

Biology Honors Research Project Proposal

Purpose: to prepare Biology Honors students to conduct research for an Honors thesis and to lay the foundation for writing the Honors thesis

Once you and your advisor have discussed an Honors project, and you have learned about your topic by reading relevant scientific literature, you are ready to write a proposal. The proposal should be prepared in the fall and a final draft should be provided for approval by your Honors advisor by Jan 31 of your Junior year. A first draft of the proposal should be sent to your advisor by November 15th to allow plenty of time for revisions. While writing the proposal, please be mindful of the **audience** who will be reading it, one of the Biology Department Honors advisors. Since your topic may be somewhat unfamiliar to your audience, it is important to provide clear explanations of concepts, to define specific terms, to minimize the use of jargon, and to define abbreviations.

A research proposal is a plan for answering a scientific question, and writing a proposal is among the most creative aspects of the scientific process. Scientists write proposals to request funding for research projects that explore new ideas. Because funding agencies do not have enough money to fund all proposals, authors need to convincingly sell an idea and to justify why their research deserves funding. Some benefits of writing this proposal are that the process will clarify research goals, objectives, and techniques, and the completed proposal provides an excellent foundation for an Honors thesis. A well-written proposal also may be revised and submitted for consideration by various funding sources within and outside of the University (e.g., Honors College, Undergraduate Research Stimulus Program [URSP], Undergraduate Symposium, etc.).

A proposal employs many of the same conventions used in writing a scientific paper: (e.g., clear, concise sentence structure, well developed paragraphs with strong topic sentences, logical progression of ideas, etc.). One obvious difference is that much of a funding proposal (except perhaps the context-providing sections of the introduction) is written using future tense. The specific format of a proposal varies, depending on the guidelines of the funding organization. While there are not specific page limits for the Honors Research Project Proposal, it should be ~5-6 pages (12-point font, double-spaced, not counting visuals or works cited) in length. It must include the following sections with headings and sub-headings (as necessary):

- **Title.** The title should specify the experimental system used as well as key variables analyzed within the study. It should be specific, informative, and brief.
- **Introduction.** Like an Introduction to a scientific paper, this section is designed to draw the reader in, to contextualize and to rationalize the study. The Introduction provides context by explaining why a topic is important or relevant and by describing what is known and what gaps remain in our knowledge of the topic. You should structure the proposal Introduction as a funnel, beginning with an explanation of the general biological issue and its significance, and progressively narrowing in on the specific question your research will address. To make your case, you will need to reference the primary literature. It often is useful to cite a review article on your topic in the opening paragraphs (and reading review articles will help you get a handle on the current state of the field). At the end of your Introduction, include the goal/purpose of the study, followed by two subsections:
 - **Research question(s).** In this section, identify your main research question (this does

not need to be in paragraph form). You may have more than one question.

- **Hypothesis and Predictions.** State your hypothesis and predictions clearly and concisely. Be sure to include the biological mechanism (the explanation why). Your prediction should reference both the dependent and independent variables used in your study. Two common ways of constructing a hypothesis/prediction statement are the “if/then” or the “Because / I expect” statements (= hypothesis/prediction). You might also include an alternative hypothesis. ***Include a figure (or figures) showing your predicted results.** Carefully consider what variables you will be measuring (or calculating from measurements taken). Making a prediction figure will force you to think about how you will analyze your data, and will prepare you to interpret your results. The figure also will help the reader better understand your study and predictions. If there are multiple hypotheses, you may include multiple figures.
- **Methods.** Here, briefly describe your research approach, including specific references for experimental design, laboratory techniques, analyses or processing, and statistical analyses as appropriate. The use of citations to related studies employing similar techniques lends credibility to your proposed study, though you also may propose the use of some novel approaches. If there are several parts to your study, the use of subheadings is recommended. Consider using visual aids to illustrate experimental design or procedures.
- **Supplies and Time-line.** Your proposal should include a list of the supplies you will need to complete your project. This would go in the “Budget” section of many proposals. In this proposal, make a list of the supplies you will need, indicating which supplies are on hand and any supplies you will need. You should also include a **timeline** for completion of the project in the format of a table to make it clear that the project is feasible. If there are several parts to your study, the timeline should specifically reference them.
- **Works cited.** Like a scientific paper, a proposal contains a works cited section. Pick a premier journal in your field and use the formatting of that Journal. You should aim for at least 10 references for the proposal, including at least one review article.

Some notes about visual aids and proposal formatting. Quality visual aids (diagrams, figures, tables) reduce the need for lengthy, purely text-based explanations and make a significant contribution to a clear, coherent proposal. Effective use of formatting within the proposal (e.g., using bold text or underlining key points, using sub-headings to guide the reader) also can improve clarity. Some examples of visual aids that could be used to highlight key concepts, predictions, and plans include:

- **Conceptual diagrams.** These often are used in the Introduction as graphic presentations of hypotheses that identify likely mechanisms and how they might be elucidated.
- **Prediction figures** clarify the experimental design and indicate expected results.
- **Figures/tables** presenting preliminary data (if available)
- **Visual aids in the Methods Section.** There are a number of ways that visual aids could be used to augment the Methods section. Some examples include: flow diagrams, organizational tables, or equipment diagrams illustrating experimental design or procedures.
- Tables describing the **timeline** of proposed research activities