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

There are several undergraduate courses in which your research with faculty members can count for credit. However there are limits on which courses and how many can be taken or counted toward the major. Please check with the undergraduate advising staff for clarification and updates. This memo only concerns honors research, including the Honors Thesis. To qualify you must have at least a 3.3 GPA in the major and overall.

Currently in IB there are two courses related to Honors Thesis work. H196A applies to research done in a term when you do not do a thesis. H196B applies to research done in a term when the thesis is due. Both courses must be taken to get credit and receive honors on the transcript. Both courses are 3 units and letter-graded.

You will need a faculty advisor who is a member of the IB faculty. You can do research with a professor in any other department, or with an off-campus researcher (e.g., at LBL, UCSF, or CHORI), but they cannot assign your grade; this is why you need an IB faculty advisor. Advisors not in IB will still supervise your research, evaluate your thesis, and propose grades for both H196A and H196B. It is up to them to complete the paperwork necessary to set up your thesis project and to grade you, *and it is up to you to make sure all this is done*. Please consult the undergraduate advising staff for forms and deadlines before you proceed.

Planning your research project

There are guidelines available from the undergraduate advising staff about what constitutes an appropriate Honors Research project. Make sure that your project is practical to do in the time allotted, that you will have appropriate training, guidance, and mentoring, and that you and your advisors are clear on what you are expected to produce. If you have any questions or concerns, you should take advantage of your IB advisor.

Writing your thesis

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 him/her well ahead of the due date. 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 what your role in the project was, and what original findings, analyses, and syntheses you developed. This should be addressed in your Introduction.

The first thing to do in writing your paper is to outline it. 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.

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.

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 s/he 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.

Practical advice

(These are only suggestions; consult your research advisors and lab members for advice!)

(1) Start with the data and figures. Figures should be of professional quality and have descriptive legends, 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.

(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.

(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.

(5) 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.

(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.

(8) If you are having difficulty, get help from your research advisor or others in the lab early on. If you need additional advice, check with your faculty advisor.

(9) 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, and what you found out and how this tested your hypothesis. Finally, be sure that you proofread your thesis, and not just with Spell-Check programs. It often helps to print out the document and read it; some mistakes are overlooked on the screen. Reading it aloud is even better. And make sure your References are 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 2010, p. 47").

Please consult your advisors early and often as you develop your thesis project. This is not a test to see if you can do it without any help! It's a learning process. So let us help you.

We are grateful to the Department of Molecular and Cell Biology for permission to use and adapt many of their ideas for writing undergraduate theses