

## **‘Intro to EEB research’ for first-year Ph.D. students in the Ecology & Evolutionary Biology Research Area – August 2023**

First-year EEB Ph.D. students are expected to write a prospectus and present orally a critical perspective on a topic selected by the student and defend it in an oral presentation. This assignment should cover a general topic that will be related to the focus of their dissertation.

The learning objectives are as follows. By the end of the first-year process, Ph.D. students should be able to:

1. Identify an intended area of research and be able to justify why it is important for expanding the general understanding of ecology and evolution.
2. Critically evaluate a subject/paper/study, beyond simply identifying a fault or weakness. This involves being able to summarize the points being made, and then evaluating the soundness of the logic, methodology, analyses and conclusions.
3. Synthesize findings from multiple papers/studies (e.g., present an idea that is more than just a series of case studies, understand the value of multiple studies).
4. Distinguish between statistical and research hypotheses. Be able to formulate research hypotheses (based on theory) and testable predictions appropriate for one’s research.

Students are encouraged to spend time in the fall reading papers and discussing possible topics with their advisor to be prepared to start this assignment in January.

At the beginning of the spring semester, each first-year grad student will be assigned a committee of 3-5 faculty members (one of them is the student’s advisor), who will be in charge of mentoring the student on strategies to successfully meet the expectations of the assignment. Therefore, students are strongly encouraged to use this committee as a source of constructive criticism to enhance the intellectual value of their assignment.

### **Topic and Content**

The topic of the prospectus should be *novel*, which means that:

- (a) a previous review or study has not already been conducted on the subject,
- (b) the proposed assignment is not merely incremental (e.g., a previous study on a particular topic has been written for fish, but the student chooses the same topic focused on amphibians),

(c) the proposed assignment fully incorporates recent primary literature, and

(d) the proposed assignment involves an introduction that synthesizes the literature to identify the gap in knowledge that will be addressed by the student. Keep in mind that a synthesis integrates the findings from different studies to provide a new perspective.

We encourage students to consider this assignment as an opportunity to expand their thinking on a biological topic and to integrate novel ideas that may potentially influence their dissertation (i.e., think outside of the box). The prospectus may be within the general realm of the student's intended thesis research area, but must be significantly broader in scope. For instance, if the intended thesis topic is "the role of learning in the development of song in sparrows", the assignment might review the genetic/developmental/behavioral mechanisms associated with vocal learning across taxa.

The assignment should, at a minimum, accomplish the following:

1. explain the state of the knowledge associated with the topic,
2. identify gaps in knowledge, and
3. select a novel question that is unanswered within their topic and develop a plan to address it.

The prospectus could be further developed by the student as a proposal to a funding agency or as a review paper that will be submitted later during their graduate career.

### **Formatting and Scope**

In preparing the prospectus, students can choose any approach and format pending committee approval. The prospectus is expected to identify a gap in our knowledge and provide methodological details on how to address such a gap via research. Students should choose the methodological approach that best allows them to address the question posed. Methodologies can include an experimental approach, a traditional review, a meta-analysis, or a systematic map among others. [General descriptions of some approaches can be found here.](#)

The student is expected to justify to the committee the choice of format and demonstrate the potential for success (i.e. a novel contribution to the literature). The students are not expected to collect new empirical data or perform a project for the purposes of this assignment, the prospectus is a proposal for a future project.

Students should make sure that the length of the text in the prospectus is **less than 1,000 words**. However, to ensure clarity about their plans for reproducibility and transparency, there is no word limit for appendices or supplementary materials.

## **Detailed description of courses**

Four courses are designed to help with the preparation of developing the prospectus. They were specifically developed to support the students and enhance the chances of success. Please, take advantage of these classes as they are intended to help students succeed.

BIOL 65200 -- Advanced Ecology and Evolutionary Biology Discussion (1 unit - offered in the fall semester)

In this course, faculty and students will critically discuss a series of classic and contemporary papers dealing with physiological ecology, behavioral ecology, disease ecology, evolutionary biology, population ecology, and conservation ecology. The goals of the course are (1) to familiarize students with the primary literature dealing with “big ideas” in ecology and evolution, (2) to get used to the idea that the constructive critical examination of other ecologists and evolutionary biologists’ work is the hallmark of the “graduate” mode of learning, and (3) to gain more experience reading and discussing review and opinion papers. For Biology PhD students, a grade of B or better is a requirement for advancement in the program.

BIOL 69500 -- Writing in Ecology and Evolutionary Biology (1 unit - offered in the spring semester)

This course will train first year EEB graduate students in the principles of scientific writing. By the end of the semester, students will be expected to (a) use logical thinking to make scientific arguments, (b) write clearly and succinctly, (c) learn how to be critical of their own writing, and (d) apply these principles to the writing of their prospectus.

### **The criteria for evaluation of the prospectus are:**

1. The topic of the prospectus must not be merely an extension or restatement of previous work done (or to be done) by the student (e.g., the student's master's thesis, undergraduate honors thesis).
2. Clarity and logic of the rationale and theoretical concepts important for the topic.
3. Comprehensiveness of how the goal, either a research proposal or a literature review, would be accomplished.
4. Quality of the questions or ideas proposed within the scope of the prospectus.

## Interactions between student and their committee

A scientist's ideas can be substantially improved by sharing them with the scientific community and receiving constructive feedback. Student-driven consultations with individual faculty (not only the research advisors, but also other faculty within EEB and elsewhere – including other departments on campus) are strongly encouraged. Such consultations will likely provide the student with a diversity of views and suggestions, some even contradicting others. It is the student's responsibility to consider these suggestions and meld them with their own views on the subject to produce a prospectus that is the student's *own* work. NOTE: while the (intended) research advisor can provide feedback on the student's prospectus throughout its development, the document should reflect the student's work rather than the advisor's work.

To make the most of the interactions between the student and their committee at each meeting, the student will have to take notes about the committee's comments, suggestions, and concerns expressed during the meetings. At the end of each meeting, the committee (including the graduate student) will agree upon specific goals or deliverables the student is expected to accomplish by or present at the next meeting. The committee will also agree upon when the next meeting should take place.

It is extremely important to note that every committee has been chosen to help the student with the design of a research project and development of a scientific framework around that project. However, committees will be different in their approach due to inevitable differences between both faculty and research topics. Nonetheless, the faculty's objective is to facilitate the student's progress. Senior graduate students can also provide valuable guidance, but students are encouraged not to rely too heavily on other students' past work and experiences (i.e., each review is different in much the same way as each paper is different).

## **Benchmarks and Deadlines**

**1. By January 15<sup>th</sup>, 2024. The faculty coordinating this assignment will meet with all first-year PhD students to review and discuss the process and expectations outlined in this document.**

**2. By February 5<sup>th</sup>, 2024. Each student must submit one paragraph statement of research interest(s) to coordinator.** This paragraph will be used by the coordinator to assign faculty members to each student's committee. In this paragraph, students should describe their research interests in broad terms (e.g., conservation genetics, sensory ecology, disease ecology) and, if possible, research themes the student would be interested in integrating as part of their prospectus.

**3. By February 9<sup>th</sup>, 2024. Each student is assigned a committee by the coordinator.** The committee consists of 3-5 faculty members who will provide feedback to the student throughout the process and ultimately evaluate the prospectus. The committee will consist of at least two faculty members whose areas of expertise are closely aligned with the student's statement of research interest. One or two faculty members with expertise outside the student's research interests may also be assigned to the committee. The composition of the committee will provide the student with specialized support in their chosen subfield as well as diverse perspectives from experts in adjacent subfields. This committee will meet with the student *at least* two times but can also be convened for additional meetings at the student's or committee's request. Please note that meetings with the committee more than 2-3 times a semester are common. Also, it may be impossible to get the entire committee together for a given meeting. Under these circumstances a meeting with an incomplete committee is better than no meeting, although the student should have a follow-up discussion with faculty that are unable to attend. Also, while developing their ideas, students are encouraged to meet frequently with their committee, as a group or individually, to enhance the intellectual value of the work for this assignment.

**4. By February 16<sup>th</sup>, 2024: Finish scheduling an initial meeting with the committee.** The student is responsible for arranging the place and time of this and all other meetings with the committee, and for notifying the coordinator when the meeting has been scheduled.

**5. March 8<sup>th</sup>, 2024: Last day to hold an initial meeting with the committee.** The intent of this initial meeting is to provide students with early feedback on their chosen topic, and to determine if the committee approves of the direction and scope of the student's prospectus. The following should be accomplished in this meeting: (i) Students should provide a brief oral presentation (~5-10 minutes) of their preliminary prospectus (slides are optional). The committee will ask questions and provide feedback to the student on the proposed topic and preliminary prospectus document. (ii) The committee should identify a faculty member on the committee that will serve as the chair of the committee (this cannot be the intended research advisor). (iii) After the presentation and discussion, the committee will convene privately to cast individual votes on whether the student has sufficiently outlined and supported the relevance of the proposed topic. A majority vote will allow the student to proceed with the proposed topic. During the committee-only portion of the meeting, members will outline specific deliverables the student is expected to present at the next meeting. Based on the voting results, the student and the committee will agree upon the date of the next meeting. The chair of the committee

will email a meeting summary (including deliverables) to the coordinator, student, and other committee members.

**6. By March 29<sup>th</sup>, 2024: Submit a draft of the *prospectus* to the committee.** The revised prospectus should incorporate the feedback provided to the student during the initial meeting with the committee. The maximum length of the revised prospectus is still 1,000 words (not including references).

**7. April 12<sup>th</sup>, 2024: Last day to hold a second meeting with the committee.** At this meeting, the committee provides (i) their approval or disapproval of the topic chosen by the student, and (ii) comments on the revised prospectus. There must be a consensus among the faculty members on the committee that the prospectus reflects the *student's independent achievement*. If the topic is not approved by a majority vote, the committee will advise the student on specific modifications that are required for approval. Finally, the committee may approve the topic but still recommend revisions to the prospectus. The chair of the committee will email a meeting summary (including deliverables) to the coordinator, student, and other committee members.

**8. By April 26<sup>nd</sup>, 2024: Last day to hold an optional third meeting with the committee.** At this meeting, the committee may provide final comments and suggestions for the student to incorporate into the prospectus. The chair of the committee will email a meeting summary (including deliverables) to the coordinator, student, and other committee members.

**9. May 3<sup>rd</sup>, 2024: *Final prospectus* is due to the committee and the coordinator.**

**10. By May 7<sup>th</sup>, 2024: The committee provides its evaluation of the final prospectus to the coordinator.** The chair of the committee will send its evaluation to the student and the coordinator, as well as additional comments to help the student that would be useful if they want to move forward developing their idea for a review or research proposal.

**If necessary, the committee and the student may agree to modify the deadlines outlined in this document. Under these circumstances, the chair of the committee should inform the coordinator at least a week before any deadline is changed.**

**The coordinator for the committees in 2024 is Prof. Jeff Lucas (jlucas@purdue.edu).**