Biochemistry & Cellular and Molecular Biology

Graduate Student Handbook

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College of Arts and Sciences

University of Tennessee, Knoxville

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DEPARTMENT HEAD WELCOME

Welcome to the BCMB Department. Our goal is to provide you with outstanding research and education opportunities while you are a graduate student at the University of Tennessee. Your graduate school experience is more than a collection of courses and a research project. In a variety of ways, the faculty in BCMB offer activities and options for professional development that are designed to prepare you for the next step in your education and career. Please study this Graduate Student Handbook carefully. This document provides guidelines about coursework, expectations for graduation, descriptions of resources across campus, and other information to ensure that you maintain steady progress in the BCMB graduate program. It also has contact information for key individuals with whom you will interact during your time in graduate school. Please check our departmental web site (http://bcmb.utk.edu/) frequently for updates on seminars, retreats and other activities. Please feel free to come by the departmental office or to contact me if you have questions orneed some advice.

Gladys Alexandre, PhD
Professor and Head

INTRODUCTION

Graduate School Introduction

In order to serve the mission and vision of the Graduate School and preserve the integrity of Graduate Programs at the University of Tennessee, Knoxville, information related to the process of graduate education in each department is to be provided for all graduate students.

Based on Best Practices offered by the Council of Graduate Schools, it is important that detailed articulation of the information specific to the graduate degrees offered in each department/program be disseminated.

The Department Graduate Handbook does not deviate from established Graduate School Policies (http://catalog.utk.edu/content.php?catoid=2&navoid=27) noted in the Graduate Catalog, but rather provides the specific ways in which those policies are carried out.

Purpose of the Handbook

This handbook is intended to assist students pursuing graduate degrees in Biochemistry & Cellular and Molecular Biology at the University of Tennessee, Knoxville. It includes basic information concerning the graduate program, including various courses offered and curriculum requirements. All faculty members within the Department are listed with phone numbers and email addresses. We have also included a description of facilities and instrumentation available to students in the Department. An effort is made to update this document periodically in light of any changes instituted by the Department or other administrative units thatmake policy. For this reason, this handbook will supersede any previous one and will itself be amended by later action of which students will be duly notified. Since not all aspects of graduate study can be included here, you are urged to consult the Graduate Catalog and the Graduate School News (usually posted on bulletin 4boards). The Graduate Affairs Committee is a faculty committee that is responsible for advising first-year students, tracking graduate student progress, and dealing with concerns raised by graduate students in the Department. Also, you are encouraged to get involved with the BCMB Graduate Student Association for fun and peer support.

Graduate students are expected to be aware of and satisfy all regulations governing their work and study at the university. Students should be aware of and should consult the following information (all available on the Graduate School website, http://gradschool.utk.edu/):

The Graduate Catalog *Hilltopics* -http://web.utk.edu/~homepage/hilltopics/

Publications on Appeals Procedures

(http://gradschool.utk.edu/GraduateCouncil/AppeComm/AppealProcedureApproved2009)

BCMB Department

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Department Head: Gladys Alexandre, Ph.D.
Associate Heads: Barry D. Bruce, Ph.D. and Albrecht von Arnim, Ph.D.
Interim Chair of Graduate Affairs Committee: Brad Binder , Ph.D.
Chair of Graduate Admissions Committee: Hong Guo, Ph.D.

Office Staff (Mossman 309):
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BCMB Faculty (http://bcmb.utk.edu/people/faculty/)

Faculty Contact information

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Research and Adjunct Faculty are listed at http://bcmb.utk.edu/people/research-faculty/)
Joint Faculty are listed at https://bcmb.utk.edu/people/ornl-joint-faculty/
Lecturers are listed at https://bcmb.utk.edu/people/lecturers/

GENERAL DUTIES AND RESPONSIBILITIES OF STUDENTS AND FACULTY

Graduate students should be familiar with their rights and responsibilities as specified in the University of Tennessee's student handbook *Hilltopics* (http://web.utk.edu/~homepage/hilltopics/) in the *Graduate School Catalog*, and with the regulations of the Department of Biochemistry & Cellular and Molecular Biology. It is their responsibility to understand all university regulations and to fulfill the requirements in a timely fashion.

The BCMB faculty will work to provide an excellent graduate education for a diverse graduate population. That educational responsibility involves offering high-quality graduate coursework in the form of lectures, lab courses, and seminars. It also includes providing opportunities for graduate students to participate in high impact, fundamental research at the cutting edge of the molecular & Cellular biological sciences. A third critical component of that education is providing graduate students with opportunities and mentoring to develop their teaching skills. The BCMB faculty is committed to fostering a strong mentoring environment for all their students that will maximize their subsequent career opportunities.

ADMISSIONS REQUIREMENTS AND APPLICATION PROCEDURES

Admission to the UT Graduate School

For Graduate School requirements and deadlines, see http://gradschool.utk.edu

Admission to the BCMB Graduate Program

Students accepted into the Department for graduate study are generally expected to have a background equivalent to that required of undergraduate majors in the Department. This includes knowledge of the basic principles of Biochemistry, Cell Biology, Molecular Biology, Genetics and Physiology. However, students with backgrounds in related fields of study may also be admitted into the program. Requirements for admission are specified in the Graduate Catalog (http://gradschool.utk.edu) and are summarized as follows: one year of general biology or the equivalent; a minimum of 8 semester hours beyond introductory biology; general and organic chemistry, with laboratories; at least one semester of biochemistry; one year of calculus; one year of physics; a minimum GPA of 3.0 on a scale of 4.0; and satisfactory performance on the GRE. International applicants must submit official TOEFL scores to the Graduate School as part of the application.

For detailed application instructions and deadline, see:
http://bcmb.utk.edu/graduate-studies/graduate-admissions/

Students interested in applying as a non-degree graduate student should apply to the Graduate School only.

For re-admission to the BCMB graduate program, contact the department head.

FINANCIAL SUPPORT

Graduate Assistantships

Most students in the Department are supported by Graduate Teaching Assistantships (GTA) and Graduate Assistantships (GA) which require the student to invest approximately 20 hours per week fall and spring semesters (excluding summer) assisting in the teaching programs of the Department or General Biology. In return, each student's tuition is paid for all three terms and a stipend is paid in equal monthly installments. Graduateassistantships are renewed yearly and are dependent upon satisfactory teaching evaluations from prior years and progress in dissertation research. Students who receive poor SAIS evaluations (as determined by the graduate affairs committee) will be given additional resources and mentorship to improve teaching. Generally, a score below 3.0 is cause for concern that may cause the committee to ask the student to take actions to improve teaching. A score below 2.0 will require the student to take actions to improve his/her teaching. If poor teaching continues, the committee will recommend to the department head that GTA support not be renewed for the student in question. Similarly, if a student fulfills any of the grounds for dismissal (see p. 42), the head may choose to discontinue TA support rather than recommend dismissal from the program.

International students who are receiving financial support must be placed on Graduate Assistantships during their first-year in residence, which requires the student to assist in a lab course, equipment maintenance, or other comparable activities that do not involve teaching directly. International students must attend an orientation session and take the OPIc test prior to registration for the fall semester. After the first-year, depending upon their progress in dealing effectively with English (as judged by the OPIc test), the student may be appointed as a GTA. International students must continue to retake the OPIc test at least twice each academic year until they obtain a score of AH or better. Failure to do so is grounds for dismissal from the program. Full GTA stipend is awarded only after the student obtains a OPIc score of AH or better.

It is expected that as a GTA you will be available prior to the start of the semester to meet with the instructor(s) of the class for training and learning the expectations for your teaching assignment. It is also expected that you be available until the end of the grading period for the semester. You need to arrange with the instructor(s) of the class for any absences from your duties.

Fellowships

Fellowships are available on a competitive basis to supplement the basic stipend. In addition, students entering labs supported by grants are eligible for both supplementation of their stipend and a reduction in teaching load. More advanced students entering labs supported by grants may be eligible for Graduate Research Assistantships (GRA).

Because most GRAs are funded via federal grants, **all entering graduate students are required to take two training classes**. One is a 1 day safety training workshop conducted by the UTK safety departments that typically is held near the beginning of your first semester. The other is that you need to pass the Responsible Conduct in Research (RCR) training modules that are online (instructions at: http://research.utk.edu/wp-content/blogs.dir/29/files/2014/02/Responses-to-CITI-RCR-training2.pdf). Certification that you have completed the RCR training needs to be sent to both the graduate affairs director and Chrissy Wills-Maples in the office. These trainings are requirements handed down by federal granting agencies. If you work with NIH funding, you will also likely have to take a bioethics class.

The Graduate School offers a limited number of fellowships to select graduate students. Fellowships require no service and are available on a competitive basis. The awards include a full-tuition waiver and a range of stipends. Each fellowship has different requirements, application procedures and deadlines. Details can be found on the graduate school website: https://gradschool.utk.edu/graduate-student-life/costs-funding/graduate-fellowships/

The Division of Biology also administers fellowships and awards. The Alexander Hollaender Fellowship is targeted to an outstanding graduate student in the biological sciences who is native of East Tennessee. Selectionfor the fellowship is on a competitive basis, with emphasis on research productivity and publications. Previously, the award amount has been approximately $6,000. The deadline is late in the spring semester each year. The Biology departments also grant a limited number of Science Alliance Awards each year. These awards are given on a competitive basis to recognize achievement in research. In the past, these awards havebeen approximately $3,000. Applications are received and reviewed each spring.

Several awards are available exclusively from the BCMB department, including the Holton Plant Sciences Award, the Wright Research Award, and the Kouns Excellence in Teaching Award. Details about these awards are available on the BCMB website.

Outside Employment

Graduate students in BCMB typically hold half-time appointments as teaching or research assistants and are

expected to pursue coursework and research activity during the remainder of their time. Outside employment, except for a few hours tutoring or engaged in other professional activities, is prohibited.

International Students beware of accepting tutoring position elsewhere on campus. These are actual UT appointments and will increase your total employment to more than 50%. Such an occurrence will put students with F-1 visas "out-of-status" and subject to immediate deportation.

Students can apply for support for research-related travel (e.g., to attend conferences or conduct research) through the BCMB department and the university's Graduate Student Travel Fund administered by the Graduate Student Senate. For more information, see p 47.

REGISTRATION AND ADVISING

Registration

Once a student has been admitted into the BCMB graduate program, they can register for classes. Priority registration usually ends about a week prior to the beginning of classes. Once late registration is reached, a late fee will be charged to students Use the website http://gradschool.utk.edu/orientation/registration.shtml, which should be ready for incoming student registration. The registration website walks you through getting your NetID and PIN number. We encourage all students to register for classes as soon as possible. We will counsel incoming students about individual courses during orientation to make sure these are the right courses for you. If class schedule changes are required after you arrive, these can be done through 'drop and add'.

You should discuss your on-going course work with the chair of the Graduate Affairs Committee during your first year in graduate school. Once you choose a research adviser and thesis committee (usually at the end of Spring semester of your first year) they will be able to advise you on which subsequent course work is most appropriate for you. Graduate students are encouraged to meet with their thesis/advisory committee **at least** once a year starting in the fall of their second year. Ultimately, however, it is your responsibility to be sure you are fulfilling all BCMB department requirements and UT Graduate School requirements for your degree.

If you register late, **you** will be responsible for paying fees which are over $1000. Therefore, it is in your interest to resister for classes on time.

University Course Load Information

The maximum load for a graduate student is 15 hours, while 9-12 is considered a full load. Students with a half-time assistantship normally should enroll in 6-12 hours. Registration for more than 15 hours during any semester, or more than 12 hours during the summer, is not permissible without prior approval.

First-year BCMB Coursework

Year 1 Fall	Course	# credit hours
BCMB 511	Advanced Protein Chemistry & Cellular Biology	3
BCMB 515	Experimental Techniques I	3
BCMB 516	Experimental Techniques II	2
BCMB 601	Departmental Seminar	1
BCMB 603	Graduate Research Colloquium	1

Year 1 Spring	Course	# credit hours
BCMB 512	Advanced Molecular Biology	3
BCMB 516	Experimental Techniques II	4
BCMB 601	Departmental Seminar	1
BCMB 603	Graduate Research Colloquium	1

Year 1 Summer	Course	# credit hours
BCMB 502	Use of Facilities	3 -9*

* You need to register for at least 3 credit hours every semester in order to be eligible to purchase student health insurance. If you register for <9 credit hours, you will need to pay a one-time (per semester) fee of $78 (amount subject to change) when you visit the health clinic.

At the end of the first year students will select an advisor/laboratory in which to carry out their dissertation work. The student should discuss this choice with the prospective advisor in question, and once accepted by that laboratory, the decision should be communicated in writing (email) to the Chair of the Graduate Affairs Committee and to the Department Head. You and your advisor should then select a committee (which will ultimately become either your M.S. or Ph.D. thesis committee) that will decide whether you should continue in the M.S. or Ph.D program. This committee will serve as your dissertation or thesis committee once you are committed to a specific program.

Upon selecting a laboratory, students should form a committee (see below) and should communicate the composition of this committee to the Chair of the Graduate Affairs Committee. It is mandatory that a committee meeting be held during the second year of graduate studies. The student should include a written summary of progress in research to their committee, and if deemed beneficial, the student and mentor should fill out the Student Evaluation Form (see Appendix 1). See more about committee meetings below.

Second-year BCMB Coursework

Year 2 Fall	Course	# credit hours
BCMB 520	Special topics (lab group meetings)	1
BCMB 525	Graduate Research Participation	3
[BCMB 500**	Thesis 3]	
BCMB 601	Departmental Seminar	1
BCMB 603	Graduate Research Colloquium	1
+ one journal club (such as: BCMB 605, 608, or 609)		1
+ 1 additional 500+ course		3

**Substitute for BCMB 525 for those students who are interested in earning a MS degree and not a Ph.D.

Year 2 Spring	Course	# credit hours
BCMB 520	Special topics (lab group meetings)	1
BCMB 525	Graduate Research Participation	3
[BCMB 500**	Thesis 3]	
BCMB 601	Departmental Seminar	1
BCMB 603	Graduate Research Colloquium	1
+ one journal club (such as: BCMB 605, 608, or 609)		1
+ 1 additional 500+ course		3

Year 2 Summer	Course	# credit hours
BCMB 502	Use of Facilities	3 -9

By the end of the second year, students (in consultation with their advisor) should decide whether they wish to pursue a Master's or doctoral degree. Those wishing to pursue a Master's degree should continue with the course work indicated below, and complete the requirements for a Master's degree as indicated. Those students wishing to pursue a Ph.D. will need to complete the Preliminary Exam, as outlined below. Students are expected to have a meeting with their M.S./Ph.D. committee during the second year.

Third year and beyond – M.S. students

Continue taking BCMB 500, 520, 601, 603 and 3 semesters of a journal club.

Make sure you are accumulating the required number of credit hours for both BCMB and Graduate School requirements. Students are expected to have a meeting with their M.S. committee at least once a year; often there will be two meetings in the third year: a regular meeting of the committee to give guidance and check on progress before the final defense, and later the thesis defense.

Third year and beyond – Ph.D. students

Continue taking BCMB 520, 601, 603 and 6 semesters of a journal club. Continue signing up for BCMB 525 every semester until your pass the preliminary exam.

Once you have passed your Prelim exam, switch from BCMB 525 to BCMB 600 and continue to sign up for it every semester (including the summer!) until you graduate.

Make sure you are accumulating the required number of graded 500+ credit hours for both BCMB and Graduate School requirements. Students are expected to meet with their Ph.D. committee at least once everyyear in their graduate education leading up to the final defense.

DEGREE REQUIREMENTS

Graduate School Requirements (refer to Graduate Catalog for details)

Master's Degree

30 hours of graduate credit (not including BCMB 500). At least 20 hours must be from courses above the 500 level (i.e., above BCMB 500). Only 6 thesis hours may be included in this. **A student must register for BCMB 500 each semester they are working on their thesis, including a minimum of 3 hours during the semester their thesis is accepted by the Graduate School. This includes all summers.**

Doctoral Degree

Student must complete at least 48 hours of graduate course work beyond their baccalaureate degree. At least 30 of these hours must be graded A-F. A minimum of 6 hours must be graded 600-level courses, exclusive of dissertation. 24 hours of BCMB 600 are required. **Once you begin registering for BCMB 600 you must continue to register for at least 3 hours of BCMB 600 each semester until you obtain your degree (including thesummer).**

BCMB Ph.D. Requirements

Once admitted to the Ph.D. program, it is the responsibility of each student to fulfill the following requirements:

1. Select an advisor/laboratory in which to carry out your dissertation work.

2. Form a Ph.D. dissertation committee (four or five total members including your Ph.D. advisor) **no later** than the beginning of fall semester of your second year. The goal of these meetings is to help you progress in your research. Therefore, even if you have minimal results, you need to meet with your committee so they can provide help. Choice of committee members should be agreedon with your faculty advisor. In addition to the mentor, two or three of the committee members should come from BCMB faculty (core, research, or adjunct faculty). At least one member should come from another UT department or from the graduate faculty at ORNL. (NOTE: Each student needs to check with theGraduate Catalog for a list of current regulations governing selection of committee members.) Your committee will monitor coursework and research progress throughout your tenure as a graduate student. You are required to meet with the committee at least once each year and to provide it with a written summary of your progress. If needed, complete the Graduate Student Evaluation form (See Appendix 1). Your advisor should also prepare a written summary of each meeting documenting your progress that will be shared with you; a copy of this should be turned in to Chrissy Wills-Maples in the BCMB office, who will place it in your file.

3. Schedule your comprehensive exam with your assigned exam committee chairman for the Fall of your third year. The exam, including a potential repeat, must be completed before the end of the summer semester of your third year. The format of the exam is explained in the section on Preliminary Exams (p 30). In extenuating circumstances, the graduate student can appeal to take the repeat exam early in the fall semester of their fourth year with approval by the graduate affairs committee.

4. Complete all coursework and research to the satisfaction of the Graduate School, the Department, and your dissertation committee. Core or required courses are as follows (also found in graduate catalog):

   a. 511,512, 515, 516
   b. At least two additional approved graduate courses in the life sciences, or chemistry, or physics, or other physical science to be determined upon consultation with the mentor and the dissertation committee. No survey courses will be accepted.

c. At least 6 hours of a 600-level graduate course graded by letters A-F.

d. Participation in 601 and 603 during the entire period of residence.
Participation in at least one other seminar or journal club chosen from among BCMB 605-609 for six semesters.

e. Completion of any additional course requirements as determined by your dissertation committee.

f. Achievement of an A or B in all BCMB core courses (510, 511, 512, 515, and 516) and maintain an overall GPA of 3.0 or better in all courses taken for graduate credit. Failure to maintain an A or B in these core classes is grounds for dismissal from the program and will be determined by the graduate affairs committee in consultation with the department head.

g. A dissertation reporting the results of original and significant research conducted during the term of candidacy.

h. A final oral examination and defense that will be concerned primarily with the student's dissertation. This examination will be preceded by a public presentation of your work in the form of a Departmental seminar.

5. An additional requirement of all Ph.D. students is the participation as a teaching assistant in a capacity that involves lecturing to students and/or leading a discussion section for a minimum of two semesters during your tenure in the Department. This requires that international students have passed the OPIc with a score of AH or better.

6. **Publication Requirement(s) for a PhD Degree (added to the PhD requirements):**
In the BCMB department, we require **ONE** first authored peer-reviewed publication relevant to the main thesis topic to be prepared and submitted prior to completion of the Ph.D. degree. The Dissertation Committee may waive this requirement in rare cases. These publications are important as they indicate that the body of work in this dissertation is accepted throughout the scientific community.

BCMB M.S. Requirements

Once admitted into the M.S. degree program, it is the responsibility of each student to fulfill the following requirements:

1. Select an advisor/laboratory in which to carry out your thesis research.

2. Select a thesis committee **no later** than the fall semester of your second year. The Master's committees are comprised of the faculty mentor and two other BCMB faculty members. (NOTE: Each student needsto check with the Graduate Catalog for a list of current regulations governing selection of committee members.) Your committee will monitor coursework and research progress throughout your tenure as a graduate student. You are required to meet with the committee at least once each year and to provide it with a written summary of your progress. If needed, complete the Graduate Student Evaluation form (See Appendix 1). Your advisor should also prepare a written summary of each meeting documenting your progress that will be shared with you; a copy of this should be turned in to Chrissy Wills-Maples in the BCMB office, who will place it in your file.

3. Complete coursework and research to the satisfaction of both the Graduate School and the Department. Core or required courses are as follows (also found in Graduate Catalog):

a. 511, 512, 515, and 516.

b. Completion of course requirements as determined by the student's thesis committee.

Achievement of an A or B in all BCMB core courses (510, 511, 512, 515, and 516) and maintain an overall GPA of 3.0 or better in all courses taken for graduate credit. Failure to maintain an A or B in these core classes is grounds for dismissal from the program and will be determined by the graduate affairs committee in consultation with the department head.

c. Participation in 601 and 603 during the entire period of residence.
Participation in at least one journal club chosen from among BCMB 605-609 for three semesters. Journal clubs in other departments are also a potential option.

d. Six hours of master's research and a thesis.

e. A final oral examination that covers both the thesis endeavor and the subject matter of the course requirements.

4. Following defense of your thesis either:

a. Leave the University with an M.S. degree.

b. If you desire and are recommended by your committee and approved by the entire faculty, you may be allowed the opportunity to enter the Ph.D. program. **[Students in the M.S. track can be recommended by their committee for the Ph.D. track at any time, not just after completion and defenseof a thesis. If the rest of the faculty concurs, the student will be allowed to enter the Ph.D. track at that point.]**

5. An additional requirement of all MS students is the participation as a teaching assistant in a capacity that involves lecturing to students and/or leading a discussion section for a minimum of two semesters during your tenure in the Department. This means that international students must have passed the OPIc test with a score of AH or better.

BCMB Graduate Catalog Course Descriptions (consult on-line catalog for most up to date list of classes)

500 Thesis (1-15) P/NP only.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before the degree is completed. May not be used toward degree requirements. May be repeated. S/NC only.

510 Computational Structural Biochemistry (1) Introduction to computational tools, internet resources and databases for biological research to analyze and model protein structures and to study protein-ligand interactions. Co-req: 511. Registration permission: consent of instructor.

511 Advanced Protein Chemistry & Cellular Biology (3) Cellular structure and function at the molecular and supramolecular level in the progression: protein structure and function; membrane structure and function; signal transduction and cell regulation; cellular organelles and membrane biogenesis; cytoskeleton and cell motility; cell-cell interactions and tissues. Prereq: Undergraduate biochemistry and cell biology and/or consent of instructor.

512 Advanced Molecular Biology (3) Regulation of nucleic acid expression and protein activity. Nucleic acid structure and function; replication and repair of nucleic acids; gene expression; protein synthesis;

posttranslational protein modification; mitosis and meiosis; cell cycle and cell growth. Prereq: 511 or consent of instructor.

513 Advanced Protein Biochemistry and Cell Biology II (3) Advanced topics of cellular function and regulation of cell division and growth, and structure and function of supramolecular structures: cytoskeleton and cell junctions and adhesions. Prereq: 511.

515 Experimental Techniques I (3) Course material covers lectures and computer lab sessions on bioinformatics, data mining, microbiological aspects, purification, and biochemical/biophysical studies of proteins.

516 Experimental Techniques II (2-4) Laboratory rotations. Students work in laboratory of faculty member on clearly defined project. Written proposal and oral report. Primarily for departmental graduate students. Pre or co-req: 515.

517 Physical Biochemistry (3) Physics and chemistry of biological systems and molecules. Thermodynamics; Diffusion and transport; Physical chemistry of macromolecules; Enzyme kinetics; Binding reactions; Spectroscopy. Prereq: 511 or Consent of Instructor.

520 Special Topics (1-2) Selected directed readings or special course in topics of current interest. Consult departmental listing for offerings. May be repeated with consent of instructor. Maximum 6 hrs.

522 Advanced Plant Physiology I (3) Plant biochemistry and metabolism; respiration, photosynthesis, carbon partitioning, and biosynthesis of specialized plant products: terpenoids, alkaloids, phenolics and plant growth regulators. Prerequisite(s): 401 and one semester of introductory plant physiology or
cell biology.

523 Advanced Plant Physiology II (3) Growth and differentiation of plants at molecular, cellular and organismal levels. Regulation of development; macromolecular interpretation of differentiation, dormancy, germination, flowering, and senescence. Prerequisite(s): 401 and one semester of introductory plant physiology orcell biology

525 Graduate Research Participation (3-12) Tutorial laboratory experience. May be repeated. Maximum 12 hrs. Graded A-F.

530 Experimental Design and Analysis (2) Development of skills in strategies of experimental design and interpretation of experimental results. Critical discussion of research articles illustrating issues in experimental design. Preparation of grant proposal in standard format to be read and discussed by class and by panel of faculty expert in area of proposal. Prereq: Consent of instructors.

550 Advanced Concepts in Neurobiology/Physiology (3) Concepts related to neurobiology/ physiology with information taken from current literature. Predominantly lecture format with student participation. Specific subject area to be announced. Permission of instructor. May be repeated.

559 Biophysical Crystallography (3) Theories and practices of X-ray diffraction, neutron diffraction and neutron scattering to elucidate the structure of nucleic acids, proteins, nucleosomes, ribosomes and viruses. Application of 3-D structures in designing drugs against AIDS, cancer, cardiac disease and neurodegenerative disorders. Recommended Background: 401 or two 300-level chemistry courses or Physics 240. Registration Permission: Consent of instructor.

560 Advanced Concepts in Structural Biology/Biochemistry (3) Concepts related to structural biology/biochemistry with information taken from current literature. Predominantly lecture format with

student participation. Specific subject area to be announced. Permission of instructor. May be repeated.

562 Introduction to Electron Microscopy-Transmission Electron Microscope (4) Practical application to techniques for preparation of biological samples for viewing in transmission electron microscopy. Use of microscope and ancillary equipment, darkroom techniques, preparation of materials for publication and special project. Admission limited only to departmentally approved graduate students. 2 hr labs.

564 Introduction to Electron Microscopy-Scanning Electron Microscope (3) Practical introduction to techniques of electron microscopy and to scanning electron microscope. Use of microscope, introduction to darkroom techniques and digital image processing, preparation of samples for observation, and special project. Prereq: Consent of instructor. 2 hrs and 1 lab.

580 Advanced Concepts in Genetics/Developmental Biology (3) Concepts related to genetics/ developmental biology with information taken from current literature. Predominantly lecture format with student participation. Specific subject area to be announced. Permission of instructor. May be repeated.

591 Foreign Study (1-15) See College of Arts and Sciences in Graduate Catalog.

592 Off-Campus Study (1-15) See College of Arts and Sciences in Graduate Catalog.

593 Independent Study (1-15) See College of Arts and Sciences in Graduate Catalog.

598 Biology Education: Theory and Practice (3)

600 Doctoral Research and Dissertation (3-15) P/NP only.

601 Departmental Seminar (1) Invited speakers. Topics posted in advance. Required every semester in residence.

603 Graduate Research Colloquium (1) Seminars and lectures dealing with current advances in fields of biochemical and biophysical methods, mechanisms of enzyme catalysis, gene expression, membrane structure and function, metabolic regulation, physical biochemistry, molecular genetics, cell biology, neurobiology, and related topics. Required every semester in residence.

605 Journal Club in Neurobiology/Physiology (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hrs.

606 Journal Club in Structural Biology/Biochemistry (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hrs.

607 Journal Club in Cellular/Molecular Biology (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hrs.

608 Journal Club in Genetics/Developmental Biology (1) Readings and discussion based on current literature. May be repeated. Maximum 12 hrs.

609 Journal Club in Plant Biology (1) Readings and discussion based on current literature. Repeatability: May be repeated. Maximum 12 hours.

610 Current Topics in Biochemistry, Cellular, and Molecular Biology (1-3) Critical reviews of research problems and methods in biochemistry, cell biology and/or molecular biology. Oral presentations, written reports,

computer simulations by faculty and students. Consent of instructor. May be repeated. Maximum 4 hrs.

612 Advanced Topics in Environmental Toxicology (103) *(Same as Ecology and Evolutionary Biology 512)*

615 Special Topics in Biochemistry, Cellular, and Molecular Biology (3) Biochemical and biophysical methods, mechanisms of enzyme catalysis, gene expression, membrane structure and function, metabolic regulation, physical biochemistry, molecular genetics, cell ultrastructure and physiology, neurobiology, and related topics. Prereq: 511-12 or consent of instructor. May be repeated. Maximum 9 hrs.

623 Advanced Plant Growth/Development (3) Growth and differentiation of plants at molecular, cellular and organismal levels. Regulation of develop; macromolecular interpretation of differentiation, dormancy, germination, flowering, and senescence. This class is intended for doctoral students. Credit Restriction: students may not receive credit for both 523 and 623. (DE) Prerequisite(s): 401. Recommended Background: One semester of introductory plant physiology or cell biology.

500 Thesis (1-15) P/NP only. May be repeated.

502 Registration for Use of Facilities (1-15) Required for the student not otherwise registered during any semester when student uses University facilities and/or faculty time before the degree is completed. May not be used toward degree requirements. May be repeated. S/NC only.

505 Research Rotation (2) Laboratory rotations with faculty members on clearly defined projects. Written proposal and oral report. May be repeated. Max 8 hr.

507 Bioinformatics and computational biology (1-3) Topics to be covered include the application of computing, modeling, data analysis, and information technology to fundamental problems in the life sciences. May be repeated. Max 12 hr.

510 Special Topics in Life Sciences (1-3) Specializations in biotechnology; cellular, molecular, and developmental biology; environmental toxicology; ethology; plant, physiology and genetics; and physiology. May be repeated. Maximum 9 hours.

515 Introduction to Genome Science and Technology I (1) Introduction to research in genome science and technology concentration. Satisfactory/No Credit grading only.

516 Introduction to Genome Science and Technology II (1) Science and ethics of practice of science. Satisfactory/No Credit grading only.

520 Genome Science and Technology I (4) Overview of genomics, advanced genetics principles.

521 Genome Science and Technology II (4) Analytical technologies and special techniques.

540 Colloquium (1) Invited speakers. Topics announced in advance. P/NP. May be repeated. Max 12 hr.

541 Colloquium (1) Invited speakers. Topics announced in advance. P/NP. May be repeated. Max 12 hr.

591 Foreign Study (1-15) May be repeated Max 15 hr.

592 Off-Campus Study (1-15) May be repeated Max 15 hr.

593 Independent Study (1-15) May be repeated Max 15 hr.

595 Special Topics in Genome Science and Technology (1-3) Tutorials or lectures in variety of special topics

to be chosen by instructor. May be repeated. Maximum 12 hours.

596 Special Topics in Genome Science and Technology (1-3) Tutorials or lectures in variety of special topics to be chosen by instructor. May be repeated. Maximum 12 hours.

600 Doctoral Research and Dissertation (3-15)

615 Journal club in Genome Science and Technology (1) Reading and discussion based on current literature. P/NP. May be repeated. Max 12 hr.
695 Advanced Topics in Genome Science and Technology (1-3) Tutorials or lectures on variety of advanced topics to be chosen by instructor. May be repeated. Maximum 12 hours.

696 Advanced Topics in Genome Science and Technology (1-3) Tutorials or lectures on variety of advanced topics to be chosen by instructor. May be repeated. Maximum 12 hours.

(NOTE: 400 level courses may sometimes be taken for credit with approval. A listing of those courses is in the Graduate Catalog.)

BCMB Coursework Information

Formal Courses

Graduate courses in BCMB are offered at various levels with differing objectives. The core courses, BCMB 510, 511 512, and 515, are to be taken by all graduate students within the Department, regardless of area of specialty. They are general courses in the areas of Protein Chemistry, Cell Biology and Molecular Biology. After completion of the core course requirements, students may also enroll in 500 and 600 level courses that cover advanced concepts and special topics in Neurobiology/Physiology, Structural Biology/Biochemistry, Cellular/Molecular Biology, Plant Biology and Genetics/Developmental Biology. Students may also select additional elective courses in the Genome Science and Technology curriculum (see LFSC courses, above). All formal courses are graded A-F. In some cases, upper division undergraduate courses may be taken for graduate credit with approval of the Department Head and Graduate Affairs Committee or upon recommendation of the dissertation/thesis committee.

Rotations (BCMB 516)

During the first year, each graduate student will participate in a total of three lab rotations. One rotation will occur during the fall semester and two in the spring semester. In some cases, a fourth rotation may be necessary (see below *Choosing a Lab*). However, in the rare case that after 4 rotations, the student cannot find a mentor willing to accept the student into their lab, this may trigger dismissal from the program and/or loss of departmental GTA support.

Lab rotations benefit first-year graduate students in that they accelerate the process of involvement in actual laboratory procedures, experimental design and data interpretation. In addition, it helps first-year students get to know other students and faculty more rapidly. The timing of the rotations is as follows (the specific dates for each academic year are designated in the Academic Calendar which is available on-line at the Officeof the Registrar- http://registrar.tennessee.edu/academic_calendar/):

Rotation 1: Start 2nd session of first semester
Rotation 2: First session of spring semester
Rotation 3: Second session of spring semester

Be aware that each mentor can have a maximum of 3 BCMB students rotating in an academic year. Also,

some faculty may be open to hosting rotation students but are not taking new students.

Arranging rotations

The fall semester usually begins the third week of August. The first rotation starts at the beginning of 2nd session (half-way through the semester, consult on-line dates at the registrars office for exact date). During the first half of the semester individual faculty will be scheduled to meet with you (during class time of BCMB 516) as a group to discuss their research and mentoring style. It is during this time that you should start arranging rotations. We will also have several sessions in our BCMB 516 meetings to discuss what to look for in rotations and in mentors for your degree. It is during this time that you should meet with potential mentors to discuss rotation project options and determine whether or not the lab has openings for a new graduate student. Just prior to the start of the 2nd session, we will meet as a group. It is by this time that you need to give your rotation choices to the graduate affairs director. These need to be approved by the graduate affairs committee prior to finalizing.

What to expect and what is expected

Generally, for the duration of the rotation you should try to become integrated into the life of the lab. Spend as much time as you can in lab learning the lab's culture, reading background literature, and designing, carrying out, and analyzing experiments. You will likely be expected to attend and participate in lab group meetings. When starting a rotation, you should talk with your mentor to find out specific expectations.

General features of rotations are:

1. Project Goals

In conjunction with the mentor, a brief project plan (1-2) that gives a short background and a list of project goals for the rotation should be generated and provided to the student and copied to the faculty member or committee in charge of rotations/BCMB 516.

2. Student/mentor meetings

Although these are likely informal, each mentor should be encouraged to meet at least weekly with the student to go over project goals and progress, and to explain rationale for experiments and techniques.

3. Notebook

Although each lab has its own style and rules for a notebook, the rotation student is required to keep a bound notebook in which experimental details and results are documented. This should be evaluated at the end of the rotation period by the mentor and should be commented on in the mentor's evaluation (see below).

4. Final report: student

The student is responsible for preparing a report on his rotation along with any data figures that will be submitted to the mentor. The report should summarize research goals, experimental techniques used with a brief description and experimental rationale, and outcome of experiments.

5. Evaluation: mentor

An evaluation of student performance will be completed by the mentor and submitted separately to the faculty member or committee in charge of rotations/BCMB 516. This will be an evaluation of the student, with a description of the project and a critique of the student's performance.

6. Presentations.

At the end of each 7-week rotation period, each student will present either a talk (rotations 1 and 3) or poster (rotation 2) that summarizes the rotation. This will be given in a small forum, usually in front

of other first year students and the faculty member/committee in charge of rotations although the presentations are open to any faculty or students.

7. Grades for 516.

Rotations will be graded A-F and will be decided by the Graduate Affairs Committee and will be generally be based on: **a.** the student's presentation and **b.** the evaluation of the rotation mentor.

Choosing a lab

At the end of your third rotation, you should be ready to choose a mentor and lab for your graduate research. Once you and your new mentor are in agreement about you joining the lab, please inform the graduate affairs director. In some cases, a fourth rotation is needed. This should be arranged in consultation with the graduate affairs committee. Once you choose a lab, please work with your adviser on a regular basis to set realistic goals and to discuss progress. A positive and productive working relationship with your adviser isvery important for your future progress.

Vacation policies

When you join a lab, you need to consult with your mentor about taking vacation away from the lab. Even though it is appealing to take a long vacation right after joining a lab, the summer is meant for you to come up to speed with your dissertation research. Any vacation plans must be discussed with your adviser **ahead of time**. Similarly, when you are TAing a class, you need to know the expectation of the instructor. It is usually expected that you take part in planning meetings before the semester starts and grading after the semester ends.

Changing mentor/lab

The BCMB Department expects and requires a collegial, mutually respectful relationship between faculty and its graduate students. Despite this academic tradition and expectation, it is possible that professional concerns or conflicts may arise impacting the graduate student-PI relationship. Examples of such professional issues might include an interpersonal conflict, concern about work-related expectations and commitment, research ideology and/or approach(s), perceptions about lack of competency or other dissatisfaction. The issues need to be identified and resolved early in the graduate student's career to minimize career disruption and/or dallying progress within the BCMB program. Conflict resolution should include:

a) Informal Resolution: In most cases, addressing the issue directly and face-to-face should be the first step in attempting to resolve any professional concern or conflict. In cases where faculty and/or committee members are counseling students on professional concerns they have with their direct advisor, the student should be encouraged to meet with their PI directly to address issues.

b) Formal Written Notification to DGS: In the rare event that concerns cannot be resolved in routine advising meetings or the following steps should be followed to document and address an unresolved professional concern. The student or PI (either may initiate this process) should initiate a written request (e.g., email) to address the professional concern through a face-to-face meeting. This written request should also be copied to the DGS (Director of Graduate Studies) and the DGS must be copied on subsequent communications between the student and PI regarding the matter. It is the responsibility of those involved to respond in a timely manner (preferrable within one week) and work together to find an agreeable meeting time. This meeting should be reserved for a direct, specific and focused discussion of the issue of concern/conflict.

c) Approved Documentation of Conflict: A written summary of this meeting, with both parties (student and PI) stating the nature of the issue and an agreed summary of the conversation regarding any potential action items, should be generated at the conclusion of the meeting. A copy of this document, signed by both parties, should be sent to the Director of Graduate Studies (DGS) for review.

d) DGS Mediation: Following this meeting, the DGS will review the resolution document and determine the next course of action via a written response to both parties. This could include suggesting a follow-up meeting between

student and PI to determine if addressing specific action items remedied concerns, meeting with a third party (mediator(s)) to find a suitable resolution or individual meetings with the student and PI. All subsequent meetings regarding the professional concern, once brought to the attention of the DGS, must be followed up with a written summary, signed by both parties, that is copied to the DGS.

e) Conflict Resolution and Change in Mentor: In the event that a professional concern between a student and PI cannot be resolved, the DGS will facilitate conflict resolution based on departmental and university policy, and the best interest of all parties involved. This may include the student conducting rotation(s) to find a suitable new lab or leaving the program. It should be noted that as each case is unique the specific actions to be taken are at the discretion of the graduate director.

f) Timing of Conflict Resolution/Change of Mentor: While several policies are in place designed to help students and mentors work together, in some instances it is best for both parties if the student changes laboratories. Additionally, in some instances, a student may decide that continuing in the BCMB Department is not the best fit for them, and elects to leave the Department/University. If upon following the conflict resolution protocol (above), the student is interested in changing laboratories, the student must meet with the DGS and discuss this as an option **PRIOR** to discussions with any new potential mentors. There are many points of consideration at such a time including: has the student passed their preliminary examination? What is the current status of the work for the dissertation? Have publications been generated? If upon weighing the above (and other) considerations, the GAC will determines a laboratory change is acceptable, then the GAC (in collaboration with the student and faculty member(s) involved) will provide a framework for completion of an additional rotation(s) in other laboratories as well as the future composition of the student's thesis/dissertation committee, if appropriate.

g) Requirements prior to Lab Departure: If the solution is to change labs, it is mandatory that the graduate student comply with normal departure policies of the lab/department.

h) Conflicts Involving the DGS: If professional concerns arise with a student in the laboratory of the DGS, another member of the GAC committee or possibly the Associate Head of Research and/or Department Head will take the place of the DGS in the above steps.

Departmental Seminar (BCMB 601)

The Department conducts a seminar on most Wednesday afternoons during the academic year at 3:35 p.m. at which invited speakers and university faculty present results of their current investigations. Participation in this seminar is a mandatory and stimulating part of the graduate program. The seminar is graded S/NC.

Graduate Research Colloquium (BCMB 603)

This Colloquium meets once a week for an hour on Monday at 12:20 p.m. during the academic year. This meeting is the forum for graduate students to present progress reports on their research, for post-rotation presentations, for seminar presentations accompanying the comprehensive exam and for journal presentations by second-year graduate students. Instructions for preparing journal presentations are given below to aid in the preparation for presentations at this Colloquium and topical journal clubs. The Seminar Committee arranges the schedule for presentations. Grading is S/NC.

Journal Clubs

In addition to the Departmental seminar and Graduate Research Colloquium, the Department offers specialized journal clubs in its four major disciplines. Two journal clubs, which are offered each semester, meet weekly and are more informal in style than the seminar or colloquium. Students and faculty who participate present reports on recent journal articles, discuss current topics related to the area, and report on meetings and conferences recently attended. Instructions are given below to help in preparation of the topical journal club presentations. While these sessions are open to all interested graduate students, registration in a total of six is required of students enrolled in the Ph. D. program.

BCMB PhD Graduate students are required to take 1 journal club/semester for 3 years of their degree. These can be selected from those offered in the Department (BCMB 605, 606, 607, 608, 609) and can also include taking the Responsible Conduct of Research (RCR) course (BCMB 614) or other Scientific Ethics course (LFSC 516). Participation in one of the RCR journal club is encouraged. Journal clubs can be repeated with the exception of the RCR class. In addition, Journal clubs in other departments may be taken with the approval of the graduate student's mentor. After completing these 6 required journal clubs, students are encouraged to participate in other journal clubs to broaden their training. If a student is supported with NIH funding, they may be required to take the Bioethics class.

Research Credit

Beginning the fall of their second year of graduate study, students will enroll for research credit (BCMB 525), graduate research participation, which is graded A-F. Students are limited to 12 credit hours in BCMB 525. Research credit is also given as BCMB 500 (for Master's students) and BCMB 600 (for Ph.D. students); grading for thesis or doctoral research and dissertation is P/NP. Students should also enroll in BCMB 520 (Special Topics/ Lab meetings) every semester once they have joined a specific lab.

EXAMINATIONS/ REQUIRED WORK

Colloquium Presentation

One of the major goals of the Graduate Research Colloquium BCMB 603 is to provide students with experience in examining the research literature critically. That critical approach should be exercised on several planes, including questions of whether the research was done with adequate awareness of prior and contemporary results from other laboratories; whether the goals were well and appropriately defined; and whether the experiments were properly conceived, properly executed, and supplemented with appropriate controls to make non-ambiguous conclusions possible. It is essential to examine carefully the argument by which the writer reaches a conclusion, and to decide whether you agree with that conclusion. It is not enough to presume the adequacy of research conclusions on the basis of the laboratory from which they emanate or the journal in which they appear. The most adept laboratories will produce a goof at least occasionally, and the best journals will publish some poor papers with surprising frequency. The burden rests with each scientist to deal with the literature critically and to make his/her own conclusions about the significance of experiments and the unfolding status of any field of science.

In preparing a presentation, one should apply all of these levels of consideration. In the presentation, one gains practice with the problem of communicating one's thoughts to others, a skill which is demanded in teaching, in publishing, in applying for grant support, and, incidentally, in dealing with the oral exams (thesis defense, comprehensive exam, etc.) in your graduate program. The presentation also provides the presenter with an opportunity to collect constructive criticism concerning the effectiveness of his/her communication skills and to compare perceptions and insights with other scientists.

Also, approach your peers/faculty for suggestions, comments, etc. Often, such one-on-one discussion leads to further improvements in the presentation and to new experiments. This is a major way by which advances in research and understanding occurs in our discipline. Learn to take advantage of it.

All students, except 1st year students (who present rotation talks at a separate time) and 3rd year students (who will be presenting their comprehensive exam proposal) will present research updates every year during colloquium. A presentation open to the department is required for the comprehensive exam. This can be during the colloquium. This is followed by a defense with the committee.

Preparation of the Subject

Remember, attendees come to your seminar, colloquium or journal club to educate themselves. For this, ***you*** must know the subject. This requires good preparation of the subject and its presentation in 45 minutes, leaving about 10 minutes for questions and discussion. **THERE IS NO SUBSTITUTE FOR GOOD DATA** but a

good presentation only enhances its importance.

Specific suggestions for preparation of the colloquium include:

1. Like it or not, **English** is the internationally accepted language of scientific communication. **Learn it**.

2. Do all the background reading essential to understand the subject.

3. Be sure that you become familiar with the techniques used to get the data. Understand the limitations of the techniques as well as their advantages. If necessary, read original papers that describe the techniques.

4. Describe briefly any new method(s) [or modification of the old one(s)] that is used to obtain data.

5. Often the techniques use various reagents. Understand their functions in the procedure (for example, if you say, "PMSF was used to inhibit serine proteases," you **must** know answers to: What is PMSF? What are serine proteases? How does PMSF inhibit serine proteases?).

6. Use up to 5 minutes to introduce the subject. The introduction should help even the least informed attendee to feel interested in your seminar.

7. A 45-minute presentation normally will accommodate no more than 20-30 slides or overheads. Slides are extremely useful, but too many can be counterproductive.

8. A picture is worth a thousand words--provided you select a good picture! A slide with too many lines or numbers will **confuse** the audience. A good slide should be clearly **visible** in all its details to **everybody** in the room. If you have to apologize for the slide ("sorry, the real gel looks a lot better than the slide," "there are too many numbers on the slide"), don't use it. Make a better one. A speaker always uses the **best** data in a slide. A poor slide makes the original data suspect.

9. Too many similar slides are distracting (e.g.: gels, sequences of nucleotides or amino acids).

10. It is often useful to write the entire talk (or to use an outline keyed to the slides, etc.) and practice it in front of a mirror or your peers, but do all you can to avoid reading your talk.

<u>Presentation of the Data</u>

How you present your data to the group is also an important part of the process. Try to adopt the attitude that when you present a journal club (or any lecture, for that matter) you are sharing your own discoveries, concerns and excitement with your audience. With that approach, lecturing is more fun for the lecturer and more interesting for the audience.

1. Speak clearly and loud enough so that everyone hears and understands you.

2. If you do not wish to be interrupted during the presentation, say so in the beginning and inform everyone that there will be 10 minutes for questions and discussion following the presentation.

3. Arrange the slides in correct order and orientation and check the sequence. Be sure that each slide is clear. A slide showing a full DNA/RNA/amino acid sequence is not impressive if it is not visible or legible.

4. Make sure you have a **functional** pointer and **use** it to explain the slides. Do not stand in front of the

screen while showing the slides.

5. Be frugal with words. Be specific. Example: "This slide shows that 2 plus 2 equal 4" is better than "Basically what we have tried to demonstrate here in this slide is that the sum of 2 and 2 is equal to 4."

6. As much as possible, avoid terms such as "What I am trying to say is . . . ," "To put it differently, . . . ," "In other words, it could be clarified as . . ."

7. Always have a summary slide. Show it to emphasize the "take home" message.

8. During the question-discussion period, take notes of any new ideas that come from the audience and make an effort to thank the contributor.

9. If you do not know the answer to any question, admit it and seek the answer from the audience. This is better than giving a long-winded answer with no substance.

10. During your preparation of the talk, anticipate questions. For starters, you may ask yourself what experiments you would do to disprove the hypothesis or what the essential control experiments are or should have been.

11. Often, someone totally unfamiliar with the subject comes up with the **most** basic question, which never occurred to the expert. (A brilliant chemist told a farmer that he wanted to discover a universal solvent--everything would dissolve in it. The farmer asked, "Where will you keep it?")

Comprehensive Exam

Nature of the Comprehensive Exam

The Comprehensive Exam (often referred to as the “Preliminary Exam”) is one of the devices by which the faculty monitors the progress of a student toward the Ph.D. degree. The goal of this exam is to test in a comprehensive fashion whether the student has assimilated formal studies and research experiences in a mannerand to a degree that indicates adequate progress toward becoming an independent research scientist.

The exam is conducted by a committee of five faculty members, four of which are members of the student’s regular dissertation committee while the student’s advisor is replaced by an *ad hoc* member from the regular BCMB faculty. If the committee consists of only four faculty members, then two *ad hoc* members will be appointed. The appointment of *ad hoc* exam members will be performed by the Departmental Graduate AffairsCommittee. The exam follows one of two alternative formats. In the first format, each committee member presents the student with a research question/topic suitable for the design of a grant proposal. In the secondformat, the student prepares a grant proposal based on his/her thesis work. In either case, the student is expected to develop a full proposal that could be submitted to NIH. The student, in consultation with their faculty mentor, should decide during the student’s second year which format the exam will follow. The student should then communicate their choice of exam format to their exam committee and the chair of the graduate affairs committee.

Exam Format 1: In **Exam Format 1*,*** the student prepares a grant proposal with a hypothesis based on a topic within or closely related to their thesis work. The student is highly encouraged to begin work on the proposal as soon as they have joined their dissertation lab. The project being proposed should tackle a major, timely, and tractable question in the student's field. Ideally, the proposal will be based on the student’s own research and it is expected that the proposal will expand beyond this

to encompass research that would be expected to take several years. Specifically, the proposal must include the following:

1. A central hypothesis or model and a detailed presentation of experimental approaches to investigate the model. The experimental rationale for proposing this hypothesis needs to be articulated.
2. A required part of the proposal is a summary of the student's research accomplishments to date, along with any preliminary results from their research. It is expected that this will be used as the background and significance section of their proposal from which they will develop a research plan and directions of future research from this starting point.
3. While it is natural, and even expected, that the research narrative will parallel the research program within the student's advisor's laboratory, it is important that the proposal be formulated independently by the student and thus give evidence of the student's creative ability to devise experimental questions and approaches, and illustrate their critical thinking skills.

A short preliminary proposal (one to two pages) describing the background, significance, specific aims, and potential outcomes of the student's proposal has to be submitted to the exam committee and to their thesis advisor at least 8 weeks before the submission of the written proposal.Students are encouraged to consult with their committee prior to writing the preliminary proposal well ahead of the submission date to determine if the project idea they wish to propose is acceptable. The exam committee will review the preproposal to determine the suitability of the topic area and research proposal. The committee may consult with the thesis adviser to assess the independence of the ideas proposed by the student. The chair of the exam committee will compile comments from exam committee members and provide feedback within 5 days of receiving the preliminary proposal. If required by the committee, the student will re-work the preliminary proposal and resubmit it for evaluation. This may mean rethinking the research directions originally proposed.

Once the preliminary proposal is acceptable, the student will be allowed to proceed with the full proposal. However, if after 3 weeks (5 weeks prior to the date scheduled for the exam) the preliminary proposal is deemed unacceptable by the committee, the exam will be postponed and the committee will meet with the research mentor to discuss the issues and determine how to proceed. Options to consider are: 1. major overhaul of the thesis proposal and resubmission in the subsequent term; 2. Request that the student switch to the master's track; or 3. In extreme cases, dismissal from the program.

Exam Format 2: Students are encouraged to pursue format 1. However, in unusual circumstances (such as changing research mentor, complete lack of research progress, project deemed inviable), an alternative format (format 2) may be chosen. In this case, the student should provide justification and obtain permission from the exam committee chair ahead of time. In **Exam Format 2**, each committee member presents the student with a research question/topic suitable for the design of a hypothetical grant proposal. As an example, here are exam questions from previous terms:

- *The cystic fibrosis transmembrane conductance regulator (CFTR) is a chloride channel that is expressed in the apical membrane of epithelial cells. This channel is thought to be critical for trans-epithelial salt and fluid transport, and defects in these properties lead to the symptoms of cystic fibrosis. The channel possesses a regulatory domain that is a target for protein phosphorylation by PKA and PKC. Phosphorylation by either leads to activation of channel activity but by a different mechanism. Design a series ofexperiments to dissect the structural and functional properties of this membrane channel and eluci-*

date how phosphorylation by either kinase leads to a higher activity state of the channel.

Viswanathan Raghuram, Hayley Hormuth and J. Kevin Foskett, Proc. Natl. Acad. Sci. USA 100, 9620-9625, 2003

- *Mutant forms of the human BRCA1 protein are implicated in the causation of breast and ovarian cancers. The BRCA1 protein has also been postulated to play a role in DNA repair – it interacts with other proteins in the DNA repair pathway and BRCA1 mutant cells show sensitivity to DNA-damaging agents. Some clues to these diverse effects come from a recent paper by Bochar et al. (2000), where it is shown that the BRCA1 protein is associated with the human SWI/SNF-related chromatin remodeling complex. Propose a program of experiments to test how BRCA1 and its complex may function in DNA repair. You will probably want to pay attention to the potential role of this complex in chromatin remodeling. You will note that the discussion of the cited paper proposes two hypotheses; you may feel free to develop other hypotheses.*

  Bochar DA et al. 2000. BRCA1 is associated with a human SWI/SNF-related complex: Linking chromatin remodeling to breast cancer. Cell 102:257-265. (July 21 issue)

- *Posttransciptional gene silencing (PTGS) is a phenomenon that involves the targeting and degradation of selective RNA, particularly double stranded RNA. In higher plants, this process is proposed to be partof an ancient defense mechanism against infection by pathogenic viruses. The signaling network involved in this process involves a proteinase, HC-Pro. Yeast two hybrid analyses suggest that this proteinase interacts with a putative calcium regulatory protein of the EF hand family, rgs-CaM. Work with transgenic plants suggests that both HC-Pro and rgs-CaM are involved in PTGS, but details of how they interact, the nature of the calcium signal involved and the sequence of events leading to PTGS and RNA degradation are still obscure. Propose a set of experiments to investigate the nature of the macromolecular interactions that lead to PTGS.*

  Science 200, 142-144, 2000.

After a period of preliminary literature review and analysis (usually no longer than one week), the student will select one topic for the focus of the exam. The student will inform the chair of the exam committee of the choice of topic and will proceed to develop a research proposal related to that topic. From the receipt of the questions, the student has exactly five weeks to choose one question and develop a research proposal which will be delivered to the exam committee.

For Either Format:
In either format, the student will prepare the written portion of the exam in the form of a grant proposal using the NIH (http://grants.nih.gov/grants/funding/phs398/phs398.html) guidelines. The grant proposal should have the following properties:

I. A face page with the title of the project.

II. A project summary in NIH format.

III. A research project plan in the NIH format. A typical structure for the project plan would include: a specific aims page, a background section summarizing the literature in the area and culminating in a statement of the problem and central hypotheses of the work, an experimental design and rationale section including hypotheses tested, procedures used, and results expected from the work.This part of the proposal should be written clearly and should not exceed 15 single spaced type-

written pages (minimum font is 11 pt) including figures but **not** including literature cited.

IV. A list of references with titles and names of all authors.

Note that budget pages, typical of most grant proposals, are not required for the exam.

The written proposal must be delivered both as a hard copy and in electronic form to each member of the exam committee no later than 5 PM one week prior to the formal oral exam date and defense. The student will then prepare a 50-minute seminar, which will be presented to Departmental faculty and students one week after the submission of the written exam.

The oral presentation ordinarily occurs during the regular Monday Graduate Research Colloquium but does not need to occur at this time and can be scheduled separately from the colloquium as long as the presentation is broadly announced and broad participation by the department is possible. The oral examination and defense before the exam committee will take place on the same day, after the seminar.

When should the Exam Occur?

A candidate for the Ph.D. degree takes the Exam approximately at the time of completion of most, if not all, of the formal course requirements set by Departmental and Graduate School rules and the student's dissertation committee. Exams have to be scheduled for fall semester of the 3rd year. The exam process (including aretake, should one be necessary) must be completed before the beginning of the student's fourth year in the program. The decision that a student is ready to take the exam is made by consultations between the studentand the major professor. Failure to pass the preliminary exam by the beginning of the fourth year in the program is grounds for dismissal.

If the student's dissertation committee believes the student is not ready to take the preliminary exam in the fall of their 3rd year, they may submit a petition to the Graduate Affairs Committee for an exemption. In this case, a written memo from their thesis committee must be submitted to the Chair of the Graduate Affairs committee requesting an exemption.

Students who complete the Master's degree and who are given approval by their thesis committee to pursue the Ph.D. will schedule the exam the semester following completion of the M.S.

International students must have passed the OPIc test with a score of AH (with AH or better being their most recent OPIc test score) in order to take the exam. Alternatively, if the student has a score of AL on the exam, they may submit a petition to the Graduate Affairs Committee for an exemption. In this case, a written memo from their thesis committee must be submitted to the Chair of the Graduate Affairs committee requesting an exemption on the basis of the student's proficiency at both speaking and writing in English.

How to Arrange for an Exam

With approval of the major professor, the student should negotiate the timing of the exam with the Department exam coordinator (typically the Chair of the Graduate Affairs Committee), who will do the following:

1. Arrange for an appointed *ad hoc* member to serve on the committee, with approval of the Department Head or Chair of the Graduate Affairs Committee. (Note that the student's major professor cannot serve on the exam committee). The other 3 or 4 committee members are those on the student's dissertation committee. In cases where there are only 3 dissertation committee members in addition to the mentor, 2 other faculty members will be appointed to the prelim committee (for a total of 5).

2. Establish a timetable for the exam that is acceptable to the student and the exam committee members.

Logistical problems the exam coordinator will resolve are: seating an exam committee member who is not a member of the student's dissertation committee, equitable distribution of exam committee assignments among the faculty, finding committee members who accommodate the timetable established for the exam, and scheduling the exam cycle so that the oral presentation will occur, if possible, at a regularly scheduled Graduate Research Colloquium. Note that scheduling the oral portions of the exam during the summer or between semesters may be difficult due to the uncertainty of assembling your exam committee during those times. It is recommended to plan ahead in order to avoid these times. **It is the student's responsibility** to arrange for a room for the oral defense and to make sure that all members of the preliminary exam committeeare informed of the time and location of both the oral presentation and oral defense portions of the exam.

Criteria for Evaluating the Preliminary Exam

A suitable research proposal has several elements: (1) clearly formulated hypotheses and specific aims; (2) the historical background from which the problem and the hypothesis or hypotheses emerged; (3) a series of ***direct and feasible*** experiments designed to test the hypothesis; and (4) a consideration of the possible forms of data which might emerge from those experiments, as well as the problems of interpreting those data. The examination committee evaluates each of these components. Following are some general guidelines to bear in mind during preparation of the written research proposal and the oral presentation. All research proposals are evaluated on similar criteria.

Originality Is the proposed research original in the sense that it will provide significant new information and knowledge on a previously unexplored problem or unanswered question of scientific importance? In this regard, will the proposed research advance new hypotheses or utilize new experimental and/or conceptual approaches to develop new knowledge?

Problem Identification Has the proposal clearly identified and stated a significant scientific problem that limits further expansion of knowledge and understanding of fundamental processes and principles? In making this determination, has an adequate literature review been conducted that identifies conflicting, antagonistic and supporting evidence of the research problem?

Hypotheses What are the basic hypotheses to be tested? Can these hypotheses be nullified? What are the alternatives if a hypothesis is rejected? How do the hypotheses relate to the problem identification?

Goals and Objectives Has the overall goal of the proposed research been identified in terms of achievements for the successful outcome of the investigation? What constitutes a successful outcome of the research? To achieve this goal, what specific objectives must be met to experimentally test hypotheses and to provide information to move the research forward?

Experimental Plan How will the experiments be conducted and what are the appropriate controls? What are the major pitfalls to be encountered and what are the alternative strategies? Will the methods to be employed and experiments proposed provide unambiguous data and experimental results? Do they address the hypotheses presented in the proposal? A consideration of experimental limitations and anticipated problems in interpreting results frequently demand the creating of "if/then" links between the postulated experiments,which should be carefully spelled out in the proposal.

Scope Can the experimental plan be conducted within the time frame of the proposed work? Do the objectives and experimental plan lead to a cohesive targeted plan of research that will clearly result in hypothesis testing and problem solving? Has care been taken to ensure that the research plan is not overly ambitious,

trying to accomplish too much and too many research objectives?

Significance Successful outcome of the research should be measurable by contributions made to fundamental principles. What contributions will be made that will lead to new problem identification and new avenues of research? How will the results of the proposed experiments advance knowledge in the area? The significance of any research project is somewhat intangible, but good research usually leads to more questions than answers.

General Guidelines for the Student

The faculty intends that the exam process will simulate, as much as possible, the professional demands that a scientist will face while pursuing a research career. Thus, the student should adopt an approach to the exam in keeping with an attitude of professionalism. It is necessary to utilize heavily the information resources of the University, including the information and perspectives to be found in the knowledge of colleagues. As the student formulates portions of the research proposal, it is both reasonable and desirable to elicit constructive criticism of the ideas and the method of presentation, just as one should do in preparing a real grant proposal for submission to a funding agency. One artificial circumstance of the exam process is that the major professor and the members of the exam committee are not available as consultants during the exam period, exceptthat it is reasonable for the student, while deciding on the choice of a topic in format 1, to discuss with a committee member the nature or scope of the topic submitted by that member. Note that similar rules applyto format 2 in that the student is encouraged to develop her/his research in consultation with her/his advisorand dissertation committee, but that this input has to be scaled back during the development of the actual proposal for the exam.

The student is responsible for typing, copying and distributing the research proposal. Copies of past preliminary exams are available in the departmental office.

How Exam Committees Operate

In case the student chooses the **first format**, the exam committee chairperson, in consultation with the other committee members, will prepare a list of topics chosen and questions to provide some diversity of choice prior to the scheduled starting day of the exam. These topics will be made available to the student in writing or by email on the morning of the appointed starting day.

In case the student chooses the **second format**, the exam committee will evaluate the preliminary proposal to assess the degree of independence from the advisor's work that the student's proposal displays. If the committee deems the student's proposal to be only derivative, the committee chair will inform the student within three days of specific changes that should be included to provide sufficient independence of thought.

The exam committee members will receive and evaluate the written version of the exam, attend the Research Colloquium presentation, receive reactions to that presentation from the faculty at large, and participate in the oral defense which follows. They will then meet as a group to discuss their evaluations of the components of the exam, and arrive at an overall evaluation.

Possible Outcomes of the Exam

The exam may be graded PASS, CONDITIONAL PASS, FAIL with opportunity to retake, or FAIL. A conditional pass means that specific remedial action is required by the student to improve the written proposal. For example, the student may be asked to improve its clarity, organization and/or grammatical adequacy before the exam committee submits a final decision of PASS or FAIL. In the case of a CONDITIONAL PASS or FAIL with opportunity to retake, it is up to the exam committee whether or not the student needs to give a new presentation to the department. Normally, students are given a second opportunity to take the exam should they fail the first attempt (FAIL with opportunity to retake). However, in some cases the committee can pre-

scribe, in consultation with the student's advisor, that no second chance should be possible (FAIL). Exam committees are sensitive to the pressures which students experience during exam times, and will make every effort to complete and report the evaluation to the student with all possible haste.

The outcome of the exam is reported to the Department Head, the Chair of the Graduate Affairs Committee, and to the Graduate School with a letter addressed to the student and signed by all members of the examining committee.

Should the student receive an evaluation of FAIL on the first attempt at the comprehensive exam and the committee approve of a second exam, he/she may request a new examination, following the same procedure as chosen for the first exam. In other words, the second attempt needs to be in the same format as used for the first attempt.

Committees that record a FAIL with opportunity to retake should offer suggestions about preparation and/or timing for any reexamination, and a student would obviously be well advised to heed those suggestions. Note carefully, however, that any reexamination must fit within the time limitations stated earlier, i.e., be completed before the end of the summer term of the third year. Evaluation of the second try is only PASS or FAIL.A third attempt is not permitted. If a student fails twice, they have the option of completing the requirements for a Master's Degree, or withdrawing from the program.

Questions about the Committee's Decision

The chairperson of the exam committee will explain to the student the nature of the decision made by the committee. The student should feel free to ask questions about that decision, but must not expect the professional evaluation of this type of exam to be done with the detailed grading used in an exam associated with a course. Any inadequacies of the performance will usually be described in general terms (e.g., the experimental approach is flawed due to technical inadequacies; the approach is indirect and will not test the proposed hypotheses; etc.). If the student is not satisfied with the action of the exam committee, the matter should be discussed promptly with the Department Head, but he/she should not expect any change in the decision.

Plagiarism

It is each student's responsibility to be familiar with, and adhere to the letter and spirit of the UT Honor Statement. One particular area of concern with respect to preliminary examinations and other written work is the potential problem of plagiarism. Simply stated, this will not be tolerated in any form. If an act of plagiarism occurs in the preparation of the preliminary examination, the student will fail the examination and will be referred to an Academic Review Board of the University. Several good examples of what constitutes plagiarism and what constitutes acceptable paraphrasing are given in the following web site: http://www.indiana.edu/~wts/pamphlets/plagiarism.shtml

If you pass

You will need to fill out and submit an *Application to Candidacy* Form. This can be obtained from the graduate school at: http://gradschool.utk.edu/gradforms.shtml

Final Oral Exam/Dissertation Defense

The culmination in a student's graduate education comes when the results of the student's research are presented to the Department. The student's dissertation committee gives approval for the student to begin pre-

paring the dissertation when he/she has satisfactorily completed all experiments required by the mentor and committee. Prior to the oral examination, a written dissertation shall be prepared and submitted to the mentor and other dissertation committee members. Normally, the dissertation will have been read and edited by the mentor prior to submission to the other committee members so that the version submitted to the committee should be nearly finalized, in proper format required by the Graduate School. The written dissertation should contain a thorough and professional presentation of all results pertinent to the hypotheses and conclusions of the dissertation. Students should be aware that writing a dissertation is a big endeavor that will usually take several months. Please be prepared to go through several drafts and revisions with the mentor prior to the time at which the dissertation should be distributed to the committee.

The oral defense will be scheduled by the seminar committee, as arranged by the graduate student's mentor, and will be coordinated with the completion of the written dissertation. Final oral examinations will consist of a formal open public seminar describing the research to be presented to the faculty, staff and students in the Department. Oral defenses that occur during the fall or spring semesters will preferably be scheduled at the weekly departmental seminar on Wednesday. Alternatively, the presentation may be given at the Graduate Research Colloquium. Oral examinations that occur during the summer term will be scheduled as needed and announced to the Department. Following the formal seminar presentation, the graduate student will meet with the dissertation committee for an oral examination that deals with the material presented in the oral presentation and written thesis/dissertation. To pass the final defense, all three components (the written thesis, the seminar presentation, and the oral examination) must meet the approval of all committee members. It is not unusual for committee members to require written revisions in the thesis before a final pass is awarded and the degree is conferred. Upon completion of all components of the final defense, each committee member must sign the final examination form to be submitted to the Graduate School.

Request for Extended Time to Graduation:
Graduate students are encouraged to complete their PhD within 7 years or less. However, for students who are in their 7th year (G7) who need to continue into their 8th year to complete their dissertation, they must work with their PhD mentor and dissertation committee to create a plan of action for completing and defending their dissertation before the end of their 8th year. The plan, signed by the student and the student's PhD mentor, must be submitted to the Director of Graduate Studies (DGS) prior to the end of their 7th year.

For students who are in their eighth year (G8) prior to graduation, if it is clear that they will not be able to finish their dissertation by the end of the year *as indicated in their previously submitted plan of action* (see above), a **Formal Extension Request** must be requested from the DGS. The request must be submitted **prior** to the end of the second semester of the student's 8th year. The request will include a) the current and the two prior progress reports, b) the previously submitted plan of action, and c) a revised plan for completion of the dissertation within the next academic year, approved by the student's dissertation committee. Extension requests must include a detailed timeline for completion within the upcoming academic year. This request must be signed by the student, the student's PhD mentor, and the members of the student's dissertation committee. **Extension requests will not be approved if a plan of action was not sent to the DGS during the previous academic year**. If approved by the DGS and Graduate Affairs Committee, the request will be forwarded to the Department Head. Only after the approval from Department Head, will an Extension from the Graduate School be requested by the Department Head. If the extension is granted and the dissertation is not defended and accepted by the new deadline, **the student will be withdrawn from candidacy**.

ACADEMIC STANDARDS, PROBLEMS, AND APPEALS

Graduate School Standards

You must maintain an overall GPA of at least 3.0 on all graduate coursework to be in good academic standing with the graduate school. If your GPA falls below 3.0 after completing 9 hours of graduate level course work, you will be placed on academic probation. You can continue in graduate school if each subsequent semester's grade point average is 3.0 or better. Upon achieving an overall GPA of 3.0 the student is removed from probationary status. If a student has a second semester with a GPA below 3.0 the Dean of the Graduate School

will terminate the student's degree status.

No graduate course with less than a "C" grade (a "D" or "F") can be used to satisfy a degree requirement.

A graduate course cannot be repeated to raise a course grade. (In effect this means you get one attempt and one attempt only at the course with grade).

Students can receive an Incomplete for courses on a case-by-case basis, but needs to fulfill required coursework as outlined in University policies. It is the student's responsibility to discuss with the faculty member(s) teaching the course to determine when and how this will be accomplished.

A 400-level course may be taken for either graduate or undergraduate credit.

Students are responsible for academic integrity and adherence to the Honor Statement of the University. The following is taken from **"Hilltopics"**, the UTK Students Handbook 2009-2010:

The Honor Statement

An essential feature of The University of Tennessee is a commitment to maintaining an atmosphere of intellectual integrity and academic honesty. As a student of the university, I pledge that I will neither knowingly give nor receive any inappropriate assistance in academic work, thus affirming my own personal commitment to honor and integrity.

A thorough understanding of the Honor Statement, stated above, is essential to the success of the honor system. The following avenues will be utilized to facilitate implementation of the statement:

1. The Honor Statement, with its attendant pledge, will appear on applications for admission (undergraduate and graduate); and applicants to the University will be required to acknowledge their affirmation by signing and dating the document as specified.

2. Information regarding the Honor Statement will be included in the catalogs (undergraduate and graduate).

3. The Honor Statement will be discussed during freshman, transfer, graduate student, and international student orientation programs.

All groups within the university community have responsibilities associated with the Honor Statement. These responsibilities are unique to each sector of the university community.

Each student is responsible for his/her own personal integrity in academic life. While there is no affirmative duty to report the academic dishonesty of another, each student, given the dictates of his/her own conscience, may choose to act on any violation of the Honor Statement.

Plagiarism

Students are also responsible for any act of plagiarism. Plagiarism is using the intellectual property or product of someone else without giving proper credit. The undocumented use of someone else's words or ideas in any medium of communication (unless such information is recognized as common knowledge) is a serious offense, subject to disciplinary action that may include failure in a course and/or dismissal from the University. Specific examples of plagiarism are:

1. Copying without proper documentation (quotation marks and a citation) written or spoken words, phrases, or sentences from any source

2. Summarizing without proper documentation (usually a citation) ideas from another source (unless such information is recognized as common knowledge)

3. Borrowing facts, statistics, graphs, pictorial representations, or phrases without acknowledging the source (unless such information is recognized as common knowledge)

4. Collaborating on a graded assignment without the instructor's approval

5. Submitting work, either in whole or in part, created by a professional service and used without attribution (e.g., paper, speech, bibliography, or photograph)

Academic Integrity

The responsibility for learning is an individual matter. Study, preparation and presentation should involve at all times the student's own work, unless it has been clearly specified that work is to be a team effort. Academic honesty requires that all work presented be the student's own work, not only on tests, but in themes, papers, homework, and class presentation. There is a clear distinction between learning new ideas and presenting them as facts or as answers, and presenting them as one's own ideas. It is part of the learning processto incorporate the thoughts or ideas of others into one's own mind and presentations with the purpose of learning and enlarging on personal boundaries of knowledge.

For more information on these topics
A*cademic Policies and Requirements for Graduate Students*,
http://catalog.utk.edu/content.php?catoid=17&navoid=1763

Academic integrity in *Hilltopics Student Handbook*, http://web.utk.edu/~homepage/hilltopics/

BCMB Program Standards/Progression Through the Program

Graduate education requires continuous evaluation of the student. This includes not only periodic objective evaluation, such as the cumulative GPA, performance on comprehensive examinations and acceptance of the thesis or dissertation, but also judgments by the faculty of the student's potential and progress. Continuation in the program is determined by consideration of all these elements by the faculty and Department Head.

Evaluation of Status, Normal Progress, Requirements for Good Standing

Upon completion of the first-year of graduate level courses, including three laboratory rotations (see p 25), the entire faculty evaluates each student's performance and a decision is made to place him/her in either the M.S. or Ph.D. degree program. To qualify for the Ph.D. track, each student is expected to achieve a 3.5 GPA or above as well as to maintain a high level of performance in lab rotations. ***[Although GPA is used as a guideline, it is only one indicator and achievement of a 3.5 or better is not a guarantee of placement in the Ph.D. track.]*** A formal letter will be sent to each student from the Department Head at the end of the first-year indicating the decision in his/her case and explaining exactly how each student was evaluated. Students are encouraged to see the Head if they have any questions and/or to discuss their immediate future in the Department.

The academic records of all graduate students are reviewed at the end of each semester, including the summer term. Graduate students must maintain a cumulative GPA of at least 3.0 on all graduate courses takenfor a letter grade of A-F.

Terms for Probation

A cumulative GPA below 3.0 in any semester will require placing a student on probation. A student has one semester to bring the cumulative GPA above 3.0 to remove the probationary status. If a student is placed on probation, he/she will be notified in writing.

Conditions Resulting in Dismissal

A cumulative GPA below 3.0 for any two consecutive semesters in residence is grounds for dismissal (see Graduate School Catalog). Similarly, insufficient research progress as documented by a grade of NP for research towards thesis (BCMB 500, M.S. Students) or dissertation (BCMB 600, Ph.D. Students) in two consecutive semesters can be grounds for dismissal. In this case, the mentor and student's committee may recommend to the department head that the student be dismissed from the program. Additionally, a grade below a B in BCMB core courses will be grounds for dismissal. In addition, to these performance issues, in the rare case that after 4 rotations, the student cannot find a mentor willing to accept the student into their lab, this may trigger the dismissal from the program and/or loss of departmental GTA support. Both of these issues will be addressed and determined by the graduate affairs committee in consultation with the department head. In these cases, the department head will inform the student personally with the DGS and in writing as to the decision and the reasons behind it.

Early Termination/Withdrawal

If a student is terminated or withdraws from a program prior to the end of the semester, the student will be responsible for payment of tuition and other fees from the termination/withdrawal date until the end of the semester. The responsibility for paying tuition and fees will apply to all students, including those who have tuition waivers during the semester in which they are terminated/withdraw early. Please see the graduate catalog for additional information about early termination/withdrawal at:

http://catalog.utk.edu/content.php?catoid=23&navoid=2827#fees_fina_assi

and

https://onestop.utk.edu/withdraw/.

If you are considering early withdrawal, you should contact the Bursar's office to inquire about the financial ramifications for early withdrawal.

Notification of Change in Status

Notification of change in status generally occurs between the spring and summer terms of the first-year but can occur at any time after the first semester in unusual cases.

Student Appeals Procedures

The Department recognizes that there will be occasions on which a student perceives that he/she has received an inappropriate grade or has otherwise been treated unjustly by a member of the faculty. We believethat such instances require prompt and careful review. To facilitate this review, the following procedures should be followed.

1. The student shall attempt to resolve the matter with the faculty member in question.

2. If the matter cannot be resolved with the faculty member, the student should notify the Department Head. This notification should be in the form of a written narrative outlining the act(s) the student perceives as unjust. This initial appeal must be filed no later than 30 days after the incident that occasioned the appeal.

3. The Department Head will consult with the Graduate Affairs Committee to investigate the complaint. If the complaint involves the student's academic performance (e.g. quality of answers on an exam) an *ad hoc* committee member who is familiar with the academic sub-discipline involved will be appointed, if necessary.

4. Within 30 days, the committee will meet separately with the student and with the faculty member involved, and will review any pertinent documents submitted by either party. On the basis of this examination, the committee will report to the Department Head, indicating whether it believes an unjust act has occurred.

5. The Department Head will review the committee's report and either accept or reject the committee's recommendation. If the final decision finds no unjust act, the Head will inform the student of that decision and the reason for it. If it is judged that an unjust act has occurred, the Department Head will consult with the faculty member involved, and attempt to negotiate a remedy. The Head will communicate the outcome of these activities to the student.

6. If the Departmental decision is not satisfactory to the student, he/she may appeal that decision to the Dean of the College. This appeal must be filed no later than 30 days after the final decision at the departmental level. Consult this document for more information: http://gradschool.utk.edu/documents/2016/02/student-appeals-procedures.pdf

APPENDICES

Staff, Facilities and Instrumentation

The research environment in the biological sciences benefits from a variety of resources that offer unique services and support. It is important for students to be familiar with the available facilities and to understand the important role that each plays in the operations of the BCMB Department at The University of Tennessee. A summary of key offices, facilities and resources follows, along with key contact people in each of the areas:

Biology Business Office

The Biology Business Office (BBO) handles all ordering and accounting for the Department. BBO orders are placed online. Go to http://bbo.utk.edu/ for form and instructions. Please note it is the responsibility of the individual requesting an order to provide the name of the company, address, telephone number, catalog item number, and description of the item. A price is also requested for each item on the order. Direct any questions you have about vendors or ordering procedures to the experienced people in the BBO.

2nd Floor Mossman Building
Phone: (865) 974-5081
FAX: (865) 974-0978

Biology Service Facility

The Biology Service Facility (BSF) houses a machine shop, an electronic shop, a woodworking shop, and a glassblowing shop which are available to staff and students within the Department. BSF also takes care of the Biocomputing computers that includes the biology servers.

Requests for custom equipment or computer hardware can be handled through this office. The BSF also handles repairs on existing equipment. Equipment repair requests are made by calling the BSF with details and the appropriate account number to cover the cost of the repairs. Any problems with the physical plant (plumbing, electrical, etc.) should also be forwarded to this office. Get to know these people! Their website is http://bsf.utk.edu/.

Room 125 Austin Peay Building
Phone: (865) 974-4219
Manager: Daniel Tipton

Animal Facility (https://biology.utk.edu/animal/)
Located in 135 Mossman Building.
Abby Turner manager, Phone: 974-2801; email : aturne79@utk.edu

BCMB Computer Laboratory (3rd floor Mossman)

A computer laboratory with 25 PC workstations is available to faculty, staff and graduate students within the Department. The laboratory is also utilized for teaching at the undergraduate level in some courses. Entrance to the computer lab is gained by a secured lock system that is keyed to individuals' 4-digit codes. Access to the laboratory is given to approved individuals after the appropriate paperwork is processed through the departmental office and the BSF. You should complete this request form soon after you arrive in the Department to begin study. All workstations are interfaced via the internet to laser printers and the central campus

computing facilities. Each computer is equipped with software for word processing (Microsoft Word), a spreadsheet program (Microsoft Excel), a graphics package, a chemical drawing program, molecular modeling software and communications software for linking to the Internet. Other software that is specific for certain undergraduate and graduate courses is also installed at each workstation. The computer laboratory is open to graduate students for academic needs, including preparation of written copy and data analysis for laboratory reports, exams, manuscripts, etc. Learn to use the computers!!! STUDENT FILES MUST BE SAVED ON external devices - NOT ON THE HARD DRIVE!!! Note that students are required to provide their own storage devices and paper.

Internet Access at UTK

The use of university information technology resources is a privilege extended in good faith to authorized students, employees, alumni and affiliates for purposes relating to education, research, service and administration. Responsible and acceptable use promotes the confidence, integrity and availability of information technology resources, as well as the authentication and accountability of each user.

In keeping with this policy, the university's chief information officer has established the Information Security Office within the Office of Information Technology (OIT). This office is charged to develop and maintain a statewide Information Technology Security Program for the University of Tennessee and create the Information Technology Security Strategy for the Knoxville area campus. For more information, please visit the security website located at http://security.utk.edu

Radiation Safety Office (https://radiationsafety.utk.edu/)

The Radiological Safety Office oversees all usage of radioisotopes for research on the UTK campus. Faculty members who use radioisotopes are licensed through this office for specific types and amounts of radioisotopes. All orders for isotopes must have the license number on the order, and all radioactive materials are received through this office. Examinations to test for knowledge about radioisotopes and their use are administered by this office. Any accidents involving radioactive materials must be reported to the Radiation Safety Office immediately. All students are required to pass an exam administered by the Radiation Safety Office regarding the policy for isotope usage at the University of Tennessee.

Phone: (865) 974-5580
email: radiationsafety@utk.edu
Radiation Safety Officer: Marsha Smith

Environmental Health and Safety Services (https://ehs.utk.edu/)

The Environmental Health and Safety Services office ensures that research laboratories at UTK offer a safe working environment. Questions about general safety, biohazards, or chemical waste should be addressed to this office.

Phone: (865) 974-5084
email: ehs_labsafety@utk.edu

BCMB Bioanalytical Resources Facility (http://bcmb.utk.edu/research/bioanalytical-resource-facility/)

The Department is well equipped with modern instrumentation essential to conducting research in a wide variety of areas. Some equipment is for general departmental use, while other items are housed and operated in individual research labs. A list of equipment available is on their website.

Manager: Ed Wright, email edwright@utk.edu

Other Analytical Facilities (listed at: https://bcmb.utk.edu/research/research-facilities-support/)

Certain pieces of highly specialized equipment, which are used by many researchers within the Division of Biology, are maintained within special facilities. Trained personnel operate these facilities on a fee-per-service basis for those using the instrumentation. Fees cover the cost of maintaining the equipment, service contracts, and technical support. Three such facilities are currently available:

1) Advanced Microscopy and Imaging Center (https://microscopy.utk.edu/)
Manager: Jaydeep Kolape, Phone 974-0904; email jkolape@utk.edu

2) Genomics Core (https://dna.utk.edu/)
email: bioseq@utk.edu

3) Biological and Small Molecular Mass Spectrometry Core (https://chem.utk.edu/facilities/biological-and-small-molecule-mass-spectrometry-core-bsmmsc/)
Buehler Hall 613
Core director: Shawn Campagna

Guide to Library Resources

Collections: Books, journals, and other materials in biology, biochemistry, and related fields are housed in theHodges Library. Some materials in microbiology, immunology, and entomology are also held in the Agriculture-Veterinary Medicine Library.

Borrowing Privileges: Your UTK ID card serves as your library card and must be presented to borrow materials. Graduate students can borrow books for 35 days and bound periodicals for 3 days. Books can be renewedin person or by telephone (974-6880).

Library Catalog: The online catalog of materials held in UTK Libraries is searchable from terminals in the Libraries and by remote access. A connection to the catalog is provided from the UTK Libraries home page (http://www.lib.utk.edu/).

Journal Databases: A number of databases that index journals in specific subject areas are available for searching in the Hodges and Ag/VetMed Libraries. Links to these databases can be found at: http://www.lib.utk.edu/cgi-perl/dbBroker.cgi?subheading=12

One useful database is Entrez. Entrez includes protein and nucleotide sequence data, a subset of over 1 million citations on genetics from the MEDLINE database, and access to BLAST searches. Entrez features a powerful yet easy-to-use menu-based interface. Entrez can be accessed at http://www.ncbi.nlm.nih.gov/sites/entrez

Library Resources: The Libraries' home page provides links to many library services as well as information sources in all areas of biology. Access to the internet is available in the Libraries and in many computer labs and offices on campus. The URL for LibLink is http://www.lib.utk.edu/. Look under “Subject Guides” for a guide to resources in biology.

Interlibrary Services: Books and articles from journals not held in the UTK Libraries can be requested from this office. For fastest service, submit your requests electronically via the World-Wide Web. A link to the Interlibrary Services request form is available on UTK library webpage (http://www.lib.utk.edu/). There is no charge for this service. Photocopies of articles are yours to keep.

Travel Policies and Procedures

The University of Tennessee provides reimbursement for those who travel in conjunction with employment duties. The following is an overview of what needs to be done to receive reimbursement. Detailed questions can be answered through the main office of the Department.

Obtaining Official Travel Status

All **out-of-state** travel must be approved in advance (at least 2 weeks notice) by a travel authorization. To get this authorization, a T-18 form must be filled out and submitted.

Reimbursements

Reimbursements are available with proper documentation to the extent previously approved. The following is a list of tips to help receive your reimbursement quickly. More information and instructions can be obtained through the Department.

1. Get Department Head approval.

2. Fill out an Authorization for Travel (T-18) 3-4 weeks in advance.

3. Save receipts from airline ticket, hotel, rental car, registration for meeting, etc.

The University of Tennessee, Knoxville

UT is a state-supported, coeducational institution with several campuses across the state. Much of the university's research effort is centered on the Knoxville campus, where there is an enrollment of about 26,000 students, approximately 6,000 of which are graduate students. The campus adjoins downtown Knoxville, and this proximity to the heart of East Tennessee's largest city serves to augment the cultural aspects of the university environment.

Students at UTK may enjoy a varied program of intercollegiate and intramural athletics, theater, music and other activities. The Student Aquatic Center has both indoor and outdoor Olympic-size pools. There are numerous tennis courts, handball, racquetball, and squash courts, and the varsity track is available for use by students. The university competes intercollegiately in most major and minor sports, with a growing emphasis on intercollegiate sports for women. Among the music groups on campus are the UT Opera Theater and the UT Symphony. Also active is a cultural attractions program that features such performances as those of the Tokyo and Julliard Quartets, Jean-Pierre Rampal, Alicia de Larrocha, and the Houston Ballet. Theater on the Knoxville campus is outstanding. The Clarence Brown Theatre Company, a professional theatre company with membership in the League of Resident Theatres (LORT) and Theatre Communications Group, Inc. (TCG) presents a varied repertoire of plays featuring nationally and internationally known guest artists. The CBT production program boasts three performance facilities: **The Clarence Brown Theatre** is a 581-seat proscenium theatre; **The Ula Love Doughty Carousel Theatre**, one of the nation's first arena theatres, is a versatile 400-seat space featuring flexible seating and staging; **The Clarence Brown Lab Theatre** is a 100-seat black box venue located inside the Clarence Brown Theatre. The Lab Theatre serves as home to productions sponsored by All Campus Theatre (ACT) and productions directly related to undergraduate and graduate class projects. Also, a superior film program is featured. A program on current issues brings to the campus stimulating and often controversial speakers who are nationally and internationally known.

Resources of the University

The University of Tennessee, Knoxville, is the oldest and largest campus of the University of Tennessee system. Its 550-acre campus with over 200 buildings is home to approximately 26,000 students, with over 8,000 faculty and staff. In 2009, UTK programs received more than $178 million from outside funding.

The Governor’s Chairs Program, initiated by Tennessee Governor Phil Bredesen, set out to exploit and enhance the synergy between the state’s flagship campus and the nation’s leading multipurpose national lab, Oak Ridge National Laboratory. It encompasses research in Biological Sciences, Environmental Microbiology, Energy Storage, Computational Sciences, Neutron Sciences, and Advanced Materials Sciences.

Moreover, the University’s ties with industry are powerful. One indicator is the amount of funding the University received from private industries, which was over $18 million in 2009, or 10% of our external funding.

The University's own particular strength, like that of all research universities (where 60 percent of the nation's research takes place), is the ability to investigate freely; to spin our promising ideas without the pressure to develop products; to build upon the base of information and knowledge in ways that increase mankind's storehouse of understanding. It is this kind of disciplined freedom that has led to many important scientific breakthroughs of recent history. It is this tradition the University seeks to uphold while at the same time

creating new pathways for the application of research in both public and private sectors.

The Science Alliance

The Science Alliance is a strong working partnership between the University of Tennessee, Knoxville and the Oak Ridge National Laboratory. By uniting these resources, the Science Alliance provides an extraordinary concentration of people, facilities, and funds to support scientific research, technological development, and educational excellence. Funded by the state of Tennessee, the goal of the Science Alliance is to help provide continued leadership for the United States and Tennessee in each of these closely related activities. Within the auspices of the Science Alliance are several Joint Institutes developed to foster research partnerships around the world. These include the Joint Institute for Advanced Materials, the Joint Institute for Biological Sciences, the Joint Institute for Computational Sciences, the Joint Institute for Heavy Ion Research, and the Joint Institute for Neutron Sciences. Resources from the Science Alliance are used to maintain cutting-edge research by providing resources for personnel and equipment. Graduate students are primarily aware of the Science Alliance because it provides funds for stipend supplements that are awarded each year on a competitive basis.

Pertinent Graduate Student Web Pages

• Best Practices in Teaching
http://gradschool.utk.edu/files/2009-10_BPIT-Flyer.pdf

• International Student and Scholar Services
http://international.utk.edu/

• Counseling Center
http://counselingcenter.utk.edu/

• UTK Graduate School with links to:
Graduate catalog, Funding, Fellowships, Assistantships for Graduate Students
http://gradschool.utk.edu

• Grad student appeals process
http://gradschool.utk.edu/GraduateCouncil/AppeComm/AppealProcedureApproved2009

• Graduate Student Senate
http://gss.utk.edu/

• International House
http://ihouse.utk.edu/

• Judicial Affairs
http://web.utk.edu/~osja/

• Office of Equity and Diversity
http://oed.utk.edu

• Office of Multicultural Student Life
http://multicultural.utk.edu

• Office of Research & Engagement
http://research.utk.edu/

• International Teaching Assistant Testing Program (OPIc) [formerly known as SPEAK TEST)

http://gradschool.utk.edu/graduate-student-life/ita-testing-program/
• Thesis/Dissertation Website
http://web.utk.edu/~thesis/

• VolAware – personal safety and related issues
http://volaware.utk.edu

• UTK Library Website
http://www.lib.utk.edu/

• OIT
http://oit.utk.edu/

Forms and Additional Resources
Copies available on Graduate School Website (http://gradschool.utk.edu):
• Graduate Student Deadline Dates
• Admission to Candidacy Application – Master's Degree
• Doctoral Committee Appointment Form
• Admission to Candidacy Application – Doctoral Degree
• Scheduling Defense of Dissertation Form
• Graduate Student Travel Award Forms (specific to department, college, and university (Graduate Student Senate Website)

STATEMENT OF NON-DISCRIMINATION

The University of Tennessee does not discriminate on the basis of race, sex, color, religion, national origin, handicap, or veteran status in provision of educational opportunities and benefits. This policy extends both to employment by and admission to t he University.

UT does not discriminate on the basis of race, sex, or disability in the education programs and activities which it operates, pursuant to requirements of Title VI of the Civil Rights Act of 1964, Title IX of the Educational Amendments of 1972, section 50 4 of the Rehabilitation Act of 1973, and the Americans with Disabilities Act (ADA) of 1990.

Inquiries and charges of violation concerning Title VI, Title IX, Section 504, ADA or the Age Discrimination in Employment Ace (ADEA), or any of the other above referenced policies should be directed to the Office of Diversity Resources and Educational Services (DRES), 1818 Lake Avenue, Knoxville, TN 37996-3560, telephone (865) 974-2498 (TTY available). Requests for accommodation of a disability should be directed to the ADA Coordinator at the Office of Human Resources Management, 600 Henley Street, Knoxville, TN 37996-4125.

A copy of the University of Tennessee Title VI Implementation Plan is available for public review at the following locations:

Knox County Public Library, Main Branch, Reference Department
500 W. Church Avenue
Knoxville, TN 37902

University of Tennessee, Knoxville
John C. Hodges Main Library, Reserve Section
1015 Volunteer Blvd.
Knoxville, TN 37996

This form is provided to help you summarize information for yourself, your mentor, and members of your committee.

BCMB Graduate Student Evaluation Form

NAME: DATE:

Student Portion

Date Entered Into Graduate Program: _____

Graduate Research Advisor/Major Professor:

Who are the members of your graduate committee?

List your lab rotations (Mentor and project)

1.

2.

Have you taken your preliminary examination?_____When?_____Passed?

If you are an international student, what was your most recent SPEAK test score, and when was that exam?

Anticipated Graduation Date:

List course requirements that have been completed and grade received (Attach a transcript).

List courses in which you are currently enrolled.

List courses needed to complete degree requirements.

List courses for which you have served as a teaching assistant, the semesters you were a TA, and the instructors.

List departmental presentations you have given and the date of the presentation.

List publications or abstracts (Full citation) on which you are an author. Indicate abstracts with an asterisk at the beginning of the citation. Indicate whether you presented the abstracts as poster or oral presentations at scientific meetings.

Name and give dates for scientific meeting participation.

List any awards, honors, fellowships, etc. that you have received.

List any undergraduate students you have mentored, the dates, and the project they worked on.

List any outreach or service activities (to the department/college/UT/community) in which you participated.

Briefly describe your research activities this past year

Indicate your plans for the next academic year with respect to coursework, research, examinations, scientific meetings, etc. What are your goals for the next year?

How would you assess your progress within the graduate program?

Advisor/Committee Portion

What is the committee's evaluation of the graduate student? Please address coursework, SPEAK test, TA performance, research, long-term goals, etc. If there are specific problems, what plan for overcoming them has been discussed with the student?

Self-assessment (optional)

Skills Assessment Worksheet for Researchers

Assess your strengths and weaknesses in the following skill areas:

4 = Highly proficient
1 = Drastic improvement needed
NA = Not applicable

Research Skills						
	Critical evaluation of data and scientific literature	NA	1	2	3	4
	Experimental design	NA	1	2	3	4
	Problem solving/troubleshooting	NA	1	2	3	4
	Statistical analysis	NA	1	2	3	4
	Computer skills	NA	1	2	3	4
	Creativity/developing new research directions	NA	1	2	3	4
	Skills specific to your field (see prompts below)	NA	1	2	3	4
Professional Skills						
	Oral presentation skills	NA	1	2	3	4
	Manuscript writing skills	NA	1	2	3	4
	Grant/fellowship writing skills	NA	1	2	3	4
	Teaching skills (in a classroom)	NA	1	2	3	4
	Teaching skills (one-on-one)	NA	1	2	3	4
	Identifying mentors and utilizing them effectively	NA	1	2	3	4
	Mentoring others	NA	1	2	3	4
Time Management		NA	1	2	3	4
	Meeting deadlines	NA	1	2	3	4
	Establishing priorities within your schedule	NA	1	2	3	4
	Working efficiently	NA	1	2	3	4
	Organizing skills	NA	1	2	3	4
	Flexibility and multitasking	NA	1	2	3	4
Interpersonal Skills						
	Positive relationships with colleagues	NA	1	2	3	4
	Reliability; following through on commitments	NA	1	2	3	4
	Communicating effectively in written correspondence	NA	1	2	3	4
	Communicating effectively in conversation	NA	1	2	3	4
	English proficiency – spoken and/or written	NA	1	2	3	4
	Ability to give and receive constructive feedback	NA	1	2	3	4
	Networking/meeting new colleagues	NA	1	2	3	4
Management and Leadership Skills						
	Data and resource management	NA	1	2	3	4
	Developing/managing budgets	NA	1	2	3	4
	Running a meeting	NA	1	2	3	4
	Establishing priorities for a team	NA	1	2	3	4
	Delegating responsibility					
	Leading and motivating others	NA	1	2	3	4
	Supervising/managing people	NA	1	2	3	4
	Working within an organization	NA	1	2	3	4

List some specific **laboratory/research techniques** that you need to improve in order to be successful in your current position or future career path.

List some specific **knowledge areas** where you need to improve your understanding in order to be successful in your current position or future career path.

List some specific **professional, management, and/or leadership areas** where you need improvement in order to be successful in your current position or future career path.

Setting Goals

When setting goals for skills development, it is important to decide on a concrete method for how you will identify whether you have reached these goals. How will you be certain that you have acquired your desired competency in these skills?

How do I assess my own skill development? A teacher assesses whether her students have learned or developed the correct skills by grading each student by a set of standards. Think of yourself as your own teacher. Identify a method for how you will assess whether you reached your goal for skills development in each area. Set standards, and select a person or group of people (mentor(s), expert(s), peer(s), and/or yourself) to assess whether you have improved and/or met those standards.

Example:
Arnaz would like to improve her science writing skills.
Method for Skill Development: Set aside one hour each Friday to write out her experimental plans for the coming week, as if she were writing the Introduction and Methods section of a paper.
Method for Assessment of Skill Development:
In 3 months, Arnaz will set aside time to assess her improvement in writing. She will use these methods:

1. Self-assessment: Do I feel more comfortable writing now than I did 3 months ago?
2. Expert assessment: I will bring a sample of my writing from both my first week of writing and my most recent week to the Office of Career and Professional Development, and get advice from a science writer there about (a) whether my writing has improved, and (b) what areas of my writing I should be continuing to work on.
3. Peer assessment: My friend is also working on improving her writing. We will meet once a month to look over each other's writing to give each other feedback on whether the other person's writing is improving, and what other areas we each could work on.

For this example, we have listed 3 methods for Arnaz. Your own assessment strategy may include fewer methods.

List the top THREE skills you would like to develop, how you plan to develop them, and how you plan to assess your progress.

1.

2.

3.

Make a Plan

Create a month-by-month timeline for the next twelve months, integrating your top-priority projects and skills development goals. If you also identified ways to assess whether you achieved these goals, then include these in your timeline.

After you are finished, **add any deadlines or important dates from this timeline to your daily calendar**, or post this calendar next to your desk to remind you of your goals and timeline.