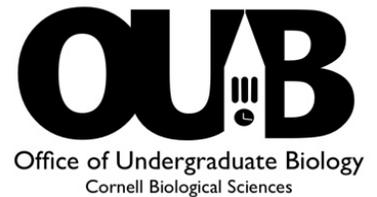


BIOLOGICAL SCIENCES HONORS PROGRAM

2019 – 2020



Contacts

BioSci Honors Coordinator: Dr. Laura Schoenle, las86@cornell.edu

Honors Program Assistant: Kristy Long, kll25@cornell.edu

Phone: (607) 255-5233

<https://biology.cornell.edu/>

WHAT IS THE BIOSCI HONORS PROGRAM?

Participants in the honors program conduct original, independent research in the biological sciences and write an honors thesis formatted as a scientific paper in the field of study. All students in the program are mentored by a Cornell faculty member on the Ithaca campus. After successful completion of the honors program students graduate with special distinction. Students in CALS are awarded “Distinction in Research” and Latin honors (e.g. Summa cum laude, etc.) are awarded based on GPA. Biological sciences majors in CAS must complete an honors thesis to be awarded Latin honors, and the level of Latin honors is determined by GPA.

WHO CAN APPLY?

- Students with an intended graduation date of **December 2019 or May 2020** who are:
 - **Biological sciences majors**
 - **Juniors in CALS** whose research area is within the biological sciences
 - See this list of CALS honors programs:
<https://cals.cornell.edu/academics/student-research/honors/>
- **CAS students must do honors within their major!**

If you have any concerns about whether BioSci Honors is the right program for you, schedule a meeting with Laura Schoenle

REQUIREMENTS FOR ADMISSION TO THE HONORS PROGRAM

- **Coursework & GPA**
 - 30 credits completed at Cornell OR junior status as a transfer student
 - a cumulative Cornell GPA of ≥ 3.0
- **Research proposal submission**
 - Submit your honors thesis proposal online (web site will be announced soon)
 - Proposals must be submitted between May 1 – July 1, 2019.
 - Given the nature of science, we understand that some aspects of your project might change after proposal submission. As long as you continue to work with your mentor, there is no need to report changes until your progress report (due in Fall 2019).
 - More details on the content of proposals is provided below.
- **Mentor agreement**
 - After you have submitted your research proposal, it will be sent to your research mentor for approval. *Note: your research mentor must be a current Cornell faculty member based at the Ithaca campus and in Ithaca the spring semester of thesis submission.*
 - Mentors must complete an online form indicating that they
 - agree to mentor you as an honors candidate, including:
 - supporting and evaluating your progress as you work towards your thesis
 - reviewing and providing feedback on your progress report
 - reviewing and providing feedback on your thesis before you submit the thesis for formal review
 - will be on the Ithaca campus during the semester you submit your thesis (i.e. not on sabbatical)
 - approve your thesis proposal and state that the proposed project is sufficient for obtaining honors in biological sciences
 - will serve as a reviewer or committee member for 1-2 other theses

THE HONORS PROGRAM

Research Groups

If your application to the honors program is accepted, you will be assigned to a research group with other students working in similar branches of biology. A faculty member leads each research group (see table below for contact information) and will be one of your primary contacts throughout the honors program. The faculty member will organize a mandatory meeting in the fall semester at which they will review program logistics and all students will give an overview of their project. The group leader will provide additional information as the meeting approaches. In the spring semester, you will submit your thesis to the group leader (and your committee in the case of NBB/Microbiology groups), and they will coordinate the review of your thesis.

The 2019-2020 Honors Faculty Committee

Research Group	Group Leader	Phone	E-mail
Animal Physiology	Dr. Mark Roberson	3-3537	msr14
Biochemistry	TBA		
Ecology and Evolutionary Biology	Dr. Irby Lovette	4-2140	ijl2
Genetics and Development	Dr. Tudorita Tumbar	5-6542	tt252
Microbiology	Dr. James Shapleigh	5-8535	jps2
Molecular and Cell Biology	Dr. Yuxin Mao	5-0783	ym253
Neurobiology & Behavior	Dr. Christiane Linster	4-4351	cl243
Plant Biology	Dr. Wojtek Pawlowski	4-8745	wp45
Honors Coordinator	Dr. Laura Schoenle	5-5233	las86
Honors Program Assistant	Ms. Kristy Long	5-6859	kll25

Honors Thesis

BioSci honors theses follow the format of a manuscript being prepared for submission to a scientific journal in the research discipline. Students should work with their research supervisor to identify a journal in their field and follow the guidelines for that journal along with the general thesis formatting guidelines available at the end of this document. In general, theses consist of an abstract, introduction, methods, results, discussion, and literature cited. There is no length requirement for the thesis because the length required will vary with the content. Throughout the writing process, you should work closely with your research mentor(s) to ensure you are meeting the standards of the field. Although your faculty research supervisor must decide if your results are sufficient to justify their presentation in an honors thesis, the ultimate responsibility for the thesis is yours. Examples of previous honors theses are available online at <https://ecommons.cornell.edu/handle/1813/2936/discover>

The BioSci Honors program uses two models to review theses: thesis by review and thesis by committee.

Thesis by review follows the model of a scientific paper submitted for publication to a journal in the field. You will submit your thesis to the research group leader who will send it out to two anonymous reviewers (other Cornell affiliated researchers, often faculty). The reviewers will provide feedback on the manuscript, including whether or not they believe the work is suitable for honors. Based on these reviews and their own assessment of your thesis, the research group leaders will make a recommendation as to whether or not you should be awarded honors. If you are recommended for honors, you will be able to edit your thesis based on the reviews and submit a final version to Canvas.

The **thesis by committee** model (currently used by the Neurobiology and Behavior and Microbiology groups) is similar to the review of a master's thesis. In the fall semester, you create a committee including your research mentor(s), the group leader, and an additional member from another lab (a professor, research associate, or postdoc). You submit your thesis to this committee and schedule a defense, where the committee will ask you questions and provide feedback on your work. Based on this meeting, your research group leader will make a recommendation about your work's suitability for honors. If you are recommended for honors, you will be able to edit your thesis based on the defense and submit a final version to Canvas.

Honors Presentation

You must publicly present your research to be eligible for honors. May graduates can present their research at poster sessions for the honors program which are typically held early in May. December graduates or May graduates that cannot attend the honors poster session can present their research at: 1) a national or regional conference, 2) a campus-wide research event such as the CURB research symposia, or 3) at a lab meeting open to members of the public. If you choose option 1 or 2, email the abstract and meeting schedule to biohonors@cornell.edu and if you choose option 3, invite Dr. Laura Schoenle to attend as a member of the public.

Timeline

December 2019 Graduates

April 1 - July 1, 2019: Honors application submission. No late proposals will be accepted.

August 2019: Receive your honors group assignment & fall informational meeting (date TBA).

September 16: Submit progress reports on Canvas. If doing thesis by committee, identify committee members and inform your group leader.

November 1, 2019: Submit full draft to thesis mentor *at the latest!

November 25, 2019: Submit final thesis to group leader and/or committee for review.

December 15, 2019: Upload formatted and revised thesis to Canvas & Turnitin.

May 2020 Graduates

April 1 - July 1, 2019: Honors application submission.

September 15, 2019: Honors application, late submission. *Requires letter of support from faculty mentor indicating the feasibility of the project and justifying late submission.

September 2019: Receive your honors group assignment & fall informational meeting.

November 4, 2019: Submit progress reports on Canvas.

November/December 2019: Small group meeting: date TBA, organized by group leader. If doing thesis by committee, identify committee members and inform group leader.

February 2020: Mandatory Spring Semester meeting: date TBA, organized by L. Schoenle.

March 23: Submit full draft to thesis mentor *at the latest!

April 17, 2020: Submit final thesis to group leader and/or committee for review.

May 15, 2020: Upload formatted and revised thesis to Canvas & Turnitin.

You must meet all submission deadlines to be considered for honors

RESOURCES FOR HONORS CANDIDATES

Research in the Biological and Life Sciences: A Guide for Undergraduate Honors Students (<http://guides.library.cornell.edu/biologyundergrads>) from Mann Library.

You will find tips for science citation management (so important!!), data management, and literature searching. See also the "Locating Theses" tab to direct you to published undergraduate honors theses on eCommons, the Cornell University Library public database.

Funding

Cornell offers multiple grant programs to support undergraduate research. You can also find funding from external sources, including professional societies. See the OUB's list of funding opportunities posted here: <https://biology.cornell.edu/research/opportunities/>

Cornell Statistical Consulting Unit (CSCU)

CSCU can help you as you design your experiments and analyze results. Remember, you should know what analyses you will do before actually start the experiment! CSCU offers workshops in statistical methods and software and one-on-one consulting. Check out the options here: <http://www.cscu.cornell.edu/index.php>

eCommons

Cornell's digital repository, eCommons, allows you to publish your thesis online once it is accepted. This way, your thesis will be freely accessible and searchable via engines like "Google Scholar." To publish your thesis in eCommons, you and your faculty mentor will sign a release agreement and submit it to the OUB in person or by email to biohonors@cornell.edu. The OUB will ensure your thesis is published on eCommons! This is a great way to allow other researchers to access your work in addition to future employers, graduate schools, and friends & family.

FAQS

Should I do an honors thesis?

Deciding to do an honors thesis is a personal decision. An honors thesis is a great way to experience the scientific process and have ownership of a project. However, collection of quality data and preparation of a thesis are time consuming processes that might interfere with your ability to commit time to academics and other activities. Keep in mind that the thesis is due just after spring break when many students are applying for jobs or interviewing. Consider your academic goals and plans for after graduation, then evaluate what is the best use for your time.

What is the difference between doing an honors thesis and getting research credit?

The honors thesis should capture the full range of the scientific process, from selecting a research question and designing a study through analysis and presentation of the results. In addition, the honors thesis should represent original research done by the student. Working in a lab for credit or pay might include part or all of this process, but the honors program requires it.

Can I do research off campus for an honors thesis?

The research must be carried out under the direct supervision of a faculty member on Cornell's Ithaca campus. If a student plans to do research off campus, it must first be approved by the Honors Committee, and a faculty member on the Ithaca campus must be a co-mentor who is

actively engaged in the research. Surrogate mentors, i.e. Cornell Ithaca campus faculty who are mentors in name only and are not directly involved in a student's research, are not allowed. Contact Dr. Laura Schoenle to discuss further.

Does my research need to be publishable in a scientific journal to be eligible for honors?

Ideally, one goal of an honors thesis is to present results that are publishable in a scientific journal, not necessarily independently but integrated with other work to flesh out the story. However, given the time limits inherent in undergraduate research, this goal in many cases is not achievable. If the results are not publishable, to be acceptable a thesis should describe the design and implementation of the experiments undertaken, the analysis of the data that were obtained, and any future modifications of the design that in principle might lead to publishable results. The initial decision on what comprises a suitable project for an honors thesis is made by the research mentor and the student. If there is some disagreement or uncertainty in this decision, the mentor and student (together or separately) should consult with the leader of the appropriate honors group. The Honors Committee, comprising all of the honors group leaders, has the final say in whether the thesis is acceptable. The committee relies heavily on the reviews by other faculty to make this decision. The most important factors considered in evaluating the thesis are the quality and rigor of the scientific work, feedback from the thesis mentor, and the thesis presentation itself.

Can I study abroad/off campus while completing an honors thesis?

The honors program has no explicit requirements that you study on the Ithaca campus while writing an honors thesis. However, honors theses do require substantial time investments some of which might need to be in the lab. Discuss your plans with your research mentor and together, you can determine whether working on an honors thesis while away from Cornell is a viable option for you.

Do I need to spend a summer on campus to do an honors thesis?

Many students spend a summer at Cornell working on the honors thesis, but this is not a requirement of the honors program. The nature of research in some labs can require large blocks of time, seasonal data collection, or have other requirements that result in the need to work in the lab over the summer. Consult with your research mentor to determine if research during the summer will be necessary for your project.

What are the consequences for leaving the honors program?

There are no consequences for deciding to leave the honors program. We understand that sometimes research takes more time than anticipated, unexpected challenges arise, or your priorities can change. Completing an honors thesis is completely optional and you can leave the program at any time.

How long should an honors thesis or X section be?

Except for the abstract (250 words), there are no length requirements for any part of the thesis. The length of any given section will depend entirely on the content of the specific thesis and the standards for that field of biological sciences. See journal articles in your field to get a sense of how to structure each section of the thesis.

THESIS FORMAT

The Honors program encourages candidates to format their thesis following a journal in their field. Most journal websites will have *Instructions for Authors* that provide detailed formatting guidelines. The thesis should include the following sections with separate headings. Except for the title page, all the text should be double spaced, with a font size of 12. Consult with your research mentor

Title page. The title page should use the template provided by the Honors program and specified by the candidate's college. It should show the title, the student author, and the mentor's name and departmental affiliation. See template at the end of this document.

Abstract. (250 words maximum) The abstract should be on its own, separate page. The abstract should summarize the results and conclusions of the paper, including the broader significance of the research. In the abstract, as well as elsewhere in the thesis, the author should use active voice and the first person singular ("I") -- not the first person plural ("we"), except for those experiments or results that were truly obtained in collaboration with someone else. You may switch to passive voice (e.g. "xxx was measured..." as opposed to "I measured...") only if the authorship has been clearly established in an earlier sentence, usually in the same paragraph by use of "I". Note that the suggested use of the first person singular is in contrast to modern scientific publications, which almost invariably have multiple authors and thus use the first person plural "we".

Introduction. The introduction should state the reason for conducting the research, the nature of the problem and/or hypotheses addressed in the paper, and outline essential background from the field. The introduction should provide enough background for a reader who is knowledgeable in modern biology, but not expert in this particular field, to understand the thesis research and the results. The introduction should explain any field-specific concepts, methodologies, or assumptions necessary to understand why the study was undertaken, and what the objective(s) of the study were (or what hypotheses were being tested). Writing a good introduction usually requires citing perhaps twenty or more published papers. Note that introductions are not comprehensive literature reviews, but rather discuss the most relevant work.

Materials and Methods. This section should explain in detail the source of the starting materials and the experimental design (i.e. how the experiments were done, data were collected, and results were analyzed). Also included in the Materials and Methods should be a paragraph explaining what statistical tests were used to analyze the data and to gauge their statistical significance. This section, which can be placed either after the Introduction and before the Results, or at the end after the Discussion (varies across journals), should be detailed enough so that someone in a different lab but with the same equipment and reagents could repeat the results. Rather than a detailed description of some experimental approaches, papers that fully describe the methods that you used may be cited. However, it is almost always appropriate also to summarize in a couple of sentences the most important methods. For example: "Proteins were purified after expression in *E. coli* as described in ref X. Briefly, after induction of protein expression, lysates were fractionated by ultracentrifugation to remove ribosomes and debris, and then submitted to ion exchange chromatography, with XX assay used to identify the purified protein."

Results. This section is the meat of the thesis. It should be organized with separate headings for the different experiments or measurements that were carried out, perhaps with one or a few paragraphs each. Every paragraph should have an easily understandable topic sentence (usually the first sentence) telling the reader what the paragraph is about. Paragraphs should not be longer than about one page (double spaced).

Discussion. This section may be combined with the Results section (“Results and Discussion”) if this type of presentation makes the data and interpretations easier to follow. The Discussion often is the most challenging to write. Frequently in scientific papers the first short paragraph of this section briefly again summarizes what the Results have shown, but this is not required. The Discussion should not repeat what has already appeared in the text of the Results, but instead should take up the bigger issues raised by the data that are presented. For example: How firm are the interpretations, or what are their limitations? Are other interpretations possible, and if so, what experiments might address this in the future? How do the data and the conclusions fit with other published work? If the results contradict something that was published earlier, how could the contradictions be resolved? At the end of the Discussion, it is often suitable to write a paragraph describing how this work could be continued profitably by others. It will strengthen the thesis if the candidate spends time discussing results with lab members in advance of writing, and/or presents the results in a lab meeting and asks for feedback on the validity of conclusions.

Figures and/or Tables. These present the data collected. As the results are described, the text should refer to each figure or table. Every figure and table must be referred to at least once some place in the text, usually in the Results but perhaps also in the Materials and Methods or Discussion. The order in which the figures are mentioned in the text determines the numbering of the figure. For example, as in journal articles, one cannot refer to “Figure 4” before one has described “Figure 3”. Graphs should have error bars or some other way of indicating statistical significance. Each Figure should have a legend that describes what is in the figure. The legend should include a short sentence about statistics. For example: “Error bars indicate standard deviation from the mean, N = 6”. In some cases, e.g. pictures such as fluorescence images of a cell, it will be necessary to say that this picture is a representative example of N such pictures that were taken. The pixel size of pictures should be reduced so that they are not unnecessarily large, to keep the megabytes of the thesis to a reasonable value. The figures or tables, with their legends, may be integrated with (interdigitated with) the text, or they may be placed after the text at the end of the thesis. In most journals, figures and tables are provided at the end of the manuscript submission. However, if you choose, you can integrate figures and tables throughout the manuscript if it makes it easier for the reviewers to read.

Acknowledgements. This short paragraph after the Discussion should give credit to those who helped in the research, including financial support, technical support, and intellectual support.

Citations (Bibliography or Reference List). Any of a variety of styles can be used for references, but the list should include all of the authors of every paper (not only the first one or two authors followed by “et al”), the date published, the full title, and of course the journal name, volume and page number. Generally it is best to use a referencing style that is common in journals in which this kind of research would be published. Whatever citation style is used, it should be the same throughout the thesis. It will be highly advantageous to use a reference manager application like EndNote or one of the similar open access applications (Mendeley or Zotero). See [<http://guides.library.cornell.edu/c.php?g=412004&p=2807644>] or the Mann workshops calendar for training sessions. Most theses have approximately two dozen or more citations, although the number may vary a lot depending on the scientific field. One common style for the reference list is that the papers appear alphabetically by first author (e.g. starting with “1. Adamson, ...”, and then “2. Bailey...”, etc.) Then the text refers to the paper by its number (e.g. “Cells were grown in DMEM medium as described in [3]”). Another common style is to number the references by the order in which they appear in the text. Still another common style is not to use numbers at all, e.g. “Cells were grown in DMEM medium as described in [Smith et al 2006].” Once you pick the style, the Citation Manager application will do all the formatting for you.

Submission of the thesis. The thesis should be submitted electronically to the honors group leader via Canvas, both as a Word document and as a PDF. If doing thesis by committee also email the thesis to your entire committee. Please use the following convention for naming the files: "LASTNAMEfirstname thesis", for example: "SMITHjudy thesis". Using this convention facilitates any manual sorting of the theses. If the file size is too large for Cornell email, please use Cornell DropBox. The final version of thesis, after making revisions suggested by reviewers, should be submitted to the honors Canvas site as a Turnitin.

Contribution of others to the thesis. Theses authored by more than one student are not acceptable. The thesis may include some figures or tables or diagrams from other people's work (either published or unpublished), if the purpose is clarity of presentation of the student's own results. But in each such case it is critically important to write an attribution in the legend, i.e. who is the author of the data and where was this published, e.g. "This figure is reproduced from Figure 2 [or perhaps 'modified from Figure 2'] in reference 6"; or "This diagram was modified from one drawn by Nancy Smith"; or "This experiment was done by Paul Jones"; or "These data were obtained with help from Paul Jones".

HELPFUL RESOURCES

Research in the Biological and Life Sciences: A Guide for Undergraduates-this guide is newly designed for Biology by Mann Library Life Sciences Librarians for Research.

Mann Library Training Workshops-Topics include Citation Management Software (Mendeley, Endnote, Zotero), Excel, Data Management, Advanced Searching in PubMed and Web of Science, Poster-making.

Statistical Resources-<http://mannlib.cornell.edu/equipmentsoftware/software/statistical-resources>. Individual consultations available to address your data analysis needs.

Mann Library Individual Research Consultations.

Plagiarism and Copyright, Mann Library Guide (referenced above).

Recognizing and Avoiding Plagiarism, Cornell College of Arts & Sciences.

Honors Thesis General Formatting

8.5 x 11 inch pages with 1 inch margin on left side and sensible page numbering.

Title Page:

The title of each honors thesis should include the following items, centered from side to side and spaced on full page:

Thesis Title

Honors Thesis
Presented to the College of Agriculture and Life Sciences (or Arts and Sciences),
Cornell University
in Partial Fulfillment of the Requirements for the
Biological Sciences Honors Program

by

[**author's name**, *Note: the author's name should appear as it does in the university's official records.*]

[**date**, e.g., May 2020]

[**research faculty mentor name**]