

GUIDELINES FOR THE SENIOR THESIS PROPOSAL

Your senior thesis proposal will contain a title and six main sections:

- Project Summary
- Introduction
- Review of Literature
- Specific Objectives or Hypotheses
- Research Design and Methods
- Literature Cited

This handout is intended to provide some guidelines on the contents of these sections. As questions arise when you write your proposal, consult with your thesis mentor.

TITLE

Select a specific and informative title. Titles such as "An Ecological Study of the Forests in York County" or "Genetic Variation in Aspen" convey little about the study. More informative titles provide a sense of purpose and direction: "The Impact of Nitrogen and Water Availability on Shrub Diversity in a Mesic Forest", or "Genetic Variation in Defense Chemistry of Aspen Foliage and its effect on Forest Tent Caterpillar."

Some granting agencies use poster sessions as a forum for attracting matching funds from corporations. The title for your poster is your best advertisement. An informative, catchy title will likely get your prospective reader to proceed to the next section of your poster.

SECTION 1 OF PROPOSAL: **PROJECT SUMMARY**

The project summary is a one paragraph (150 words or less) summary of the proposed research. It is not an abstract of the proposal, but is a self-contained description of the activity that would result should the proposal be funded. It usually includes several background sentences that preface a statement of objectives, general methods to be employed and the significance of the proposed activity to the advancement of knowledge. The project summary does not delve into the rationale of why the study should be done (e.g. a study of this type has never been conducted), but rather indicates the perceived value or potential commercial application of the project results.

SECTION 2 OF PROPOSAL: **INTRODUCTION (also known as executive summary)**

The first section of the proposal will be the INTRODUCTION. We recommend writing the last sentence (or two) of the INTRODUCTION first. This sentence will provide an indication of the general topic or question that your proposed study will address. The rest of the section will introduce the topic in general terms only, leaving the detailed literature review and the discussion of research design and methods for the sections that follow. It is important that you express why your proposed research topic is interesting and why it merits a research effort. If you do that well, your reader may be compelled to agree with you. At the very least, the reader will appreciate that the proposed research question can be clearly associated with a general but legitimate research area in biology. The INTRODUCTION will be short, probably two or three paragraphs.

SECTION 3 OF PROPOSAL: **REVIEW OF LITERATURE**

A successful **REVIEW OF LITERATURE** section creates a context for the proposed research. The context is created by positioning the proposed research into the “big picture” that has emerged from past research. To do this, you must discuss the salient points of the primary research articles that you consider interesting and relevant to your thesis topic. You might approach this by citing articles that describe what is known about a particular system and point out that there are gaps in the current knowledge of that system. Remember that these articles do not necessarily have to describe research that is similar or identical to your proposed research. A seemingly unrelated article may be quite useful if it makes an observation or cites a method that has relevance to your plans. This includes using articles that examine species, cells, proteins or genes that are different from yours, but share a similar experimental approach as your own. Be advised – conducting a standard experiment or using a previous method on an organism, cell, protein or gene just because ‘it’ has not been tested before is not a compelling motive for conducting research or for persuading funding agencies.

The **REVIEW OF LITERATURE** should convey a sense of the current state of understanding. To do that, the reader has to be brought up to date on the data and viewpoints that are regarded by practitioners in the field as ‘state of the art’. Some thesis topics will have a very large literature to review. Other topics may have attracted only a small number of researchers in the past and the number of relevant publications will be small. Proposals in rapidly evolving disciplines such as immunology and molecular genetics would focus on relatively recent publications. In other areas such as ecology and animal behavior, older ‘classical’ literature may be necessary to cite and discuss.

The **REVIEW OF LITERATURE** should also indicate the limits of current understanding. Do current scientists agree that there are key questions that must be addressed? Are there controversies in the literature that can benefit from well-designed new studies? Where are the gaps in our knowledge? Which important gap(s) will your proposed research address? Convey how your project, if completed, can complement and extend existing knowledge.

Clearly, the effectiveness of this section is proportional to the exhaustiveness of the literature review and your demonstrated understanding of difficult papers. You want to start by introducing the topic broadly, gradually narrowing the scope of your review down to the key piece of research that must be conducted to complete the picture. Ideally, the reader will be compelled to agree that the proposed study is the logical next step in the field.

End this section with a short paragraph stating your intentions for the proposal. What is your proposal topic and what is the basic goal in doing the proposed research? This statement should be more specific and concrete than the topic statement in the last sentence of the **INTRODUCTION**.

Results from **PRELIMINARY STUDIES** are generally presented before objectives and methods. Preliminary studies may contribute to the state of knowledge leading to the hypotheses and often indicate that the proposed experiments are indeed technically feasible. The description of preliminary work is short on methods and long on relevant results.

SECTION 4 OF PROPOSAL: **SPECIFIC OBJECTIVES OR HYPOTHESES**

In this short section, in list form, state your specific research objectives or your specific research hypotheses. Decide, in consultation with your research mentor, if objectives or hypotheses are more appropriate for your topic. Limit yourself to a small number of highly explicit objectives or hypotheses.

SECTION 5 OF PROPOSAL: **RESEARCH DESIGN AND METHODS**

You now have the opportunity to discuss what you want to do. The goal of this section is to make a convincing link between your stated objectives or hypotheses and your plan of action. A reasonable place to start might involve your ideas about a pilot study. Pilot studies, if done, should be simple and should answer questions about the feasibility of specific and potentially troublesome steps in the research. Be advised, however, that pilot studies alone will not suffice as a legitimate research proposal. Your research design may well involve a variation on a design seen during your literature review. Similarly, your methods will probably be very similar to those encountered during your reading.

'The Devil is in the Details' - nowhere in your proposal is this statement more important. This is your opportunity to specifically explain how you will conduct the research; where will you obtain your research organisms, how many will you test, what type of experiments/sampling will you conduct, how will the data be collected/recorded and how will that data be analyzed? Information about equipment, reagents, species, experimental controls, and basic statistics are all appropriate in this section. Other pertinent information in this section: What kind of data will you be collecting? Can you do this research by yourself or will it require collaboration? Will the research be done on campus or elsewhere? Are there seasonal constraints (e.g. reproductive behavior occurring only in April)? Even the most brilliant of research questions will not be funded if you cannot provide a practical and scientifically sound methodology that demonstrates that you can indeed obtain an answer.

As you describe your methods, you should point out which hypotheses/objectives each experiment addresses. It is here that you state the expected outcome of your experiment or the conditions under which you may accept or reject or hypothesis. The purpose of this exercise is to demonstrate that you have a substantial grasp of how your particular system works. Predictions based upon your depth of knowledge are more likely to get your proposal funded than a stab in the dark (sometimes known as a fishing expedition because you never know what you might get).

SECTION 6 OF PROPOSAL: **LITERATURE CITED**

This section lists the full citations of the articles cited in the proposal. The style of citing literature in the text and in the LITERATURE CITED section should follow that described in the handout entitled Lab Report Format for YCP Biology Courses.

The following books contain short but useful descriptions of proposal writing in addition to some genuine examples of undergraduate research proposals. These books are currently on reserve in Schmidt Library.

Davis, M. 1997. Scientific papers and presentations. Academic Press, San Diego, CA.
(see p. 44)

McMillan, V.E. 1997. Writing papers in the biological sciences. 2nd ed. Bedford Books, Boston. (see p. 167)

Pechenik, J.A. 1993. A short guide to writing about biology. 2nd ed. HarperCollins, New York. (see p. 135)