DOCTOR OF PHILOSOPHY (Ph.D.) IN BIOLOGY

The Doctor of Philosophy is a research degree granted for proven ability, independent investigation, and scholarly contribution in a specialized field. It is not granted solely on the completion of a certain number of credits and there is no set credit requirement for this degree. The dissertation research must involve original and creative work. Credits for the dissertation and the research on which it is based should comprise a substantial portion of the program.

ADMISSION

For applicants who hold a M.S. degree, entrance into the Ph.D. program requires a minimum GPA of 3.0 for courses taken in the previous degree program and scores in the 35th percentile or higher on the verbal and quantitative sections of the GRE.

For applicants who hold only a Bachelor's degree in biological sciences or a closely related discipline, entrance into the Ph.D. program requires a GPA of 3.0 or higher for all undergraduate work and scores in the 50th percentile or higher on the verbal and quantitative sections of the GRE.

Students for whom English is a second language who do not meet the minimum verbal GRE score must meet the Graduate School minimal TOEFL score. Other exceptions to the verbal and quantitative GRE requirements will be granted only in exceptional circumstances.

All applicants must also submit scores for the GRE subject area test in Biology or in Biochemistry/Cell/Molecular Biology.

The application must be approved by a majority vote of the Graduate Programs Committee prior to formal acceptance by the Department. No student in the Department's Master's program will be permitted to advance to the PhD program without approval of the Graduate Programs Committee. Application for advancement must include (1) a letter from the student that provides a rationale for the status change and (2) a letter of support from the major professor.

PROGRESSING THROUGHT THE PH.D. PROGRAM (10 EASY STEPS)

1. Initial Evaluation

The purpose of this evaluation is to provide the incoming student with guidance regarding coursework and other studies that will help them to be successful in their degree program. The evaluation should take place by the end of the second full month in residence (October, for students entering in the fall).

The Evaluation Committee should consist of the major advisor and two other faculty members, at least one of whom is also a regular (i.e., tenure track or research) faculty member in the Department of Biological Sciences. Members of the Evaluation Committee should be chosen by the advisor and student, and may become part of the student's Advisory Committee.

The result of the Initial Evaluation should be the creation of an Initial Program of Study.

2. Initial Program of Study

Based on the results of the GRE Subject test, the student's transcripts, and the student's research interests, the Evaluation Committee should help the student draft an Initial Program of Study that lists coursework the student will take to meet the program requirements and support the student's research. The Initial Program of Study should indicate how the student will meet the requirement for exposure to three Core Areas (Cellular and Molecular Biology, Organismal Biology, and Ecology & Evolution). A copy of the Initial Program of Study should be given to the Chair of the Graduate Programs Committee and then filed in the student's permanent file.

3. Core Areas

Students in the Ph.D. program are required to have some exposure to each of the following core areas:

Cellular and Molecular Biology – which can include cellular structure and function, genetics, and molecular biology

Organismal Biology – which can include any of the '-ologies', organismal structure, function, development, growth, and diversity

Ecology and Evolution – which can include population biology, conservation biology, evolutionary ecology, community ecology, population ecology, and behavior

Exposure to these areas can include undergraduate coursework, graduate coursework, or directed readings. The taxonomic focus of coursework may reflect the student's research focus. For example, a microbiologist could satisfy the first core area with coursework in microbial genetics, the second core area with coursework in microbiology, and the third core area with coursework in microbial evolution, whereas a mammalian physiologist could satisfy the first core area with coursework in population genetics, the second core area with coursework in comparative anatomy, and the third core area with coursework in vertebrate paleontology.

4. Advisory Committee

Ph.D. students should establish an advisory committee no later than the end of their second semester in residence. The Advisory Committee will consist of the major professor, at least three other members of the graduate faculty, and a Graduate Faculty Representative (GFR). The GFR is officially appointed by the Dean of the Graduate School, however recommendations made by the Department are typically honored by the Graduate Dean. Because the primary role for GFR is to serve as a representative of the Graduate Faculty, the GFR does not have to be identified during the first year of the student's program. The Advisory Committee may include individuals

from other departments or persons from outside the University who hold affiliate rank in the Department, but the majority of any committee must consist of regular departmental faculty.

Within the broad guidelines outlined in this document and the General Graduate Program Requirements, it is the responsibility of the Advisory Committee to monitor and direct the student's progress and:

1. identify how the student will satisfy the requirement to have some background in each of the three core areas,

2. review the student's research proposal, conduct an oral examination following a public presentation of the research proposal, and determine if the student has passed that examination,

3. review and sign the student's Program of Study, ensuring that it meets the Graduate School requirements (i.e., total number of credits, number of 600-level credits, number of credits if a minor is part of the student's program),

4. conduct a comprehensive examination after the student has completed the majority of the coursework on the Program of Study, and

5. review the dissertation and conduct a rigorous examination of the candidate's research before approving and signing the dissertation.

5. Research Proposal

All Ph.D. students are required to develop a research proposal that details how they will develop the research that will form the basis of their dissertation. The proposal should follow the guidelines for an NSF dissertation improvement grant or proposal to a comparable national funding source. The proposal will include: (1) a survey of the literature, to develop a rationale for the research, (2) a statement of the problem(s) or hypothesis (es) to be addressed, (3) detailed descriptions of methods including the experimental design and planned statistical analyses, (4) preliminary data (optional, but strongly encouraged), (5) a time line, (6) a bibliography, and (8) a budget.

The student must present the proposal to the department during a one-hour seminar to be scheduled no later than the end of the third semester of residency. The proposal must be provided to all members of the Advisory Committee at least seven days before the seminar. After the seminar the student will meet with the advisory committee for an oral defense of the proposal. The committee may ask to re-examine the student upon revision of the proposal if significant shortcomings are identified.

If the committee decides that the student is not able to demonstrate sufficient mastery of the research area, the committee may recommend that the student not complete the Ph.D. program, but consider alternative possibilities, such as switching to an M.S. program. Following approval

of the proposal by the Advisory Committee the proposal should be submitted to an appropriate agency for funding.

Once the student has successfully defended the research proposal the student is advanced to candidacy.

6. Revised Program of Study

Following the successful proposal defense, the student should submit to the Assistant Chair for Graduate Programs a Program of Study that has been approved and signed by the Advisory Committee. This form should indicate how the student will satisfy all of the degree coursework requirements. Subsequent substitutions for any courses on this Program of Study must be approved by the student's Advisory Committee.

7. Minor

There is no requirement for Ph.D. candidates to have a minor, however, a candidate may identify a minor that develops expertise in an area outside the major research focus. Courses to be applied to a minor must appear on the Final Program of Study for the minor to be noted on the transcript. The minor should consist of 9 or more credit hours that address a common theme. That theme may be in a subject area outside of Biology (e.g. Geosciences), or it may be an area within the Biological Sciences that is distinct from the candidate's primary research topic. For example, a microbiologist might develop a minor in ecology, a physiologist might develop a minor in environmental science, an ecologist might develop a minor in microbiology. In addition, any candidate may develop a minor in Biology Education by taking advantage of the existing Doctor of Arts in Biology curriculum. The minor in Biology Education will normally consist of 4 credits of seminars (Bios 693 -Seminar in College Teaching and/or Bios 694-Advanced Studies in College Teaching) and 5 credits of Supervised Teaching Internship (Bios 700). Students who pursue the minor in Biology Education are eligible for one year of D.A. Fellowship support.

8. Comprehensive Examination

The student must pass a Comprehensive Examination intended to test his/her preparation for completing the Ph.D. degree program. The Comprehensive Examination should address at least two of the three core areas (see above). The extent to which these areas are addressed in the Comprehensive Examination will be determined by the Advisory Committee, and should reflect the student's area of research specialization. In addition to the core areas, the Comprehensive Examination should address the specific knowledge the Advisory Committee feels the student will need to successfully address the research that is the focus of the dissertation.

The Comprehensive Examination should be scheduled after the student has completed the majority (i.e., all but one or two classes) of the coursework for the degree program. At least three

months prior to the examination, the student should meet with the Advisory Committee to identify the specific areas that will be covered and the committee member who will be responsible for writing questions for each area. If the student has a minor then a portion of the comprehensive examination should focus on that minor. Students should meet individually with committee members to determine how best to prepare for the specific topics that will be covered by the examination. The examination must be partly written and partly oral. Both portions must be passed satisfactorily in order to complete the Comprehensive Examination requirements.

The written portion of the Comprehensive Examination generally will consist of eight sections (each meant to be completed in 3-4 hours). The form of the written portion is flexible. If it is of a 'closed book' type it should not be less than the equivalent of three (8 hour-long) days nor more than five (8 hour-long) days of actual writing time. Normally the written exams will be completed within the span of one week. Evaluation of each section of the written examination is on a pass/fail basis. The student must earn a passing evaluation on at least 75% of the sections to pass the written portion of the comprehensive examination. Failed sections may be repeated once, at a time designated by the student's Advisory Committee, but within a year of the original examination. The completed and graded written portion of the Comprehensive Examination is to be placed in the student's departmental file.

The purpose of the oral portion of the examination is to provide an opportunity to clarify and explore further implications of the written examination as well as to present the student with new questions in the same general subject areas as those covered by the written exams. The oral portion should not be given until after the written examination has been evaluated by all of the committee members, but no later than two weeks after completion of the written portion. The orals must be passed by simple majority vote of the advisory committee. In case of failure, the student may be allowed to retake all or part of the oral examination at the discretion of his/her advisory committee.

If the Graduate Faculty Representative (GFR) was chosen to provide specific expertise to support the student's graduate program, the GFR should participate in both the written and oral portions of the Comprehensive Examination.

9. Dissertation

Every student working toward the PhD degree must submit a dissertation embodying the results of original and creative research. The dissertation must demonstrate the student's ability in independent investigation and must be an original contribution to scientific knowledge. It must display mastery of the literature of the subject field and must demonstrate an organized, coherent development of ideas, with a clear exposition of results and creative discussion of the conclusions.

The form and style of the dissertation should comply with the format prescribed by the national- or international-level journal, in which the student intends to publish the material and must meet

the requirements of 'Instructions for Preparing Theses, Dissertations, DA Papers, and Professional Projects,' which is available from the Office of Graduate Studies. Within the framework of these constraints, however, the format of the dissertation can vary, ranging from a series of stand-alone chapters to single, comprehensive unit. In the former case, a preface that explains the overall layout should be included. After the dissertation has been approved for format and content by the major professor, and at least two weeks before the date of the final examination, the student must deliver a copy of the dissertation to each member of the Advisory Committee.

10. Dissertation Defense

The student's Advisory Committee, including the GFR, will conduct the final examination of the dissertation. The final defense must be completed at least two weeks before the date set for the commencement exercises at which the student expects to obtain a degree. Students are required to give a departmental seminar on the dissertation immediately preceding the final defense, and the student is required to publicize the seminar at least one week in advance (i.e., notice in the Departmental Newsletter and notices posted in the Life Sciences Building).

The examination is concerned primarily with the student's research as embodied in the dissertation, but it may be broader and extend over fields of study related to the dissertation. The final examination is entirely oral and is open to faculty invited by the advisor, Department Chair, or Dean of Graduate Studies. Committee members may ask questions and those visitors specifically invited to do so by mutual agreement of the student's Advisory Committee and the Dean of Graduate Studies. A majority of the examining committee must approve the dissertation and the final defense.