BCB FACULTY COMMITTEES (2013-14)

**Graduate Advising Committee:**
Bartel (Chair)  
Wagner  
Nikonowicz  
Cates

**Graduate Grievance Committee:**
Farach-Carson (Chair)  
Wagner  
Matthews  
Tao

**Safety Officers, including radiation:**
Beason-Abmayr  
Nikonowicz  
Farach-Carson

**Graduate Program Director:**
Bartel

**Graduate Recruiting and Admissions:**
G. Bennett (Chair)  
Lwigale  
Cates  
Gustin  
Silberg  
Tao

**Graduate Curriculum Committee:**
Bartel (Chair)  
Cates  
Eich  
Farach-Carson  
Silberg

**BCB Ombudsperson:**
Olson
BCB GRADUATE STUDENT HELP MENU

BCB graduate students are welcome to ask any of our staff for assistance at any time. This page provides information regarding each staff member’s job title.

The first help resource for graduate students is Angel Forward, the staff graduate program coordinator. This year she will handle all graduate student records, including payroll and travel award applications. Her direct back-up on the staff is provided by Monica Roberts, Susan Merz, and Sandy Saunders for all matters administrative, such as building access, payroll, insurance, and human resources; and Susan Cates for academic matters such as academic records, advising recommendations, applications for independent funding, awards, and scholarships, and how to procure training for departmental equipment.

<table>
<thead>
<tr>
<th>Title</th>
<th>Name</th>
<th>Phone</th>
<th>Email @rice.edu</th>
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<tr>
<td>GRADUATE PROG COORD</td>
<td>Angel Forward</td>
<td>X4230</td>
<td>ajf2</td>
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<tr>
<td>DEPARTMENT COORD</td>
<td>Monica Roberts</td>
<td>X4207</td>
<td>mr19</td>
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<td>ACCOUNTING ASSISTANT</td>
<td>Natalie Fulmer</td>
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<td>Sandy Saunders</td>
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<td>hssaund</td>
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<tr>
<td>RECRUITING ADMIN</td>
<td>Susan Cates</td>
<td>X5777</td>
<td>mscates</td>
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<td>RECEPTION</td>
<td>Susan Merz</td>
<td>X4015</td>
<td>smerz</td>
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<td>RESEARCH ACCOUNTING</td>
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<td>X2131</td>
<td>dgrayson</td>
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<td>FACILITIES ADMIN</td>
<td>Gerald Mixon</td>
<td>X4294</td>
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<tr>
<td>RECEIVING AGENT/MAIL</td>
<td>Juan Sanchez</td>
<td>X4233</td>
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<td>ACCOUNTANT</td>
<td>Minnie Taylor</td>
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<tr>
<td>ACCOUNTING ASSISTANT</td>
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<td>regina.mckinzie</td>
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BCB Graduate Student Association (BCB-GSA):

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<tr>
<td>president</td>
<td>Brian Engel</td>
<td>X3649</td>
<td>Brian.J.Engel</td>
</tr>
<tr>
<td>vice-president</td>
<td>Kim Gonzalez</td>
<td>X4866</td>
<td>klg1</td>
</tr>
<tr>
<td>secretary</td>
<td>Erin O’Brien</td>
<td>X4393</td>
<td>erinobrien</td>
</tr>
<tr>
<td>treasurer</td>
<td>Andrew Hirning</td>
<td>X4393</td>
<td>ajh7</td>
</tr>
<tr>
<td>GSA representative</td>
<td>Mauro Rinaldi</td>
<td>X4866</td>
<td>mar4</td>
</tr>
<tr>
<td>2nd year representative</td>
<td>Thomas Clements</td>
<td>X3003</td>
<td>tclements31</td>
</tr>
<tr>
<td></td>
<td>Mariane Martinez</td>
<td>X8302</td>
<td>mariane.martinez</td>
</tr>
<tr>
<td>3rd year representative</td>
<td>Alicia Jones</td>
<td>X4936</td>
<td>alicia.jones</td>
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<tr>
<td>4th year plus representatives</td>
<td>James Spurlin</td>
<td>X6788</td>
<td>jspurlin</td>
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<td>David Shis</td>
<td>X4393</td>
<td>David.L.Shis</td>
</tr>
<tr>
<td></td>
<td>Anisha Perez</td>
<td>X2492</td>
<td>Anisha.M.Perez</td>
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1. THE CHALLENGES AND GOALS OF GRADUATE STUDY

Graduate education provides advanced specialized training beyond the baccalaureate program. The goals of the graduate training provided by the Department of Biochemistry & Cell Biology are to guide students as they develop into doctoral recipients who:

- Are knowledgeable of past and current research accomplishments and techniques in biochemistry and cell biology
- Are adept in independent problem solving and critical thinking skills
- Have demonstrated capacity for independent, publishable research
- Can thoughtfully relate their research to that of others in their field
- Possess effective written and oral communication skills
- Assume responsibility for continued professional growth
- Strive to continuously acquire the knowledge and skills needed for scholarly achievement and success in their chosen career

Graduate study requires that students be committed to:

- Assuming responsibility and demonstrating initiative in their research and scholarly activities
- Engaging in active learning, including participating in weekly departmental and graduate student seminars, attending relevant seminars outside of the department, and reading extensively within their chosen field of study
- Initiating and completing innovative and productive research activities
- Improving oral and written communication skills
- Accepting and providing constructive scientific criticism
- Exercising high professional standards in all aspects of work

The Biochemistry & Cell Biology faculty members are committed to training and mentoring graduate students to reach their full potential as scientists. We seek to facilitate students’ progression towards fulfilling and exciting careers in academia, industry, or government, and to develop their skills as future leaders in science and society.
2. ADMISSIONS

Admission for graduate study in the Department of Biochemistry & Cell Biology requires: (1) a bachelor’s degree in biochemistry, biology, chemistry, chemical engineering, physics, or the equivalent; and (2) demonstrated quality and motivation as indicated by the student’s previous academic record, Graduate Record Examination scores, and recommendation letters. While we do accept students who have already earned their master’s degrees, our program is designed to be a five-year program from the bachelor’s degree to the doctorate.

Students must sign and return the “Memorandum of Understanding” which states, in part, that acceptance of the stipend requires that no outside employment or course enrollment is allowed unless approved by the thesis advisor and department chair.

The advanced degree requirements given on the following pages are those established by the Department of Biochemistry & Cell Biology and are above and beyond the general requirements of Rice University for the M.A. and Ph.D. degrees. Students should be familiar with the general University regulations for graduate students that are listed in the Rice University General Announcements. Any changes in these policies and/or regulations will be brought to students’ attention by the Office of Graduate Studies and/or the Department of Biochemistry & Cell Biology.
3. DOCTOR OF PHILOSOPHY DEGREE PROGRAM IN BIOCHEMISTRY & CELL BIOLOGY 2012

Most of the formal courses will be completed in the first year of residence to allow students to commence thesis research at the end of their second semester. During the first year, graduate students will be advised by the Graduate Advisory Committee (current members listed in preface, page i). This committee will tailor the formal course program to be taken during the first year.

Students are required to have training in Biochemistry and Cell Biology. If students are missing formal training in these subjects, they are required to take the equivalent background courses during their first year.

The corresponding courses at Rice are:
BIOC 301 Biochemistry (fall, prerequisite, does not count as a graduate level credit)
BIOC 341 Cell Biology (fall, prerequisite, does not count as a graduate level credit)

All Ph.D. students are required to take the following graduate courses:
BIOC 575 Introduction to Research (fall, 1 credit hour)
BIOC 581, 582 Graduate Research Seminars (fall & spring, 1 credit per semester of residence)
BIOC 583 Molecular Interactions (fall, 4 credit hours)
BIOC 587 Research Design, Proposal Writing, and Professional Development (summer, 3 credits)
BIOC 588 Cellular Interactions (spring, 4 credits)
UNIV 594 Responsible Conduct of Research (fall, 1 credit hour)
BIOC 599 Graduate Teaching in BCB (2 semesters in year 2) (fall & spring, 1 credit each)
BIOC 701,702 Graduate Lab Research (1st year rotations) (fall & spring,
2 credits/course; 4 credits/semester)

Students also must take 6 credit hours from the following advanced courses:
BIOC 525 Plant Molecular Genetics and Development (3) (not offered fall 2013)
BIOC 530, 535 Graduate Laboratory Modules in Molecular Biophysics (2 each) (spring)
BIOC 540 Metabolic Engineering (3) (not offered fall 2013)
BIOC 544 Developmental Biology (3) (spring)
BIOC 545 Advanced Molecular Biology and Genetics (3) (fall)
BIOC 547 Experimental Biology and the Future of Medicine (3) (spring)
BIOC 550 Viruses and Infectious Diseases (3) (fall)
BIOC 551 Molecular Biophysics I (3) (fall)
BIOC 552 Molecular Biophysics II (3) (spring)
BIOC 555 Computational Synthetic Biology (3) (fall)
BIOC 560 Cancer Biology (3) (spring)
BIOC 572 Bioinformatics: Networks (3) (fall)
BIOC 580 Protein Engineering (3) (fall)
Students also may take additional advanced level courses in the Biochemistry & Cell Biology Department and other select graduate courses in outside departments at Rice, Baylor College of Medicine, University of Houston, or University of Texas Health Science Center. Once the student selects a thesis advisor, the advisor may require additional specialized course work. Safety orientation will be provided during the first year.

Course Registration.
Continuing graduate students must register three times per year to remain in the program. The recommended number of hours after the first year is to register for any courses required by the graduate program or the advisor, and then register for enough hours of BIOC 800 Graduate Research to equal 15 hours total for all 3 semesters, Fall, Spring, and Summer. (The advising registration worksheet has detailed instructions and is in the Forms appendix.) Registration is on-line through the Esther system. Exact dates are found at the registrar’s web site (http://registrar.rice.edu/calendars/). New students register for fall classes during orientation week after meeting with the advising committee. After the first semester, continuing students register in mid-November for the spring, in early March for the summer, and in early April for the following fall. Late registration is permitted but incurs a fee (currently $75 - $125) that must be paid by the student. It is the student’s responsibility to keep track of the registration dates and to register by the deadline each semester. The graduate advising committee will confer with students about course selections for the first two semesters of residence or until all required coursework is complete.

First-year students will register for at least 14 hours in the 1st semester and at least 12 hours in the 2nd semester. Any adds or drops during the first year require the written approval of the chair of the graduate advising committee. First-year students should register for 2 hours each of BIOC 701/702 Graduate Lab Research rotations in both semesters unless otherwise instructed by the advising committee.

All second-year students are required to take two semesters of BIOC 599 (Graduate Teaching in Biochemistry & Cell Biology). In this course, students will gain experience in teaching by serving as discussion leaders and graders in sections of undergraduate courses.

All students are required to attend BIOC 581 and 582 during all years of residency. Students are also required to attend all departmental seminars beginning with their first semester of residence. The seminar schedule is on the main BCB web page, and the seminars are usually held on Mondays.

Students must achieve a minimum overall average of B (≥ 3.0/4.0) in the formal biosciences courses to be a candidate for the Ph.D. degree. The BCB faculty will evaluate the student’s overall performance (see Chapter 8).
4. TRANSFER CREDIT GUIDELINES

The Department of Biochemistry & Cell Biology does not generally accept transfer students from other programs except when the student accompanies a principal investigator who is joining the department faculty. All other students, even students who come into the program with Master’s degrees, must meet all the requirements of our degree program while enrolled at Rice (Chapter 3). Most courses should be taken at Rice, but with advance approval from the graduate advising committee, graduate students can also meet some of the degree requirements with courses that qualify under the Inter-Institutional Graduate Program agreement between Rice University, the University of Texas System, Baylor College of Medicine, and the University of Houston. The program allows a full-time graduate student to enroll in a course at one of the participating schools when the course is not offered at the student’s own school. The course is then transferred to the student’s home university, as long as the proper procedure is followed. (The registrar dictates the proper procedure and provides forms for the inter-institutional transfer credit, see http://registrar.rice.edu/gradtransfer.aspx.)

Students Transferring into the Department with a Faculty Advisor.
Students transferring into the department with a principal investigator who is joining the faculty may receive some transfer credit for courses taken at their previous graduate institution if the graduate advising committee determines that the course(s) taken are equivalent to courses at Rice. In this case, the registrar’s Graduate Transfer Request form must be submitted, showing the mapping of the courses from the previous institution’s transcript to the appropriate Rice course number and title. Graduate students who have met the Ph.D. candidacy requirements at their previous institution can sometimes transfer into the department with their candidacy intact, if the graduate advising committee determines that the previous institution’s requirements for candidacy were comparable to BCB’s requirements.
5. LAB RESEARCH ROTATIONS (BIOC 701/702)

Lab rotations (BIOC 701/702) are a critical part of the graduate school experience. Rotations assist students in their choice of research advisor, allow students to demonstrate research competence, and provide an opportunity for students to become acquainted with different research areas in the department. Students rotate in two labs in the fall and one lab in the spring; each rotation is worth two credits. Most students will be matched with their dissertation lab after three rotations; a fourth rotation is optional if additional lab exposure is desired.

Each rotation lasts approximately 7 weeks. During these rotations, the student will spend a minimum of 12 hours a week in the lab performing research and will be mentored by the advisor. The student also will benefit from the help of other graduate students and postdocs in the lab to learn the methods and techniques used in the lab's research. Students should use this opportunity to demonstrate to potential advisors their enthusiasm, responsibility, maturity, and initiative, because rotations are an important component in the process by which first-year students are evaluated and in determining lab assignments for thesis research (described in the next section).

Choosing Lab Rotations.
Each student emails the Department Chair and the Graduate Program Coordinator a list of three possible choices for the upcoming rotation, ranked in order of preference, by noon on the dates listed below. For the first list, students should talk to at least 3 faculty members to learn about possible research projects. The student will obtain a signature from each of these faculty members and turn these in to Angel Forward by August 26. The student will receive confirmation of the first rotation assignment within a week after preferences have been submitted, and students will start their rotations as soon as lab assignments are made.

2012-13 Rotation Information:

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<td>August 26 at noon</td>
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<td>Oct 7, noon</td>
<td>Oct 14 - Dec 13</td>
<td>Dec 5 - 6</td>
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<td>Dec 2, noon</td>
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Provide a ranked list of 3 faculty names for each rotation, also hand in your list of faculty signatures (separately) to the Graduate Program Coordinator for rotation 1. Subsequent rotation lists do not require faculty signatures, but students should talk to all faculty members on their list prior to submission of the list. Students receive a schedule with the order of rotation talk presentations approximately one week in advance.

Thesis Lab choice is due Feb 17 at noon (also a ranked list of 3).
During the Rotation.
After a rotation lab has been assigned, it is the student’s responsibility to meet with the advisor to discuss and design a research project for the rotation period. The advisor should make clear his/her expectations for the rotation. The student must keep an up-to-date laboratory notebook and record the experiments conducted and other useful information for anyone who may follow up on his/her work.

At the End of Each Rotation.
The laboratory notebook is to be turned in to the research advisor on the last day of the research rotation. Additionally, a 4-5 page, double-spaced (including figures) summary of the rotation work should be turned in to the Graduate Program Coordinator and the research advisor by 5:00 pm on the last day of each rotation period. The report should include three sections: background and significance, methods, and results and conclusions. The student may want to include discussions of any difficulties or problems encountered in the research. Furthermore, the student should make a list of relevant materials and reagents (protein samples, DNA, etc.) and specify their location so that they can be used in the future.

Rotation talks.
After each of the three required rotations, students present 10-minute rotation talks in which they briefly describe their rotation projects, including the background and goals underlying the project, any specific accomplishments achieved during the rotation period, and possible next steps. The students should submit a draft of their presentation to the rotation advisor one week before their talk is scheduled and invite the advisor to attend once the student has been notified of their scheduled time slot. These talks will be scheduled for lunchtime (or evening) meetings and attended by first-year BCB graduate students, the graduate advising committee, and any interested faculty. Individual labs also may have rotating graduate students present their results to other lab members in a group-meeting format. It is advisable to ask the rotation advisor for an opportunity to give the rotation talk in the lab group-meeting format in advance, because this provides an opportunity to practice the presentation, to receive suggestions from lab members, and to make sure the talk stays within the allotted 10 minute time frame. The advising committee encourages the first-year students to be an active audience and ask questions/provide suggestions to their peers.

A grade of S (satisfactory) or U (unsatisfactory) will be given for each rotation (BIOC 701/702) based on motivation and effort in the lab, completion of the written report, and completion of the rotation talk.
6. SELECTING A THESIS ADVISOR

Students and thesis advisors are matched during the second semester in residence. Advisor selection is a very important decision and should be based upon information obtained through BI0C 575 (Introduction to Research), seminar presentations by faculty members, research rotations, and meetings with individual faculty members.

Selection of and acceptance into a lab depends on several factors, including funding, available space, the student's academic standing, rotation performances, and the relationship between the potential faculty mentor and the student. All of these factors are taken into consideration to decide on the final thesis lab and faculty mentor who ultimately will help shape the graduate career. It is important that students actively engage in lab work during the rotation period, including attending lab meetings, interacting with other graduate students and post-docs, and discussing research with the faculty member. These interactions are invaluable to the selection of a lab and thesis advisor by providing insight into the research being conducted in the lab.

After three rotations are completed, each student will submit a list of three faculty members, in order of preference. This list is due at noon on February 17, 2013. The department chair, in consultation with the Graduate Advisory Committee and faculty, will consider thesis advisor requests and attempt to accommodate student selections within the constraints of available funding, research space, and the judgment of the concerned faculty.

Because thesis lab assignments are made by the department chair, individual faculty members cannot make commitments to individual students prior to the lab assignment date in February. In addition, students should not make commitments to faculty members beyond providing the ordered preference list to the department chair.

The thesis advisor preference list should be carefully composed based on criteria such as the lab's research field, potential future research interests, how well the student and advisor interact on personal and professional levels, and interactions between the student and other lab members. In most cases, the student will be granted his or her primary choice for a thesis research advisor. When a match with the top choice is not possible, the student will likely be matched with one of his or her alternative choices. In the rare case when no match satisfactory to both the student and a faculty member is made, the Chair will recommend that the student transfer to another department at Rice or to another institution that is more in line with the student's interests. The student must be assigned to a thesis lab by the end of the second semester in residence to continue in the program.
7. THE RESEARCH PROGRESS COMMITTEE

Each graduate student in the Biochemistry & Cell Biology program is assigned a Research Progress Committee of three faculty, of which at least two will be BCB departmental faculty members, who, along with the faculty advisor, oversee the progress made by the student on his or her dissertation work.

Role of the Committee.
The purpose of the committee is to evaluate the student’s research progress by administering the Admission to Candidacy Exam (A-exam) after the end of the student’s second year and by reading, critiquing, and actively participating in the student’s annual progress reviews. This advisory committee, along with the thesis advisor and an outside member, also administers the student’s final oral defense and evaluates the thesis manuscript.

It is important that the student and committee maintain an effective working relationship. Committee members can help resolve disputes (if any) between student and thesis advisor, can supply scientific and technical advice, can assist the student in achieving career goals, and might ultimately provide references for a student when s/he searches for professional positions after the Ph.D. is awarded.

Selection of the Committee.
The committee is made up of two or three faculty members from the Biochemistry & Cell Biology Department (one of these members will be designated as the chair). The third member can be a faculty member from a neighboring institution, including adjunct BCB faculty members. The selection of a committee involves the student, the advisor, and the department chair. The student and advisor should meet and discuss possible committee members, and a list of six prospective committee members should be submitted to the departmental office no later than June 1st of the first year of residence. Candidate BCB faculty members can be requested without contacting the faculty member; adjunct and other TMC faculty members should be contacted by the student or advisor to see if they are willing to serve if selected. The departmental office will take these preferences into consideration, but must ultimately select committee members based on the availability of the faculty members. Every effort will be made to include at least one committee member from the student’s preference list. The final Research Progress Committee is generally assigned by mid-July.
Grievance Process.
Problems or conflicts may arise during a student’s graduate education, and students must take responsibility for informing faculty of any such problem. Depending on the problem, students should feel free to go to their advisor, members of their progress review committee, the departmental ombudsperson (page i), or any faculty member with whom they feel comfortable for advice. It is best to move to resolve any conflicts quickly and amicably. However, if attempts to resolve a serious problem informally are unsuccessful, the following grievance procedure should be followed:

1. The student should submit the grievance in writing to the department chair, who will attempt to resolve the problem.

2. If the student remains unsatisfied, the problem should be presented to the BCB graduate grievance committee for resolution. This committee is a standing departmental committee (current members listed in the preface, page i). If a member of this standing committee also serves as the student’s advisor or on the student’s research progress committee, the student may ask the department chair for an alternate pro tem committee member. Both the student and the department chair should submit a written record of their view to this committee.

3. If the student remains unsatisfied with the resolution of the issue, the problem should be referred to a standing subcommittee designated at the Graduate Council and composed of three faculty members (representing diverse disciplines within the University), one graduate student, and the dean of graduate studies. A written report of proceedings at stage two should be presented to the Chair of the Graduate Council, for forwarding to the subcommittee, together with all other written materials generated during the investigation. The decision of this subcommittee will be considered final.
8. EVALUATION OF PROGRESS IN GRADUATE STUDY

Six procedures are used to evaluate a graduate student’s progress in the Department of Biochemistry & Cell Biology at Rice.

1. At the end of each of the first two semesters of residence, the department faculty review each student’s course work, performance in laboratory rotations, and motivation. **Students must maintain at least a B average (3.0/4.0), obtain satisfactory marks in research rotations, and demonstrate potential for research to continue in the Ph.D. program.**

2. **Continual review of research progress** is made by the thesis advisor, and a written evaluation is provided by the advisor prior to each progress review meeting after the A-Exam.

3. **Written and oral progress reports** are evaluated by the student’s progress review committee every year until completion of his or her degree. See Chapter 9 for details.

4. **A research seminar is presented annually** in BIOC 581/582 beginning in the second year and continuing until the thesis is submitted and the defense is scheduled. Attendance and participation at the presentations is mandatory for all students. See Chapter 10 for details. Attendance at the departmental guest seminar series is a critical part of the student's professional development and is also expected.

5. By May 1 of the fourth semester in residency, each student must have submitted the “**Admission to Candidacy Examination (A-exam)**”. This examination consists of a written Ph.D. thesis proposal following the format of an NIH postdoctoral grant proposal. The research plan is developed in collaboration with the thesis director, but the proposal is written wholly by the student. Three faculty members who comprise the student’s progress review committee will evaluate the proposal. The student defends the proposal in an oral examination in front of this committee and the thesis advisor. The goals are to demonstrate:

   (a) abilities to organize and present scientific information; (b) a thorough background knowledge of the relevant literature; and (c) familiarity with the techniques required to carry out the project.

   Successful completion of these goals will help to facilitate rapid progress toward completion of thesis research. See Chapter 11 for details.

6. **The Ph.D. thesis defense** involves a public seminar presentation, followed by oral examination defending the written thesis. All Ph.D. students must defend the thesis before the end of their 16th semester in residency, according to university policy. See Chapter 18 for details.

   Failure to meet the above requirements can result in termination from the program by the department chair, after consultation with the faculty.
9. ANNUAL REVIEW OF RESEARCH PROGRESS

In addition to the continual review of progress by the thesis advisor, the research progress committee conducts an annual research progress review of each student. The first meeting (in the 3rd semester of residence) will include the thesis advisor; advisor presence is optional for meetings after the candidacy exam. There are two components of the progress review: the written report and the committee meeting.

Due Dates.
The first written progress report is due at the beginning of the 2nd year (August 15), and is submitted to the research advisor by August 1 to enable time for feedback. After receiving feedback, the student should incorporate appropriate changes and corrections. The Admission to Candidacy exam (A-exam, see Chapter 10) replaces the progress review at the end of the 2nd year. Subsequent progress reviews occur annually in conjunction with the BIOC 581/582 seminar until the student has completed a doctoral thesis. The written report must be submitted to the thesis advisor for feedback 2 weeks prior to the BIOC 581/582 research seminar. The final version of the progress report, along with the self-evaluation, described later, will be submitted to the Graduate Program Coordinator by 5 pm 1 week prior to the student’s BIOC 581/582 presentation (or by August 15 for 2nd-year students). The student prepares 5 copies of the final report – 3 for committee members (can be placed in mailboxes), 1 for the thesis advisor, and 1 for the Graduate Program Coordinator. The student is responsible for (i) copy quality; make sure all copies are in color if it is required for the proper interpretation of figures, and (ii) submission by the due dates; this includes all copies and forms. Failure to meet these deadlines may result in probation. If the final report is not submitted within 3 weeks of the deadline, the department chair, after consultation with the faculty, can dismiss the student from the program.

The Written Report.
The progress review report should be no more than eight single-spaced pages, excluding figures, figure legends, tables, and references. Use Arial 11 or Times 12 font sizes. Excessive length is generally detrimental rather than helpful. The document given to the thesis advisors a week before it is due to committees should not be a "rough" draft. It should be a complete, high quality document ready to provide to the committee. The review by the thesis advisor is meant as a final check to insure that the student has written a clear and cogent document.

Students should review progress review document guidelines, including plagiarism definitions, prior to preparing documents.

If students want feedback on rough drafts, the drafts should be provided to the advisor much earlier to enable substantial writing improvements far in advance of the document due date. The Rice University Center for Writing, Oral and Visual Communication is available for writing and presentation feedback; schedule a consultation at their website (http://cwovc.rice.edu/). In addition, Dr. Mary Purugganan can provide some writing guidance. Please contact her well in advance if you would like assistance.
The report should contain five sections: Specific Aims, Background, Results, Future Plans, and References.

**Specific Aims**—should contain the overall objectives, the hypotheses to be tested, and the specific aims to be accomplished.

**Background**—should contain all relevant information required to evaluate the current status of the proposed research. Parts of this section may remain unchanged from previous reports. However, this section must remain current and include recent relevant advances.

**Results**—should contain experimental results pertaining to the specific aims. After the first progress review, this section should be divided into “Previous Results” and “Progress since Previous Progress Review”. “Previous Results” should briefly summarize relevant data discussed at previous progress review meetings, whereas data obtained since the last progress review should be discussed in detail. This section should constitute the bulk of the progress report.

**Future Plans**—a concise description of the remaining experiments to be conducted.

**References**—should include full author lists and titles, such as used by the journal *Cell*.

**Figures**—the use of informative figures describing results or models is encouraged. Figures must be accompanied by legends that enable understanding of the figure without reference to the text. Figures should be of publication quality and incorporated into the text at a point after their first mention. Figures from other sources should include a reference to the source in the legend.

**The Self-Evaluation.**
The student will fill out a supplemental self-evaluation questionnaire to attach to each copy of the Progress Review report. A copy of the questionnaire and a set of progress review guidelines are included in the Appendix of this handbook.

**The Advisor Letter.**
The research advisor must submit a letter containing a written evaluation of the student’s progress to the graduate program coordinator and to the student prior to each progress review after the candidacy exam. The meeting will be rescheduled if the advisor’s report has not been submitted.

**Advisor Presence.**
The advisor attends the first progress review and the A-exam as an observer. After the A-exam, advisor presence is optional at progress review meetings. A letter from the advisor to the committee and student outlining student performance must be submitted prior to the meeting even if the advisor attends the meeting, beginning with the first progress review after the A-exam. This letter will be part of the student’s permanent file. After the formal meeting, the advisor leaves and the student meets with the committee chair privately.
**The Committee Meeting.**
The student’s committee members are encouraged to attend his/her BIOC 581/82 seminar to evaluate the student’s progress in seminar presentation skills. However, committee members will reserve major questions for the subsequent committee meeting. Beginning in the third year, the progress review meeting will be scheduled by the Graduate Program Coordinator for the day after the student’s BIOC 581/582 presentation. If, due to scheduling conflicts, the meeting cannot be held the day after the student’s seminar, it will be scheduled as early as possible.

The student should arrive at the meeting with laboratory notebooks and an abbreviated, seminar-style presentation of relevant data including figures from the report, prepared to explain any conclusions with original data and observations, and ready to discuss particular difficulties encountered in the research. The committee chair will review the degree requirements checklist and the transcript at the beginning of the meeting until all requirements are met and they can sign-off on the checklist. The committee chair will also write an evaluation of the student’s progress following the meeting. Copies of this evaluation will be placed in the student’s file and provided to both the student and the thesis advisor.

Each progress review is as important as the initial admission to candidacy examination. If the committee judges that the student is not making progress or exerting sufficient effort, the committee members can recommend to the department chair that the student be placed on research probation or dismissed from the program. However, the primary purpose of the annual progress review is to provide guidance and help for the student’s research work. The student should be prepared to take notes of the committee’s comments, concerns, and suggestions for discussion with the thesis advisor and, if appropriate, incorporation into future experiments and progress reviews.

Students are encouraged to seek advice from committee members or other faculty as needed. Students or advisors might occasionally find it helpful to have an additional progress review meeting outside of those automatically scheduled after the BIOC 581/582 seminar, e.g., for assistance in dealing with difficult scientific problems or for advice in choosing an effective experimental approach. Any student wishing to schedule an additional meeting should contact his/her committee chair.

**Post Meeting Summary.**
The committee chair summarizes the meeting in writing. This summary is provided to the student and the advisor and is part of the student’s file.
All students, beginning in the second year, are required to present an annual research seminar in BIOC 581/582, which currently meets Monday at 2:00 pm. Attendance is required and students are encouraged to participate actively in the discussion period that follows the formal presentations.

There are three goals of this course:
- to provide a forum for graduate students to gain expertise in presenting a scientific seminar
- to provide exposure to other ongoing research in the department
- to develop critical analysis skills by evaluating the seminars of other students

Research seminars should be 25-30 minutes in length followed by a question period. Seminars should be presented in a format appropriate for a scientific meeting or regular departmental seminar, and include a brief background to the field and the specific research, a summary of relevant research results and conclusions, a discussion of possible future work, and acknowledgments.

While the primary audience for BIOC 581/582 is the graduate student body, students are encouraged to open their seminars to faculty, staff, and postdoctoral fellows as a way of broadening the potential feedback and discussion. The student's progress review committee is encouraged to attend the BIOC 581/582 seminar. This allows the committee the opportunity to gain a broad overview of the project and may eliminate the need for a second presentation during the progress review. Committee members will reserve major questions for the progress review meeting. For more information about preparing a BIOC 581/582 seminar see Dr. Janet Braam or Dr. Mary Purugganan.

**Attendance policy.**
Four or more unexcused absences in the semester (without a documented illness, emergency, or other excused absence) will result in a grade of unsatisfactory in the course, which in turn will result in academic probation. Please request excused absences well ahead of time (e.g., the preceding Friday) via an email to the instructors and include a reasoned justification for the request. Copy the Graduate Program Coordinator on the excused absence request. Arrival to class more than 5 minutes late will be considered an absence.
11. ADMISSION TO CANDIDACY EXAMINATION

The admission to candidacy examination (A-exam) occurs at the end of the fourth semester during May or June. Only under special circumstances (e.g., the absence of a committee member or student due to a family emergency or an approved academic activity) will the exam be scheduled later than June 30. The Graduate Program Coordinator will schedule the A-exam. The student and committee members generally will be informed of the date of the A-exam before May 1.

**Exam Format.**
The A-exam includes a formal written proposal and an oral examination conducted by the student's research progress committee (Chapter 7). This committee will determine the suitability of the student's candidacy for further pursuit of the doctoral degree based on his or her performance on the written and oral portions of the A-exam. The student's overall academic record and research progress also are considered in determining the student's “pass” or “fail.”

**Written Exam.**
The written exam consists of a research proposal on the thesis project that is due on May 1 of the student's second year. The proposal format should be similar to the proposal prepared for Grant Writing (BIOC 587) that first-year students take in the summer. The format of the proposal should be of a quality that could be submitted to a federal funding agency (e.g., NIH NRSA). Preliminary data should be presented in publication-quality figures and diagrams, and there should be no typographical or spelling errors. The length of the proposal may vary; however, it should not exceed 15 pages (single spaced, font Times 12 or Arial 11), including specific aims, figures and tables, but excluding references and the title page. An abstract is not required. A general overview of the necessary sections of the proposal is included below; however, review of the handouts and lecture material from BIOC 587 (see Forms Appendix) will be of greater use when preparing this document. The committee uses a rubric to evaluate the written component of the A-exam that provides additional guidance on committee expectations (see Forms Appendix).

**SPECIFIC AIMS** -- State the overall objective, the hypotheses to be tested, and list the specific aims you hope to accomplish (1 p).

**BACKGROUND AND SIGNIFICANCE** -- Describe the significance of your project in one or two well-written paragraphs. Provide a historical background of your proposed research including major relevant findings by others (3-5 p).

**PRELIMINARY RESULTS** -- Present data from your initial experiments that support the ideas and approaches being used and proposed. Incorporate figures with legends into the text (2-5 p).

**RESEARCH PLAN** -- Describe in more detail the rationale, hypotheses, methodology, controls, expected outcomes, interpretations, and possible alternative approaches for each aim. Include a time line estimating completion of proposed experiments (5-7 p).
REFERENCES -- List cited literature references. References must include complete author lists and full titles (e.g., style of Cell) (no page limit).

The Oral Exam.
The oral portion of the A-exam involves student's research progress committee. The student's research advisor also attends this session. The advisor is not allowed to initiate questions during the exam, but can serve as a resource on the topic.

The goal of the oral exam is to test both the student's understanding of the proposed thesis project and his or her understanding of fundamental principles of biochemistry and cell biology and other appropriate subjects. The oral exam involves a formal presentation of the student's proposed research plan in PowerPoint format. After this brief presentation (~30 min), the committee will ask questions related to the proposed project. The committee also may probe more deeply into the student's general knowledge of particular aspects of his/her project to determine the student's familiarity and overall understanding of his/her research topic. The oral exam is generally 2-4 hours in length. At the conclusion of the oral exam, the committee will decide among three possible outcomes:

1. **Pass.** The written proposal was judged to be a well written, logical, and feasible Ph.D. project, and the student effectively communicated exemplary knowledge in all areas covered during the exam that were deemed to be central to the student's research.

2. **Conditional pass.** The student effectively communicated exemplary knowledge in most areas covered during the exam, but displayed incomplete knowledge or communication of some aspect of the project or the underlying science. In this case, the committee will assign one or more additional brief (usually 2-4 pages) papers on specific topics to improve the student's basic science foundation and to facilitate thesis completion. These reports will be written by the student and submitted to committee members within a short period (usually 1-2 weeks) following the exam. If the reports are acceptable, the student will formally “pass” the oral examination. (In most years, the majority of students are in this category.)

3. **Fail.** If the committee decides that the student has failed the written or oral exam, the student may be dismissed from the Ph.D. program. Alternatively, at the discretion of the committee and in consultation with the department chair, a make-up exam may be scheduled within six months. If the student fails the second exam, the student will be dismissed from the Ph.D. program. Students who fail the candidacy exam can request permission to complete a Master's degree within one year from the date of the candidacy exam. The thesis advisor, the progress review committee, and the department chair must approve this request. A primary consideration in granting this request will be whether the preliminary research already conducted support the likelihood of successful completion of a novel research project within the one-year time frame.
12. PETITION FOR PH.D. DEGREE CANDIDACY

Immediately following successful completion of the Admission to Candidacy examination, the student must submit a petition through the department chair to the Graduate Council for official approval of his/her candidacy for the Ph.D. degree. Note that this form requires the student to name the “outside” member of his or her thesis committee (see Chapter 15).

Departmental policy is that the petition should be filed prior to the first progress review after the candidacy exam, or the committee chair will be notified that the student has not filed in a timely fashion. University policy requires that approval of candidacy be achieved prior to the end of the 6th semester of residency to obtain continued financial support. A copy of the Petition for Candidacy form is included in the Appendix of this handbook. On the form, the thesis advisor should be listed as the Director of the Thesis Committee, the outside committee member should be a Rice faculty member from another department, the chair of the progress review committee should be listed as the member from within the department, and everyone else on the progress review committee should be listed as additional members.

13. BCB TEACHING AND MENTORING CERTIFICATE PROGRAM

The Biochemistry and Cell Biology Department offers a set of optional activities for graduate students and postdoctoral researchers interested enhancing and documenting their teaching and mentoring experiences at Rice. A "Higher Education Teaching and Mentoring Certificate" will be awarded upon completion of the four components. Prerequisites for certificate eligibility include successful completion of the Admission to Candidacy Exam (for graduate students) and a letter of support from the research advisor (for graduate students and postdoctoral researchers). Progress must be documented on the Record of Training Activities form. Program guidelines and the Record of Training Activities form can be found on the BCB website, under the Graduate Studies menu, at the following URL:

https://biochem.rice.edu/Content.aspx?id=567
14. ATTENDANCE AT SCIENTIFIC CONFERENCES

The department encourages students to participate in national and international scientific conferences. This participation enables students to present their work to a wide audience, listen to research presentations from a range of speakers, and meet with individuals sharing common research interests. Students also use these meetings to network with future collaborators and employers. To help expedite attendance, the department makes funds available to students to partially defray the costs of student attendance. These funds are available to students who will present their research in an oral or poster format. The form used to request funds is included as an Appendix to this handbook.

It is very important to contact the graduate program coordinator for travel guidelines before making your travel arrangements. Whether you have been awarded funds for travel by the department, by a training grant, by an outside fellowship, or by your principal investigator, the travel guidelines must be followed. Reviewing these guidelines in advance will prevent misunderstandings regarding costs that are reimbursable versus costs that are considered personal.

15. DEPARTMENT SEMINARS

Graduate students are required to attend the department guest seminar series, usually scheduled on Mondays. Scientists from outside of BCB share their latest findings, and students can sign up for lunch with the seminar speaker after the talk. The graduate students can nominate speakers for the seminar series; nominations are solicited through the BCB GSA. Graduate students are encouraged to attend other scientific seminars in their field of interest such as the Keck seminars Friday at 4 pm, other TMC seminars, and seminars hosted by other Rice departments.
16. GRADUATE STUDENT AWARDS

The department periodically recognizes students whose performance or accomplishments have been particularly outstanding. Awards are presented for outstanding teaching, service, and seminar presentations during the previous year. In addition, Schroepfer awards, given in honor and memory of George Schroepfer, Jr., founder of our department, are given for outstanding Ph.D. dissertation and for outstanding research publication during the previous year. A certificate and cash prize accompanies each award. Recipients from previous years are listed below. Students are only eligible to receive each award once.

George J. Schroepfer, Jr. Award
for Outstanding Ph.D. Thesis in Biochemistry & Cell Biology
2005: Rafael Counago 2010: Naxhiely Martínez Ramón
2006: Nikki Delk and Corey Wilson 2011: Todd Mollan and Zhao Huang
2007: Wiriya Chiranand and Jeanne Rasbery 2012: Magda Walkiewicz
2008: Damian Dalle-Nogare 2013: Chelsey McKenna

George J. Schroepfer, Jr. Award
for Outstanding Published Research in Biochemistry & Cell Biology
2005: Corey Wilson and Andrew Woodward 2010: Ivan Birukou
2006: Phillip Caldwell 2011: Matthew Peña
2007: Junhua Pan and Adina Maximciuc 2012: Danielle Goodspeed
2008: Yu-Chang Tsai 2013: David Shis

Outstanding BCB Student Seminar
2004: Brenton Scott 2008: Jeff Crawford and Cassidy Johnson
2005: Adina Maximciuc 2011: Joseph Faust
2006: Damian Dalle-Nogare and Megan Guelker 2012: Curtis Warren
2007: Blair Doneske and Shivas Amin 2013: Aaron Collier

BCB Service Award
2004: Emily Horton 2010: Todd Mollan
2005: Jeff van Komen 2012: Chelsey McKenna
2006: Damian Dalle-Nogare and Angela Hvítved 2013: Erin O’Brien and Andrew Hirning
2007: Megan Guelker

Biochemistry & Cell Biology Excellence in Teaching Award
2004: Phillip Graves and Elizabeth McCormack 2010: Chelsey McKenna and Kalie Van Ree
2005: Jeff Crawford and Megan Guelker 2011: Patricia Chapela
2006: Shivas Amin 2012: David Shis
2007: Todd Mollan 2013: Alicia Jones and Justin Harper
2008: Anu Maharjan and Matthew Peña
17. FINAL PH.D. THESIS EXAMINATION COMMITTEE

The University committee for the final oral examination (defense of thesis exam) must be approved by the Office of Graduate Studies at the same time as the candidacy is approved. This committee is composed of the thesis advisor, the members of the Research Progress Committee, and a Rice faculty member whose primary appointment is outside the BCB department. This latter member must be chosen in consultation with the thesis advisor and the department chair. The “outside” member must be selected prior to the petition for approval of candidacy (see Candidacy form in Appendix) and be approved along with the other committee members by the Graduate Council. When appropriate, the student may elect to have an “external examiner” from another university also serve on the committee. In such cases, the department chair must secure the approval of the Office of Graduate Studies for the addition of an “external examiner” to the committee.
18. PREPARATION AND FINAL ORAL DEFENSE OF PH.D. THESIS

During the final progress review examination, the student must convince the committee members that the thesis research is essentially complete and of sufficient merit and originality to be published in a reputable scientific journal. This final review session may be held any time prior to or in conjunction with the regularly scheduled, annual progress review. In addition to the usual written progress report, the student submits a detailed thesis outline (approved by the research advisor) one week prior to the review session. As in the case of a regular progress review, the research advisor submits a written evaluation of the student’s progress. Again, the review meeting cannot be held if this report has not been submitted. If all committee members and the thesis advisor are in agreement, the student can begin the preparation of his/her thesis. However, during the writing of the thesis, the need for further experimentation often occurs, and the student should be aware of these possible complications and make allowance in scheduling the final examination.

It is essential that each student publish most or all of their dissertation research in peer-reviewed journals. A strong publication record is the most important metric by which research accomplishment is evaluated, and is necessary for a student to establish a scientific career following the receipt of the Ph.D. On average, graduates from the Biochemistry and Cell Biology Department co-author more than two papers during their graduate career. Students should not plan to defend their dissertation until the bulk of their research has been accepted for publication.

The requirements and format of the written dissertation are set forth by the Office of Graduate Studies. It is to the student’s advantage to be fully aware of these requirements before undertaking the writing process. The title page should list the thesis advisor first, then the remaining committee members should be listed in alphabetical order. The thesis advisor should read at least one preliminary draft of the thesis and must approve the final copy before its distribution to the four other committee members. For the examination, the final copy shall consist of a printed manuscript, which, if accepted, could be bound and submitted without editing to the Office of Graduate Studies. The final copies must be submitted to the thesis committee members, along with a copy to the graduate program coordinator, at least two weeks before the final examination. The student should note that, in order to participate in the commencement ceremonies at the end of the academic year, the committee members must approve the final copy of the thesis before the deadlines imposed by the Office of Graduate Studies.

The student is responsible for scheduling the thesis defense and reserving a room. Generally, a 2-hour block of time is sufficient for the lecture and subsequent examination. The final oral examination is public, and the student must arrange to have it announced in the Rice weekly Calendar of Events at least two weeks before the scheduled date. To do this, the event must be posted.
with the Office of Graduate Studies through their website, and the student must notify the graduate program coordinator to post the defense on the department calendar.

The final thesis examination consists of two parts. (1) Initially, the student presents an hour-long public lecture that is handled like a departmental seminar. (2) The official examination by the thesis committee follows the seminar. The student is expected to defend in detail his/her research work and the text of the written thesis. The committee members will consider both the student's research work and the final copy of the thesis. If the committee members approve the student’s performance and the text of the thesis, they sign the Candidacy Approval Form, which must be brought to the examination by the student. The student should obtain this form from the graduate program coordinator prior to the defense. If minor alterations in the written text of the thesis are requested, the student must submit a revised copy of the thesis to the dissenting members for their approval and signatures on the title page. In the case of an unsatisfactory performance, a second examination can be scheduled. A second unsatisfactory performance will result in dismissal from the program.

Deadlines.
Rice University requires the thesis to be defended before the end of the 16th semester of residency at Rice. However, the BCB department may decide to terminate the stipend at the end of the 15th semester of residency at Rice in cases where the progress review committee and the faculty advisor believe the student has had ample time to complete the thesis. The student will receive advance warning that the stipend will be discontinued.
19. MASTER OF ARTS DEGREE PROGRAM IN BIOCHEMISTRY & CELL BIOLOGY

The course requirements for a candidate for the Master of Arts degree will be determined by the Graduate Advisory Committee as outlined in Part A. As in the case of Ph.D. candidates, all students complete (unless equivalent educational experience has been obtained previously) the following courses:

BIOC 301 Biochemistry
BIOC 341 Cell Biology

All M.A. students are required to take the following graduate courses:
BIOC 575 Introduction to Research (fall, 1 credit hour)
BIOC 581, 582 Graduate Research Seminars (fall & spring, 1 credit per semester of residence)
BIOC 583 Molecular Interactions (fall, 4 credit hours)
BIOC 587 Research Design, Proposal Writing, and Professional Development (summer, 3 credits)
BIOC 588 Cellular Interactions (spring, 4 credits)
UNIV 594 Responsible Conduct of Research (fall, 1 credit hour)
BIOC 599 Graduate Teaching in BCB (2 semesters in year 2) (fall & spring, 1 credit each)
BIOC 701, 702 Graduate Lab Research (1st year rotations) (fall & spring, 2 credits/course; 4 credits/semester)

Students also must take 6 credit hours from the following advanced courses:
BIOC 525 Plant Molecular Genetics and Development (3) (not offered fall 2013)
BIOC 530, 535 Graduate Laboratory Modules in Molecular Biophysics (2 each) (spring)
BIOC 540 Metabolic Engineering (3) (not offered fall 2013)
BIOC 544 Developmental Biology (3) (spring)
BIOC 545 Advanced Molecular Biology and Genetics (3) (fall)
BIOC 547 Experimental Biology and the Future of Medicine (3) (spring)
BIOC 550 Viruses and Infectious Diseases (3) (fall)
BIOC 551 Molecular Biophysics I (3) (fall)
BIOC 552 Molecular Biophysics II (3) (spring)
BIOC 555 Computational Synthetic Biology (3) (fall)
BIOC 560 Cancer Biology (3) (spring)
BIOC 572 Bioinformatics: Networks (3) (fall)
BIOC 580 Protein Engineering (3) (fall)

Students may also take additional advanced level courses in the Biochemistry & Cell Biology Department and other select graduate courses in other departments at Rice, Baylor College of Medicine, University of Houston, or University of Texas Health Science Center.
The specific courses will be determined in consultation with the Graduate Advisory Committee. There will be an evaluation of previous course studies, and any deficiencies must be corrected, usually in the first year. Once the student selects a thesis advisor, the advisor may require additional specialized course work.

Students must achieve a minimum overall average of B- (≥ 2.67/4.0) in the formal biosciences courses to be a candidate for the M.A. degree. The BCB faculty will evaluate the student’s overall performance after the second semester in residence.

One progress review will be held for M.A. students during their second full year of residence. This research review session is similar to the admission to candidacy examination for Ph.D. students and requires an 8-10 page description of the student’s research activities and plans. No other preliminary examination will be held prior to the final oral defense of the written Master’s thesis. As in the case of Ph.D. students, a petition for approval of candidacy is submitted to the Office of Graduate Studies along with the names of the thesis committee members. These members include the thesis advisor and the Progress Review Committee. The department chair must approve this action. Master’s degrees must be completed by the fifth year of residency, according to university policy. In order to attend graduation at the end of the academic year, the student must submit a petition for candidacy prior to February 1.
20. FINAL ORAL EXAMINATION AND
THESIS FOR MASTER’S DEGREE

Master of Arts degree candidates are required to submit a formal written thesis that is consistent with the format and requirements set by the Office of Graduate Studies. A final copy of the thesis, which has been approved previously by the major advisor, must be submitted to each of the other committee members two weeks prior to the final examination. The final examination, which is required to be open to the public, will consist of a brief oral presentation of the research work to the committee members followed by a question-and-answer session. The student must bring the master’s candidacy form to the defense so that the committee members can sign it. The graduate program coordinator automatically obtains this form from the Office of Graduate Studies when the student posts notice of the defense examination on the Graduate Studies website. Notice of the final examination for a Master’s degree must be posted with Graduate Studies and with the department at least one week prior to the scheduled date. As in the case of Ph.D. candidates, the final copy of the thesis must be approved by the official committee members prior to any deadlines imposed by the Office of Graduate Studies in order for the student to participate in commencement exercises. A second failure of the final examination will automatically lead to withdrawal from the University.
## 21. FORMS APPENDIX
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Candidacy for the Doctoral degree cannot be approved until the applicant has completed all course requirements, all qualifying or preliminary examinations or department equivalent, and any foreign language requirements.

1. Name of applicant _____________________________________________________________________
   (Last)    (First)    (M.I.)

2. Department _______________________________         Student ID#_______________________

3. Attach to this application a current transcript (printed from Esther).

4. Attach to this application a statement of all applicable departmental requirements for both course work and qualifying or preliminary examinations.

5. Attach student’s departmental checklist to candidacy to document how the student has fulfilled departmental requirements.

6. Proposed thesis topic (tentative title) ____________________________________________________
   ______________________________________________________________________________________

7. Thesis Committee, subject to the approval of the GPS. (type or print)
   (a) Thesis Director _________________________________________________________________
       Committee Chair within the department (if different) BCB DOES NOT USE THIS LINE
   (b) Member within the department _____________________________________________________
   (c) Member outside the department _____________________________________________________
       Additional member(s) _________________________________________________________________

8. Signatures:
   ___________________________________________  Date __________________________
   Original signature of Department Chair or Director of Graduate Studies

   ___________________________________________  Date __________________________
   Graduate Coordinator signature

   ___________________________________________  Date __________________________
   Dean of Graduate & Postdoctoral Studies
Graduate Student Travel Award
Application Form
Please include an abstract and CV with your application.

NAME: ____________________________________________________________

Student ID#: ___________________________ Ext: ___________________

Department: Biochemistry & Cell Biology

Name of Conference or other purpose of travel:

__________________________________________________________________

Presentation type (Check one): _______ Poster _______ Oral

Title: ____________________________________________________________

__________________________________________________________________

Location of conference: ____________________________________________

Dates of travel: __________________________________________________

Estimated Budget:

Transportation: _______________

Lodging: _______________

Meals: _______________

Registration: _______________

Other: _______________

Total: _______________

Source of Matching Funds: ________________________

(Research Grant vs. Internally Designated vs. Gift vs. Departmental Funds)

APPROVALS:

__________________________________________________________________

Faculty Advisor ___________________________ Date Submitted ____________

__________________________________________________________________

Department Chair _________________________ Date Submitted ____________

August 4, 2012
Student Self-Evaluation Questionnaire
Supplement to the Graduate Student Progress Review Report

It is valuable to periodically evaluate how well you are expending your time and to make changes in your behavior that improve your productivity (even after you have your PhD). In addition, it is important to identify ways to effectively engage others in discussions that accelerate your research progress, extend your research skills, and expand your intellectual breadth. Finally, it is vital that you assess what steps you need to take to become an independent researcher who identifies hypotheses that are compelling, testable, and worthy of your valuable time and effort. To help you think about these issues as you proceed through graduate school, you should provide typed answers to the following questions for your advisor and committee prior to your annual progress reviews (no more than one page). You are encouraged to discuss these with your advisor and committee and to ask them for input on the changes you are planning for the upcoming year.

1) How have you divided your time among the diverse activities that are part of your research training over the past year, i.e., reading literature, attending seminars, designing experiments, performing experiments, analyzing data, preparing written and oral presentations, mentoring students, and other activities? Indicate the average number of hours per week that you work and estimate the percentage of time that you spend on these different activities. In addition, express whether you think changes in your time management would be useful for your productivity during the next year, and describe what changes you are planning.

2) What mechanism(s) have you been using to engage others in discussions about research hypotheses, experimental design, data interpretation, data presentation (oral and written), and learning new experimental methods? Indicate the people that you engage, the frequency of discussing these matters, and the mechanisms that have been most productive for you to improve your research progress. In addition, express whether you think there are changes in how you engage people over the next year that would accelerate your research progress.

3) How has your research independence changed over the past year? Indicate whether your research progress is less dependent on others than it was prior to your last progress review. Give examples that illustrate this point by commenting on your independence with respect to the following: designing experiments, solving technical problems, identifying new hypotheses, and writing manuscripts.
PROGRESS REVIEW GUIDELINES

The following items should be covered during all Research Progress Exams. A checklist sheet, based on the items below, will be attached to the form that the Chair of the Committee fills out after the progress review. Furthermore, the student and the mentor should each receive a written copy of the Chair’s report.

Has the student fulfilled or is he/she fulfilling the course work adequately?

Does the student have significant research results?

   Can the student give a clear, concise, and forceful rationale for doing his/her project?

   Is the student well motivated to do research?

Are the student’s lab skills developing appropriately?

Are the student’s writing skills developing?

Is the notebook in order? Does it serve as adequate record keeping as required by federal agencies?

Is the student aware of literature in his/her chosen field?

Does the student attend department and/or other seminars?

Is the student developing an appropriate sense of ethics in science?

Are there concerns expressed by the research advisor?

Is the thesis director paying close enough attention to the needs of the student?

Insufficient overall performance is grounds for placing the students on “research probation,” and another review should be scheduled within six months. Failure to rectify the problems by that next meeting would be grounds for dismissal under the terms of the “satisfactory progress” rule in the graduate requirements.
Recognize and Avoid Plagiarism; Cite Sources

Plagiarism is the use of someone else’s ideas, results, equipment design, visuals, wording, or even sentence structure as if they were your own. You may state the information provided by others but only if you use your own words and cite the source of the information. Alternatively, you may use the words of others but only if you use quotation marks and appropriate citation. Changing a few words per sentence is not acceptable; it is plagiarism.

Plagiarism can be intentional if you knowingly:
- Copy something word for word without using quotation marks, even though you cite the source;
- Use all or part of a visual without crediting the source;
- Steal someone’s ideas and state them (written or orally) as if there were your own without crediting the source.

Or it can be accidental if:
- You don’t realize what is considered plagiarism in the United States;
- When you took notes, you didn’t put exact wording in quotation marks and now you plagiarize without realizing it;
- You mistakenly think that everything on the Internet is free use.

Why is it important to avoid plagiarism?
In the United States, plagiarism is considered academic misconduct, and you are expected to avoid plagiarism, either intentional or accidental.

Plagiarized work can result in a failing course grade, expulsion, rejection of a paper submitted for publication, denial of an advanced degree, or loss of job. It is an increasingly serious matter now that the Internet has made plagiarism easier than ever before. Rice University has an Honor Code, which you must follow; journals are becoming increasingly explicit about the need to avoid plagiarism.

How can you avoid plagiarizing?
1. For each source you read, keep electronic notes. You might want to use the Template for Taking Notes, which can be downloaded from the Engineering Web site, link Thesis Writing Seminar: www.engr.rice.edu. As you enter the information, proofread for completeness and accuracy. As you take notes, put quotation marks around any wording that you copy directly from the source so that later you can put it into your own words and won’t accidentally plagiarize.
2. If you copy something word for word, put quotation marks around it and cite it: (Jones 2008). If you paraphrase by putting ideas into your own words, cite the source of the ideas: (Jones 2008). If you copy a figure or table, cite it at the end of the caption and inside the period: (Jones 2008). If you adapt a figure or table or use only part of it, cite it at the end of the caption: (Adapted from Jones 2005). Put the complete bibliographic reference for all citations in the Bibliography (or Works Cited).
3. Practice paraphrasing (putting someone else’s ideas into your own words) because it’s often difficult to do. Avoid the temptation of paraphrasing too many details. Focus on the main idea or evidence that you need to cite. Once you have determined what you need to paraphrase, reread the source and then cover it up.
Write the main idea from memory and then check to verify that you haven’t used
exact wording or sentence structure. Simply changing the verb tense or
substituting one adverb for another, but leaving the sentence structure essentially
the same, is still considered to be plagiarism. Using the same technical terms or
words widely used in your field is acceptable because there are probably no
accurate substitutes.

4. If you simply cannot figure out a different way of saying it, use quotation marks
to indicate that you are quoting exactly. [Because few writers in science or
engineering use quotations, generally preferring paraphrases, paraphrasing is a
skill you must learn. In contrast, writers in the humanities often use quotations to
illustrate key points, but they also paraphrase when exact wording is not
essential.]

5. Always cite your source, whether for text, visuals, or ideas. If you cannot
remember the source, you can’t use the information. Put citations in as you write
your first draft so that you don’t have to go back later when identifying the source
may be difficult.

6. In your text, make clear what the source is. Generally, it is a good idea to
identify an author by name rather than by referring to a number in your
bibliography, though this practice varies somewhat by field or by journal. In any
case, try not use a reference number as a part of speech. Do not, for example,
write that “[10] gives more compelling evidence than [98] provides.” Think of
how time consuming it is for a reader to have to keep flipping to the bibliography
to see who has said what. It would be preferable to write “Johnson (10) gives
more compelling evidence than Dickerson et al. (98) provide.” And then move to
the evidence, clearly identifying the references as you discuss the evidence each
author gives. Whether you use square brackets or parentheses depends on the field
or journal. Generally [ ] are used when the citations are listed numerically rather
than alphabetically in the Works Cited section of your paper,

Examples of Citation within the Text
CONFUSING: [10] and [15] were the next to apply this algorithm to new genetic
sequences.
CONFUSING: The first big improvement came in the work of [10].
CLEAR: Koninsky et al. and Rebert et al. were the next to apply this algorithm to
new genetic sequences (10, 15).
CLEAR: Koninsky et al. (10) and Rebert et al. (15) were the next to apply this
algorithm to new genetic sequences.
CLEAR: Smith and Wesson (2001) were the next to apply this algorithm to new
genetic sequences.
CLEAR: Research teams then began to apply this algorithm to new genetic
sequences (Smith and Wesson 2001).
CLEAR: Research teams then began to apply this algorithm to new genetic
sequences. (See, for example, Smith and Wesson 2007 and Rebert et al. 2009.)
RIGHT, but LESS CLEAR: Research teams then began to apply this algorithm to
new genetic sequences. (See, e.g., 10, 15, 22, and 54.)
For suggestions on how to avoid plagiarism and cite information, see Diana Hacker’s The Bedford Handbook, 7th ed. (Revised 2009) or the 2009 8th edition. She includes extensive examples of APA and Chicago style guides. I suggest, too, that you check the Web Site for the book: www.dianahacker.com/bedhandbook for further information. Or go to other Web sources for the APA Citation Style Guide or the Chicago Manual of Style Citation Guide. Journal Style Guides also give examples.

Examples of Plagiarizing and Paraphrasing

**The original text**
“The new Internet economy has brought about the development of competing search engine companies, each with its own proprietary software. Sites are collected and updated differently. After a search is conducted, one search engine provides exactly what’s required within the first ten hits whereas another is useless. Frequently there is tremendous overlap, although no two search engines are exactly alike. Since the outcome varies from search engine to search engine, researchers often find it necessary to use several engines for the same question for either the best or more comprehensive results.”

Read the following student-written examples and decide if each is paraphrasing or plagiarism.

1. Burnett points out that competing search engine companies have proprietary software that collects and updates sites differently. As a result, one will provide what you want within the first ten hits, while another is useless. That means that researchers will frequently need to use several engines to obtain the best or more comprehensive answers (2001).

2. Multiple search engines on the Internet have arisen, each with unique strengths and weaknesses. These differences derive from each engine’s respective method of analyzing and classifying information on the Internet. As a direct result of these differences, more exhaustive search results are often obtained through the use of several engines (Burnett 2001).

3. When researching a specific subject on the Internet, the use of multiple search engines is essential for a thorough search because each search engine utilizes different algorithms.

4. Rebecca Burnett suggests that we use several search engines because sometimes there is tremendous overlap in results and the outcome differs from search engine to search engine (2001).
Analysis of the four responses

1. Even though the author’s name and date are cited, this is clearly plagiarism. Changing the verb from passive to active (“are collected and updated differently”) becomes “collects and updates differently”) is not sufficient change. Substituting “while” for “whereas” in “within the first ten hits … another is useless” again is not sufficient change. Some exact wording is retained; sentence structure is identical. The same objections hold for “to use several engines… the best or more comprehensive answers.”

   Some students have tried to argue that the information in the original paragraph is now common knowledge and that, as a result, some use of the exact wording is inevitable. I agree, to a certain extent. I wouldn’t be surprised if “proprietary software” occurs to many writers as a phrase. But example #1 relies far too heavily on simple substitution while retaining sentence structure and whole blocks of words.

2. This is a fine paraphrase. The source is cited and the only duplicate wording occurs in “several engines,” a phrase that I would agree is in common use and therefore is not plagiarism.

3. This is an acceptable paraphrase, but the source is not cited. So it is plagiarism!

4. Because this is so short, you might be tempted to call it a paraphrase. But “tremendous overlap” is identical, and “the outcome differs from search engine to search engine” changes only “varies” to “differs” and leaves the rest of the wording and structure the same. It is plagiarism.

Frequently asked questions

1. When don’t I have to cite the source for information?
   You don’t have to cite basic knowledge that is found in two or more textbooks. But neither can you use it word for word—you must paraphrase. The exception would be something like a common definition, formula or algorithm; those you may use as they appear in the source.

2. What if I’m using a common method that’s difficult to reword? Do I have to cite the source?
   If you use it word for word rather than paraphrasing it, you must cite the source. I know of an Assistant Professor who was denied tenure for taking a method word for word from a published paper. If the method is widely used, consider referring the reader to a published paper for the method; then note any changes you make.

3. How do I cite a source that I read about in a different article, a review article, for example?
   You will have to cite the source as well as the review article. It’s always best to get a copy of the original article instead of relying on what someone else says about it, however. Reviewers are not equally good, and even a good reviewer may be focusing on different aspects of the article than you need. The exception would be an article originally published in a language you can’t read or an article
that is no longer available. In such cases you must make clear that it is the
reviewer’s interpretation that you are citing.

4. What do I put in the Bibliography or Works Cited?
   Everything you cited and nothing that you didn’t cite.

5. What should I do if I have an important quotation or a really relevant figure,
   but I can’t remember where I found it?
   See if you can track it down via the Internet. If you can’t find it, you can’t use it.

6. Can I cite my own previously published paper or my thesis?
   Of course! But first read the contract you signed with the journal. Some journals
   give you permission in the contract to use your paper in a thesis. In other cases,
   you must contact the journal to get permission for use. You do not have to get
   permission from the other authors listed on your paper, however, because all the
   authors have equal copyright ownership. Each of you can cite the paper. If you
   were first author and are now using essentially the entire paper as a chapter in
   your Master’s or PhD thesis, make clear at the outset of the chapter that it comes
   largely from your paper (cite it clearly!). Then later in the chapter make it
   absolutely clear that the chapter is based on your paper. If you use any figures or
   tables from the published paper, cite those as well. If you are using your thesis as
   the basis for a paper, make that clear, too. You can cite it as an unpublished thesis
   or dissertation.

7. When do I have to get permission to quote or paraphrase someone else’s
   work?
   In the academic world, this is sometimes a gray area. You usually don’t have to
   get permission for use if you are writing a paper for a class, a Master’s thesis, or a
   PhD dissertation, though you must cite the source. And because being cited helps
   faculty receive tenure or academic awards, most researchers are delighted to be
   cited in academic journals. However, journals increasingly have guidelines that
   forbid plagiarism and insist that you receive permission to cite. The issue
   becomes less clear if your conference paper is chosen to be published in a
   Proceedings; because publication is involved, you probably have to get
   permission for use there. Check with the editors. And if you publish a book, you
   will certainly need to get permission from the author. Keep a paper copy of your
   request and a paper copy of the reply. Know, too, that if your paper comes out of
   funded research, you may need permission to publish what might otherwise be
   considered the intellectual property of the funding agency, especially if a
   corporation is the funding source. If you use an Internet source, you must get
   permission unless the site clearly states that the material is for free use.
   Otherwise, everything on the Internet is copyrighted and will require permission.

Modified from an original document by
Janice L. Hewitt, Ph.D. The Brown School of Engineering Rice University, 2009
Copyright and Electronic Publishing: Citation

Basic Information

- The copyright protections associated with print also govern the use of audio, video, images, and text on the World Wide Web (WWW).
- If a document is on the WWW, that DOES NOT mean that it is in the public domain and may be used with no restrictions. Assume that a work is copyrighted unless the site explicitly authorizes use.
- The same copyright protections exist for the author of a work regardless of whether the work is in a database, CD, podcast, discussion board, blog, facebook, personal or commercial web page, or any other electronic form. Electronic journals have the same copyright protection as a print journal. The Rice Connexions site (www.cnx.org) is an exception; it is for free use, though the work must be cited and the author credited in the citation.
- If you use a visual downloaded from the Web, cite it in the text at the end of the Figure or Table caption: (Robertson 2009), just as you would cite text in a paragraph. If you use only part of a visual or change it, cite it as (Adapted from Walker et al. 2005). Place the citation inside the period. If you use a downloaded visual in a slide for an oral presentation, include the citation (but it can be in very small print at the bottom of the screen).
- Put all electronic citations in your Bibliography or Works Cited.

Tips on Using Internet Resources

- ALWAYS credit the source of your information.
- Check to see if the author provides information on how his/her work (e.g., video, audio, graphic, icon, web page) may be used. Follow the guidelines, if they exist.
- If possible, ask the owner of the copyright for permission to use the work. Because a journal usually owns the copyright of a published article, contact the journal for permission to cite. Some journals will give you blanket permission to cite an article for a thesis or dissertation if you cite the journal. Keep a paper copy of your request for permission and of the permission received. If you then wish to publish parts of your thesis or dissertation, you must check journal requirements for citation requirements. Written permission is required by many journals; it is essential in a book, whether an e-book or print version.
- If you use one of your own (first author) published articles in your thesis, you don’t need permission from the other authors because all the authors have equal copyright rights, though as a courtesy, you should talk to them about your plans. In your thesis clearly state the source, however, and recognize the contributions of the other authors. Most journals will give you permission to use your published paper in your thesis, but check the contract!
- If you post on your personal web site a chapter from your unfinished thesis or a paper you plan to submit for publication, it is considered published and copyrighted by the act of placing it on the Internet. Some journals will allow a previous posting on a personal web site; others will not. Some will let you reference it on your personal website with a link to the journal. Check the Style Guide and publishing requirements in the journal you wish to submit to before you post your work! Become familiar with the requirements of the major journals in your field.
Guidelines for Citing Electronic Media

Check with the journal, your advisor, or your professor to determine what style is required. The APA style guide and the Chicago Manual of Style are commonly used, but some journals have their own style sheets. If you are submitting for publication outside the U.S., style expectations will differ. Preferred style may differ from field to field, as well. Ask fellow graduate students if they can recommend software, some of which is capable of automatically reformatting to differing styles. If you have kept an accurate and complete electronic file of notes on what you read, you’ll be able to meet any requirements. (You may download the Template for Taking Notes on Research Papers Read from www.engr.rice.edu.)

What to Include (if available)

- Name of the author, editor, compiler, or translator of the document or graphic. Last name, First initial.
- Date of document’s publication or last update on the Web site. If the publication date is not known, use n.d. to indicate “no date” (n.d.).
- Title of the document, graphic, or the Web Site.
- Publication information--the name of the main Web Site where the document or graphic is posted.
- Page number range or total number of pages, paragraphs, or other sections, if they are numbered.
- Date accessed and location of the material on that date: Month, day, year; URL, DOI.
- Keep a paper copy to prove the date accessed to protect yourself if it disappears from the Web.
- If you download and print a copy of an article published as print, you may cite it as a printed source. If you cite an article in an electronic journal, you must cite it as a Web source. If you read it on a Kindle or similar source, be aware that graphics are often omitted or distorted.

Examples of Citation in a Bibliography or Works Cited

Notice that the same basic information is included in the three entries for journal articles, although the styles differ. Choose the style appropriate for what you are writing, and then be consistent within the document. You must follow a style guide. If the Bibliography is set up numerically rather than alphabetically, as would happen when references are numbered consecutively within a text, the entries would be numbered and the authors’ names would all be first name first, as in [1] Christopher Beattie, Mark Embree, etc.

Print sources


**Electronic sources**


Janice L. Hewitt, PhD. Brown School of Engineering, Rice University, 2009  
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Template for Taking Notes on Research Articles: Easy access for later use

Download this template from the Rice University Engineering Web Site: www.engr.rice.edu

Use the following format (or something similar—from LaTex or Endnote, for example) to make an electronic record of your notes for later easy access. You may think you’ll remember everything you read, but details will slip away. The time spent filling out the form will help you understand the reading and will save you hours of rereading when you write a Background, Related Work, or a Literature Review section. Put quotation marks around any exact wording you write down so that you can avoid accidental plagiarism when you later cite the article.

Complete citation. Author(s), Date of publication, Title (book or article), publisher, Journal, Volume #, Issue #, pages. How you use this information will vary by journal Style Sheet requirements, class requirements, or thesis advisor/departmental requirements. Put everything down initially so you’ll have what you later need. Use the Web to access detailed examples of Chicago or APA styles. You can also find examples in a writer’s handbook such as Diana Hacker’s *The Bedford Handbook* (7th edition with 2009 MLA Update or 8th edition). Always be consistent within a document!

If electronic source: URL (may be required by your advisor or professional journal); DOI (digital object identifier) if available or name of database or document number; date retrieved

Key Words:

General subject:

Specific subject:

Authors’ Hypothesis or Claim:

Methodology:

Result(s):

Evidence:

Summary of key points:

Context and relationships (how this article relates to other work in the field; how it ties in with key issues and findings by others, including yourself):

Significance (to the field; in relation to your own work):

Important Figures and/or Tables (brief description; page number):

Cited References to follow up on: (cite those obviously related to your topic AND any papers frequently cited by others because those works may well prove to be essential as you develop your own work):

Your evaluative comments on the work:

Janice L. Hewitt, PhD, Brown School of Engineering, 2009  jhewitt@rice.edu
When should I reference something?
Give a reference if
- its someone else’s idea
- its some one else’s technique
- its some one else’s observation

Disruption of xxx blocks the yyy pathway in Arabidopsis (Smith and Jones, 2003). Because of their similarity to xxx, the abc kinases may be part of the yyy pathway (Doe, 2005). To test this, I will use homologous recombination (Jones and Smith, 2001) to disrupt abc1 and determine if this blocks the yyy pathway.

You could leave the reference off of the second sentence only if this is completely your idea, and was not published by someone else or told to you by someone else. So if Doe mentioned this idea to you but never published it, you would write:

Because of their similarity to xxx, the abc kinases may be part of the yyy pathway (Doe, personal communication).

A good rule of thumb is that each sentence in an introduction needs a reference; sometimes a sentence clearly continues the description of the work in a previously referenced sentence and then doesn’t need a reference.

How do I reference material from a review article?
Sometimes you get a review article (Epsiloni, 2008) that reads something like

The abc kinases were first discovered by Alpher (Alpher, 1982). There are 15 abc kinases (Beta, 2007). There are two types of abc kinases, type I and type II (Gamow, 2006). The type I but not the type II abc kinases are present in plants but not in animals or fungi (Delter, 2008).

If you paraphrase the above section without reading the four articles, and/or without referencing the review article, you will be in trouble. If you didn’t read the 4 original papers, you should only reference the review article:

Two types of abc kinases have been described (see Epsiloni, 2008 for review).

If you read the 4 original papers, and in your writing you follow the general outline or format of the review paper (or any other document), you need to reference the review paper or document.

A recent review Epsiloni (Epsiloni, 2008) describes how Alpher first identified abc kinases (Alpher, 1982), and that are 7 type I and 8 type II abc kinases (Gamow, 2006; Beta, 2007)…..
A. General Format

Propose a project that reasonably could be accomplished by one person during a three-year post-doctoral fellowship. Assume that you are working in a lab that is well equipped for the type of research proposed, and that you are competent in the required techniques.

Your proposal format will be similar to that of an (old format) NIH Post-Doctoral Fellowship proposal, with a maximum length of **10 pages** of text including figures but excluding the bibliography. Use Arial or Helvetica font, size **12**, and one-inch margins (Table 1). Include page numbers on the bottom center of each page. Below is a summary of the format; what we expect in some of these sections is expanded in section E.

1. **Title**
   Choose a succinct and informative title that describes your proposal.

2. **Abstract**
   Write an abstract aimed at a general audience succinctly summarizing your proposal.

3. **Specific Aims**
   List the hypotheses to be tested, the key experiments planned, and the type of information that you expect to learn (1 page). This should be the stand-alone specific aims page that you wrote during the first part of the course.

4. **Background and Significance**
   In 4-5 pages, describe what the problem is, why it is important, what progress toward solving the problem has already been made (including essential techniques that have been developed), and give a brief summary of how accomplishing your specific aims will advance our understanding of the problem. All mentions of published work must be referenced.

5. **Preliminary Results**
   Not included in the Bios 587 proposal, but is part of the Candidacy Exam.

6. **Research Design and Methods**
   This is the main body of the proposal (5-6 pages). Describe the experiments to be done to accomplish the specific aims. Outline the possible results and make logical connections between what is already known, what will be learned from each experiment, and the ultimate solution to the problem described earlier.

7. **Literature Cited**
   List all the papers, books, etc. to which you have referred in the text. Use a program such as EndNote or Zotero to manage your references, along with the referencing style for the journal Cell, in which references are referred to in the text by author and date, and complete titles are included in the bibliography. We expect that virtually all references will be to journal articles and not web pages, which do not undergo peer review. This section does not count toward your page limit.

**Figures**

Figures, diagrams, tables, and flow charts can be very useful and are encouraged. Each figure needs a legend and must be referred to in the text. If you borrow or modify a figure from another source, be sure to cite the source in the legend.
Table 1. Summary of page limits for BIOC 587 and A-exam

<table>
<thead>
<tr>
<th>Item</th>
<th>BIOC 587 requirements</th>
<th>A-exam requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formatting</td>
<td>11 pt Arial, single spaced, 1’ margins, include page numbers</td>
<td>12 pt Times or 11 pt. Arial, single spaced, 1’ margins, include page numbers</td>
</tr>
<tr>
<td>Abstract</td>
<td>30 lines</td>
<td>Not required</td>
</tr>
<tr>
<td>Specific Aims</td>
<td>1 page</td>
<td>1 page</td>
</tr>
<tr>
<td>Research Plan</td>
<td>10 pages (excluding Specific Aims and References)</td>
<td>14 pages (excluding Specific Aims and References)</td>
</tr>
<tr>
<td>• Background and Significance</td>
<td>4-5 pages</td>
<td>3-5 pages</td>
</tr>
<tr>
<td>• Preliminary Results</td>
<td>Not included</td>
<td>2-5 pages</td>
</tr>
<tr>
<td>• Research Design and Methods</td>
<td>5-6 pages</td>
<td>5-7 pages</td>
</tr>
<tr>
<td>References cited</td>
<td>No limit</td>
<td>No limit</td>
</tr>
</tbody>
</table>

B. Understanding your subject

It is essential that you completely understand everything that you write. What you say won’t make sense to others if it doesn’t make sense to you. The process of writing a first draft often helps to develop your understanding. Organizing a subject into words to explain it to someone else often results in the realization that there is an essential step in the reasoning that you have not considered, so you have to figure it out or look it up. Alternatively, you may realize that an idea will not work, and you have to start over with a different idea. Do not try to disguise a lack of understanding by generating a vaguely worded proposal without meaning.

It can be helpful to start by outlining, in point form or short phrases, the main objectives and the means to accomplish them. Think through the arguments at the level of concepts before formally writing. If you are uncertain about how an experiment will answer a certain question, resolve the science before you write. You must make your proposal convincing, not simply fill space with error-free text.

C. Expressing yourself clearly

It is essential to write clearly, so that every word says exactly what you mean. Before showing your draft to anyone else, read it over sentence by sentence as if you had never seen it before. See what it says to a reader coming upon it for the first time, and revise to ensure you are conveying your intended meaning. Consider each word for whether it is the best word for the purpose. You may find that nearly every sentence needs to be rewritten. As you realize that essential steps in the logic were not included in the first draft, paragraphs often have to be rearranged and new paragraphs added. It is also important to strip out excess words that add no meaning. For example, always replace “in order to” with “to.”

There is an old saying that "Writing without rewriting is just typing." It is the process of repeatedly revising until you get it right that makes good writing so difficult. Unless you are a remarkably gifted writer, a single draft is not going to be something that you can reasonably ask someone else to read. Thus, the “first draft” that you give to others for critique should be something that you have gone over repeatedly yourself, correcting the weaknesses that you recognize.
Improper grammar and unconventional sentence structure make writing difficult to understand, so it is important to follow standard English rules. This can be challenging for those whose native language is not English, but it is important to work to overcome this difficulty. Use of incorrect English makes communication less effective, both because it is less easy to understand and because there is often a subconscious assumption that improperly expressed ideas are less likely to be valid. All critiques should include corrections of mistakes in English usage. Take advantage of spell check and grammar check, which can catch some of your mistakes.

D. Plagiarism

It is absolutely forbidden to copy any portion of any written work (paper, thesis, grant proposal, web page, figure, etc.) in your proposal without referencing the written work. Copying is plagiarism, which is a serious offense, and students have been dismissed the program for this reason. Please consult an instructor if you are uncertain of the definition of plagiarism.

E. Subject matter

(1) Title Page

Grant title; your name; date; contact information

(2) Specific aims

This section can be viewed as your proposal in condensed form. Generally, it begins with a paragraph or two (about 1/2 page) that defines and describes the experimental problem, the general question(s) to be asked, the methods to be employed, and how the anticipated results will move the field forward. The specific aims are then listed (as questions, or hypotheses to be tested), followed by two-three sentences of description.

This section should be self-contained. It is essential that every concept, technique, phenomenon, or molecule that you introduce in this section be defined so that your reviewer can understand you. It is lethal for your reviewer to be confused about your writing in any part of the proposal, particularly in this section. We understand that this section is short, and you must be brief, but if your point is important enough to include in this section, it must be described in enough detail to be understood. If you don't have enough room to describe something sufficiently, then leave it out. You should prioritize the topics you want to discuss, and describe only the most important ones.

a) Opening paragraph: Before you start writing, you need to know what your proposal is about and how it could be stated in 1-2 sentences. Then begin your paragraph with a definition of the phenomenon you are studying, followed by the reasons why an understanding of the phenomenon is important for biology (or if appropriate, a particular disease). Your third sentence might read something like "Despite the importance of this phenomenon, unanswered questions remain concerning this phenomenon." (By the way, never write "this phenomenon remains poorly understood". It is likely that your proposal will be reviewed by someone who has spent 30 years working on your phenomenon. This old person doesn't want to read some whippersnapper writing that his or her life's work has led to a poor understanding of the phenomenon.) Then write a few sentences about what we know about the phenomenon from previous work. It is very helpful if this part mentions the data that supports your hypothesis.

Developing your central hypothesis: Your next paragraph should develop your hypothesis or model. Clearly state your hypothesis. Then write a sentence that might begin "However, it remains unclear if ..." Then write "To test this possibility," or "To distinguish between these possibilities, I propose to ..." Then "In particular, I will use my experimental approach to make my measurements, which will help determine if my hypothesis is correct." Finally, write that successful completion of these experiments should improve our understanding of your
phenomenon in whatever way you think. Finally, write "The following specific aims are proposed."

b) Specific aims: Begin each aim with a statement of a task to perform, or as a question to be answered. Then write "To accomplish this goal (or answer this question), I will apply (your experimental approach), and measure (X). If I observe what my hypothesis predicts, then I will conclude ..." A grant usually has two to four specific aims, often arranged in order of increasing challenge.

(3) Background and Significance

This is the section in which you describe the previous results related to your experiments. Remember this is a persuasive document. This section is not meant to be a general review of the field. Rather, your job here is to provide your reviewer with the information he or she needs to assess the significance and feasibility of your experiments. Basically, you want to provide the reviewer with the information needed to appreciate the excellence and importance of your experiments. Therefore, it is your particular experiments themselves that will determine the particular subject matter that must be included in this section.

Define Your Subject: Your first paragraph should be a definition and introduction of your phenomenon. In this paragraph, it is best to emphasize the part of your phenomenon that is most closely related to what your particular experiments will be testing.

Establish Relevance: The theme of your second paragraph should be why your phenomenon is important to biology, what unanswered questions remain, why it is important to answer these questions, and how your unique approach or hypothesis will enable novel and important information about your phenomenon to be generated. Tell the reviewer why the successful completion of your experiments will advance the field. Keep the subject focused on your proposed experiments. If you are proposing to study the roles of potassium channels in learning and memory, then you should focus on the previous work on potassium channels on learning and memory, rather than digress into other issues, no matter how interesting. Also, be as detailed as possible. It is not very impressive to write: "Potassium channels are important for neuronal function, and because neurons are important for learning and memory, potassium channels are important for learning and memory as well." It is better to write: "Potassium channels are important for learning and memory. For example, Kandel and colleagues (reference) showed that short term synaptic plasticity of the gill and siphon-withdrawal reflex of the sea slug Aplysia occurred by the serotonin-induced, cAMP-dependent phosphorylation of the "S" type potassium channel, leading to its more rapid inactivation, which in turn caused increased action potential duration and increased synaptic strength." To write in such detail, you will have to understand your field thoroughly, which means much studying of the literature.

Support Your Hypothesis: Another paragraph should provide the evidence that your hypothesis might be correct. If your hypothesis is a good one, it will be based on some experimental data, rather than pulled out of thin air. Provide all of this evidence that you can; something along the lines of "Smith and Jones (2001) previously showed ... raising the possibility that my hypothesis might be true." might be appropriate. But don't give the impression that the hypothesis is already proven, otherwise the reviewer won't fund your proposal. Therefore, also write what the previous researchers didn't test (what you propose to test), or other experiments that provide conflicting evidence, showing that the validity of your hypothesis remains an open question. Don't be afraid to tie in what you are writing here to your own proposed experiments - it helps the reviewer understand why you are writing all of this. Therefore, a sentence such as "The experiments presented in aim #2 are designed to resolve these inconsistencies" would be entirely appropriate.

Support Your Method: By this time, the reviewer is (hopefully) convinced that your proposal
is significant, and that your hypothesis is based on solid data. Next you have to convince the reviewer that your approach is both valid and feasible. This is because the reviewer, while reading your experimental methods section, might think, "This is all very interesting, but I'm sure that this method won't work." To disarm the reviewer, it helps if you can use this paragraph to explain how your approach has been used successfully in the past to address related questions, which gives you reason to be optimistic that your approach will similarly succeed for you. Cite multiple examples in the literature, if possible, for all approaches you are taking. This way, while reading your experiments, the reviewer will be aware that what you are proposing is probably feasible because similar experiments have been performed successfully by others.

Wrap It Up and Tie It With a Bow: You will want to conclude with a paragraph tying together your anticipated results with what has been discovered previously in your field. This is your chance to display your vision of the field, and how you intend to contribute to it. For this paragraph, imagine that all of your specific aims have been carried out successfully. How do these new results and conclusions change our way of thinking about the field, or provide new mechanistic insights, etc.? How do these results open the way for future investigations? Give the reviewer a bulleted list of clear outcomes they can use in the review.

In all cases, think and write as deeply about the issues that you cover as you are able to. Try to think of as many objections and caveats as you can, and then try to think of ways in which these can be overcome. If possible, provide examples from the literature of how similar obstacles were overcome by others. If you do this, your reviewer will think that you are on top of things, have thought things through, and will be able to deal with whatever complications or hurdles you might encounter during your experiments. In contrast, if you are superficial in your descriptions and conclusions, your reviewer might think that you will be equally superficial in the performance of your specific aims and is less likely to fund you.

(4) Preliminary Results

This section is not included in your Bios 587 proposal, but is a part of your candidacy exam document. Describe the results that you have obtained that support the feasibility of your project. Include high-quality figures and complete legends.

(5) Research Design and Methods

For this section, each specific aim is described in detail one at a time. The specific aims must be listed exactly as they were in the specific aims section. Make sure that your experiments actually answer the question or test the hypothesis posed in the title of the specific aim. (This point sounds obvious, but it is surprising how often scientists fail to do this.) It is essential to consider very carefully the conclusions that your experiments do or do not support so that you don't overstate your results. It is also important to include multiple, independent tests of specific questions if possible. This is because any single test has the potential for artifact (perhaps as a result of an incorrect assumption), so any conclusion based on multiple independent tests is more believable than one based on only a single test. Finally, reviewers find it impressive if potential "pitfalls" (things that potentially can go wrong, such as the possibility that a particular protein won't express in E. coli, etc.) are stated and possible solutions to the pitfalls are suggested.

For each aim:

1) Rationale: Remind the reviewer in 1-2 sentences of the rationale for the aim (for example, to determine the molecular and cellular mechanisms underlying classical conditioning of the gill and siphon-withdrawal reflex in the sea slug Aplysia), and of the goal of the aim (for example, to
test the hypothesis that serotonin-induced, cAMP-dependent phosphorylation of a potassium channel is required ...).

2) Method: Describe the experimental steps that you will take to achieve this goal. How much experimental detail to include is always a judgment call, because it depends on knowing what you can reasonably assume that your reviewer knows. As an example, if you were proposing to analyze DNA prepared from yeast, you don't have to include a protocol for DNA preparation, because you can reasonably assume that anybody likely to review your proposal knows what a DNA prep is. Therefore, you can just state that you will prepare DNA from exponential growing yeast according to published procedures. However, if you were proposing to perform a GST pull-down experiment, you can't reasonably assume that every reviewer would know exactly what that means and how one performs it; therefore, you would want to include a brief (2-3 sentence) description of the method accompanied by a few references.

3) Expected outcome and interpretation: Describe explicitly the anticipated result, or possible results, to the experiments. Describe explicitly what you would conclude in the event that you observe any or the potential results that you list above.

4) Alternative methods: As mentioned above, it is helpful to include a "potential pitfalls" section, in which you describe the most important ways in which your experimental approach could fail. A pitfall could include a protein that won't express in E. coli, a double mutant that you wish to analyze that turns out to be inviable, or a protein that proves to be impossible to crystallize. If you include this section, be sure to include one or more steps that you will take to solve the problem. This solution could involve alternative approaches that would enable the pitfall to be bypassed, permitting your experiments to be performed. If you can do this, your reviewer will think that you are a thoughtful person, who has considered all possible outcomes of the experiments (even the negative ones), and has come up with contingency plans to address them. This is good because it can convince the reviewer that you will be able to accomplish your experiments despite the setbacks that inevitably occur in research.

Below is an example of how one specific aim might be described in this section. This example is a particularly simple set of experiments to test the hypothesis that a particular yeast protein (called Gal4) is a transcriptional activator of another yeast gene (called GAL1).

Specific aim #1: Determine if the yeast Gal4 protein is a transcription initiation activator of GAL1.

Two pieces of evidence support the hypothesis that the yeast Gal4 protein is a transcriptional activator of the GAL1 gene. First, GAL4 encodes a protein homologous to other known transcription factors (reference), and second, the enzyme encoded by GAL1 fails to accumulate in gal4 mutants (reference). I propose several lines of experiments to test this hypothesis.

The inability of Gal1 protein to accumulate in a gal4 mutant is consistent with the possibility that GAL4 activates transcription of GAL1. However, alternative possibilities exist. For example, Gal4 protein might be required to stabilize Gal1 protein from proteolytic degradation. I will distinguish these possibilities by comparing GAL1 RNA levels in gal4 mutants versus wild type using Northern blot hybridization. This Northern blot will also be probed with DNA from the URA3 gene, which will serve as an internal loading control; GAL1 RNA levels in each strain will be normalized to the amount of URA3 detected. I anticipate that GAL1 levels will be significantly greater in wild type than in the gal4 mutant. If so, then I will conclude that Gal4 is required for transcription of GAL1. However, if GAL1 transcripts are found in equal amounts between gal4 mutants and wild type, then I will conclude that Gal4 protein is required for Gal1 production at a posttranscriptional stage.
Note that if you stop your description at this point, your proposal might very well get a poor score. What could your reviewer object to in your approach or conclusions? Although the reviewer might be convinced that you will be able to determine if GAL1 RNA is reduced in the gal4 mutant, the reviewer might not be convinced that this reduction is due to loss of Gal4 protein instead of a second mutation present unnoticed in your gal4 mutant stock. One way this possibility could be tested and ruled out is to introduce the GAL4 DNA on a plasmid into the gal4 mutant and show that this is sufficient to restore GAL1 RNA levels to wild-type levels. Therefore you would include an additional sentence in the paragraph above: "To demonstrate that this reduction in GAL1 RNA results from lack of Gal4 protein, rather than a second mutation present unnoticed in the gal4 mutant stock, I will reintroduce the GAL4 DNA on a plasmid into the GAL4 mutant. I anticipate that this re-introduction will be sufficient to restore GAL1 RNA levels in the gal4 mutant to normal. If so, then I will conclude that the lack of Gal4 is responsible for the reduction in GAL1 transcript levels." The addition of these two sentences will show the reviewer that you are a thoughtful person who carefully considers every possible interpretation of results, and can propose experiments to distinguish these various interpretations.

Anything else? The question in this aim was originally phrased "Determine if the yeast Gal4 protein is a transcription initiation activator of GAL1". Your method to answer this question was a Northern blot. But the question as posed cannot be answered with this method alone because although one can measure differences in transcript amounts between strains with a Northern blot, one cannot determine if alterations in transcript levels result from altered transcription initiation or altered transcript stability. Therefore, your approach doesn't precisely answer the question and a careful reviewer would deduct points for this. You can deal with this problem in either of two ways. First, you can re-phrase your question so that it can be answered by your method of choice. With this solution, you would write "to test the possibility that the yeast GAL4 protein regulates transcript levels," leaving the precise mechanism as an unexplored issue. You would probably state explicitly in the proposal that your approach cannot distinguish between a role for Gal4 in transcription initiation or transcript stability. A better solution would be to figure out and propose an experimental method that can distinguish between these possibilities. You could probably come up with several such methods, and the introduction of these additional experiments would greatly improve your proposal and the quality of your science.
Admission to Candidacy Exam Evaluation
Biochemistry and Cell Biology Department, Rice University

Student: ______________________________ Date of exam: ________________

Please review guidelines for evaluation on reverse and provide comments as needed
(comments required for “unsatisfactory” components)

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Summary evaluation
I have read this exam, and recommend: ☐ pass A-exam
☐ conditional pass (see comments above and in summary document from committee chair)
☐ fail A-exam

Committee member: ______________________________
signature

A- 22
## Guidelines for Evaluation of BCB Admission to Candidacy Exam

<table>
<thead>
<tr>
<th>Section</th>
<th>Excellent</th>
<th>Satisfactory</th>
<th>Unsatisfactory</th>
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<tbody>
<tr>
<td><strong>Specific Aims</strong></td>
<td>Each aim is a logical test of the hypothesis or has clear rationale at its foundation. Hypotheses are soundly based predictions of biological importance and address scientific concepts rather than experimental outcomes.</td>
<td>Aims are clearly stated; a case is made for the work's rationale</td>
<td>Aims are not clearly stated; little context or justification is provided</td>
</tr>
<tr>
<td><strong>Background and Significance</strong></td>
<td>Identifies all relevant results and techniques from the literature, and synthesizes them in a thoughtful discussion</td>
<td>Discusses major previous works and places them in context for the present project</td>
<td>Fails to cite or assimilate previous work</td>
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<tr>
<td><strong>Preliminary Results</strong></td>
<td>Extensive preliminary results with thoughtful discussion</td>
<td>Some preliminary results that are adequately described</td>
<td>Limited preliminary results or low quality of discussion</td>
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<tr>
<td><strong>Research Plan</strong></td>
<td>Research plan would be competitive for funding with clear rationales, experimental plans, controls, interpretation of expected results, and alternative approaches</td>
<td>Research plan clear; experiments are technically sound and feasible</td>
<td>Research plan unclear, lacks description of controls or rationale, or includes inappropriate level of detail</td>
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<tr>
<td><strong>Novelty</strong></td>
<td>Original research that demonstrates distinct creativity in the question or experimental design</td>
<td>Describes a novel problem appropriate for a Ph.D.</td>
<td>Incremental approach unlikely to yield publishable findings</td>
</tr>
<tr>
<td><strong>Document text</strong></td>
<td>Good organization, fluent prose, and few grammatical errors; full compliance with formatting guidelines</td>
<td>Decent organization, coherent prose, and limited grammatical errors; full compliance with formatting guidelines</td>
<td>Poor organization, incoherent prose, and/or numerous grammatical errors; not in compliance with formatting guidelines</td>
</tr>
<tr>
<td><strong>Presentation</strong></td>
<td>Engaging, highly polished presentation with well crafted slides that illustrate key results in the project and clearly describe future directions</td>
<td>Professional presentation on par with a solid conference talk; includes a coherent project narrative and future plans</td>
<td>Too much or too little detail; unclear about project goals and direction; incoherent or illegible slides; read from slides</td>
</tr>
<tr>
<td><strong>Replies to questions</strong></td>
<td>Complete answers that demonstrate a deep understanding of the discipline that extends beyond the contents of the document</td>
<td>Competent answers that illustrate a facility with the issues and techniques immediately relevant to the thesis project</td>
<td>Answers reveal a limited familiarity with the thesis project or its context</td>
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ADVISING FOR 1ST YEAR GRADUATE STUDENTS

Most of the formal courses required in the Biochemistry & Cell Biology graduate program will be completed in the first year of residence to allow students to commence thesis research at the end of their second semester. During the first year, the Graduate Advisory Committee will advise all graduate students, tailoring the formal course program to be taken during the first year. Once a student selects a thesis advisor, the faculty advisor may require additional courses of a more specialized nature.

Students are required to have training in Biochemistry and Cell Biology. If students are missing formal training in these subjects, they are required to take the equivalent background courses during their first year.

The following list includes the Fall and Spring BCB courses most commonly suggested for graduate students. This list is provided to assist students in preparing for the advising meeting.

**Fall Semester Courses** (total of 14 to 17 hours in first year)

**COURSES THAT MAY BE NEEDED TO SATISFY PREREQUISITES:**
- BIOC 301 Full Term BIOCHEMISTRY 11:00AM - 11:50AM MWF 3
- BIOC 341 Full Term CELL BIOLOGY 01:00PM - 02:15PM TR 3

**REQUIRED COURSES IN THE FALL OF THE 1ST YEAR:**
- BIOC 575 1st Half INTRO RESEARCH
- BIOC 581 Full Term GRAD SEM BCB 02:00PM - 03:15PM M
- BIOC 583 Full Term MOL INTERACTIONS 08:40AM - 10:30AM TR
- UNIV 594 Full Term RESPONS COND RES 12:10PM - 01:40PM W
- BIOC 701 1st Half GRAD LAB RESEARCH I
- BIOC 702 2nd Half GRAD LAB RESEARCH II

**COURSES THAT MEET GRADUATE ELECTIVE REQUIREMENTS:**
- BIOC 545 Full Term ADV MOL BIO & GENETICS 10:50AM - 12:05PM TR 3
- BIOC 551 Full Term MOL BIOPHYS I 10:45AM - 12:00PM MW 3
- BIOC 580 Full Term PROTEIN ENGINEERING 10:50AM - 12:05PM TR 3
- BIOC 555 Full Term COMP SYNTH BIOLOGY 09:25 AM - 10:40AM TR 3
- BIOC 572 Full Term BIOINFORMATICS: NETWORKS 01:00PM - 02:15PM TR 3

**OPTIONAL SEMINARS (these are pass/fail, attendance required seminars):**
- BIOC 592 Full Term SEMINAR COMP BIOL (KECK) 04:00PM - 06:00PM F 1
- BIOC 593 Full Term PLANT SEMINAR 12:00PM - 01:30PM W 1

**Spring Semester Courses** (total of 12 to 16 hours in first year)

**REQUIRED COURSES IN THE SPRING OF THE 1ST YEAR:**
- BIOC 582 Full Term GRAD SEM BCB 02:00PM - 03:15PM M 1
- BIOC 588 Full Term SEM 1ST YR BCB 4
- BIOC 701 1st Half GRADUATE LAB RESEARCH I 2
- BIOC 702 2nd Half GRADUATE LAB RESEARCH II 2
COURSES THAT MEET GRADUATE ELECTIVE REQUIREMENTS:

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<td>BIOC 535</td>
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<td>X-RAY CRYSTALLOGRAPHY</td>
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<td>BIOC 544</td>
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<td>EXPERIMENTAL BIOLOGY &amp; FUTURE OF MEDICINE</td>
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<td>BIOC 550</td>
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<td>VIRUSES AND INFECTIOUS DISEASES</td>
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<td>BIOC 552</td>
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<td>MOLECULAR BIOPHYSICS II</td>
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<td>BIOC 560</td>
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<td>CANCER BIOLOGY</td>
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OPTIONAL SEMINARS (these are pass/fail, attendance required seminars):

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COURSES THAT DO NOT QUALIFY FOR GRADUATE LEVEL CREDIT:

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Summer Semester Courses (total of 15 hours)

REQUIRED COURSES IN THE FIRST SUMMER:

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Second Year Required Courses (total of 15 hours)

If your thesis advisor requires additional courses, just reduce the number of BIOC 800 hours to total 15 hours.

REQUIRED COURSES IN FALL OF SECOND YEAR:

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REQUIRED COURSES IN FALL OF SECOND YEAR

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Summer Semester Courses (total of 15 hours)

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Third Year and Beyond (total of 15 hours)

If your thesis advisor requires additional courses, just reduce the number of BIOC 800 hours to total 15 hours.

REQUIRED COURSES IN FALL:

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<tr>
<td>BIOC 800</td>
<td>Full Term</td>
<td>GRAD LAB RESEARCH I</td>
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REQUIRED COURSES IN SPRING:

<table>
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<tr>
<th>Course Code</th>
<th>Term</th>
<th>Course Title</th>
<th>Credits</th>
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REQUIRED COURSES IN SUMMER:

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A-25
### Biochemistry & Cell Biology Advising Committee

#### Course Requirements Checklist

<table>
<thead>
<tr>
<th>Student Name</th>
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**Core Requirements met in undergraduate transcript?**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Time</th>
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<tbody>
<tr>
<td>BIOC 301</td>
<td>Biochemistry</td>
<td>11:00-11:50AM MWF</td>
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<tr>
<td>BIOC 341</td>
<td>Cell Biology</td>
<td>01:00 - 02:25PM TR</td>
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**1st Year SUMMER Courses recommended by the Advising Committee**

<table>
<thead>
<tr>
<th>Course</th>
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<td>800</td>
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**Second Year Courses recommended by the Advising Committee**

<table>
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<tr>
<th>Fall Year</th>
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<td>581</td>
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<table>
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<th>Hours</th>
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<tr>
<td>582 Graduate Research Seminar</td>
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**TOTAL OF 14 – 17 HOURS**

**TOTAL OF 12 – 16 HOURS**
### BIOC 525 Plan Molecular Genetics and Development

<table>
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<tr>
<th>Semester</th>
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<th>Grade</th>
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</tr>
<tr>
<td>FALL</td>
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**Any 6 credits of the following advanced courses**

- BIOC 533 X-Ray Laboratory Module in Molecular Biophysics
- BIOC 530 NMR Laboratory Module in Molecular Biophysics
- BIOC 525 Plan Molecular Genetics and Development

**Doctoral Candidacy on Transcript? (Yes/No)**

- Yes
- No

**Second Year Students are Required to Take 2 Semesters of**

- BIOC 540 Metabolic Engineering
- BIOC 542 Molecular Biology II
- BIOC 544 Developmental Biology
- BIOC 545 Advanced Molecular Biology and Genetics

**Required Course for all PhD Candidates**

- BIOC 341 Cell Biology
- BIOC 301 Biochemistry

**Admission to Candidacy Exam**

- Yes
- No