

BIOLOGY DEPARTMENT GUIDELINES FOR GRADUATE STUDENTS

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posted at <http://ase.tufts.edu/biology/graduate/current.asp> as pdf file)

The Biology Department offers research opportunities in many different areas within molecular biology, developmental biology, physiology, behavior, ecology and conservation biology. Although graduate education involves specialization, we want all our students to be familiar with the broad, general concepts of our science, to be able to appreciate and respect work in several areas of biology, and to understand how they are interrelated.

Common Experience

The Biology Department requires that all graduate students attend and participate in all departmental seminars. When outside speakers come, the faculty host will provide papers to the department in advance of the seminar. All students are expected to read these papers. Students also are encouraged to meet individually with invited speakers and there are often opportunities to join outside speakers for lunch.

Expectations and requirements for graduate students are set forth so that our graduate students, both incoming and experienced, will have a clear idea of what is expected of them and the time schedule for meeting these obligations.

Course Requirements

Students normally must have taken several biology courses (especially Introductory Biology and Genetics), as well as one semester of calculus, physics and organic chemistry as undergraduates. If critical courses have not been taken before admission, they must be made up, generally within the first year. Because we offer a broad-based biology grad program, we require that all graduate students take or have taken at least one course from each of the three subdisciplines - Groups A, B, and C (See catalogue for definitions of A, B, and C).

The Graduate Entrance Committee (see Graduate Committees below) will tell accepted students how and when it expects certain courses to be made up. Any 100-level biology courses approved by the student's committee can be used toward the graduate degree. A student's Thesis Committee may also require other courses to be taken, depending on the student's area of study.

Required Courses

Coursework Master of Science (cw MS) - Upon entering, a student will be assigned a committee comprised of two faculty members. It is suggested that cw-MS students meet with their entrance committee once each term to review the student's program of study.

Eight graduate level course credits are required and the grades must be B- or higher. No more than one of the seven required courses may be a guided individual study (e.g. Bio293, 294) and no more than one may be a research course (e.g. Bio193, Bio194). One of the eight must be an approved seminar course, usually either Bio243 or Bio244.

Research Masters of Science - Eight graduate level course credits are required and the grades must be B- or higher. Students will take courses as recommended by the graduate school, the biology program and by their committees (see Graduate Committees below). Normally 4 of the credits will be for laboratory research including rotation projects (Bio253 fall or Bio254 spring; one credit for each rotation completed, usually for a letter grade) or Master's thesis research (Bio295 and Bio296; one credit each, generally graded as satisfactory or

unsatisfactory); the other 4 are regular graduate level courses, which must be completed with grades of B- or better. One of the eight must be an approved seminar course – typically either Biology 243 (Topics in Molecular and Cell Biology) or Biology 244 (Topics in Evolutionary Ecology). For international and other students needing to demonstrate full-time status as a student, students must register for Bio402FT (Masters candidate full-time).

Doctor of Philosophy - Students will take courses as required by their committees (see Graduate Committees below). Normally a student registers for Bio502FT (see rationale below) and two courses each term during the first and second year of the PhD program. One or both of these two courses may be for research credit. Either Bio243 (Topics in Molecular and Cell Biology) or Bio244 (Topics in Evolutionary Ecology) is required of all Ph.D. students. While doing fall or spring semester rotations during the first year, students will enroll in Rotation Research courses (Bio253 fall or Bio254 spring; one credit for each rotation completed, usually for a letter grade). This serves to provide both laboratory research experience (see below) as well as an in depth knowledge of the subject matter. Prior to their qualifying exam, students may also receive credit for Bio297 or Bio298 (PhD-track Graduate Research; generally graded as satisfactory or unsatisfactory). Ph.D. candidates should register each semester (including both summer semesters) as a continuing doctoral student (Bio502FT).

Graduate Student Registration in the post-9/11 Era: For international and other students needing to demonstrate full-time status as a student (which is important for most students), students will register for either Bio402FT (Masters candidates) or Bio502FT (PhD candidates). These courses automatically confer full-time status, regardless of what appears on the transcript. Authorities seeking to verify the student's status (for the purposes of immigration, student loans, health insurance, etc.) will receive an "enrollment verification form" indicating full-time student status. **STUDENTS MUST REGISTER EACH SEMESTER – INCLUDING SUMMER SEMESTERS DURING THEIR TENURE AT TUFTS**

Student Research Rotations - A research rotation is an opportunity to explore a new area of Biology, to learn new techniques, and to become acquainted with some of the research ongoing in our department.

All Ph.D. students are expected to do at least two rotations in the department. Research M.S. students may, but are not required to, perform research rotations. If a student on entering is already interested in a particular lab for thesis research, one of the required rotations can be in that lab. Students need not have both rotations in the same general area of biology. Students must choose and be accepted by a lab for thesis research by the end of the summer of the first year. Research credit is given to students successfully completing the requirements of their rotations via enrolling in either (fall) Bio253 or (spring) Bio254 Rotation Research courses (1 credit each usually taken for a letter grade).

Under special circumstances, with committee consent, students can work as a research assistant with a principal investigator outside our department for one of the rotations.

Students should start and end rotations in synchrony on a semester basis so that a critical mass of students can report on rotations at the same time: Fall rotation—early September to mid-January, spring rotation—mid-January to end of May, and summer rotation—beginning of June to end of August. Students will normally present their findings on or near the following dates: the Friday before the start of spring semester (fall semester rotations), and the first Friday of the fall semester (spring or summer rotations). Rotation Duration: Oral reports will be given to a group consisting of other students who have just finished a rotation, the sponsoring research mentors, members of the students' committees, graduate students, and other interested persons. Research M.S. students doing a rotation or engaged in thesis research in year 1 will give oral reports on their work as well. Following the oral presentations, the students will schedule a meeting with their entrance committee.

Graduate Committees

Entrance Committee - Upon entering the Graduate program a student will be assigned a committee of two or three faculty members, whose functions are: (1) to review undergraduate courses to determine if coursework deficiencies exist, (2) to provide advice on coursework and rotations until a graduate committee is established, and (3) to file semi-annual reports of progress made toward completion of the requirements.

Ph.D. Qualifying Exam Committee - This committee will consist of the student's thesis advisor and at least three additional members, usually to represent breadth as well as depth. These members will be chosen in consultation with the advisor and this committee will be approved by the student's entrance committee.

M.S. Thesis Committees - Once a research advisor is identified, the student in consultation with the advisor, will select at least two additional committee members.

Ph.D. Thesis Committees - Once a research advisor is identified, the student in consultation with the advisor will select at least three additional committee members. At least 3 members, including the advisor, should be from within the department. A person from outside the University is required for the defense of the Ph.D. thesis. The Ph.D. Thesis Committee will approve the outside member before he or she is invited.

Defense of Research M.S. - To complete the research M.S., the candidate is required to prepare and defend a thesis based on original research done under supervision of a departmental faculty member. Prior to completion, the student will give a public presentation of his/her results to the department, and then immediately meet with the thesis committee to defend the thesis.

The Ph.D. Qualifying Examinations (Part 1= written exam; Part 2=Research Proposal exercise)

PART 1: Ph.D. Written Qualifying Examination

The written examination, composed by the student's exam committee, tests a student's broad knowledge of those areas of biology that are related to the student's specialization. For example, a student of animal behavior would not be asked to answer a question involving methylation-directed mismatch-repair of DNA in bacteria. The exam usually will contain about seven or eight questions of which the student must answer five. There may be alternatives for certain questions; other questions may be obligatory. Four of the five questions answered will deal with material from courses or from material related to their professional interests. Only one of the five questions can be taken directly from the immediate area of their thesis.

The exam committee will meet with the student to discuss the general topics that will be covered a few months prior to exam. If the committee members wish to provide reading lists for the specific topics - this should be completed a few months prior to the exam (typically by Feb. 15th). These lists should serve as a starting point for preparation; they are not meant to supplant the responsibility for individual inquiry and reading of the literature. Typically the exam is given on the Friday before commencement in the student's second year, i.e., about 21 months after entry into the program. In special circumstances, students in consultation with their members of their committee, may take the exam earlier (e.g., students with masters degrees may take it in their second semester and students with research commitments in May can seek permission to take it at the beginning of the 4th semester).

The student is given eight hours to write the exam. Each question will be graded by two committee members. If needed, the second grader can be from outside the committee. The score for each question will be the average of the two grades. A passing grade is 70% of the exam's total points. The exam should be marked within four working days of the date of the exam. The student should be told the final score but not the scores for each question. However, the graders' comments, if any, on each question should be given to the student.

If the student's overall score is less than 70%, the committee will consider the quality of the answers given as well as the student's record including rotations, teaching assistantships, and courses in deciding if the student will be re-examined. The written re-examination, if needed, would occur the following September. The committee would clearly indicate the general topics covered on the re-examination. Re-examination can occur only once; if a student fails a second time they may not continue in the graduate program.

Even with an overall total passing score ($\geq 70\%$) the committee can still require study or coursework in certain areas that the exam may have revealed as weaknesses.

Exam Committee Member responsibilities: In addition to providing reading lists/topics, the committee members will submit questions to the thesis advisor at least one week prior to the scheduled exam. These will be copied and circulated to the entire committee in advance of a planning meeting at which time the committee will decide on the questions to be used. At this meeting, a date and time for the graders to meet and discuss the scores should also be scheduled.

PART 2: Ph.D. Qualifying Exam - Research Proposal

**THERE ARE SPECIFIC INSTRUCTIONS LOCATED IN A DOCUMENT ENTITLED
“Ph.D. WRITTEN QUALIFYING EXAM
RESEARCH PROPOSAL (Part 2) GUIDELINES”
&
SEVERAL EXAMPLES OF NSF-STYLE PROPOSALS LOCATED IN THE
“BIOLOGY GRADUATE STUDENT SURVIVAL GUIDE”
BINDER IN THE MAIN OFFICE.**

General comments about the PhD QUALIFYING EXAM (Part 2) – RESEARCH PROPOSAL

The purpose of the proposal is to make students thoroughly familiar with the theory behind the techniques that they will use; to give them a complete grounding in the literature, both current and historical, of their research field; and, most importantly, to get them to think about their research. The proposal is called a research proposal, not a thesis proposal. The proposal will cover the expected thesis area, but is it not inconceivable that the thesis will eventually be on another topic.

Your research proposal should consist of:

- 1. Title**
- 2. “Abstract”** (Summary or Project Overview) (What are you planning to do and why? – Big picture)
- 3. Hypothesis statement** – (What are the important questions being asked? What don't we currently know?)
- 4. Specific Aims** (Overview and rationale of how are you planning to ask your questions)
- 5. Background & Significance** (What is already known or **not** known? (the ‘gap’ in literature) Why should we care?)
- 6. Preliminary Data** (What have you already done to address this gap and answer your questions?)
- 7. Research Design and Methods** (How are you doing to ask your questions – the proposed methods/data analysis/interpretation/plan B)
- 8. Conclusion /Summary** (What will we know after the proposed experiments/project are completed, that we didn't know before the project was completed)
- 9. Literature cited**

The Research Proposal normally must be defended no later than the end of the student's fifth semester (extensions will only be granted by the graduate program director in consultation with the thesis advisor under extreme circumstances). If the direction of the thesis research changes significantly from what has been proposed, the student's thesis committee can request an additional written description of the proposed work.

Proposal Time Line

(For detailed instructions and suggestions see document entitled “Ph.D. WRITTEN QUALIFYING EXAM RESEARCH PROPOSAL (Part 2) GUIDELINES” located in the “Biology Graduate Student Survival Guide” binder in the main office.

PRIOR to submitting proposals to thesis committee members, research advisors must pre-approve all grant applications (typically the research advisor is given the “final” proposal by the student no later than **Oct. 15th**). Your advisor should have seen at least one draft by the beginning of October. AFTER the advisor has approved the student’s proposal, it is given to the other committee members for comments. Committee members should receive their “final” copy no later than **November 1st**.

After your committee receives a copy of your Research Proposal, each committee member will return written comments to the student. At that time each committee member can sign-off on the proposal as defensible or ask for significant revisions. The final proposal must be approved by signature of all committee members **before** the defense is scheduled.

At the defense, the student presents the proposal orally and is then questioned about it. If the defense is not satisfactory, the student must be re-examined within four months on those aspects of the defense indicated by the committee. Re-examination can only occur once.

Oversight of Graduate Student Progress

The appropriate committee, entering, exam, or thesis, depending on the student's stage of progress, should meet with the student twice a year. If the student is presenting his or her work at the Friday afternoon seminar or at a rotation seminar, all members of the student's committee should attend. Students are expected to give a seminar each spring to the department. The graduate student is responsible for scheduling a committee meeting in the fall and in the spring (usually within 2 weeks of the student’s seminar; for more details see “Graduate Student Committee Meetings”).

The chair of each student's committee will keep minutes of each meeting. Items such as course needs, rotations completed or in progress, courses taken and those to be taken, research progress, exam scheduling, and work as a teaching assistant should be discussed.

Before the minutes of the meeting are put into the student's folder, they should be circulated to all committee members for additions and/or corrections. After committee approval, the chair of the student’s committee will give a copy to the student, all committee members, and to the graduate staff assistant (Eileen Magnant for the student’s file). In addition to committee minutes, a student's folder should also have a copy of the Graduate Progress Form, to be kept up to date by the student's advisor. This form is used for: Ph.D., Research Masters, and Coursework Masters students. Students have the right to add comments to their files in response to the minutes of committee meetings.

Ph.D. and Thesis Masters students should submit reports to their committees three to four working days before each semi-annual meeting. The reports should be brief, not exceeding 2 pages, excluding figures and tables. Figures can be simple and hand-drawn, but should be clear and easily interpreted. The report should contain the specific aims of their research (for rotations, the limited aim of that period), approaches used, results obtained, and a brief discussion. The report should conclude with research plans for the next six months. Students should bring their lab notebooks containing the original data to the scheduled meetings. If the student completed a

rotation, the head of the lab in which the rotation was done should send a brief evaluation to the committee. These reports will be kept in the student's folder.

Unsatisfactory Progress

The most important aspect of progress toward a degree is generating a thesis of publishable quality. Course grades must be B- or higher to count for graduate credit. In the event of a lower grade, the student's committee will decide if the course must be retaken. Overall grade point average must be at least 2.670. Unsatisfactory progress can also result from unacceptable or inadequate work as teaching assistants or in rotations and research, lack of progress in completing the requirements, or academic dishonesty.

In case of inadequate performance in research or courses, the student will be warned, in writing, by his/her committee and given three to six months to improve. The warning should specifically state the work or actions required of the student. In cases of academic dishonesty or failure upon re-examination in the qualifying procedure, dismissal requires no warning.

Departmental T.A. Support

All thesis graduate students are required to TA for at least two semesters. At the end of the semester, an evaluation of the student's work as a T.A. should be completed by the supervising faculty member using a standard evaluation form. The evaluation is placed in the student's file. Before the beginning of the semester, all T.A.'s should be given in writing a clear explanation of their duties and responsibilities by the faculty member in charge of the course.

***Starting fall 2008 - Students assigned to serve as teaching assistants for Bio13L (Introductory biology) must also enroll in Bio260 (Teaching Biology: Pedagogy and Practice) during the semester they are teaching. (If assigned to teach Bio13L again, returning graduate students will be required to attend only portions of Bio260 in subsequent years.)

A student can only receive T.A. support from the department through the second semester of their sixth year. A student has a maximum of seven years to complete their Ph.D.; however, students are encouraged to complete their thesis in six years or less.

Submission of Master's Thesis and Doctoral Dissertation

The Graduate School requires that the Thesis/Dissertation be submitted in PDF format through the following link: <http://gradstudy.tufts.edu/> (Thesis/Dissertation Electronic submission). The Thesis/Dissertation will be submitted to ProQuest/UMI from this site.

The Biology Department **requires that a bound copy be on display in the department reading room.** It is the responsibility of the student to provide a final, bound copy for the department. It is suggested that Acme Bookbinding Co., Inc., 100 Cambridge St., Charlestown, MA, (617) 242-1100, be used for the departmental copy. Acme will print in color, document will be single-sided, will conform to all Tufts standards. Acme will be able to match the format of the binding to that used in dissertations submitted by former students in Biology.

Time Line of Important Dates for Ph.D. Candidates

TIME	ACTION
Year 1	Complete Rotations (at least 2; fall & spring) Present Rotation Reports (at least 2; fall & spring)
Year 2	Choose a Thesis Advisor (fall) Qualifying Exam Part 1 – Ph.D. Written Qualifying Exam (spring)
Year 3	Qualifying Exam Part 2 - Ph.D. Research Proposal (fall)
Year 6	T.A. Support completed (end of year 6)