along with the epilogue. It sums up my perspective through the eyes of an individual struggling very very hard to live in their truth, to be authentic, to have integrity. Here, I use metaphor and other rhetorical devices that I learned in AP English and AP Language from my experiences in Lowell High School (a San Francisco PUBLIC high school) to entice readers who may or may not be familiar with the historical context of my own dissertation.

As a famous Pulitzer Prize winner Kendrick Lamar once wrote in his song Meet the Graham's "I guess integrity is lost when the metaphors doesn't reach you" (https://genius.com/Kendrick-lamar-meet-the-grahams-lyrics) which I am going to argue is one of the strongest lines in the hit track, as it demonstrates who can abstractly understand the current, or, to be more academically minded "Contemporary", or, to be more culturally relevant in 2024, "Catching the vibe", or just in plain English euphemism "reading the room", and who lacks this ability. Those who lack it tend to not acknowledge its power. Remember that!

3.2 CHAPTER I: REVIEW CHAPTER INTRODUCING FOUNDATIONS FOR DATA CHAPTER

This should be a review chapter that assesses all relevant information as if it were a review written after you wrote your paper to demonstrate how it answers a gap in the literature. If I could go back to redo this process I would have used my qualifying exam and time spent reading to publish a review for chapter 1 so

that I'd be established for publishing my next chapter (a data chapter) as a primary research document in years 3-4 of graduate school.

This would have been instrumental in my training and self confidence in addition to beginning the writing process and making mistakes EARLY as opposed to rushing at the end. It is not easy if you have never or rather, haven't in quite some time, have had an opportunity to write a paper for publication, thus many of the small but most time consuming factors could be ameliorated by going into the process of a PhD knowing that one can publish a review article first

. I am unsure if bio archives accept reviews but even just being forced to go through the process and not pay the fees associated would be helpful to use in the future. These tools I will describe and methods which worked for me would be hammered out. I would give my right hand to have been using overleaf from the beginning, and to have had at least one publication from my time in graduate school.

3.3 CHAPTER II: DATA CHAPTER

Ideally this would be published as a first authored paper following the review covered in chapter 1. Collecting data in years 2-4 would be helpful in updating the introduction chapter too, as more research is performed and more time is spent with the project as it develops.

This chapter looks like any research chapter you have seen.

Abstract

Introduction

Methods

Results

Discussion

Conclusion

It should also state contributions of authors and credit for those who helped in any way.

Example from my undergraduate thesis which is freely available through UC Berkeley, a public institution. https://nature.berkeley.edu/classes/es196/projects/2013final/HowellsJ_2013.pdf

3.4 CHAPTER 3: Discussion & Perspectives developed

This chapter should serve as a reflection of chapter 1 with additional perspective from chapter 2 (what gap did you fill? Why is this important?) Ideally, if I could go back and repeat this process, I would view it as a perspectives paper published after the second chapter, demonstrating that by performing the research aspects including design, data collection, analysis of data, and conclusions reached regarding literature gaps and how to fill future research gaps created by your data chapter, one is now able to fully grasp the context and meaning of their work.

Thus this would be a third and final publication under the domain of “perspectives” “opinions” or “commentary”

See your favorite journal to determine what these look like. Nature, Science, Cell, and Frontiers (my favorite) have some examples.

3.5 BIBLIOGRAPHY

Citations should be centered and placed two inches from the top of the paper in uppercase type. I do not know if this must be at the end of the entire document or after each chapter. I will inquire. One should expect to have 50-100 citations per chapter.

3.6 EPILOGUE (not required, but, being me I highly recommend it if you care deeply about your work)

Should mirror the prologue in a similar way as the introduction mirrors discussion. The epilogue in my dissertation as cited below set up my postdoctoral scholar work. It is the true philosophy of science I have developed based on the techniques and data collected in chapter 2, the review of accepted tools, methods, and yes, unfortunately, perspectives count under acceptable or not (whether this should be the case or not is up to you as a new philosopher, right?). This can have figures, and be far more abstract than the prior chapters.

Citation

Howells, Jacqueline M., "Elucidating mechanisms of murine neutrophil progenitor engraftment in bone marrow" (2024). Pathobiology Theses and Dissertations. Brown Digital Repository. Brown University Library. https://repository.library.brown.edu/studio/item/bdr:49eu8uxw/

Chapter 2 Figures

Elucidating mechanisms of murine neutrophil progenitors engraftment in bone marrow.

By

Jacqueline M. Howells

B.S., University of California, Berkeley, 2013

Thesis

Submitted in partial fulfillment of the requirements for the Degree of Doctor of Philosophy in the Department of Pathobiology at Brown University

PROVIDENCE, RHODE ISLAND

May 2024

Figure 2.1 Title page example.

Figure 2.2 Example of a copyright page.

Chapter 4. Learn how you write

4.1) Everyone writes incredibly differently.

As stated an endeavor approached from the heart, such as writing a dissertation, will inevitably be emotional, at least I have yet to meet an individual who experienced no negative emotion throughout their PhD, in fact I've even heard quotes like "If you haven't considered quitting once, you might not really be cut out for research" on the other hand, many have phrased things such as "If you love it you won't ever want to quit". While I can provide my personal perspective on how I operate, this will be a hurdle for nearly every individual who has written a PhD dissertation. The amount of time, care, energy, excitement, despair, hopelessness, and joy is what makes research so appealing and worthwhile for me. Upon reflection, the exact same characteristics that make one a good scientist may also be the same characteristics which impede success and growth.

4.2) find out where and when you write the best

This writing process was made much easier when I found time to consider why I would feel down or not able to proceed or confused by feedback and instructions, thus I suggest reflecting in a separate document or notebook (for me handwriting has been helpful in this reflection), and writing what you have done down, including the feelings or negative thoughts alongside to see if they make sense. Write down all of the joys and good things too, (Darwin has plenty of notes like this in his lab notebook published as what is now theory of evolution as

described in the NPR podcast episode linked here: https://www.npr.org/sections/krulwich/2012/10/18/163181524/charles-darwin-and-the-terrible-horrible-no-good-very-bad-day.

I personally keep a notebook of every time someone has really left an impression on me in terms of encouragement, I often return to this book of documented moments in the hardest of times and reading the reality truly does help one remember that this is simply a process not an indictment or judgment of your ability or value. Additionally it serves as a sanity check to remember you do indeed belong here. Take deserve out of the grad school dictionary until merit is actually the determining factor for success.

4.3) giving yourself and others grace & accepting/giving feedback.

To those who ever suffer deeply from this aspect of research, the personal aspect which academia both fortunately and unfortunately inherently is paradoxical to professionalism, do not feel as though emotionality and deep care for your work and ideas is incompatible with pursuing scientific inquiry at the PhD level. One personal thing that I learned that has helped me infinitely in the past few days (i.e. the few days of me finishing up the writing process) is to think about how you critique yourself in your words, and how this may impact how you communicate with others.

My realization or "clicking" moment was the moment I realized that part of my personal hurdles were that I assumed that I critiqued my own work in a kinder way than I do, and that this has deeply impacted my perception of both

received and given feedback, in addition to causing unnecessary stress on top of what is already an incredibly stressful process. This was pointed out to me by another, and I would not have realized it on my own.

Writing groups, or finding someone to write with can help make the process feel collaborative and fun (remember when it was fun?). Many will discuss how the PhD process caused emotional and psychological damage, and like everything in life that is known as a large undertaking, it definitely can. However, just as the characteristics that make one a valued member of the scientific community can be the same that bar one from providing value to their fullest extent, this too can be reversed, as the process of receiving feedback and providing feedback has led me to a better understanding of my own way of processing emotions about work and life goals.

I feel as though in this regard, I have healed immensely on a psychological/cognitive level through the grace provided to me and my willingness to accept it without ego (or my attempt to). Despite potentially being unprofessional at moments due to emotionality and care for what we do as students of pathobiology, this emotional aspect is something that I believe, with time, care, and practice of acceptance of differences and encouragement of curiosity and inclusiveness, equity and fairness is achieved in a manner that is quite organic and meaningful throughout a career span.

When discussing with other recent PhD graduates, one of the questions I ask is “What do you feel like you benefited from the most” or “What is

it like on the other side do you feel different?" and overwhelmingly almost every recent graduate has told me the following in some form "I do not feel like I have to prove myself to take myself seriously anymore, I feel like I am respected and I respect others, I have grown as a person due to the confidence I had to find when I felt hopeless, and now know I can survive anything despite the hell at the end"

Hell is the word consistent among every student I have spoken to, but much like the end of a marathon, it seems this hell is more of a backdrop to their perception of themselves before and after finishing. Amongst the older PIs, I have spoken to over my time in academia, I have learned that the aspects which most students strive for (mostly awards and acknowledgements) are not even fully remembered, but rather the moment of insight about their project during their PhD or postdoc years are the experiences most worthwhile to discuss. I can think of two instances in which I have congratulated a PI for an extremely highly lauded award received, only to be met with confusion as if they could not remember receiving it and instead were much more excited to discuss with me their favorite textbooks from their time in research or their new whiteboard they just purchased to write down new ideas.

Maybe it is hell-ish, but maybe it's also part of what we notice about one another in the extremely small and thus interactive ecosystems we work in together, and providing grace to oneself and others, could provide examples of those who one can emulate to achieve success. There is a middle ground one can find in academia for success, while everyone's emotional processes will be

different, knowing you are not alone and working together in communities resolves much of the inner critic and feelings of self deprecation as you will find, no one finds this process to be easy, and the things that can hurt the most may actually not be so relevant with respect to your future self's memory of the time spent learning.

Chapter 4: software & other notes.

Everyone should be able to access and learn basic software components applicable to writing the thesis. When in need: increase your google speed and look up overleaf.com and templates. Here you will find templates by searching: overleaf dissertation template. Overleaf is a platform that is incredibly easy (albeit annoyingly time consuming to use) . It is a good idea to get used to this though as this is required for most journals. If I could ask for anything in terms of what would have made this process smoother it is by far this. Knowing what a thesis should look like, but not just from looking at others' but rather looking at others' in the context of the structure provided. It will save you so much time down the line.

Front End Aesthetic Syntax

OVERLEAF

Overleaf uses the coding language latex, (math ppl call it lay-tech whereas biomed ppl call it Lay-tex. Weird but it's coding so what can you do?) Software such as overleaf is based on Latex, which is essentially a language with syntax meant for producing and displaying mathematical equations, producing a consistent layout, basically anything that in the software engineering startup world would be considered "Front end", or the aesthetic syntax if you will.

While coding may seem intimidating, do NOT use R first. Find the easiest platform for you to use.

Folks should understand the process that goes into these patterns for coding, people like to make it out that it's super difficult because of the jargon, look up ANOVA proof to understand that the math is condensed by the code itself. No one is performing this by hand:

Source of Variations	Sum of Square*	Degree of Freedom**	Mean Square	F Statistics
Within Columns	$SSW = \sum_{\text{all columns}} \sum_{\text{all } i} (X_i - \bar{x}_{col})^2$	$df_w = (R-1) \cdot C$	$MS_w = \frac{SSW}{df_w}$	$F = \frac{MS_b}{MS_w}$
Between Columns	$SSB_c = \sum_{\text{all columns}} (x_{col} - \bar{x}_o)^2$	$df_b = C - 1$	$MS_b = \frac{SSB_c}{df_b}$	
Total	$\sum_{\text{all } i} (x_i - \bar{x}_{grand})^2$	$df_t = R \cdot C - 1$		
* X_i = individual data value, $\bar{x}_{col}$ = mean of within each column, X_o = mean for all data ** R = number of rows, C = number of columns				

Therefore, My suggestion for learning basic statistical analysis required for contemporary biomedical research based in code language is the following softwares listed.

CURRENTLY ACCEPTED SOFTWARE FOR BIOMEDICAL STATISTICS AND VISUALIZATION

PRISM

Basic stats better excel, for biomedical stats at least, will provide biostatistics and information about how to use them, easy interface, and helps to teach statistical analysis currently accepted in biomedical sciences, whether or not

these statistics are always appropriate is beyond the scope of this document but I am open to discussing.

MATLAB

MatLAB is the same as other languages in pattern but it's platform is specifically not open source, and that's for a reason. It's incredibly powerful, the code is often already written in chunks. They have teams of people on staff who will answer questions. Many people will make fun of Matlab for being private, and I guess that makes sense, but in the end don't let that deter you from using your free version from school! It is an invaluable resource to learning

PYTHON.

All code is somewhat written similarly to python. It seems that python users and R users are split across the field. If you feel strongly about this then pick what works.

MICROSOFT TEAMS

It sends automated notifications to take breaks, give yourself joy, breathe(literally), remind me to sleep or rest or stress or even notice I'm thirsty. I get into time blindness when I'm focused and to be completely honest I've never been super pain (bodily) sensitive, no clue why but I just don't realize when I'm even feeling my leg fall asleep for hours, this app is great for someone like me! I don't care how silly I look, it's good to breathe.

A larger benefit of teams is that everything stays in one place and everyone can easily share, slack is a wonderful tool but has imposed 90 day limits to

messages relatively arbitrarily without warning (I am sure many of you may have experienced how devastating this was for some folks) Teams, while seemingly "outdated" I have found to be incredibly useful for sorting out my own thoughts and having some sort of defined pipeline and access to invaluable tools that would have made this process much more streamlined (the number of times I have spent hours cropping a small photo for example.

All students should have access to this mode of communication or at least a streamlined process for projects at the very beginning which is the same for all students working together or in labs which often work together even if just for convenience across servers.

Figures & Communication:

Biorender

Helpful for graphical abstracts and very easy to use. Downside from my perspective is that now almost every figure looks the same, which can be quite limiting in research. Also, similarly to Slack, as it is not developed specifically for the school's standards, and since it's a newer platform still in early business stages, costs will change and reliability of its functionality may reduce over time. While a great learning tool or tool for quickly making a stunning figure, I have found it most helpful for learning and graphically drawing out what I would like to write. I typically make figures of what I will write about prior to writing as the

words form while I'm creating the figure. I am certain this is not the same for everyone but it is worth considering as a learning modality which is also time efficient.

Adobe illustrator

If you have access, a fast and expensive computer, and time to learn, I have no doubt Illustrator will increase your confidence and add a very crucial skill to your resume. I have enjoyed learning how to make a pair of scissors and what looks like a book layout for newsletters, however, since I had no fast computation access, it often ended up taking up more time than it was worth, despite having access to the software.

Powerpoint

By the end of my thesis writing PowerPoint became super helpful for me because it reduced options (all the templates and predesigned cell picture from birender can make me lose the forest from the trees) Found myself making abstract figures or graphics more original which also helped me learn given the restraints in PowerPoint.

Excel- Excel hates me but I am learning to love it

Oh excel, you and I have had our ups and downs, but in the end you make me happy because nearly everyone else can use you. Excel should be used to maintain data integrity in my opinion. There are SO many functions, and

programming languages such as SAS which can be referred to for excel stats and graphical creation. Towards the end of my thesis, I actually used excel a lot for modeling abstract ideas with simple graphs that now look a lot like the figures in the philosophy of science books I admire so much and have attempted to emulate.

Citation Managers

Citation managers work if that's what you like to use. I neer used one well beyond papers for classes; this is due to the way I have condensed writing and literature review into one. Several that are popular are: EndNote, Mendeley, Zotero and I'm certain countless others. EndNote seems a bit ridiculous to me at this point, Mendeley is great but didn't fit with the needs of my dissertation for whatever reason, and Zotero is somewhat just unintuitive for me. I sincerely don't think any of these outrank doing it by hand.

My advice? Make a google doc, pick a format from the following, and put it in a google doc that is backed up on multiple accounts and/or computers if you can somehow afford all of this.

APA (American psychological association)

MLA (Modern Language Association)

AMA (American Medical Association)

Or find out more here: https://pitt.libguides.com/citationhelp

Cheat codes for formatting:

To apply superscript formatting in Microsoft Word using a keyboard shortcut, you can press Ctrl, Shift, and the Plus sign (+) simultaneously:

Select the text you want to format

Press Ctrl, Shift, and + (at the same time give superscript)

To turn off superscript formatting, press the same shortcut again

Save the document to keep the new formatting

To apply subscript formatting in Microsoft Word using a keyboard shortcut, you can press Ctrl, Plus sign (+) simultaneously:

Insert section break by going to the “insert” tab at the top of google docs and scroll to break. There are section breaks and page breaks. You can also turn on “non printing characters to be able to actually read these breaks and where they are this will also pull up a paragraph symbol (no idea what that’s called). To view these go to “view” and select non printing characters.

4. Grammarly. (2024). Grammarly (May 26 version) [Large language model].

https://app.grammarly.com/ Note: Copy this citation and paste it into your document.Grammarly. (2024). Grammarly (May 26 version) [Large language model].

https://app.grammarly.com/ Note: Copy this citation and paste it into your document.

I thought this would maybe work for citations and being able to organize in docs it was not helpful. I couldn't tell what it even did-don't try the tool again. I do like it enough for when I have a big idea and I can't type it out fast enough and the predictive language helps a bit there almost like writing cursive or bullet

points, but I usually return back to it and change it.

I've noticed it makes a lot of grammar corrections that are invalid /correct literature itself which seems like it's not a great tool to do grammar checks under the current grammar used by scientists/in general. I feel it makes sentences lose all personality. Lately, I've had trouble distinguishing between emails sent in sincerity and ai crafted ones, as someone who operates how I do this is extremely hard to parse and puts me in a weird state of mind.

Also it worries me that if everyone starts to use the same exact words, as these LLMs learn off of what has already been written and is prone to confirmation bias, it sort of feels like it's selectively restricting science based on quorum sensing, except the quorum isn't exactly giving informed consent partially because we communicate through words not chemicals, at least not consciously, I appreciate when it corrects my spaces, I also like when it tells me I've done a good job! Lastly it provides stats on writing (number of words used, unique words used, hours spent writing) and this helps me remind myself I did actually do work, Sometimes i'm so anxious that even if I work all day I forget, and literally rewrite the same thing (I've done this multiple times for school assignments like essays for Patho 1 for example). I Find it exceptionally helpful with emails and tone in a sad way because of the whole homogenous thing with language and expression.

SUPER DOWNSIDE TECHNICALLY:

Even if you don't agree that LLMs like chatGPT, alpha3, gemini, smarter

child, whatever you name it, if it's aggregating from various places, i.e. other human's work, (think of it like wikipedia, except you just don't want to go to wikipedia because you'd then have to cite wikipedia, which is absolutely unacceptable for most people), it is still only able to process short chunks of data (i.e your words you type) so fast. Soon, it pretty clear that these generators of aggregation will likely slow to a point that they will again become irrelevant for any sort of original thought or personal perspective bringing creative value.

Be honest with yourself for a second and think about how aggregated knowledge is neither unique to you nor created by you, as it will have more aggregated data to parse and learn from (that's what the "learn" in these machine learning models means, really it's training). Thus, as more people use it and add it to their platforms, exponentially more amounts of data will be algorithmically parsed, using an intensive and extreme amount of energy that will not be able to keep up with changes you've made to the document.

As for the utility of these types of machine learning algorithms with a platform offer for the way I write, I found it only helpful in the context of very short portions of a document as with 20 pages of niche materials the algorithm literally takes longer to catch up with spelling and grammar errors that I do to read and correct them by hand and will cause your document to crash.