

GRADUATE PROGRAM IN  
CELL AND MOLECULAR BIOLOGY



**Policies and Procedures  
for  
Graduate Students  
2009 - 2010**

This document should be read in conjunction with the current *Graduate and Professional Bulletin* of Colorado State University. It has been written to emphasize certain policies contained in the Bulletin and to outline policies and procedures specific for the CMB Graduate Program.



## **ADMISSION**

The admission requirements of the Cell and Molecular Biology Graduate Degree Program (CMB Program) include a bachelor's degree in any of the biological, biochemical, or physical sciences. The university requirements for admission to graduate school apply with the following additions: a minimum of one year each of organic chemistry, physics, and biology; mathematics through differential and integral calculus. A course in biochemistry is highly recommended. Additional science courses such as cell biology, microbiology, developmental biology, immunology, genetics, physical chemistry, analytical chemistry, biophysics, physiology, and anatomy are considered in evaluation for admission. Promising students with deficiencies in entrance requirements may be accepted into the program provided all deficiencies are corrected during the first year. This may be accomplished by passing a background examination in the subject, by taking appropriate undergraduate courses, or by successfully completing graduate level courses that require the undergraduate courses as prerequisites. Graduate Record Examination (GRE) scores for the general examination are required and one advanced examination in an area of science is strongly recommended for consideration of financial aid. Applications are evaluated by the Admissions Committee.

## **FOREIGN STUDENT APPLICATIONS**

The CMB Program is also committed to educate a limited number of students from foreign countries, particularly those from developing countries. Foreign student applicants must meet the same admission requirements as United States applicants (including GRE requirements). In addition, they must show evidence of competence in the written and spoken English language as evidenced by a TOEFL score of 263 (computer-based), 625 (paper-based) or 107 (ibt) or higher. If the transcript of a foreign student is difficult to evaluate, such a student will not be eligible for a graduate assistantship until after the end of his/her second semester of study.

Foreign students who are accepted without a fellowship or graduate assistantship must show evidence of adequate financial support to be admitted to the graduate program.

## **SELECTION OF ADVISER AND GRADUATE COMMITTEE**

The Program Director with input from the Academic Committee will advise students concerning course work during the first year, unless a student is admitted with direct support from a faculty member. In the latter case, the faculty member will serve as both the academic and research adviser. After registering, a graduate student must obtain approval from the Academic Committee or his/her adviser before adding or dropping a course. The Academic Committee must also approve a change in a student's degree objective from an M.S. to a Ph.D. degree. Ph.D. students receiving support from the CMB Program must rotate through three laboratories of their choice during their first two semesters in residence. This experience will allow them to become familiar with potential thesis projects and with several faculty members in their area of interest.

*Final selection of an adviser should be made by the end of the second semester following enrollment, but must be made by the end of the first calendar year.*

The adviser and student shall select a Graduate Advisory Committee that represents major areas of the student's graduate study. A minimum of 3 members is required for M.S. degree candidates and 4 committee members for Ph.D. degree candidates, at least two (M.S.) and three (Ph.D.) of the committee members must be members of the CMB faculty. In addition, the graduate school requires the appointment of an outside member. This member must be a faculty member whose primary appointment is outside the home department of the student's advisor. The development of a formal plan of course work and research activities is the responsibility of the Graduate Advisory Committee.

*The Graduate Advisory Committee should be selected and meet before the end of the third semester after enrollment to prepare the formal plan of study (Form GS 6, Program of Study). Subsequently, this committee should meet annually, or more frequently if necessary, to advise a student and to submit an evaluation of the student's progress in completing his/her academic requirements and thesis research.*

The procedures required for graduation are detailed by the Graduate School in the *Graduate and Professional Bulletin*.

## **ANNUAL MEETING WITH GRADUATE ADVISORY COMMITTEE (GAC) Annual Performance Evaluation by Graduate Advisory Committee**

To assist in the evaluation of a student's progress in research, each student must meet annually with his/her Graduate Advisory Committee. This annual evaluation will consist of the following:

1. **A written progress report.** The report should briefly summarize the goals of the research and the progress made since the previous meeting with the Graduate Advisory Committee. The progress report must be distributed to the members of the Advisory committee at least one week before the scheduled meeting of the committee.
2. **A research seminar in CM 793.** Students in their second, third and fourth year of the Ph.D. program are required to enroll either semester in CM 793 and present a seminar describing their completed research. Students should inform their committee well in advance of the date of their scheduled seminar and strongly encourage members of their Graduate Advisory Committee to attend. Optimally, students should give their written progress to their committee a week prior to their research seminar and a meeting should be scheduled within two weeks after the seminar to clarify questions raised by the progress report and the seminar, and to solicit guidance and suggestions from the Graduate Advisory Committee concerning goals, methods, and evaluation of the research. The Graduate Advisory Committee members will sign an evaluation form for the students file.

## **LABORATORY ROTATIONS FOR FIRST YEAR STUDENTS**

The adviser-student relationship is unique and it is the mutual strength, respect, and stimulus of this relationship that promotes scientific achievement. First-year Ph.D. students who receive support from the CMB Program must complete three laboratory rotations during the first two semesters in residence. The aim of this program is to introduce students to a variety of research approaches, techniques and projects, and to aid students in choosing an adviser for their dissertation research. The goal of each rotation is to allow the student to accomplish some research and to experience the culture of the laboratory. Students are expected to attend group meetings of the laboratories through which they rotate and complete some original research while learning the techniques and approaches of different disciplines.

Entering students will participate in an orientation program (CM510) that will begin during the week prior to the first day of classes. The orientation will provide students with information on the breadth of research conducted by faculty in the program, the available research resources on campus, and faculty who are willing to provide laboratory rotations. At the conclusion of the orientation, students will submit a list of their preferred rotations. Matches will be done in consultation with the Academic Committee. Students will begin the first rotation shortly after classes begin. By mid-October, they will choose a second laboratory for rotation and will switch to that laboratory about November 15<sup>th</sup>. They will choose a third laboratory by the end of January and begin the final rotation about mid-February. The final rotation is completed at the end of the spring semester. The selection of an advisor should occur near the end of the spring semester. This allows the student maximum flexibility in making their final choice of adviser.

*In consultation with the Director or Academic Committee, Ph.D. students should register for a variable number of CM795 credits (Independent Study) for these lab rotations.*

## **DIRECT RECRUITMENT INTO LABORATORIES**

Faculty will be allowed to recruit incoming students directly to their laboratories to immediately begin work on a thesis or dissertation project. Such students must be approved for admission into the CMB program by the Admissions Committee and the Graduate School and must be supported by funds other than those of the CMB Program. Such students will not participate in rotations.

To protect the interests of the student in the unlikely event that the student and faculty member are incompatible, students who are recruited by a faculty member have the opportunity to change laboratories at the end of the spring semester, if they so desire. The laboratory that supported the student through the first year would have no hold on the student and would not be reimbursed for their support during the first year. Of course, the faculty member would have no further obligation regarding funding of students who left his/her laboratory.

## **STANDARDS OF PERFORMANCE**

The academic and research performance of each student is evaluated annually by the student's Graduate Advisory Committee and a signed evaluation report must be submitted to the CMB Program to be put in the student's file. Unsatisfactory performance in course work, laboratory rotations, or research is grounds for probation or dismissal from the CMB program following Graduate School guidelines. In course work, an unsatisfactory performance is based upon grade point average. For laboratory rotation and research, unsatisfactory grades are assigned based upon a comparison with the performance of successful students in similar disciplines. This requirement is to assure that students are making adequate progress and that failure to progress satisfactorily is addressed expeditiously.

Each student must maintain a cumulative Grade Point Average (GPA) of at least 3.00 in all didactic course work taken during his/her graduate program at Colorado State University and receive satisfactory grades in Independent Study and Thesis Research courses. After a second semester in which a student fails to attain a cumulative average of 3.00, he/she will be dismissed in accordance with Graduate School procedures. Any exception must be initiated by the student in the form of a petition to the student's Graduate Advisory Committee or the CMB Director, if no Graduate Advisory Committee has been established. The adviser or the director may then appeal to the Dean of the Graduate School for reinstatement.

## **GRADUATE ASSISTANTSHIPS**

Graduate Assistantships may be awarded to students who enter with a GPA of 3.00 or above. These are awarded on a competitive basis and most start at the beginning of the fall semester. A student entering with less than a 3.00 GPA is usually eligible only after he/she has completed one semester with a cumulative GPA of 3.0 or better. Any student holding a Graduate Assistantship and failing to maintain a cumulative GPA of 3.00 will lose such support immediately and will be eligible again only after raising his/her cumulative GPA to 3.00 or above.

Students entering with support as a Graduate Teaching Assistant from the CMB Program currently receive a monthly stipend of \$1800. Alternative and subsequent support for graduate students are provided through a diversity of sources, including fellowships, research grants awarded to faculty members, and GTAs from various departments that utilize different guidelines. However, the goal of the CMB Program is that all students should receive a stipend of at least equal \$1800 per month or the level set by the departmental program of their advisor if that is greater than \$1800 per month.

Students who have been advanced to candidacy and are appointed to a graduate research assistantship are expected to devote a full-time effort to their research. It is the responsibility of the adviser to designate the work load. Graduate Assistants are considered temporary employees by the University and, as such, do not earn vacation time. The general CMB Program leave policy is two weeks per year for all Graduate Assistants, subject to approval of their adviser.

## GRADUATION REQUIREMENTS

The graduation requirements will in general follow those outlined in the current *Graduate and Professional Bulletin*. During the first two semesters, M.S. and Ph.D. candidates are expected to complete a graduate course in Cell Biology (BC565) and Molecular Genetics (BC 563). Students will also be expected to enroll in the CMB seminar (CM 792) in which invited speakers present their research. In addition, second, third, and fourth year students must enroll in a graduate seminar (CM 793), in which each student presents his/her thesis research. Appropriate courses to complete the elective requirements, along with additional courses appropriate for the planned thesis research, may be established by the Graduate Advisory Committee.

To advance to candidacy for the Ph.D. degree, students are required to pass a preliminary examination administered by the student's Graduate Advisory Committee according to the procedures described in the Preliminary Examination section of this booklet and in the *Graduate and Professional Bulletin*. The plan A M.S. degree in Cell and Molecular Biology is a research-oriented degree, so the Plan A Master's thesis must be based upon laboratory research. The M.S. degree is not a prerequisite for the Ph.D. degree.

***The completion of a thesis is necessary for both the M.S. (Plan A) and Ph.D. degrees. Each candidate is required to present a formal seminar summarizing his/her research and to pass a formal thesis defense administered by the Graduate Advisory Committee. In special cases a Plan B M.S. degree may be awarded. The Plan B M.S. degree does not require a thesis, but does require a written report on a topic approved by the Graduate Advisory Committee and an oral exam.***

## COURSES REQUIRED FOR THE M.S. DEGREE

<u>Course No.</u>	<u>Title</u>	<u>Credits</u>
BC 565	Advanced Cell Biology	4
BC 563	Molecular Genetics	4
CM 666/BC 601 or MIP 654	Ethical Conduct of Science	1-3
CM 510	Introduction to Cell & Molecular Biology	1
CM 792	Cell and Molecular Biology Seminar	2
CM 793	Graduate Seminar (fall of second year)	1
CM 699	Thesis (for Plan A) and Electives	variable
Electives *	At least 4 credits in regular graduate level courses	<u>variable</u>
		30

The M.S. degree requires 12 credits of upper level (500 or above) didactic course work.

## COURSES REQUIRED FOR THE Ph.D. DEGREE

<u>Course No.</u>	<u>Title</u>	<u>Credits</u>
BC 565	Advanced Cell Biology	4
BC 563	Molecular Genetics	4
CM 510	Introduction to Cell & Molecular Biology	1
CM 792	Cell and Molecular Biology Seminar	4
CM 666/BC 601 or MIP 654	Ethical Conduct of Science	1-3
CM 793	Graduate Seminar (2 <sup>nd</sup> , 3 <sup>rd</sup> , 4th years)	3
CM 799	Dissertation	variable
Electives *	At least 6 credits in regular graduate level courses	<u>variable</u>

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Additional courses required for Cancer Biology program

<u>Course No.</u>	<u>Title</u>	<u>Credits</u>
ERHS 611	Cancer Genetics	2
ERHS 510	Cancer Biology	3
VS 780	Cancer Biology Clinical Practicum	2

Any variation from the required course must be approved by the Academic Committee and the student's Graduate Advisory Committee. Requests for course substitutions or omissions must be submitted to the Academic Committee by the student in writing. Each graduate student must present a seminar of his/her work before graduating.

It is the responsibility of each graduate student to know and meet all requirements of the Graduate School. These are listed in the Colorado State University *Graduate and Professional Bulletin*, Handbook on Graduate Study, and Guidelines for Graduate Advising and Committee Service. The latter two publications will be sent to you the first term you are registered.

\* Electives: Cell and Molecular Biology courses listed below, the elective courses offered by other departments listed on page 10 & 11, or other courses required by the Graduate Committee.

## **CELL AND MOLECULAR BIOLOGY COURSES**

### **FALL**

#### **Course No.**

#### **Title**

CM 502 (2cr)

Techniques in Cell Biology

CM 510 (1cr)

Intro. to Cell & Molec. Biol.

CM 595 Var

Independent Study

CM 699 Var

Thesis

CM 701D (1cr)

Radiation Cytogenetics

Even Fall

CM 701I (2cr)

Planning Research and Grant Proposals

CM 792 (1cr)

Cell and Molecular Biology Seminar

CM 793 (1cr)

Graduate Seminar

CM 784 Var

Supervised College Teaching

CM 795 Var

Independent Study

CM 799 Var

Dissertation

### **SPRING**

#### **Course No.**

#### **Title**

CM 595 Var

Independent Study

CM 640 (3cr)

Creative Science Writing

CM/PL 666 (3cr)

Science and Ethics

CM 699 Var

Thesis

CM 702B (1cr)

Mammalian Cell Culture Techniques

CM 702D (1cr)

Radiation Cytogenetics

Odd Spring

CM 792 (1cr)

Cell and Molecular Biology Seminar

CM 784 Var

Supervised College Teaching

CM 795 Var

Independent Study

CM 799 Var

Dissertation

## **ELECTIVE COURSES**

### **FALL**

<b><u>Course No.</u></b>	<b><u>Title</u></b>
BC 511 (4cr)	Structural Biology I
BC 611 (2cr)	Structural Biology II
BMS 500 (4cr)	Mammalian Physiology I
BMS 640 (5cr)	Reproductive Physiology & Endocrinology
BZ 572 (3cr)	Phytoremediation
BZ 578 (4cr)	Genetics of Natural Populations
ERHS 502 (3cr)	Fundamentals of Toxicology
ERHS 520 (3cr)	Advanced Environmental Health
ERHS 532 (3cr)	Epidemiologic Methods
ERHS 542 (3cr)	Biostatistical Methods for Qualitative Data
ERHS 603 (3cr)	Toxicological Pathology
ERHS 665 (3cr)	Radiochemistry
ERHS 751 (3cr)	Advanced Radiation Biology I
ERHS 770 (1cr)	Radiation Biology- Tumor Therapy
MIP 576 (3cr)	Bioinformatics
MIP 630 (3cr)	Advances in Microbial Physiology
MIP 651 (3cr)	Immunobiology
MIP 654 (1cr)	Research Policies & Regulations
MIP 555 (3cr)	Principles & Mechanisms of Disease

## **ELECTIVE COURSES**

### **SPRING**

<b><u>Course No.</u></b>	<b><u>Title</u></b>
BC 511 (4cr)	Structural Biology I
BC 513 (1cr)	Enzymology
BC 571 (1cr)	Quantitative Biochemistry
BC 663 (2cr)	Gene Expression
BMS 501 (5cr)	Mammalian Physiology II
BMS 545 (5cr)	Neuroanatomy
BMS 620 (3cr)	Cardiovascular Physiology
BZ 520 (3cr)	Advanced Systematics
BZ 530 (2cr)	Ecological Plant Morphology
BZ 537 (3cr)	Topics in Mycology
BZ 570 (3cr)	Molecular Aspects of Plant Development
ERHS 533 (3cr)	Epidemiology of Infectious Diseases/Zoonoses
ERHS 544 (3cr)	Biostatistical Methods-Quantitative Data
ERHS 601 (4cr)	Advanced Toxicology I
MIP 530 (3cr)	Advanced Molecular Virology
MIP 533 (3cr)	Epidemiology of Infectious Diseases/Zoonoses
MIP 550 (4cr)	Microbial & Molecular Genetics Lab
MIP 576 (3cr)	Bioinformatics

## **SAMPLE CURRICULUM - M.S.**

This is based on a Plan A - M.S. degree requiring a thesis. It may be possible to do this in fewer semesters than four. A Plan A Masters degree requires 30 credits of which 12 credits are at the 500 level or above in regular course work.

### First Semester

BC 563	Molecular Genetics	4
CM 792	Cell and Molecular Biology Seminar	1
	Electives	4
CM 595	Thesis	Variable

### Second Semester

BC 565	Molecular Regulation/Cell Function	4
BC 601	Ethical Conduct of Science	1
CM 792	Cell and Molecular Biology Seminar	1
	Electives	4
CM 595	Thesis	Variable

### Third Semester

CM 793	Graduate Seminar	1
CM 699	Thesis and/or Electives	Variable

### Fourth Semester (if needed)

CM 699	Thesis and/or Electives	Variable
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## **SAMPLE CURRICULUM – Ph.D.**

This is based on a Plan A - M.S. degree requiring a thesis. It may be possible to do this in fewer semesters than four. A Plan A Masters degree requires 30 credits of which 12 credits are at the 500 level or above in regular course work.

### First Semester

BC 563	Molecular Genetics	4
CM 792	Cell and Molecular Biology Seminar	1
	Electives	4
CM 795	Thesis	Variable

### Second Semester

BC 565	Molecular Regulation/Cell Function	4
BC 601	Ethical Conduct of Science	1
CM 792	Cell and Molecular Biology Seminar	1
	Electives	4
CM 795	Thesis	Variable

### Third Semester

CM 793	Graduate Seminar	1
CM 699	Thesis and/or Electives	Variable

### Fourth Semester (if needed)

CM 699	Thesis and/or Electives	Variable
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## EXAMINATIONS

See the current *Graduate and Professional Bulletin* for details concerning administration of examinations and requirements for submitting specific forms to the Graduate School Office including graduation requirements.

**Final M.S. Examination** - The final examination will be oral, conducted by the student's Graduate Advisory Committee that is chaired by his/her adviser. The examination for Plan "A" is primarily a defense of the student's thesis. The examination for Plan "B" is based upon the completed course work and the topic selected for the final report due under Plan "B". A copy of the thesis/report must be circulated to the student's Graduate Committee at least two weeks before the final examination. All CMB faculty and students are invited to attend. The graduate student has the responsibility to check with each committee member in order to schedule a suitable time and place for the oral examination, and to inform the CMB Administrative Assistant so that the CMB faculty can be notified at least two weeks in advance of the examination.

**Preliminary Examination for Ph.D. Degree** - After formal acceptance into a Ph.D. degree program and completion of major course requirements, a comprehensive preliminary examination is administered to determine if the student is qualified to continue toward the doctorate degree. This examination should ascertain the student's potential to become a research scientist capable of making significant contributions to his/her field of learning. Therefore, during the examination the student will be expected to demonstrate his/her ability to interrelate knowledge and concepts acquired in undergraduate and graduate courses, with emphasis on the specific courses listed under Minimum Graduation Requirements, and to be able to apply these concepts to a fundamental research investigation.

Students are expected to have knowledge beyond the scope of the research area with which they are affiliated. Students will be expected to demonstrate an understanding of material taught in the required core courses and the completed elective courses. These subject areas are considered to be the basic foundation for cell and molecular biologists and are covered on the oral preliminary examination.

*This examination is to be administered no sooner than one year after formal acceptance into the CMB Program and after completion of all the required courses for the Ph.D. degree. An initial examination must be scheduled by the end of the student's second year in the Ph.D. program.*

If the student does not pass the preliminary examination on the first attempt, it should be rescheduled within two to three months after the first attempt. *Students must pass the preliminary examination before beginning their fifth semester in the Ph.D. program, which is normally the fall semester of the third year in the program. The preliminary examination must include a written and an oral component. The format of the written portion of the examination will be decided by the student's Graduate Advisory Committee and may be in the form a grant proposal or a set of written questions prepared by the Graduate Advisory Committee.*

The conduct of the examination is the responsibility of the student's adviser and Graduate Advisory Committee. The graduate student has the responsibility to check with each committee member in order to schedule a suitable time and place for the oral examination, and to inform the CMB Administrative Assistant so that the committee members and the Graduate School can be notified at least two weeks in advance of the examination.

**Final Ph.D. Examination** - *The examination is primarily a defense of the dissertation research and is open to all members of the University community and the public at large.* An external examiner from another institution who is an expert in the student's research area may participate in the examination. A copy of the dissertation must be circulated to the student's Graduate Committee at least two weeks before the final examination. The graduate student has the responsibility to check with each committee member in order to schedule a suitable time and place for the oral examination, and to inform the CMB Administrative Assistant so that the Program Chairman, the committee members, other CMB faculty and the Graduate School can be notified at least two weeks in advance of the examination.

## PUBLICATIONS

Presentation of research results is an important aspect of graduate education. Ph.D. candidates must prepare and submit a manuscript for publication in a peer-reviewed scientific journal with the student as first author.

## STUDENT APPEALS OF GRADING DECISIONS

Faculty members are responsible for stating clearly the instructional objectives of the course at the beginning of each term and for evaluating student achievement in a manner consistent with these objectives. Students are responsible for meeting standards of academic performance established for each course in which they are enrolled. Faculty members and instructors are responsible for determining and assigning final course grades. Graded examinations, papers and other materials used as a basis for evaluating a student's achievement will be available to the student for inspection and discussion. Students may appeal faculty grading decisions. The burden of proof, however, rests with the student to demonstrate that the grading decision was made on the basis of any of the following conditions:

- a. A grading decision was made on some basis other than performance and other than as a penalty for academic dishonesty.
- b. A grading decision was based upon standards unreasonably different from those which were applied to other students.
- c. A grading decision was based on a substantial, unreasonable, or unannounced departure from previously articulated standards.

Before making an appeal, the student should discuss the situation with the faculty member(s) involved in the decision.

To appeal a grading decision, the student shall submit a written request to the Department Chairperson. The request must set forth the basis for the appeal, identifying one of the three categories set forth above. The request must be submitted or postmarked, if mailed, no later than 30 calendar days after the first day of classes of the next regular semester following the date the grade was recorded. If no appeal is filed within this time period, the grade shall be considered final.

Within 30 days of receipt of the request for an appeal, the student's appeal shall be provided to the faculty member or instructor who assigned the grade and an appeals committee formed in accordance with the Departmental Code. If the request is received prior to or during the summer session when the instructor(s) who assigned the grade or other faculty members may not be available, then the appeals committee will be formed no later than 30 days from the beginning of the following fall semester. This committee shall be composed of two faculty members and two students from within the department and one outside faculty member who shall serve as the voting chair.

The appeals committee will review the written appeal and response of the faculty member(s) or instructor(s). They may elect to separately interview both the student and the faculty member or instructor before rendering a decision. The decision of the appeals committee will be based upon whether one of the conditions for an appeal set forth above has been met. At the conclusion of the deliberations, the committee shall render one of the following decisions:

- 1) The original grading decision is upheld, or
- 2) The Chairperson or his/her designee(s) will reevaluate the student's achievement of the instructional objectives of the course and assign a grade accordingly.

Written notice of the committee's decision and the reasons for the decision normally will be sent to the student and the faculty member(s) or instructor(s) within 30 calendar days of appointment of the committee. The appeal committee's decision is the final decision of the University. Written summaries of the hearing and decision, together with a rationale for that decision, shall be provided to the student and the faculty member who assigned the grade and shall be retained in the department office for a period of one year.

**REVISED** – August 15, 2008.