

BIO 350 Junior Colloquium Research Proposal Guidelines and BIO 354 Thesis and Presentation Information:

A goal of BIO 350 Junior Colloquium is to have students write a research proposal on a project that they may ultimately want to conduct as a senior research project. All the details of senior thesis requirements appear later in this document. Whether or not a student chooses to pursue a research project beyond the proposal, the research proposal in BIO 350 must follow specific guidelines:

Selecting an Advisor for Writing the Research Proposal:

The research advisor should have compatible research interests and be willing to guide the student through the development and oversight of her research project. To help students learn about potential projects, departmental faculty will give research presentations as part of the Junior Colloquium Course (BIO 350). Students are not required to select an advisor from within their specific major field, as interdisciplinary approaches are often beneficial to the advancement of science. In addition, students are not limited to the expertise of the departmental faculty, as students may conduct research with faculty outside of the department (e.g., in the Chemistry or Psychology Departments), if a non-Departmental faculty member is willing to supervise the project. Please note that all students selecting research advisors from outside of the department must choose a second advisor, their departmental research advisor, from within the Department of Biological Sciences. Once the student has chosen a research advisor(s), they should meet to discuss potential research projects. Each student will have a research advisor sign a form agreeing that they will work together on developing a research proposal. Students working with faculty outside of the Department of Biological Sciences should have a second advisor (within the Department of Biological Sciences) sign off on the form declaring that the Departmental faculty member will also review the proposal.

Writing a Research Proposal:

Students may choose to write a proposal for a project that would be conducted in the laboratory or the field, or the student may choose to write a proposal for a project that would be primarily literature-based. For a literature-based or library thesis, a student would need to focus on a particular topic that has several areas of research supporting differing outcomes, and would ultimately read and evaluate the different outcomes to draw her own conclusions, with guidance from her research advisor. For example, a student may be interested in studies done on different treatments for a particular disease. The student would read primary literature papers on the different treatments, summarize the pros and cons of each treatment, and, if conducting this research for a thesis, she would ultimately have to draw a conclusion, based upon her assessment of the information available in the literature, towards which treatment seems the

most beneficial for particular patient types. (Other library thesis topics might be related to conservation issues, research regarding learned vs. genetic bases of behavior, etc.).

A variety of assignments in BIO 350 Junior Colloquium will be given to help each student develop her research proposal, typically including: writing a blog on her research, creating an annotated bibliography related to her research, presenting a primary literature paper on her research, writing an introduction to her proposal and having it critiqued, handing in a draft proposal to her advisor(s), presenting her proposed research orally to the class, and handing in a final draft of her research proposal to be graded by her Junior Colloquium advisor.

Format of the BIO 350 Junior Colloquium Proposal:

The proposal should have the following sections. Note that there are instructions for both a lab/ field-based proposal or a library-based proposal:

- **Cover Page:** Title of project, names of investigators (student and advisor(s)), and approval signatures of advisor(s)
- **Table of Contents**
- **Abstract:** One-page summary of the question(s) and potential answer(s), with concluding 1-2 sentences of your critique/suggested future research directions for answering this/these question(s).
- **Introduction and project summary:** The Introduction should contain background information and how it relates to the question(s) that you are pursuing. When providing background information, this section should contain citations to literature in your bibliography. Try to indicate how different scientists have pursued the answer(s) of this/these question(s). Do there seem to be several groups that have different opinions and procedures for answering these questions?
- **Goals/Objectives (for library research papers only):** This section of the proposal should state clearly and concisely the question(s), potential answer(s), and a brief overview of your critique of the answer(s). This section should literally stand out from the rest of the proposal, so that the reader can refer back to it easily, if he/she needs a reminder of the question(s) and potential answer(s). This section can be set up with italics, bold, numbered or bulleted sentences and phrases.
- **Description of Answers and Critique (for library research papers only):** Give an overview of the potential answers to the questions and how you will pursue your critique of the answers/suggestions on future research that might be done to answer this/these questions.
- **Goals/Objectives (for laboratory/ field research papers only):** This section of the proposal should state clearly and concisely the scientific objectives, goals, or

hypotheses to be tested. The context in which these goals are important should have been made clear in the Introduction and the means by which the goals will be achieved will come in the Experimental Methods section of the proposal. This section should literally stand out from the rest of the proposal, so that the reader can refer back to it easily if he needs a reminder of how something else in the proposal relates to the goals. This section can be set up with italics, bold, numbered, or bulleted sentences and phrases.

- **Experimental Methods (for laboratory/ field research papers only):** Give a detailed explanation of the protocols to be used in the project. This part can be broken into smaller sections, if appropriate, each one labeled with what part of the question is being answered with that particular method (not to exceed five single-spaced pages or ten double-spaced pages).
- **Significance of the project:** Remind the reader one more time of how this question relates to the “bigger picture” in science. If this connection is still a bit unclear to you, your research sponsor should be able to guide you through this section.
- **Literature Cited:** Includes all works cited in the proposal.
- **Biographical sketch of the principal investigator (student resume).**

Requirements for Transforming the Research Proposal into a Thesis:

Proposals for Research Conducted within the Department of Biological Sciences

A draft of the written proposal should be given to the student's research advisor by the beginning of November, as indicated on the Junior Colloquium syllabus. The research advisor, who will review the proposal, and the student should make any necessary revisions. The revised proposal (with copies of the proposal as edited by the research advisor(s) and by the peer reader) will then be submitted as part of the Junior Colloquium course by the date indicated on the course syllabus.

Proposals for Research Conducted within other CCC Departments

The student should satisfy the policy as written above for students conducting research within the Department of Biological Sciences; however, the student must identify a departmental research advisor of her choice who reviews the proposal and determines whether it meets the departmental standards for senior research. The departmental research advisor then has the option of 1) approving the project as proposed, 2) approving the project pending specified revisions, or 3) rejecting the project. If the departmental research advisor deems the project unacceptable, the student has the option of developing a new project with the same faculty member or selecting a new research advisor and developing a new proposal.

Department of Biological Sciences Senior Research and Thesis Policies

Students should consult the Cedar Crest College Catalog to confirm course requirements.

- Students enrolled in BIO 353 must present their work at a departmental Research Friday before or during their last year.
- Students wishing to complete the thesis option will choose research mentors in the Biological Sciences or Chemical & Physical Sciences departments. Students will spend a minimum of two semesters working with their chosen research mentor.
- BIO 354: Thesis and Presentation will be offered by the department for 1 credit. Prerequisites for the course are 4 credits of BIO 353, or 2 credits of BIO 353 and concurrent enrollment in 2 credits of BIO 353, or 4 credits of BIO 243 and 2 credits of BIO 353 (that can be concurrent with BIO 354) and permission of the faculty mentor. In order to complete BIO 354, students must complete a written thesis and give an oral or poster presentation to the college community.
- Each thesis should be unique, and submitted and presented by a single student; having two or more student authors on a single thesis deviates from the philosophy behind the thesis option.
- BIO 143, BIO 243, and BIO 353 are available for students choosing to enroll in research. Students conducting research after completion of BIO 123 should enroll in BIO 243. The prerequisite for BIO 353 is successful completion of BIO 350, Junior Colloquium.
- Students completing the library thesis option [literature work, as opposed to laboratory/field work] will be graded in BIO 353 on the progress they make on their library research. These students would still need to register for BIO 354 and their written thesis would be part of their grade earned in BIO 354.
- A standard syllabus for BIO 354 will address the general requirements and evaluation for the course. However, individual faculty will have discretion over expectations and assessment. Only the research advisor will evaluate the presentation for grading, although all faculty may evaluate presentations for assessment purposes.
- Students must petition the department if they want to follow a plan that deviates from stated policies. For example, if a student wishes to complete the thesis option and needs to take BIO 350 Junior Colloquium, BIO 355 Science Ethics & Society, and BIO 353 concurrently, the student must petition the department.

Registration concerns:

- Students concurrently or previously enrolled in HON 350/351 (3 credits) will generally enroll in BIO 354 (and BIO 353) for 0 credits. If you are conducting research on a separate topic for an Honors thesis, you may enroll in BIO 354 for 1 credit. All Honors students should inform the BIO 354 instructor of their status.
- Students concurrently or previously enrolled in CHE 390/391 (3 credits) should enroll in BIO 354 for 0 credits.