

**GRADUATE  
PROGRAM  
GUIDE**

**DEPARTMENT OF  
BIOLOGY**

**BOSTON  
UNIVERSITY**

**2014-2015**

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## BIOLOGY DEPARTMENT ADMINISTRATION

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Frank Naya  
William Eldred  
Pamela Templer

Director of Graduate Studies

Kim McCall

Director of Undergraduate Affairs

Eric Widmaier

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Academic Program Coordinator  
Administrative Coordinator  
Senior Accounts Analyst  
Materials/Facilities Manager  
Stockroom Senior Staff Assistant  
Stable Isotope Laboratory Coordinator  
Workshop Supervisor  
Instructional Labs Director  
Lab Supervisor (Introductory Labs)  
Introductory Biology Administrative Coordinator  
Introductory Lab Supervisor  
Lab Supervisor (upper-level)  
Anatomy Labs Coordinator  
Physiology Labs Coordinator  
Imaging and Proteomics Core Director

Sara Martin  
Richard Rigolini  
Michelle Sherman  
Meredith Canode  
Portia Ross  
Kelly McGuire  
Barbara Caloggero  
Thomas Symancyk  
Nate Garrison  
Robert Michener  
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Fred Earthrowl  
Chenille Hogan  
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Barkha Shah  
Dale Pasino  
Angela Seliga  
Todd Blute

## **BIOLOGY DEPARTMENT GRADUATE PROGRAM ADMINISTRATION**

The goal of the Biology Department at Boston University is to train students at the highest level in one of three broad sub-fields within modern Biology. Upon completion of the Ph.D., students should be prepared for post-graduate training and to eventually assume teaching and/or research positions in academia, industry, government or non-profit agencies.

The Director of Graduate Studies oversees academic programs and policies at the graduate level in the Department of Biology. In addition, we have a Graduate Committee, consisting of the Chair of the Committee and department faculty representing the three programmatic areas in the Department (Ecology, Behavior and Evolution; Cell & Molecular Biology; Neurobiology). The Committee Chair and members of the Committee are appointed by the Chair of the Department. The Graduate Committee is responsible for the programs of continuing students, allocating Department Travel and Research Grants, and maintaining overall standards in the Graduate programs.

### **Graduate committee:**

Chair/ Ecology, Behavior, and Evolution  
Cell & Molecular Biology  
Neurobiology

Pete Buston  
Horacio Frydman  
Ian Davison

### **Research Material Ownership**

All Master's and Ph. D. students should be aware that Boston University serves as the guardian of research conducted at Boston University, including research supported by all Government agencies and most private foundations. This has several implications.

- Patents that arise from research conducted at Boston University are the property of Boston University, as outlined in the Faculty Handbook.
- Students are required to leave all original data and notebooks at Boston University upon completion of their studies. Students may take photocopies of these original research data and notes.

### **Grades and Academic Standing for Graduate Students**

#### ***Student responsibilities:***

Briefly, each graduate student is expected to maintain a 3.0 GPA and receive no more than two grades below B-. Three failing grades (C+ or lower or a permanent "I" grade) will result in termination from the program.

As outlined in the Graduate School Bulletin, the Graduate School allows no more than eight credits with a grade less than B- (C+ or lower) and the Biology Department requires maintenance of a 3.0 GPA to remain in good academic standing and be eligible to complete the graduate degree. Teaching grades are not included in calculating the GPA. Any student receiving a grade lower than B- in a graduate course will be counseled by his or her faculty advisor and the appropriate member of the Graduate Committee. Any student who receives a second grade lower than B- will be counseled by the Director of Graduate Studies, and will lose good academic standing in the

Biology Department. All Departmental guarantees including financial support guarantees are dependent on being in good academic standing.

The Director of Graduate Studies will advise any student on academic probation of the specific time frame (generally within 2 semesters) during which the student must re-establish a cumulative GPA of 3.0 and, thus, regain good academic standing. Failure to meet these requirements within the specified time, or receipt of a third grade lower than B- will result in a recommendation to the graduate school of termination of the student's enrollment at the University. Appeals of the decision to recommend termination may be made to the Graduate Committee.

*Faculty responsibilities:*

The faculty advisor and the Director of Graduate Studies are responsible for monitoring the academic performance of each graduate student each semester. These individuals should notify the Graduate Committee of any student who receives a grade below B-. The Director of Graduate Studies will inform the Graduate Committee of the requirements for regaining good academic standing for any student placed on academic probation. The Graduate Committee will serve as the venue for student appeals.

**FACILITIES FOR TRAINING AND RESEARCH**

(All Charles River Campus Biology buildings are non-smoking)

**Biology Research Building (BRB)**, 5 Cummington Street, Boston, MA

This building houses departmental administrative offices, research laboratories, and offices of faculty in the Ecology, Behavior, and Evolution (EBE), Marine (BUMP), and the Physiology, Endocrinology, Reproduction (PER) programs. It also houses departmental common facilities, including the Aquarium Room, Stable Isotope Laboratory, DNA Sequencing and Molecular Biology Facility, Workshop, Instrument Rooms, Environmental Rooms, a graduate student lounge, seminar rooms, and two classrooms.

**Biological Science Center (BSC)**, 2 Cummington Street, Boston, MA

This building houses research laboratories, and offices for faculty and graduate students in Cell & Molecular Biology (CM).

**Life Sciences and Engineering Building (LSE)**, 24 Cummington Street, Boston, MA

This building houses a centralized stockroom, the offices and laboratories of faculty members in Cell and Molecular Biology (CM) and Neurobiology (NEURO) as well as departmental common facilities, including instrument rooms and environmental rooms. It also houses departmental common facilities, including the Electron Microscope and Confocal Imaging Facility and the Biology Media Center.

**Metcalf Center for Science and Engineering (SCI)**, 590 Commonwealth Ave., Boston, MA

This facility houses the administrative offices for Introductory Biology and the departmental teaching laboratories. Laboratories for Introductory Biology are located on the third floor (west side). The fourth floor houses upper-division teaching laboratories. This building houses the University-wide Laboratory Animal Care Facility, and public lounges, as well as the teaching laboratories, offices, and research laboratories of the Departments of Chemistry and Physics.

**Science and Engineering Library**, 38 Cummington Street, Boston, MA

This library contains most of the University's holdings in Science and Engineering. More general holdings are located in the Mugar Library at 775 Commonwealth Ave. On-line catalogue and journal access is available at both libraries, as well as any departmental computer terminal.

## DEGREE REQUIREMENTS

### **M.A. DEGREE Requirements for the Department of Biology** (Individual program requirements may be more specific)

#### **Faculty Advisors**

Each graduate student admitted to the M.A. Degree program will be assigned a faculty advisor. The appropriate Research or Library Research paper committee will be formed no later than the first year of full-time graduate study.

#### **I. General Requirements:**

- **General Credits.** All Master's Students must complete at least 32 credits of graduate work (as detailed below for each type of Master's degree in Biology). Two courses (8 credits) may be transferred in from another university upon approval of the advisor (Transfer Credit Approval forms are available in Graduate School, 705 Commonwealth Ave., Room 112).
- **Financial Aid.** Students in the Master's' programs are eligible for Teaching Fellowships and Departmental Scholarships, but typically are not provided with a guarantee of support.

#### **II. Special Requirements:**

##### **1. Research Master's (with thesis)**

- *Course Work.* The student must complete at least 32 credits of graduate level work. At least 20 of these graduate level credits must come from formal course work (cannot include credits from any research course).
- *Research Thesis.* The student must write a thesis detailing original research that was conducted under the sponsoring faculty member. The thesis will generally include the following sections: Abstract, Introduction, Materials and Methods, Results, Discussion, References and figures and/or tables summarizing research. The thesis must be read and approved by a committee of three faculty members that includes at least two faculty members from the Biology Department; one committee member must be the faculty member who acted as the Major Professor for the student's research. A final copy of the thesis must be given to all committee members, the Department, and one copy should be kept by the student. An oral defense, while not required, is strongly recommended.

##### **2. Non-Research Master's (with Library Research Paper).**

- *Course Work.* The student must complete 32 credits of graduate level course work. Ordinarily, these courses will be selected under the mentorship of the faculty member who is serving as the student's primary library research paper reader (see

below).

- *Library Research Paper.* The student must write a Library Research Paper on a selected topic in Biology. This paper will generally be a document of approximately 30-80 pages on a selected research topic in current Biology and will usually include several chapters and extensive literature references. This paper will be written in consultation with a faculty member from the Biology Department who will serve as the primary reader. The final version of the document must be read and approved by at least two faculty members (e.g., the primary reader and one other faculty member) from the Biology Department. A final copy must be given to all committee members, the Department, and one copy should be kept by the student.

### 3. Master's of Arts for Ph.D. students. Two options.

- *Option one.* A Ph.D. student who has advanced to candidacy (as demonstrated by passing the Ph.D. qualifying exam), and has completed 32 credits of graduate level course work (not including research) may apply to the Graduate School for a Master's of Arts degree in Biology. This must be approved by the Director of Graduate Studies within the Biology Department. The student's major professor should receive notification of this application process.
- *Option two.* A Ph.D. student who has not been advanced to candidacy based on the Ph.D. qualifying examination may still receive a Master's degree. This student may receive a Master's degree if at least three members (including at least two faculty members from the Biology Department) of the Ph.D. qualifying examination committee vote that the student's performance on the qualifying examination was of sufficiently high quality for a Master's degree. In addition, this student must have completed at least 32 credits of graduate level course work.

**Time Limits.** Officially, Research and Non-Research Master's must be completed within three years from the date of first registration. However, students may apply to the graduate school for extensions past the three-year deadline. The degree is conferred at the end of the academic year or as specified in the Graduate School Bulletin.

#### M.A. TIMETABLE FOR THESIS PREPARATION AND DEFENSE\*

	<u>Sept. 25, 2014</u>	<u>Jan. 25, 2015</u>	<u>May 17, 2015</u>
Thesis Title Approval			
Card due in GRS Office	April 4, 2014	May 3, 2014	Nov 7, 2014
*Diploma Application due in GRS Office	June 1, 2014	Nov. 1, 2014	Feb. 1, 2015
First draft of thesis (submitted to readers)	July 3, 2014	Oct. 3, 2014	March 6, 2015
***Approved and signed thesis (2 copies) due in GRS Office	Aug, 15, 2014	Dec. 12, 2014	April 10, 2015

\*The diploma application is valid only for the graduation date specified; a new application must be filed if the student does not graduate as planned.

\*\*\*Prior to the signing of the thesis, the candidate must schedule an appointment with the Graduate School Records Officer for review of the thesis format. M.A. degree requirements are complete only when both copies of the thesis have been certified as meeting the standards of the graduate School and of the library. This is not necessary for the library research paper (non-research MA).

**Ph.D. DEGREE requirements for the Department of Biology**  
**(Individual program requirements may be more specific)**

**Course Requirements**

A. Post-bachelor's Ph.D.

- 64 credits
- No more than 32 research credits (the rest must be formal courses)
- A maximum of 2 courses (8 credits) may be transferred in from other institutions

B. Post-master's Ph.D.

- M.A. degree from accredited university
- 32 credits
- Maximum of 16 research credits (the rest must be formal courses)
- No courses may be transferred from other institutions

**\*\*The GRS BI 699 course for which all teaching fellows register does not count toward these requirements.**

**Faculty Advisory Committee**

All Biology graduate students are paired with a primary research advisor (major professor), who is a member of the Biology faculty and who serves as first reader on the student's thesis. That individual will serve as first reader on his/her thesis. All students admitted to the Ph.D. program will be assigned a temporary faculty advisor. By the end of the second semester of the first year a permanent major advisor should be selected. No later than the end of the third year, the student, in consultation with the major advisor, will have selected a committee consisting of five persons to serve as an Advisory Committee. This committee shall include the research advisor and at least two other faculty members from the Department of Biology, one of whom will serve as the Chair of the Committee for the qualifying examination. The fourth and fifth members of the Committee may be chosen from other faculty of Boston University or from other institutions upon approval of the Director of Graduate Studies, the Department Chair, and the Dean of the Graduate School. (For faculty outside BU, a "Special Service Appointment Form" must be filled out completely, including a copy of the proposed committee member's curriculum vitae, and then submitted to the Department Chair. These forms are available in BRB 101.) It is expected that the research advisor will serve as the first reader. Neither first nor second readers may be the chair of the committee.

Once each subsequent year, the student and his/her major professor must jointly convene the Advisory Committee to evaluate the progress of the student. It is recommended that this meeting coincide with the annual research presentation at the student seminar. The student should be prepared to present either a written or an oral report on research progress to the committee. Deficiencies in course work, research activity, etc. should be noted, and recommendations, if needed, should be made to the student and included in his/her annual report. Students failing to comply with these recommendations may be subject to probation and loss of financial support from the Department. Generally, the composition of the Faculty Advisory Committee remains the same for the duration of the student's graduate program. Changes in committee membership can be made by mutual agreement among those involved, but the final dissertation committee must meet the membership requirements listed above.

**Teaching Requirement:** The department requires a minimum of two semesters of

teaching during a student's graduate career as part of the Doctor of Philosophy degree. During the first semester of teaching, students are required to enroll in our first year seminar course, BI697. The course provides guidance and training on pedagogy and other aspects of graduate school.

**Qualifying Examination:** A Ph.D. student is required to complete a written and oral qualifying examination in his/her field of specialization and related fields as defined by the Faculty. The faculty committee will prepare and administer each phase of the examination. This examination must be passed within the first three years of residence at Boston University. Failure of any part of the examination constitutes failure to advance to candidacy. A student will have two chances to pass the examination. A second failure will result in dismissal of the student from the graduate program. Individual graduate programs within the Biology Department may have more specific guidelines for candidacy and the qualifying examination.

**Dissertation:** Responsibility for the successful completion of the dissertation lies with the candidate, who, through insight, initiative, and resourcefulness, shall make a definite contribution to the knowledge of his or her specialized field. A timetable for the preparation and defense of the dissertation can be found at the end of this section.

**Responsible Conduct in Research:** All Biology Ph.D. students are required to complete the Responsible Conduct in Research (RCR) training during their first two years in the program. RCR is offered through the Provost's Office and involves a series of afternoon training sessions of lectures and round table discussions covering topics such as proper data acquisition and management, research collaboration ethics, publication do's and don'ts, social responsibility in research, research that involves human subjects, and research that involves animals. Information about this series will be provided at appropriate times during the academic year.

### **PREPARATION AND SUBMISSION OF A BIOLOGY PH.D. DISSERTATION**

Conferral of the Ph.D. degree in Biology is dependent upon the successful preparation and defense of a Ph.D. dissertation on original research conducted by the student. **A precise timetable for completion of essential steps in submission of a Ph.D. dissertation can be obtained from the Graduate School Office.** These steps and Biology Department requirements and guidelines are summarized briefly here.

- **A student must have a Dissertation Committee that includes at least five faculty members.** As noted previously, this committee must include at least three full-time faculty members from the Biology Department. One Biology Department member of the Dissertation Committee will be the student's research advisor, who will be the first reader of the dissertation. A second member of the committee will serve as the second reader. A third Biology Department member of the committee will serve as Chair of the Dissertation Defense (see below).
- **Approximately one year prior to the proposed graduation date, a formal Dissertation Prospectus must be submitted to the Graduate School Office.** This document should be prepared in consultation with and with approval of the first and second thesis readers, the Director of Biology Graduate Studies, and the Biology Department Chairman. It is recommended that the student discuss the prospectus at an annual committee meeting prior to submission, or otherwise email the committee for approval. The prospectus generally provides an outline

of the major chapters and subheadings to be included in the Ph.D. dissertation. Each chapter listed in the prospectus should include an abstract, that describes what problem will be investigated, what results will be shown and what conclusions will be drawn in the chapter. The abstract will then be followed by a number of points, outlining the major specific results (or lists of figures and tables) that will be presented in that chapter in the final dissertation. The formal Prospectus will generally be approximately 5 to 10 typed, double-spaced pages, but no more than 20.

- **Approximately two months before the defense, the student and the first reader should meet with the Director of Graduate Studies and Departmental Administrative Coordinator to review the timeline and requirements for graduation.**

- **At least 3 weeks prior to the Dissertation Defense:**

- **An Abstract of the dissertation must be submitted to the Graduate School Office.** This Abstract (maximum of 350 words) must be approved by the first and second readers, by the Director of Biology Graduate Studies and the Chair of the Biology Department.
- **Submit draft of dissertation to Laura Wipf by attaching the draft to an email message (to [lwipf@bu.edu](mailto:lwipf@bu.edu));** you will be notified if the format is approved.

Because the formatting of the dissertation can be very time consuming; it is advised that all **formatting issues be resolved before you defend your dissertation.** Following your defense, please allow ample time to complete all corrections and content revisions that are required by your committee; 7-14 days for rewrites is advised.

Six videos that will be helpful to you when formatting your dissertation are located at BUniverse. At the site search for "ETDs for GRS". Please note that at the site they do not appear in the correct order. To benefit from the information be sure to start with No. 1, "Introduction".

- **At least 2 weeks prior to the Dissertation Defense, all work that comprises the dissertation, which is prepared as described below and approved by both readers must be distributed to all members of the Dissertation Committee.** The student should prepare the dissertation in close consultation with the first and second readers. Ordinarily the dissertation will go through several revisions by the first reader, followed by one or more revisions by second reader.
- A formal announcement of the Dissertation Seminar and Defense will be made in several ways. It is the responsibility of the student to see that the following matters are taken care of.
  - **At least 2 weeks prior to the Dissertation Defense, a schedule of the Final Seminar and Defense (time, place and list of Dissertation Committee members) must be submitted to the Graduate School Office, along with 14 copies of the approved Dissertation Abstract.**
  - The Graduate School Office will mail a formal announcement to all committee members. The Chair of the committee will receive important paperwork needed at the defense.

- **A four-page flyer containing an announcement of the Dissertation Seminar and Defense, the Dissertation Abstract, and a brief CV of the candidate must be distributed to all Biology Faculty.** This flyer must be prepared by the student and can be given to the Departmental Administrative Coordinator for printing and distribution. A template for the flyer is available on the Biology Department website. Usually the Dissertation Seminar is also publicized by informal posters and e-mail (arranged with the Graduate Program Coordinator).
- **A formal Biology Department Dissertation Seminar, for which all five Dissertation Committee members are present, must be given by the Ph.D. candidate.** This PowerPoint presentation on the dissertation research will ordinarily last approximately 45-50 minutes and is open to the public. This seminar is usually given immediately before the dissertation defense, but unusual circumstances may be accommodated by prior arrangement with the Committee and the Director of Graduate Studies.
- **The student must also pass a private Dissertation Defense in front of the Dissertation Committee (at least five members must be present).** By prior arrangement one out of town member of the committee may participate via Skype with interactive video and audio, however a backup committee member must be available in the event of technical difficulties. The Dissertation Defense will ordinarily be a time where committee members will ensure that the research has been completed by and is understood by the candidate, and will voice any concerns over data or the preparation of the dissertation. The Dissertation Defense will usually last 1-2 hours. More than one failing vote on the Dissertation Defense will constitute a failure. Because the signature of the major professor is required on the dissertation (see below), the major professor must be one of the committee members passing the student on the Ph.D. Dissertation Defense.
- Ordinarily the student will receive written comments from all committee members that he is required to incorporate, in consultation with the first and second readers, into a final version of the dissertation. Upon satisfactory completion of revisions, the first and second readers must sign and approve several copies of the final version of the dissertation. Following the defense when all corrections and revisions required by your committee have been completed, the final approved dissertation is submitted **electronically** to the ETD Administrator, (<http://www.etsadmin.com/bu>) The final electronic version will be reviewed by Laura Wipf, and then forwarded to the Mugar Library ETD Administrator for the final format review, before its submission to ProQuest/UMI Administrator.
- **Please note:** If either office notifies you of necessary corrections or changes, they must be made immediately. A quick response will avoid your registering for another semester, a delay in verifying the completion of your degree requirements, and the issuing of the diploma. It may take some time before the final library review is complete.
- **Contact the Records Officer, Laura Wipf (617-353-2696) for an appointment to**

submit the required materials, which will complete the final requirements of the degree program. (Forms must be submitted together).

- **The student must also give final copies to the first and second readers (and, when requested, other members of the Dissertation Committee), and should retain at least one final copy for himself.** To save on photocopying costs and paper, committee members (who are not first and second readers) will often request only that they receive back their copies of the dissertation after the revisions and the corrections have been made by the student. Some committee members may also request pdf copies of the dissertation and this is considered acceptable.
- **Organization of the Biology Ph.D. dissertation. A set of rules concerning page sizes, page numbering, etc., of the dissertation can be obtained from the Graduate School Office in a pamphlet entitled Guide for the Writers of Theses and Dissertations.** The Graduate School rules must be strictly followed.

Below are the guidelines, which are generally applicable to Biology Ph.D. dissertations. **The format of the complete dissertation document submitted at the time of the defense should meet the specifications of the Graduate School for final submission** of the dissertation as well as these guidelines that follow.

In general, **the dissertation is usually organized in one of two formats.** The exact format to be followed will usually be decided by the student and the first and second readers.

**Comprehensive dissertation.** This type of dissertation normally will include, in order, the following sections: Title Page, Approval Signature Page, Acknowledgments, Abstract, Table of Contents, List of Figures, List of Tables, List of Abbreviations, several Chapters, and a comprehensive Reference List. The comprehensive dissertation should have a consistent style format from chapter to chapter. For example, Materials & Methods from multiple papers should be combined into a single consistent Materials & Methods chapter, References should be cited consistently throughout the dissertation, and there should be a single Introduction, Discussion, and Reference List.

*Chapter One* usually provides a general and specific Introduction to the dissertation. This will include an overview of the importance of the work, a specific introduction to the field, and a statement of the dissertation goals.

*Chapter Two* usually details the Materials & Methods used in the dissertation work.

*Chapter Three* (and more) describes the Results obtained from the dissertation work. These chapters include figures, tables and descriptions of original work. Often these chapters will have short introductions to provide a framework for the results that will follow. Figures and tables must have appropriate legends.

*The final Chapter* should include a specific and general Discussion of the dissertation work in light of other work in the field.

**Partitioned dissertation.** This type of dissertation will normally include, in order, the following sections: Title Page, Approval Signature Page, Acknowledgments, Abstract, Table of Contents, List of Figures, List of Tables, List of Abbreviations, several Chapters, and a comprehensive Reference List.

*Chapter One* usually provides a general and specific Introduction to the dissertation. This will include an overview of the importance of the work, a specific introduction to the field, and a statement of the dissertation goals.

*Chapter Two*, (and more), will present the Results of the dissertation research organized in a research paper format. That is, each chapter will include the following material as pertinent to the research included in the given chapter: Introduction: Materials & Methods, Results, Discussion and Specific Reference List.

*The final Chapter* will present a summary of the original research accomplished in the thesis work, and its relevance to the large field, and some perspective for future work.

To be consistent with Graduate School rules, the partitioned dissertation must also include a comprehensive Reference List.

### **Specific guidelines for presentation of research and data:**

In all cases, details for the presentation of original data will be worked out between the student and the first and second readers. However, the following can be used as guidelines:

- **Large parts of the written dissertation may be taken or adapted from material already published by the student.** However, published papers cannot be simply digitally pasted together. In addition, care must be taken to appropriately identify work done by others in such papers.
- **In general, all data relevant to the dissertation should be included in the dissertation.** It is usually not acceptable to list primary, relevant data as "data not shown" or refer to the student's data published in another source.
- **It is recognized that figures within the dissertation may not be in a consistent format.** For example, figures may have been taken from published articles in journals with different format requirements. In general, it is not necessary to re-make figures for the dissertation. Any work done by others, such as coauthors, must be strictly attributed to them if it needs to be included in the student's dissertation.

### **Specific guidelines for scholarship and citation:**

References must be listed and cited according to a standard and consistent journal format. The full title of each journal referenced must be included unless the reference list is preceded by a list of all journal abbreviations used.

- **The Reference List must include authors, year published, title of article, journal, volume and inclusive pages.** The following provides examples of a suggested format for references:

Gilmore TD, White DW, Sarkar S & Sif S (1995) Malignant transformation of cells by the v-Rel oncoprotein. In, The DNA Provirus: Howard Temin's Scientific Legacy (Cooper GM, Greenberg-Temin R & Sugden B, eds), American Society for Microbiology, Washington DC, pp 109-128

White DW & Gilmore TD (1993) Temperature-sensitive transforming mutants of the

*v-rel* oncogene. Journal of Virology 67: 6876-6881

White DW, Roy A & Gilmore TD (1995) The v-Rel oncoprotein blocks apoptosis and proteolysis of I $\kappa$ B- $\alpha$  in transformed chicken spleen cells. Oncogene 10: 857-868

References should be ordered alphabetically in the final Reference List. Journal name abbreviations may only be used if the Reference List is preceded by a list of these abbreviations along with the full name of each journal. If a given first author has multiple citations, these should be ordered chronologically in the list (starting with the earliest publication). If a given first author has multiple papers in a single year, they should be designated by "a" and "b" (e.g., Doe et al., 1988a; Doe et al., 1988b), etc.

All references included in the final Reference List must be cited at least once within the text of the dissertation, and all references cited within the text must be included in the final Reference List.

- **Citations within text should provide author(s) and date, and be provided in parentheses.** If two authors, use Doe & Smith; if more than two authors, use Doe et al. If multiple citations are given, they are to be separated by semicolons, and ordered by year. That is, the above references would be cited in the text as (White & Gilmore, 1993; Gilmore et al., 1995; White et al., 1995). If one discusses a specific study within the text, include only the year in parentheses; for example, "White et al. (1995) showed that..."

**Expenses:** Costs related to dissertation photocopying and binding are the responsibility of the student.

**Time Limits:** Requirements must be completed within five years after registration for doctoral studies beyond the M.A. degree and within seven years after first registration for the Ph.D. program beyond the baccalaureate degree. While these limits can be extended by the GRS, any extension must be justified.

**Boston University**  
**2013/2014 Ph.D. Graduation Calendar**

**With notes from Department of Biology**

**DOCTOR OF PHILOSOPHY DEGREE CANDIDATES**

	<b><u>Deadline Dates for September 25, 2014</u></b>	<b><u>Deadline Dates for January 25, 2015</u></b>	<b><u>Deadline Dates for May 17, 2015</u></b>
<input type="checkbox"/> <b>Dissertation Prospectus</b> due in GRS (arrange for signatures with Meredith Canode)	February 1, 2014	April 5, 2014	October 4, 2014
<input type="checkbox"/> <b>Meet with Meredith Canode and DGS</b> to review requirements for defense. <b>Bring copy of academic transcript</b>	About two months prior to Final Oral Exam	About two months prior to Final Oral Exam	About two months prior to Final Oral Exam
<input type="checkbox"/> <b>Arrange for any special service appointments</b> if committee members are not BU Faculty (see Meredith Canode)	At least two months prior to Final Oral Exam	At least two months prior to Final Oral Exam	At least two months prior to Final Oral Exam
<input type="checkbox"/> <b>Review academic transcript</b> to resolve any grade issues and to review credit count.	At least two months prior to Final Oral Exam	At least two months prior to Final Oral Exam	At least two months prior to Final Oral Exam
<input type="checkbox"/> <b>First draft of dissertation</b> (arrange with readers)	About two months prior to Final Oral Exam	About two months prior to Final Oral Exam	About two months prior to Final Oral Exam
<input type="checkbox"/> <b>Diploma Application</b> due in GRS*	June 1, 2014	November 1, 2014	February 1, 2014
<input type="checkbox"/> <b>Dissertation abstract (max. 350 words)</b> approved by department /program– due in GRS Office for review and approval by Dean (arrange for signatures with Meredith Canode)	At least three weeks prior to Final Oral Exam	At least three weeks prior to Final Oral Exam	At least three weeks prior to Final Oral Exam
<input type="checkbox"/> <b>Properly formatted draft of dissertation</b> submitted to <b>GRS Records Officer</b> ( <a href="mailto:grsrec@bu.edu">grsrec@bu.edu</a> ) for format review by GRS	Submitted by e-mail at least three weeks prior to Final Oral Exam	Submitted by e-mail at least three weeks prior to Final Oral Exam	Submitted by e-mail at least three weeks prior to Final Oral Exam
<input type="checkbox"/> <b>Schedule of Final Oral Examination</b> due in GRS with two copies of the approved abstract (arrange for signatures with Meredith Canode)	At least two weeks prior to Final Oral Exam	At least two weeks prior to Final Oral Exam	At least two weeks prior to Final Oral Exam
<input type="checkbox"/> <b>Reserve room(s) for public seminar and defense</b>	At least two weeks prior to Final Oral Exam	At least two weeks prior to Final Oral Exam	At least two weeks prior to Final Oral Exam
<input type="checkbox"/> <b>Dissertation to all committee members</b>	At least two weeks prior to Final Oral Exam	At least two weeks prior to Final Oral Exam	At least two weeks prior to Final Oral Exam
<input type="checkbox"/> <b>Submit thesis program booklet to Meredith Canode</b>	At least one week prior to Final Oral Exam	At least one week prior to Final Oral Exam	At least one week prior to Final Oral Exam
<input type="checkbox"/> <b>Last date to hold Final Oral Exam</b> N.B. The deadline for submission of the dissertation is the same date (See item below)	August 15, 2014	December 12, 2014	April 10, 2015
<input type="checkbox"/> <b>Final reader-approved dissertation</b> submitted to <b>ETD Administrator</b> ( <a href="http://www.etsadmin.com/bu">http://www.etsadmin.com/bu</a> ) for final approval by GRS <b>on or before this date**</b>	August 15, 2014 Submitted electronically	December 12, 2014 Submitted electronically	April 10, 2015 Submitted electronically
<input type="checkbox"/> <b>Documentation of Readers' Approval</b> submitted to the Graduate School Office <b>on or before this date</b>	August 15, 2014	December 12, 2014	April 10, 2015
<input type="checkbox"/> <b>Copies of dissertation to committee members</b> (if requested)			

\* The diploma application is valid only for the graduation date specified; a new application must be filed if the student does not graduate as planned.

\*\* All degree requirements are complete only when the doctoral dissertation has been certified as meeting the standards of the Graduate School of Arts and Sciences and of the Mugar Memorial Library.

Abbreviations: GRS = Graduate School of Arts and Sciences, DGS = Director of Graduate Studies, ETD = Electronic Thesis and Dissertation

## **PH.D. FINANCIAL ASSISTANCE**

All University appointments are for one year only. Continuing students will be notified of the date for accepting financial aid for their teaching fellowship or research assistantship. Students who have failed to submit an Annual Report will not be considered for financial aid. Students filing late application for financial aid cannot be guaranteed support. Master's students normally will not be guaranteed Department Aid.

Dean's Fellowships: These are fellowships allocated to first year graduate students that do not have immediate teaching requirements.

Teaching Fellowships: These provide a stipend plus tuition (for up to two courses per semester), and cover fees and medical insurance. Teaching responsibilities require approximately 20 hours per week. Full or partial awards may be given.

Research Assistantships: These awards are made to assist individual faculty with specific areas of research and are funded by faculty research grants. Tuition scholarships and medical insurance may be included as part of the award. Consult your faculty advisor.

Training Grants: Opportunities for support through this avenue exist (e.g. through the medical school).

Work Study Aid: All eligible graduate students can apply for summer and academic year awards. Applications may be obtained from the Graduate School. Students receiving work-study aid will be expected to provide service to the Department (teaching) or in the laboratory of their major professor (research). Master's candidates are eligible for federal work-study funding.

National Science Foundation (NSF) Graduate Fellowships: First and second-year graduate students are urged to apply for these prestigious three-year fellowships. Applications must be submitted through Fastlane. Information is available at <http://www.nsfgrfp.org/>.

Department Graduate Travel Grants: Travel Grants may be available to assist students in their travel to professional scientific meetings. Students presenting papers or posters on their research will receive first consideration. Further questions may be directed to the Graduate Committee.

Other sources: Students should see their faculty advisors for other potential sources of financial support, or check the small reference library at the Associate Dean's Office, Graduate School, Room 115.

## **PROGRAM AND RESEARCH AREAS**

The Department has three graduate program areas: Ecology, Behavior, and Evolution (EBE, including Marine Biology); Neurobiology (NEURO); and Cell and Molecular Biology (CM). Each program area has unique strengths and suggested curricula. The department offers both master's and doctoral degrees in Biology that emphasize independent research on the part of the student, and a

non-research master's degree. Many Biology faculty members participate in inter-departmental programs that offer graduate degrees. Among them are: Molecular Biology, Cell Biology, and Biochemistry (MCBB); Graduate Program in Neuroscience (GPN); and Bioinformatics (BF).

Various Biology Department programs include faculty active in research in the areas listed below.

- Animal behavior
- Behavioral ecology and sociobiology
- Cancer biology
- Biochemistry
- Cell and molecular neurobiology
- Cell signaling and gene regulation
- Developmental biology
- Ecology and conservation biology
- Endocrinology and reproductive biology
- Genetics
- Marine biology
- Microbial physiology and genetics
- Molecular ecology and evolution
- Neural systems and behavior
- Neuroendocrinology
- Tropical ecology

### CELL AND MOLECULAR BIOLOGY PROGRAM

The Program in Cell and Molecular Biology offers courses and research opportunities in developmental biology, cell signaling and gene regulation, cancer biology, genetics, biochemistry, microbiology, physiology, and membrane structure and function. Associated programs include the interdisciplinary program in Molecular Biology, Cell Biology, and Biochemistry (MCBB), and the Bioinformatics program.

#### **Requirements for Cell & Molecular Biology (CM) Candidates in the PhD Program**

<b>1. Coursework:</b>	<u>Post-BS</u>	<u>Post-MA</u>	
Molecular Biology I (BI 552)*	4 cr.	4 cr.	20 cr.
Advanced Molecular Biology (BI 753)	4 cr.	4 cr.	
Graduate Biochemistry (MB 721)*	4 cr.	4 cr.	
Advanced Cell Biology (BI 735)	4 cr.	4 cr.	
Progress in CM Biology (BI 583/584)	2 cr./2 cr.	2 cr./2 cr.	
Electives: 3 courses <sup>‡</sup>	12 cr.	0-12 cr. (0-3 courses)	
Research courses:	32 cr.	0-12 cr.	
<b>TOTAL CREDITS:</b>	<b>64 cr.</b>	<b>32 cr.</b>	

\*students with strong molecular biology/biochemistry backgrounds may bypass this requirement (credit still needed from another elective course)

<sup>‡</sup>List of recommended elective courses: (although any Biology course can be taken as

long as it is for graduate credit. One among those listed in **Bold** is necessary for MA students to satisfy a cell biology requirement)

**BB 522 Molecular Biology Lab (4 cr)**

BI 527 Biochemistry I Laboratory (2 cr)

BI 528 Biochemistry II Laboratory (2 cr)

BI 545 Neurobiology of Motivated Behavior (4 cr)

**BI 551 Stem Cells (4 cr)**

**BI 553 Molecular Biology II (4 cr, for MA students)**

BI 554 Neuroendocrinology (4 cr)

**BI 556 Membrane Biochemistry** (4 cr)

**BI 560 Systems Biology** (4 cr)

**BI 572 Advanced Genetics** (4 cr)

BI 575 Techniques in Molecular and Cellular Neurobiology (4 cr)

**BI 576 Carcinogenesis (4 cr)**

BI 581/582 Seminar in Biology (various topics) (2 x 2 cr)

**BI 610 Developmental Biology** (4 cr)

BI 625 General Endocrinology (4 cr)

BI 645 Neurophysiology (4 cr)

BI 655 Developmental Neurobiology (4 cr)

**BI 681 Molecular Biology of the Neuron (4 cr)**

**BI 753 Molecular Biology II** (4 cr.)

BE 561 Protein and DNA Sequence Analysis (4 cr)

BE 768 Biological Database Systems (4 cr)

BE 700 Computational Genomics (4 cr)

BF 527 Bioinformatics (4 cr)

CH 525 Physical Biochemistry (4 cr)

CH 541 Natural Products Chemistry

CH 612 Separation Methods in Chemistry and Biochemistry (4 cr)

CH 721 Enzyme Kinetics and Mechanisms (4 cr)

CH 722 Protein Chemistry (4 cr)

MB 722 Advanced Biochemistry (4 cr)

SPH BS 704 Biostatistics (3 cr)

## 2. Grant writing seminar

In the first semester of the first year, students take a grant writing seminar course (BI581, 2 credits) that counts towards elective credit. Students will be expected to write an NSF GRFP proposal, which is submitted in early November. Students write this proposal in consultation with the first rotation advisor.

## 3. Seminar

Students participate in the CM seminar program that consists of two required weekly seminars, and a number of optional lectures and colloquia. These include BI583/584, described above (meets at 12 noon on Fridays) and the Biology Departmental Seminar Series (meets at 12 noon on Mondays).

## 4. Lab Rotations

Students are required to perform three laboratory rotations with Biology faculty during their first academic year (6-8 weeks each).

## 5. Examinations/Defenses

**A. Preliminary Exam.** In January or February of the second year, a preliminary exam is administered. This exam must be passed prior to the qualifying examination. The exam covers topics related to Cell Biology, Molecular Biology, and Biochemistry that should have been mastered by students through the required coursework. If any topics are not passed satisfactorily, the student has a second chance to take the exam (usually in June). A student has two chances to pass this exam. If a student fails to pass on their second attempt, the preliminary exam committee, the major professor, and the Department Chair determine if the performance on the exam(s) and/or any additional work is sufficient to confer the M.A. degree.

**B. Qualifying Exam.** The qualifying examination consists of two parts: one, a written research proposal; and two, the oral defense of this research proposal. The qualifying exam should be taken within nine months of passing the preliminary exam.

- **Written Proposal.** The student in consultation with the major professor and other parties submits a WRITTEN proposal of the intended dissertation research. The academic code of conduct applies, and the written document should be from the student's own hand, not just cutting and pasting old grant proposals, papers, etc. The major professor and the examination committee may have input in the form of suggestions on content and organization, but should not directly edit the document. This proposal should include an extensive introduction complete with appropriately cited literature, a list of specific aims, and a description of the intended experiments. The proposal should be approximately 15-20 pages long, double-spaced. The written proposal must be submitted to and approved by the qualifying examination chair at least two weeks prior to the scheduled examination.
- **Oral Exam.** At the examination, the student gives an oral presentation of the proposal. The committee poses questions related to the intended research, background information, and the field of the work. The committee may also

question areas perceived as the student's weaknesses during the preliminary exam, but only as they pertain to the research proposal. The committee chair ensures that the questions are appropriate (e.g. not too far afield) and that each committee member has a more-or-less equal opportunity to question the student.

While this proposal and oral defense is normally on research the student plans to carry out, it is not a thesis defense. There is no requirement for preliminary work and the eventual dissertation work may change considerably over time.

- **Advancing to Candidacy.** The student's Qualifying Examination Committee is responsible for grading the exam. More than one failing vote, or a failing vote by the major professor, on the qualifying examination constitutes a failure. Any student failing this examination has the opportunity to take it again; at least three months must elapse before a student is allowed to retake the exam. Failure of the second examination is grounds for automatic dismissal from the Ph.D. program and the loss of any further financial aid, although the student may still be eligible for the M.A. degree provided that those degree requirements are met. If at least four members of the Qualifying Examination Committee, including at least three of the CM faculty, vote that the student's performance on the examination was at a level appropriate for an M.A. degree, the degree is given. In addition, this student must have completed at least 32 credits of graduate level course work.

**C. Dissertation Defense.** After advancing to candidacy for the Ph.D., the student and his major professor must jointly convene a Dissertation Committee, which meets at least once a year. Ph.D. students should present either a written or oral report on research progress to the thesis committee. The committee meeting date and synopsis must be included on the annual report. This committee consists of no less than five faculty members, of who at least three must be members of the CM faculty. The Dissertation Committee shall consist of a Chairperson, a First Reader (the major advisor in CM-Biology), a Second Reader, and at least two other members (a third reader is optional). The dissertation is "defended" at the Final Dissertation Committee meeting at a time agreed on by the student and the Dissertation Committee. At least two weeks prior to the defense, all work that comprises the dissertation and the written dissertation, which meets the specification, described above and has been approved by all readers, must be distributed to the committee. At the Final Dissertation Committee meeting the committee agrees on the adequacy of the body of work and written thesis for the Ph.D. degree. Finally, there is a required public seminar, which is normally given before the defense.

**M.A.**

**Coursework**

Molecular Biology I (BI 552)	4 cr.
Biochemistry I (BI 621)	4 cr.
One cell biology course <sup>†</sup>	4 cr.
Electives: 5 courses <sup>‡, **</sup>	20 cr.
<b>TOTAL CREDITS:</b>	<b>32 cr.</b>

†See list of elective courses, above, under Ph.D. requirements. Those denoted by **Bold** in the list are acceptable.

‡See list of recommended elective courses, above (except BI 527).

\*\*For those doing a research master's elective courses 12 credits can come from "research (900-level)" courses.

## **Seminar**

M.A. students are not required to participate in the CM seminar program, but they are encouraged to attend both of the following required weekly seminars for the Ph.D. students:

Mondays at 12:00 NOON, Biology Departmental Seminar Series (Outside speakers for Biology and MCBB).

Fridays at 12:00 NOON, CM/MCBB Student Seminar Series.

## **ECOLOGY, BEHAVIOR, AND EVOLUTION PROGRAM (includes the Marine Program)**

The Program in Ecology, Behavior, and Evolution (EBE) includes courses and research opportunities in behavioral ecology and sociobiology, ecological and evolutionary developmental biology, molecular ecology and evolution, community ecology, biogeochemical ecology, population biology, tropical ecology, and ecosystem ecology. A broad biological perspective is emphasized, including microbes, protists, fungi, plants, insects, fish, birds, and mammals.

## **Requirements for the Ecology, Behavior and Evolution Candidates in the Ph.D. Program**

The goal of the Ph.D. program in EBE is to produce comprehensively trained professionals who excel in their individual research and possess a deep and broad understanding of Ecology, Behavior and Evolution. Each person's ability, preparation, and needs will vary; however, a guide to critical steps in the student's graduate career is useful for both the student and his/her advisor(s). The following guidelines have been developed as an aid to planning a student's graduate career. Because the department guarantees financial support for five years only, students are encouraged to be cognizant of time and work efficiently.

### *Committees*

Each student is responsible for organizing **annual** meetings with the committee that will advise and oversee his/her Ph.D. program. The annual meeting with the committee is critically important. During these meetings the student will receive advice and guidance in his/her professional development and will have the undivided attention of several faculty members simultaneously.

Three committees must be established. The student's research advisor will serve on each committee but the composition of the committees may vary (although it is recommended that students maintain the composition of their committees as much as possible). In chronological order, the first is the Advisory Committee,

the second is the Qualifying Exam Committee, and the third is the Dissertation Committee. The Advisory Committee will help the student develop a plan for coursework and research in the first year. The Qualifying Exam Committee will help the student prepare for the qualifying exam and will administer the qualifying exam in the student's fourth semester. The student must pass this exam to advance to candidacy for the Ph.D. degree (see **The Qualifying Exam and Advancing to Candidacy**). It is recommended that the student organize his/her Qualifying Exam Committee as early as possible (most people do it at the beginning of their third semester) and arrange to take courses or directed readings with the faculty members. Finally, the Dissertation Committee is the group ultimately responsible for overseeing the student's dissertation research. They will advise the student during the course of his/her research and it is important that the student keep them informed of research progress and plans through annual committee meetings.

NOTE: Faculty members are often under severe time constraints so students should organize their committees and meetings well in advance of the dates for the qualifying exam, thesis defense, etc.

The following is an example of how a student might organize his/her graduate studies. The nature and schedule of research in different EBE labs varies, and students should consult closely with their advisors to develop an appropriate individualized plan for their progression through the PhD.

### **Year 1**

Semester 1: Student, in consultation with advisor, develops a plan of coursework and research.

Semester 2: Coursework, independent reading, regular consultation with advisor, and initial pilot research or planning for a field season as necessary to prepare the student for the first summer of research.

Summer I: Student begins dissertation research. Often this is a pilot study to determine the feasibility of a project or to identify potential projects. Research plans often change and therefore it is a good idea to meet with the Advisory Committee early in the following semester.

### **Year 2**

Semester 3: Student forms Qualifying Exam Committee and meets with committee members (individually or collectively) to discuss preparation for the Qualifying Exam. Preparation may include coursework, directed readings, or other requirements with the explicit aim of developing the student's breadth and depth of knowledge in Ecology, Behavior, and Evolution.

Semester 4: Student takes Qualifying Exam. The student is responsible for organizing the time for the Qualifying Exam and should make arrangements early in the semester to avoid problems with committee members' schedules. The Qualifying Exam should be taken by the end of semester 4 and must be taken before the start of semester 5. The exam will consist of a written examination on questions composed by the committee, followed by an oral

examination with the committee members, typically one week later.

For students in EBE, the exams will be designed to test the student's breadth and depth of knowledge in Ecology, Behavior, and Evolution (and possibly other branches of biology or additional disciplines relevant to the student's research interests). It is strongly recommended that students take courses in each of these areas prior to the exam and/or organize directed readings with committee members well in advance of the Qualifying Exam (see above).

**Summer II:** Student pursues research with the explicit aim of demonstrating the feasibility and importance of the project. It is useful for the student to view their research during this summer as an opportunity to gather sufficient preliminary data for an NSF dissertation improvement grant.

### **Year 3**

The student should have a clear plan for a feasible dissertation project and sufficient data to apply for independent research funding.

The student should present their research to the department in a seminar that includes the conceptual background, rationale, methodology, preliminary results and plans for their dissertation work. The seminar course BI579 Progress in EBE & Marine Biology is a weekly venue for all current EBE/MB graduate students to present their research to their peers once per year. All students are expected to present once per academic year and all students are required to register for the course at least once.

The student should present their research progress and plans to their Dissertation Committee in their annual committee meeting, for discussion and approval. Students should provide their committee with a written synopsis of their research progress and dissertation plans in advance of the meeting to facilitate feedback. Scheduling a committee meeting to immediately follow a seminar is efficient, but students may present their research during the committee meeting if necessitated by scheduling constraints.

Students should apply for an NSF Doctoral Dissertation Improvement Grant or other independent support for their research, as appropriate to their research field. DDIG proposals are due the second Thursday of October. Students should plan well in advance to receive feedback on proposal drafts from their advisor and committee members.

### **Years 4 & 5**

It is expected that students will pursue a fruitful line of research and will publish in a timely fashion. We especially encourage students to develop scholarly publications prior to completion of their dissertation. It is

expected that the student will file and defend the Ph.D. dissertation by the end of the fifth year. Students should arrange the time for their dissertation defense and should submit the dissertation to committee members well in advance of the defense (two weeks or more prior to the defense).

### **For current students beyond their first year in the PhD program.**

Students beginning their second year should establish their Qualifying Exam Committee, meet with their committee members early in the academic year, and prepare for Qualifying Exams in the spring semester. We expect that by the end of the academic year all second year students will have passed the Qualifying Exams and be on track with the schedule outlined above.

Third year students, if they have not already done so, should establish their Dissertation Committee immediately, develop and distribute their dissertation prospectus, and schedule a seminar and committee meeting to present and discuss the prospectus. All third year students should have passed their Qualifying Exam and presented their dissertation prospectus by the end of the Fall semester. We also encourage third year students to actively pursue grant funding for their dissertation work.

Students who are beyond the third year should already be well on track to complete their dissertation by the end of the fifth year. If they have not done so they should submit a dissertation prospectus to their committee members for feedback.

### **The Qualifying Exam and Advancing to Candidacy.**

The Qualifying Exam Committee is responsible for composing and evaluating the exam. If the student demonstrates sufficient scientific prowess, intellectual development, and depth and breadth of knowledge in their chosen field, the student will pass the exam and advance to candidacy for the Ph.D. degree. More than one failing vote, or a failing vote by the research advisor, constitutes a failure on the Qualifying Exam. Any student failing this examination has the opportunity to take the exam again; at least three months must elapse before a student is allowed to retake the exam. Failure of the second exam is grounds for automatic dismissal from the Ph.D. program and the loss of any further financial aid, although the student may still be eligible for the M.A. degree provided that those degree requirements are met (see Option Two under Master of Arts for Ph.D. students). If at least three members of the Qualifying Exam Committee, including at least two EBE faculty members, vote that the student's performance on the examination was at a level appropriate for an M.A. degree, and the student has completed at least 32 credits of graduate level course work, the M.A. degree is awarded.

### **Marine Biology Financial Assistance**

Several competitive awards are available to graduate students performing research in Marine Biology in addition to the Financial Assistance available generally to graduate students in the Department of Biology. These include:

**Warren McLeod Fellowships** – provides either a summer stipend support or a single year of support. The award is competitive and based on written proposals. Eligibility: PhD students who have passed the qualifying exam.

**Dana Wright Fellowship** – supports summer research in Marine Biology. It may be used for stipend support (up to 4 months), research supplies, and/or travel expenses related to research. The award is competitive and based on written proposals. Eligibility: MA and PhD students.

**NEUROBIOLOGY PROGRAM**

The Program in Neurobiology offers courses and research opportunities in areas of contemporary neurobiology, including: neurotransmission and synaptic plasticity, molecular neurobiology, genetic and hormonal control of neural development; sensory physiology, including retinal circuitry and neurochemistry; as well as olfactory processing, and the neuroendocrine control of behavior. The organisms under investigation include crayfish, lobster, goldfish, zebra finch, rat, and mouse. Biology faculty members also participate in the interdepartmental Ph.D. Graduate Program in Neuroscience (GPN).

**Requirements for Neurobiology (NEURO) Candidates in the Ph.D. Program Coursework**

	<u>Post-BA</u>	<u>Post-MA</u>
Cellular and Systems Neuroscience (BI 755)	4 cr.	4 cr.
Systems and Cognitive Neuroscience (BI 756)	4 cr.	4 cr.
Graduate Seminar Series in Neuroscience (NE 500/NE 501)	2 cr./2 cr.	2 cr./2 cr.
Electives: 5 courses	20 cr.	8-20 cr. (2-5 courses)
Research courses:	32 cr.	0-12 cr.
<b>TOTAL CREDITS:</b>	<b>64 cr.</b>	<b>32 cr.</b>

*The elective courses should be chosen in consultation with the faculty advisor. It is **STRONGLY** recommended that at least one of the elective courses be a relevant graduate laboratory course.*

## **Seminar**

Students must participate in the weekly NEURO seminar program (NE 500) that meets at 9:30 AM on Fridays, and a number of optional lectures and colloquia. They are not required to attend the journal club associated with NE500/501.

## **Lab Rotations**

Students are required to perform at least two laboratory rotations with Neurobiology faculty during their first academic year (6-8 weeks each).

## **Examinations/Defenses**

### **Preliminary and Qualifying Examinations**

For the Ph.D. degree, preliminary and qualifying examinations must be passed. Once the student has passed these exams, she/he is formally a candidate for the Ph.D. in the NEURO program.

**1. Preliminary Exam.** Once a year, usually in June, a preliminary exam is administered. This exam must be passed prior to taking the qualifying examination. The exam covers topics related to assigned readings. A committee of faculty members writes the exam, which includes those who are responsible for teaching the required core courses. A student has two chances to pass this exam. If a student fails to pass the second attempt, the preliminary exam committee, the major professor, and the Department Chair determine if the performance on the exam(s) and any additional work is sufficient to confer the M.A. degree.

**2. Qualifying Exam.** The qualifying examination consists of two parts; one, a written research proposal and two, the oral defense of this research proposal. Normally, the qualifying exam should be completed within 6 months of passing the preliminary exam.

- **Written Proposal.** The student, in consultation with the research advisor and other parties, submits a WRITTEN proposal of the intended dissertation research. The academic code of conduct applies, and the written document should be from the student's own hand, not just cutting and pasting old grant proposals, papers, etc. The major professor may have input in the form of suggestions on content and organization, but should not directly edit the document. This proposal should be written in the form of an NIH grant proposal, and it should include a list of specific aims, an extensive introduction and an outline of the intended experiments with necessary preliminary data, complete with appropriately cited literature, a list of specific aims, and an outline of the intended experiments. The proposal should be approximately 15-20 pages long, double-spaced. The written proposal must be given to and approved by the qualifying examination committee at least two weeks prior to the scheduled examination.
- **Oral Exam.** At the examination, the student gives an oral presentation of the proposal, including preliminary results. The committee then poses questions related to the intended research, background information, and the field of the work. The committee may also question areas perceived as the student's weaknesses during the preliminary exam, but only as they pertain to the research proposal. The committee chair ensures that the questions are and

that each committee member has a more-or-less equal opportunity to question the student.

While this proposal and oral defense is normally on research the student plans to carry out, it is not a thesis defense. Thus, the eventual dissertation work may change considerably over time.

### M.A.

#### Coursework

Cellular and Systems Neuroscience (BI755)	4 cr.
Systems and Cognitive Neuroscience (BI756)	4 cr.
Graduate Seminar Series in Neuroscience (NE 500/NE 501)	2 cr./2 cr.
Electives: 5 courses	<u>20 cr.</u>
TOTAL CREDITS:	32 cr.

*The elective courses should be chosen in consultation with the faculty advisor. It is **STRONGLY** recommended that at least one of the elective courses be a relevant graduate laboratory course. For those doing a research master's, 12 credits can come from research courses.*

**BIOLOGY AND RELATED COURSES APPROVED FOR GRADUATE  
STUDY IN THE DEPARTMENT OF BIOLOGY**

<b><u>COURSE</u></b>	<b><u>TITLE</u></b>
CAS BI 502	Comp Perspect Biol Sys
CAS BI 503	Symbiosis
CAS BI 504	Advanced Evolution
CAS BI 505	Evolution and Development
CAS BI 506	Phenotypic Plasticity
CAS BI 508	Behavioral Ecology
CAS BI 512	Mammalian Ecology
CAS BI 513	Genetics Laboratory
CAS BI 515	Population Genetics
CAS BI 519	Theoretical Evolutionary Ecology
CAS BI 520	Sensory Biology
CAS BI/GE 523	Urban Marine Ecology
CAS BI 527	Biochemistry Lab I
CAS BI 528	Biochemistry Lab II
CAS BI 530	Forest Ecology
CAS BI 531	Ichthyology I
CAS BI 532	Ichthyology II
CAS BI 536	Molecular Ecology and Evolution
CAS BI/ES 539	Coral Reef Dynamics
CAS BI 545	Neurobiology of Motivated Behavior
CAS BI 547	Marine Invert: Natural History and Mol Phylogeny
CAS BI 549	Molecular Phylogenetics and Evolution
CAS BI550	Marine Genomics
CAS BI 551	Stem Cells
CAS BI 552	Molecular Biology I
CAS BI 553	Molecular Biology II
CAS BI 554	Neuroendocrinology
CAS BI 556	Membrane Biochemistry
CAS BI/ES 558	Coastal Nutrient Cycling
CAS BI 569	Tropical Marine Invertebrates
CAS BI 572	Advanced Genetics
CAS BI 575	Tech in Molecular and Cellular Neurobiology
CAS BI 576	Carcinogenesis
CAS BI 579	Progress in EBE and Marine Biology
CAS BI 581/582	Seminar in Biology (may be repeated as topics vary)
CAS BI 583/584	Progress in Cell & Molecular Biology
CAS BI 599	Biology of Synapses
GRS BI 607	Animal Behavior
GRS BI 610	Cellular Aspects of Development and Differentiation
GRS BI 614	Ornithology
GRS BI 615	Biology of Mammals
GRS BI 621/622	Principles of Biochemistry I and II
GRS BI 623	Marine Biogeochemistry
GRS BI 625	General Endocrinology
GRS BI 643	Terrestrial Biogeochemistry
GRS BI 645	Neurobiology
GRS BI 648	Conservation Biology

GRS	BI 655	Developmental Neurobiology
GRS	BI 563	Sensory Biology
GRS	BI 671	Survey of EBE and Marine Biology
GRS	BI 681	Molecular Biology of the Neuron
GRS	BI 719	Colloquium in Terrestrial Biogeoscience
GRS	BI 720	Practicum in Terrestrial Biogeoscience
GRS	BI 735	Advanced Cell Biology
GRS	BI 753	Advanced Molecular Biology
GRS	BI 755	Cellular and Systems Neuroscience
GRS	BI 756	Systems and Behavioral Neuroscience
CAS	BB 522	Molecular Biology Laboratory
GRS	MB 721	Graduate Biochemistry
GRS	MB 722	Advanced Biochemistry

Consult recent GRS catalogue for listing of research courses and for other related courses available in cognate departments.

## **GENERAL INFORMATION FOR CHARLES RIVER CAMPUS BUILDINGS**

### **Emergencies**

In case of emergencies at 2 Cummington Street building services (heat, electricity, water, refrigeration, air-conditioning, etc.), call Tom Symancyk, Materials Manager, at x3-2467. If Tom is unavailable call the building supervisor Dennis Batista 358-4282. If Dennis is not available, call the Buildings and Grounds Emergency number 353-2105. In case of emergencies at 5 and 24 Cummington Street, contact Dennis Batista 358-4282. If Dennis is not available, contact Peter Castellano 353-8736.

In case of emergencies posing threat to health or safety (chemical spills, etc.), contact Director of Environmental Health and Safety, at 353-9734, or for immediate assistance, contact Campus Police at 353-2121.

### **First Aid**

To report an accident or emergency dial 353-2121 (Campus Police). They will send a police officer to evaluate the situation and to determine what action should be taken. Later you should contact Sara Martin in the Biology Office to file the required Accident Report Form.

### **Building Hours and Security Procedures.**

Main doors to 2, 5, Cummington Street and 590 Commonwealth Avenue will be unlocked from 6:30 a.m. to 10:00 p.m., Monday through Friday. Admittance is possible 24 hours a day (including weekends). For after-hour access, Maddy Davis or Kelly McGuire in BRB 101. Main doors to 24 Cummington Street will be unlocked from 6 am to 7pm, Monday through Friday. After hour access at 24 Cummington Street is coordinated by Peter Castellano in LSE 602.

At 5 Cummington Street, your office key will open most common spaces. At 2, 5 & 24 Cummington Street, as well as 590 Commonwealth Avenue, there is a swipe card reader to open the front door after hours.

All keys for BSC, BRB, and SCI are distributed by Front Desk Staff in BRB 101. You will need to complete and return a "Key Request Form" with your advisor's signature, as well as \$5.00 deposit. Check the number on the door locks/cores.

All keys for LSE are distributed by Peter Castellano in LSE 602 or Tom Symancyk in LSE 107.

### **Department Facilities**

All persons using departmental facilities must arrange for their use through the staff or faculty member responsible for the facility. Persons using the facility must be checked out before use by the responsible staff member and must familiarize themselves with the regulations governing its use and maintenance.

<u>Facility Name</u>	<u>Room</u>	<u>Contact Person</u>
Aquarium Room	BRB25	Justin Scace
Biology Media Center	LSE 602	Peter Castellano
Confocal Imaging Facility	LSE 448	Todd Blute
Department Van	LSE 107	Tom Symancyk
DNA Chip Reader Facility	LSE 444	Todd Blute
DNA Sequencing Facility	BRB 519	Michael Sorenson
Imaging and Proteomics Core Facility	LSE 449	Todd Blute
Inverted Fluorescent Microscope	LSE 617	Todd Blute
Laboratory Animal Care Facility	SCI 427	Beverly Keniston
Museum	SCI 401	Dale Pasino
Photo Labs	BRB B25	Todd Blute
(includes darkrooms)	SCI 423A	
Phytotron Facility	BRB 508	Richard Primack
Real time Quantitative PCR & Phosphorimager	LSE 632	Todd Blute
Isotope Ratio Mass Spectrometer Facility	BRB 440	Robert Michener
Tissue Culture Facilities	LSE 312	Tom Gilmore
	BRB 208B	Gloria Callard
Workshop	BRB B19	Jonathan Perry

## DEPARTMENT ADMINISTRATIVE SUPPORT POLICIES

### Mail

Graduate student mailboxes are located in the corridor outside BRB 101. They are set up alphabetically. The combinations and box number assignments can be obtained from Front Desk Staff in BRB 101.

The Boston University Postal Service picks up federal and interdepartmental mail from the mailroom once a day. The BU Postal Service sorts this mail into interdepartmental and U.S. Mail, so please make sure that interdepartmental mail is in manila envelopes and clearly marked. If you must use a white envelope for interdepartmental mail it should be clearly marked or it will be sorted into the US Mail and charged back to the Department. It will also take a long time for this mail to arrive at its destination as it will be sent outside the University and then returned to go once again through the BU Postal Service. **This is intended for Department and University business and not for personal mail. Any personal mail must have a postage stamp affixed before being placed in this bin.**

### Telephones

There are telephones in all graduate student offices in 5 and 24 Cummington. In 2 Cummington, since most graduate student offices are within the advisor's laboratory, you are expected to use that telephone unless your advisor has made other arrangements. You will need to check with your advisor as to what his or her policy is about using laboratory phones. To get an outside line you must dial

'9' followed by the number you wish to reach.

### **Facsimile Machine (FAX)**

The Department has a FAX machine located in BRB 101 that is available for general departmental use. FAX machines are quite simple to use; nevertheless, see Front Desk Staff for assistance if you need any help. Since FAX machines operate over telephone wires, all charges associated with its use will appear on a phone statement. The Department covers the cost of all local Fax's. All long-distance Fax's must be charged to your professor's telephone code. You must make your own arrangements with your advisor about using his or her telephone code to make these calls.

Your incoming FAX messages will be placed in your mailbox.

### **Photocopying Procedures and Policies**

There are three copying machines within the Department available for general use.

In 5 Cummington Street, BRB 101C, there is a large Canon copier. This room can be accessed from the corridor at any time. The key that opens all common spaces also opens this room. This copier can be used by buying a copying-code.

Please keep in mind:

- Large jobs should not be copied between 9 am and 5 p.m., Monday through Friday;
- Faculty and staff have priority at the copying machines;
- If you have questions about how to use either machine please see Front Desk Staff in BRB 101.

The Biology Department will pay only for photocopying needed for a course in which the graduate student is a teaching fellow. If the photocopying pertains to a grant, you may be able to charge the grant. The student must pay for any other copying.

If you plan on using the Canon copy machine, it is recommended that you purchase a copy code. Payment may be in cash, but checks are preferred. Codes may be purchased from Rich Rigolini in BRB 101, Monday-Friday, 9:00 am-5:00 pm in counts of 500 copies for \$30 or 1000 copies for \$60.

### **Computers**

The University has a multi-user UNIX computer called ACS (Academic Computing System) that you can access to read email, word processing, etc., by way of public terminals or personal computers. Public terminals can be found throughout the campus. The largest terminal room is located on the first floor of the Mugar Library, 771 Commonwealth Avenue.

The College of Arts and Sciences offers a file server ([casfsb.bu.edu](http://casfsb.bu.edu)) to all faculty, staff, and students to back up and share their data. To establish a folder on this

server, go to <http://cashelp.bu.edu>, click on "File Servers" and follow the instructions.

Many students choose to bring their own personal computers into their office or labs. There are limited Ethernet connections within the department for Internet access. Check with your advisor for more information about ethernet port availability in your office. A laptop lock is highly recommended.

Wireless on campus is available in most academic buildings, but signal strength can vary floor to floor, building to building. To join the BU wireless network, you will need to accept the certificate for the secured and encrypted 802.1x security protocol with your user login and kerberos password. For more information on how to join the wireless network, go to <http://www.bu.edu/tech/accounts/wireless/> or stop by one of the IT Help centers at Mugar Library, 771 Commonwealth Ave. or the main Help Center in Kenmore Square at 533 Commonwealth Ave. (next to the Barnes and Noble Bookstore).

### **Getting a Computer Account**

ACS (Academic Computing System) is a shared cluster of UNIX systems, which can be used as your sole computing resource or in conjunction with personal or departmental computers. ACS provides access to e-mail, the Web, statistical and scientific software packages, programming languages, text processing software, and much more. All graduate students, faculty and staff at the University are eligible for an account on ACS.

You should have already received an "early-bird" login with instructions for activating your account. If you did not, then visit one of the two the IT Help Centers (see above) with your BU ID card to set up your account.

### **Getting on Biology Email Aliases**

Once you have an ACS account, you will automatically be added to the all-department alias ("bio-dept-list@bu.edu") and the graduate student alias ("bio-grad-students-list@bu.edu") for the Biology Department. We have five additional aliases for the individual groups ("bio-grad-cm-list@bu.edu", "bio-grad-ebi-list@bu.edu, etc.). To subscribe to one of these lists, you will need to complete the Graduate Student Information Form and return it to Meredith Canode.

### **Using the Departmental Laser Printers**

There are several networked printers throughout the various biology buildings. For information on how to connect to these printers, see the front office in Biology for printers in 5 Cummington Street, or Peter Castellano for access to printers in 24 Cummington Street.

The main networked printer in 5 Cummington Street is a "HP LaserJet 4050 Series", located in BRB 101C. You can connect to this printer via its IP address, 128.197.80.190

## **The Biology Media Center**

The Biology Media Center in room 627 of 24 Cummington Street provides a range of media services to the department for little or no cost. Available services are flatbed scanning, slide scanning, color laser printing, di-sub printing (photo-like prints) and large format poster printing.

These facilities operate on both Mac and Windows platforms in order to handle the varied media formats.

Due to the popularity of the media center, there is a "reservation" policy. If you need to use the media center services, you should contact Peter Castellano via e-mail at pcastell@bu.edu, or telephone at 353-8736 to reserve a time to use the equipment.

To facilitate the availability of these graphics resources, the associated computers are to be used only for departmental-related purposes and not for general use or e-mail.

## **Memos and Announcements**

Memos and announcements will be sent to you via electronic mail. Also check the easel outside of BRB 101 for announcements.

## **Reimbursement Procedures and Policies**

Supplies, and other expenses incurred that are course or grant related, will be reimbursed if the proper procedures are followed. Reimbursements can be either cash or check depending upon the amount and the nature of the expense. To process a reimbursement, please see Barbara Caloggero in BRB 101.

A **CASH** reimbursement will be made under the following conditions:

- Supplies needed are of an emergency nature.
- Supplies not normally secured through the stockroom, at 24 Cummington St.
- An original receipt is given for each reimbursement.
- The receipt is under \$10.00.

Petty cash is limited to two receipts per day for each account and cannot be used for personal advances (IOU's) or for entertainment purposes. University policy does not allow reimbursement for taxes paid. If the expense incurred does not fit the above criteria a check reimbursement will be made. A reimbursement form must be filled out completely or there will be a delay in processing. It usually takes two to six weeks once the form is received for a check to be issued.

If the supply has already been purchased and paid for, a check will be issued to you. If you have an invoice from the vendor a check will be sent directly to the vendor. Only original receipts or invoices will be accepted. Invoices must name Boston University and provide some detail of what goods and services were

provided. We are unable to process altered invoices or receipts. A reimbursement form, available from Barbara Caloggero in BRB 101, must be filled out for all reimbursement requests.

### **Travel**

A reimbursement form may also be used for travel advances and other travel-related expenses. See Financial Administrator, Rich Rigolini, in BRB 101.

### **Travel Advance**

Advances will not be issued if the traveler has not fully accounted for a previous trip with a Travel Expense Report or a requisition for any fare advance.

Advances cannot be issued more than two weeks prior to departure. If the requested advance exceeds \$1500, a detailed itinerary is required. Only one advance can be issued per trip. If registration or reservation fees must be paid in advance, request an Accounts Payable Request Voucher to make direct payment.

A travel advance will not be issued for a traveler to pay for airline tickets. Requisitions are used for airfare advances and are paid directly to the travel agent. Advances cannot be issued for airfare from sources other than University travel agents. (See the Stockroom regarding requisitions.)

### **Clearing a Travel Advance and Travel Reports**

A travel report must be submitted one week after the conclusion of a trip. Reports must have original receipts for all expenses. Copies of receipts are not accepted. Meal expenses must be reported per meal, per day. Registration and Reservation Fees paid directly to the vendor should not be included in the report.

Reports that result in a payment due the University must be accompanied by a check or money order only (no cash). For example, if a travel advance was issued for \$500 and only \$300 was needed, a check must be made out to the University for the difference.

Airfare advances paid directly to University travel agents must be included in the travel report. Airfare advances are considered to be the same as cash advances by the University. Passenger coupons (receipts) or unused tickets must be submitted with a travel report.

The use of a personal car can only be reimbursed for the mileage at the University mileage reimbursement rate (currently .375 cents per mile). Receipts for gasoline purchase cannot be accepted for personal car use; gasoline receipts are acceptable for car rentals or for a University vehicle.

## **SEXUAL HARASSMENT GUIDELINES**

The Department of Biology expects that the learning and work environment will be free of sexual harassment, including unprofessional conduct in faculty-student relationships and sexism in the classroom. Sexual harassment is an abuse of authority. Such behavior is unacceptable, and serves as a barrier to the

educational, scholarly, and research goals of the University. The faculty in the Department of Biology adopted the following guidelines:

- Professors, teaching fellows, or undergraduate assistants may not date a student in their class, laboratory section, or discussion section until the final grade has been given. A teaching fellow already dating a student in his/her sections cannot be responsible for the grade of the student.
- Professors should avoid dating members of their laboratory (i.e., graduate students, technicians, or postdoctoral fellows). If such a relationship exists, the member of the lab should consider and/or be advised to change labs. If the student remains in the lab, the professor must excuse him or herself as an official member of all evaluating committees (e.g., qualifying and defense committees) for the student, and can only serve as an ad hoc non-voting member of the committees. Remember that although both parties may initially consent to this relationship, it is only the professor, by virtue of his/her special responsibility, who is held accountable for unprofessional behavior.
- A professor dating a graduate student from another laboratory must excuse him or herself from all evaluating committees (e.g., qualifying and defense committees) for the student.
- Do not touch a student, technician, or postdoctoral fellow except with the universally accepted handshake. Hugs, kisses, high-fives, or slaps on different regions of the body may be acceptable in American culture, but may be interpreted in unintended ways by students of other cultures.
- When meeting alone with a student, keep your door open if possible.
- Do not invite a student to your home when you and the student would be alone. Try to include more than one member of the class in all social occasions.
- Inappropriate sexual comments in classrooms, laboratory sessions, or discussion sessions are not acceptable. Inappropriate messages may be subtle and even unintentional, but nevertheless these comments compromise the learning experience of the students.
- When hanging material on doors or walls, be sensitive to other people's feelings.

Remember, sexual harassment is a form of sex discrimination that is illegal under the Civil Rights Act. Students, fellows, or faculty who think that they are being sexually harassed are encouraged to speak in confidence with Michael Sorenson, chair of the Biology Department; Kim McCall, Director of Graduate Studies in the Biology Department; Eric Widmaier, Director of Undergraduate Programs in the Biology Department; and/or Edward Loechler, chair of the Ad hoc Sexual Harassment Committee in the Biology Department.

## NOTES

[www.bu.edu/cas/graduate/](http://www.bu.edu/cas/graduate/)

Where you can locate a copy of the most recent Graduate School bulletins on line, as well as information regarding the graduate school.

[www.bu.edu/studentlink/](http://www.bu.edu/studentlink/)

Once you have set up and obtain your ACS email account, the Office of Information Technology can provide you with locations of available computer labs (or you can use your own laptop or home computer) to access the above student link to update your local and billing addresses, view your class schedule and student account, waive medical insurance and see whatever information pertinent to your stay here at Boston University.

[www.bu.edu/biology/](http://www.bu.edu/biology/)