

Writing up your project or thesis

Some advice to get you started with scientific writing, and making a timeline

Kresten Lindorff-Larsen and Amelie Stein, March, 2019



Read, read, and read some more (also, write)

Scientific writing has its own style, and you should aim to learn this and use this in your thesis. The best ways to learn include:

- **Reading** a lot of papers — aim to look at at least one paper per day (yes, it'll take a while initially, but you'll pick up speed)
 - You might benefit from using some reference manager software (Zotero, Mendeley, Papers, ... [https://en.wikipedia.org/wiki/Comparison_of_reference_management_software]) to organize your papers; this will also make it easier to include references while writing
- **Writing**, not just the bare minimum — a brief report before you write your actual thesis helps you both get practice, and summarise the key points

"If you want to be a writer, you must do two things above all others: read a lot and write a lot."

-- Stephen King

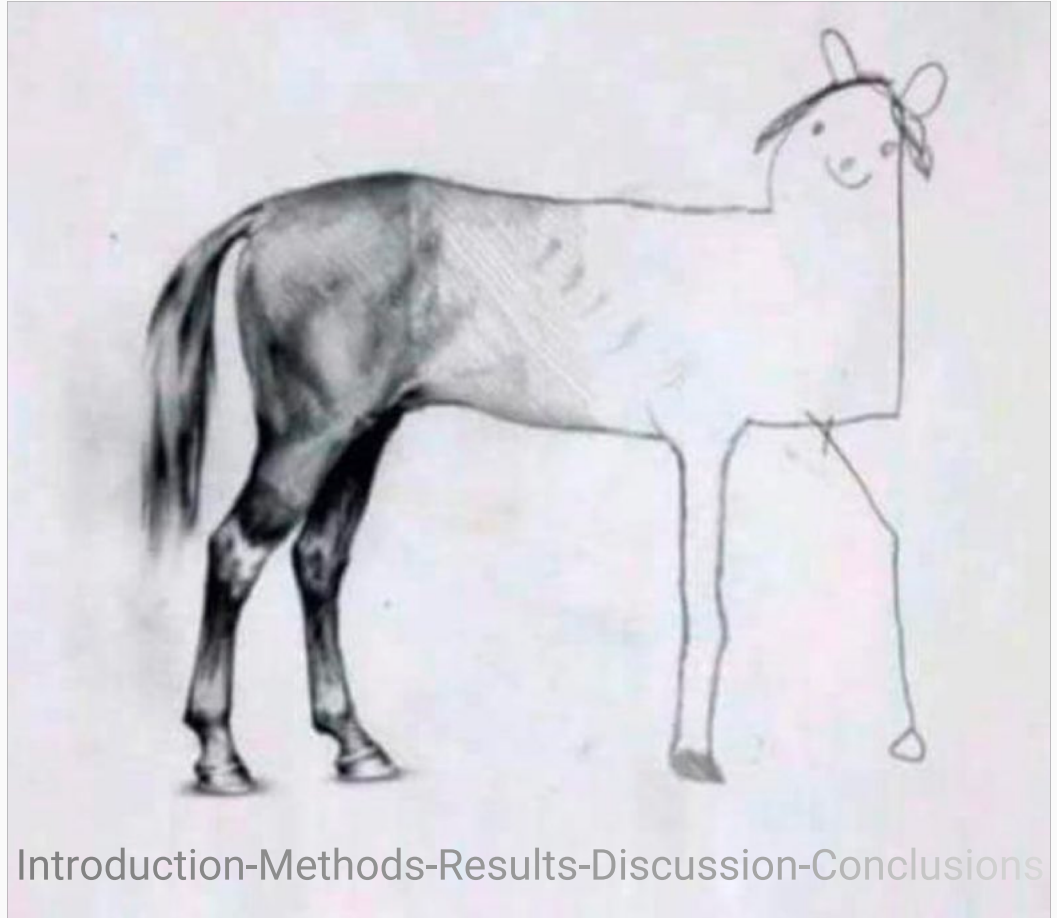
Some additional sources of information

While nothing beats reading (a lot), and finding papers whose style you (and your supervisor) like, there are plenty of additional sources including these papers

- *How to write consistently boring scientific literature*, <https://doi.org/10.1111/j.2007.0030-1299.15674.x>
- *Living Science: Love writing*, <https://doi.org/10.7554/eLife.45734>
- *The art of writing science*, <https://doi.org/10.1002/pro.514>
- *Ten simple rules for structuring papers*, <https://doi.org/10.1371/journal.pcbi.1005619>
- *Ten simple rules for developing good reading habits during graduate school and beyond*
<https://journals.plos.org/ploscompbiol/article?id=10.1371/journal.pcbi.1006467>
- *Ten simple rules for scientists: Improving your writing productivity*
<https://journals.plos.org/ploscompbiol/article?id=10.1371/journal.pcbi.1006379>

Plan your time

Don't let your thesis look like this

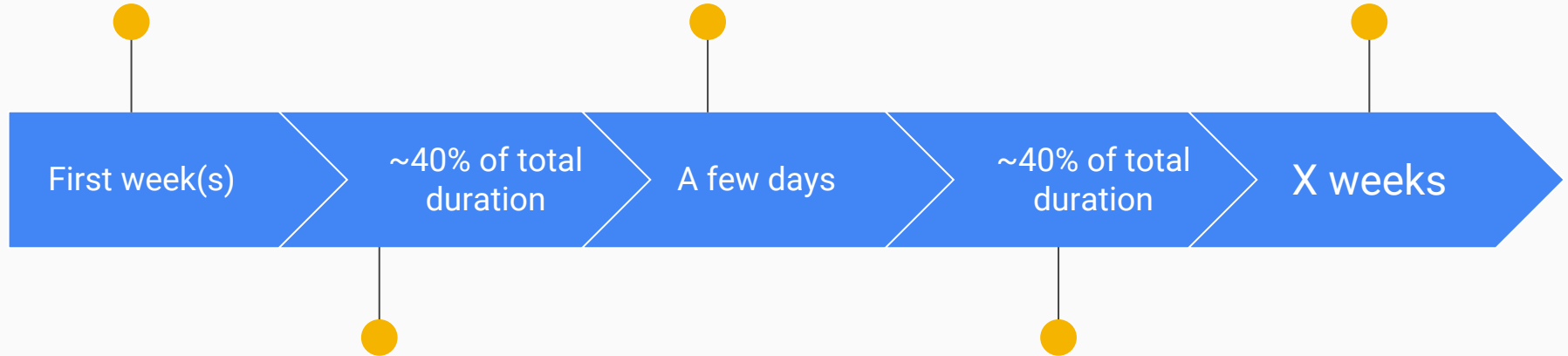


Introduction-Methods-Results-Discussion-Conclusions

Get started — read literature, learn essential tools

Mid-project report — a rough outline and some figures

Write your thesis, finalize figures and transfer data



Main research phase I

Main research phase II

- Determine with mid-project report & supervisor what you need to wrap up

Content

This will obviously vary whether this is a BSc, MSc or PhD thesis. And on the subject, outcomes, the specific rules and what you agree with your supervisor. But here are some general guidelines and topics that should generally be found in a thesis/report.

- Cover page (title, name, date, department, supervisor, ...)
- Abstract (~250 words)
- List of abbreviations
- Table of contents
- Introduction
- Aims and Motivation of work
- Methods
- Results
- Discussion
- Conclusions and future perspectives
- References (in consistent format)
- Appendices

Start writing early

While it's tempting to “keep producing results”, it often becomes more clear what your project and thesis are missing when you lay it all out on paper. That is why we strongly encourage you to have a solid outline with figures halfway through your project.

- What results do I have so far?
- Do they address my research question?
- What's missing?

Remember - research rarely goes exactly as planned — which often is fun, but can be frustrating when your deadline is looming.

Keep the big picture in mind

A challenge — both in writing and in research in general — is the balance of detailed understanding of individual techniques and theories, and how these pieces together form the bigger picture of the research question you are addressing. For example, in writing about forest ecosystems, you may not need the electron transport chain in photosystem II, though it undoubtedly is fascinating.

It can be tempting to write a lot about the things you know well, e.g. from classes or the literature. For each topic, consider its importance for your main research question. If it's not critical, keep writing brief to avoid the situation illustrated on page 4. Make sure to explain how your work relates to previous work, and discuss implications.

Figures

- Visualise your data early – look at the raw data, and experiment with concise summaries of illustrating it, to make the main findings obvious for the observer. You'll use good figures a lot: from individual meetings to presentations. And of course in your thesis.
- It's usually best to script or otherwise semi-automate figure making, so that you can easily re-generate them if you get or make an updated dataset.
- Essentials: label axes & data sources (in legible font size) – often it's helpful to have additional comments in the script, so that you can trace back what exactly went into the plot. Clear colour schemes, consistent across multiple figures.
- Don't spend too much time making preliminary figures pretty, but you might as well make more central figures nice while you remember what it is you are plotting/showing
- If you want a deep dive into how to make nice figures, check out "*Fundamentals of Data Visualization*" freely available at <https://serialmentor.com/dataviz/>

Determine actual thesis writing time (X)

N: number of pages you need to write

P: pages per day you manage to write (including figures)

W: How many days per week will you realistically be writing? 5, 6, 7?

Plus 2 weeks of “buffer”:

1 week for computer crashes (remember backup!), illness and other disasters

1 week for proofreading and finalizing

number of weeks to schedule:

$$X = N/P/W + 2$$

**Now calculate the relevant dates backwards
from your thesis submission deadline**

What's the worst that could happen?

- You're done 2 weeks ahead of time - hurray!
- You have time to get feedback and incorporate that

More likely

- Something will take longer
- You'll discover this crucial experiment or that important analysis that would really be great to include... and might even have time to do it

Keep in mind

- There is a lot of focus on results in science. Nevertheless, it is critical to get your thesis written, and written well. So at some point (see p. 5) you must stop producing results and start writing. Once you're done writing, you can go back to your research, and include the additional findings in the presentation — or in the thesis, if you were really ahead of schedule.
- It is not a good idea to spend your writing period on getting the first half of the thesis polished and the second half hurried (see p. 4). In particular if the second half includes all of your results and the important conclusions
- This is a generic outline and there's no one-size-fits-all model. Adapt it to your situation (parallel deadlines, family situation, etc.)

Data transfer

- Your data and results will likely be used by future students and in publications. This is easiest (and most likely to happen) if you provide us with a clean collection of all final scripts and data in a directory in on the central storage. For experimental work, make sure to hand off plasmids, strains etc.
- Put all relevant (complex) command lines into your thesis (Methods or Appendix), or at least in some kind of README files in the folders. For experimental work, remember to hand off labbooks.
- Make sure your work is backed up. Know which parts are backed up by the University and which you need to take care of yourself. In particular make sure to backup key scripts and code, and the actual thesis.

The presentation and defense

- Focus on the key aspects of your contribution, no need to present every detail
- Practice, practice, practice (also with an audience)
- The presentation is a good time to address issues from the written thesis such as
 - errors you spotted after submission
 - improved figures
 - additional analyses or conclusions, etc.
- For the subsequent discussion, it's a good idea to show the PDF of your thesis on the screen, so that everyone can see what's being discussed.