UC Berkeley Department of Integrative Biology
Guidelines for Writing the Undergraduate Honors Thesis

A thesis usually describes hypothesis-based research. A hypothesis is a suggested explanation for a phenomenon – it is experimentally testable and allows one to predict outcomes of experiments. When experimental results are consistent with the hypothesis, they increase the probability that the hypothesis is valid. Hypothesis-driven research often appeals to a much broader audience than a more descriptive paper because (a) the emphasis on the biological question ("big picture") addressed by the hypothesis helps readers understand the motivation for the work, (b) possible experimental outcomes are predicted and interpreted in the context of the hypothesis, and (c) the reader becomes engaged in the logic of your arguments and thus the justification for your experiments. Sometimes, a student engages in research to develop new methods or to optimize protocols; although this work is not usually hypothesis-driven, the student can and should provide a clear explanation to justify why they undertook the project. For example, a description of a new taxon, or a taxonomic revision of a taxon that has already been named, is a perfectly appropriate subject.

Your thesis should include enough background and references so that any professor, postdoctoral fellow, or graduate student can understand the motivation for and importance of your work. References must be included when discussing the work of others. Plagiarism (copying text or figures from any source, printed or online, without attribution) is unacceptable and will result in an automatic failure.

Traditionally, the thesis is written in the format of a research paper with Abstract, Introduction, Materials and Methods, Results (including tables and figures), Discussion, and References. Your research advisor may have additional requirements for your thesis, which you should discuss with them well ahead of the due date – the last day of RRR week. These additional requirements may include formatting preferences, additional sections (e.g., appendices, acknowledgements), or discussion of concurrent submission for publication. It is understood that in most cases this is a collaborative work that you have developed with your advisor and perhaps others. It should be very clear from your thesis what your role in the project was, and what original findings, analyses, and syntheses you developed. These items are typically first addressed in your Introduction as a lead-in to the experimental design and results sections.

The writing process is unique for each student. Consult with your advisors throughout the process for suggestions and edits. The advising office has samples from past years to help you understand the variation in layout and style. Joint writing sessions set up by the academic advisors are also a resource to define a writing schedule and overcome writer's block.

Practical advice

Many students start with their lab notebook and an outline. Use the following suggestions to outline and expand on the various sections of your thesis

1. Start with the data and figures. Figures should be of professional quality and have descriptive captions, comparable to figures published in scientific journals. Every figure should be referred to, in order, in the narrative, in a way that readers understand the motivation for the experiment, the proposed outcomes, and the actual observations. Figures can be placed at the end of the narrative, as you will find in some manuscripts, or embedded in the text as they are referenced.

2. Once you lay out the big picture and the data, talk through your figures to envision the text transitions between each figure. You may see obvious gaps when more information/data is needed for a particular transition, or you may decide that you need to present the work in a different order. Science is rarely linear. To support your conclusions, the presentation of your results should be in a LOGICAL order, not in the chronoLOGICAL order in which you did the experiments.

3. After deciding on a logical order for your figures, you will be able to write the Results section. In the Results section, some data interpretation may be necessary to transition from one experiment to the next (e.g. to motivate the next question/experiment); however, remember that a full discussion of the implications of the results should be reserved for the Discussion.

4. After writing the Results section, it will be much easier to see how to discuss your results. Whereas the Results describe the data, the Discussion is the place to highlight the importance of your findings and put them in the context of the field. Writing the Discussion after the Results are completed will also help you see what background you need to cover in the Introduction to ensure the reader has the appropriate context to understand the question addressed by your hypothesis and to follow the experimental logic. This is also a space to highlight future directions and identify shortcomings of your approach.

5. The Introduction should lay out the problem that you are addressing and give readers the background to follow what will be explained through the rest of the paper. You want to be as clear and logical as possible.

6. Write the abstract LAST. (Or, if you write it first, be prepared to rewrite it later!) An abstract is typically 200-400 words and outlines the hypothesis and the key conclusions of the work. Your main points will be obvious and much easier to state after completing the Results and Discussion.

7. If you get writer's block, you can always start with the Materials and Methods. This section is usually written in narrative form, without bullet points or numbering. At the discretion of your faculty advisor(s), the Materials and Methods can cite previously published

descriptions of common techniques unless you developed novel protocols as part of your thesis work. The Introduction, likewise can succinctly lay the necessary foundation without being a complete history of your field.

8. Your references should be consistent and follow a standard format (any scientific journal will do); do NOT use MLA style (e.g., “Smith 47”), but cite sources in scientific form (e.g., “Smith 2010” or “Smith et. al. 2010”).

9. If you are having difficulty, get help from your research advisor, others in the lab, or your faculty and staff advisors early on.

10. We are often asked “How long should my thesis be?” It should be long enough to fully develop your ideas, clearly present your data, and carefully discuss the results and the implications of the work. Some 80-page theses would have been much improved in shorter format, and some 10-page theses are clearly underdeveloped.

11. The document should demonstrate that you know what you’re talking about. Don’t try to imitate scientific prose; write simply and directly; say what you did and why, what you found out, and how this tested your hypothesis. Finally, be sure that you proofread your thesis, and not just with spell check. It often helps to print out the document and read it; some mistakes are overlooked on the screen. Read it aloud. Have your lab read it. Have someone outside your lab read it.

Please consult your advisors early and often as you develop your thesis project and present your results. This is not a test to see if you can do it without any help, it’s a learning process.