

## 1. SUMMARY OF EXPECTATIONS

BIOL4990R is intended to provide juniors and seniors with an opportunity to communicate the findings, methods, and significance related to their original scientific research project(s) performed while enrolled in at least two consecutive semesters of research. It is usually the case that students have completed three semesters of research (BIOL 4960R, BIOL 4970R, BIOL 4980R), and it is sometimes the case that students perform some of this research while enrolled in BIOL 4990R and writing the thesis.

Keep in mind that a student's thesis will be one of the first resources that their mentor will grab when they need to look up something about the student's work long after the student leaves the lab. Therefore, the thesis should be more than a summary of all of the student's previous work; rather, it should be an extended written treatment of the subject of research. In particular, a student thesis should substantiate a specific view by constructing an argument, not just regurgitating results from previously completed research.

Since the thesis describes the results of multiples semesters of research, the length of the thesis is typically 25-60 pages of double-spaced type (12-point font). The student should consult their research sponsor regarding the scope of the thesis.

When writing the thesis, we recommend using a continuous style of writing which allows the thesis to flow as one, cohesive document. It should include an "Introduction" section to explain the rationale/goals of the thesis and describe the necessary background literature; a "Methods" section specific for the experiments described; a "Results" section in which the writer walks the reader through a summary of the experimental outcomes; and a "Discussion" section that discusses the meaning of those results in the larger context of the field of research.

The following outline is recommended (details for each section follow this list):

- ✓ Title Page
- ✓ Acknowledgements Page (optional)
- ✓ Table of Contents
- ✓ Abstract (limited to 1 page which is generally about 500 words)
- ✓ Introduction (typically 6-12 pages)
- ✓ Methods (typically 2-8 pages)
- ✓ Results (typically 5-15 pages)
- ✓ Discussion (typically 3-8 pages)
- ✓ Appendix/Appendices (optional, could be anywhere from 1-20 pages). This may include supplemental data or information the writer would like to include about the research process.
- ✓ References (typically 20-70 references of original research articles. Review articles may be included but kept to a minimum)

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[https://genetics.rutgers.edu/images/documents/honors\\_thesis\\_guidelines\\_2008.pdf](https://genetics.rutgers.edu/images/documents/honors_thesis_guidelines_2008.pdf)

## 2. FORMATTING/ORGANIZATION

- ✓ **Margins:** 1” top, bottom, left and right (use 1.5” left margin if printing/binding)
- ✓ **Header/Footer:** 0.5-1”
- ✓ **Page numbers:** Bottom middle, beginning on the first page (1, 2, 3, etc.).
- ✓ **Font:** 12-point, easily read fonts such as Times New Roman or Arial.
- ✓ Follow proper nomenclature and terminology rules for your discipline. Abbreviations should be defined the first time you use them in the text.
  
- ✓ **Title page:**
  - ✓ Title (a meaningful, accurate description of the content of your research).
  - ✓ Your full name.
  - ✓ “Submitted to the Division of Biological Sciences in Partial Fulfillment of the Requirements for the Degree of,” then list your degree and major.
  - ✓ “University of Georgia, Division of Biological Sciences”
  - ✓ “Written under the direction of” then your thesis advisor’s name, degree, and departmental and university affiliation.
  - ✓ “Read by” then your Reader’s name, degree, and department and university affiliation.
  
- ✓ **Acknowledgement and/or Dedication** (optional): This is typically a single page recognizing colleagues that supported the work, provided reagents, etc. The acknowledgement page is where you should recognize funding sources (grants, summer program, scholarships) and is also a place to thank family and friends for their support.
  
- ✓ **Table of contents (with page references for each item):**
  - ✓ Includes Acknowledgement and/or Dedication page (if provided) and main text sections: Abstract, Introduction, Methods, Results, Discussion, Appendix/Appendices (if provided), References
  - ✓ Includes subsections of any main text section
  - ✓ Page numbers should form an even column on the right-hand side of the page.

For the following **Main Text Sections**, the BIOL research paper writing guidelines (<https://biosciences.uga.edu/forms>) will provide finer details on what to include in each section.

- ✓ **Abstract:** Provides a succinct summary of the thesis that describes the questions and/or research focus, the methods employed, the major findings, and conclusions drawn from these findings. This should be no longer than one double-spaced page (generally about 500 words). \*Note: the BIOL Research paper writing guidelines specify a maximum of 200 words for one semester of research. For your thesis, the abstract will contain more information since you are summarizing multiple semesters of research.

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- ✓ **Introduction:** Previously, in individual BIOL research courses, the Introduction provided background on one semester of research, but in the thesis, you are including more expansive background that incorporates more information about multiple semesters of research. Therefore, it will read more like a literature review in the field of study. This section should communicate the writer's immersion in the field of study and therefore an extensive knowledge of the science being discussed.
  - ✓ The thesis Introduction should adequately prepare a reader (assume they have a scientific background but are unfamiliar with your specific topic) to understand the motivation for your study objective.
  - ✓ It will often be broken into subsections to cover background topics relevant to the research, proving the reader with information required to understand the research question and methodological approach of the thesis.
  - ✓ It will often include multiple figures that help summarize the background material. The writer should generate these figures to help convey processes or concepts, rather than including experimental data from other studies.
  - ✓ As described in the BIOL writing guidelines (<https://biosciences.uga.edu/forms>), the Introduction should follow a "broad to narrow" structure to frame the research questions/specific study(ies) and should include a description of why the research is needed (e.g. identify gaps in knowledge on the research topic). The Introduction must end with your hypothesis or specific question and explain your approach to the research problem.

### **Methods:**

- ✓ If your thesis encompasses the same experimental methodologies across multiple semesters of research, you should write this section as you would for a typical research paper. See the BIOL writing guidelines (<https://biosciences.uga.edu/forms>) for more specific instruction on writing this section.
- ✓ If your thesis encompasses different experimental methodologies across multiple semesters of research (i.e. distinct projects driven by different research questions), they should be presented as separate sub-sections of the Methods.

### **Results:**

- ✓ This section should present a description of all data obtained, summarizing key findings that address questions from the collective research experience.
- ✓ This section should include your Figures and Tables, and references to all Figures and Tables must be incorporated within the text of the Results section.
- ✓ If some of your data has been published, indicate those figures or sections at the start of the Results section.
- ✓ If some of the data presented in this section is not yours, note this at the start of the Results section, including the names of the contributors of such data, and with reference to specific figures or sections that were done by these individuals.
- ✓ If research is qualitative, it is appropriate to combine the Results and Discussion

sections. This promotes clear and coherent interpretation of qualitative findings, such as quotes.

- ✓ See the BIOL writing guidelines (<https://biosciences.uga.edu/forms>) for more specific instruction on writing this section.

**Discussion:** The goal of this section is to communicate your research findings and explain how they connect to your field of study. You may have several conclusions to discuss, so consider your initial research question(s) and/or hypothesis to determine the order in which you present them. This structured approach will help the reader understand how this work addressed the study objectives and what new information it contributes.

- ✓ Like a typical peer-reviewed research paper, this section should provide conclusions that encompass all research conducted. This includes an interpretation of the results obtained to address original objective(s) and new questions raised by this collective work. Discuss all relevant data, even if you determine that some of it leads to “inconclusive” findings.
  - ✓ To explain how your results tie back to the literature discussed in the Introduction of the thesis, include new literature that adds to the synthesis of the conclusions drawn. This means including specific references to contextualize your interpretations.
  - ✓ You should discuss limitations of this study (i.e. consider what can or cannot be concluded from the research). This may lead into your recommendations for future work, as you consider what questions your study raised.
  - ✓ See the BIOL writing guidelines (<https://biosciences.uga.edu/forms>) for more specific instruction on writing this section.
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- ✓ **Appendices** (optional):
    - ✓ This is the place for experiments and data that do not fit well into the overall narrative of the thesis but should be included for archival reasons (e.g. for a record of troubleshooting or optimizing). The format can follow that of the individual sections, but flexibility can be used here.
    - ✓ This would also be an appropriate place to document efforts made to promote broader impacts of the research (e.g. a summary of outreach or science communication of the work).

## **Additional Formatting**

- ✓ **Figures:** Figures can be incorporated within text of Results section or as separate Appendices.
  - ✓ Figures must fit within the margins and must be identified.
  - ✓ Figures must be uniquely numbered and captioned, using consecutive numbering throughout the thesis/dissertation (e.g. Figure 1, 2, 3, 4, etc.).
  - ✓ The number and caption of a figure must be placed below the figure in a consistent manner (i.e. always justified left of figure edge).
  - ✓ See the BIOL writing guidelines (<https://biosciences.uga.edu/forms>) for more

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specific instruction on writing and formatting Figures.

- ✓ **Tables:** Tables can be incorporated within text of Results section or as separate Appendices.
  - ✓ Tables must fit within the 1” margins and must be identified.
  - ✓ Tables must be uniquely numbered and captioned, using consecutive numbering throughout (e.g. Table 1, 2, 3, 4, etc.).
  - ✓ The number and caption must be placed above the table in a consistent manner (i.e. always justified left of table edge).
  - ✓ See the BIOL writing guidelines (<https://biosciences.uga.edu/forms>) for more specific instruction on writing and formatting Tables.
  
- ✓ **References:** See the BIOL writing guidelines (<https://biosciences.uga.edu/forms>) for more specific instruction on writing and formatting References.
  - ✓ Note: It is often useful and more expedient to use a **citation manager** program that can integrate/work with your word processing application. For example, Endnote is a program available free of charge from the UGA libraries site (Student login required). It has plug-ins that allow it to work with word processing applications such as Microsoft Word and Apple Pages. Refworks is another available citation manager that may be useful. Information available at: <http://guides.libs.uga.edu/citationmanagement>