

June 9, 2015

**POLICIES & PROCEDURES  
OF THE  
CELL & MOLECULAR BIOLOGY  
GRADUATE PROGRAM**

**2015-2016**

This document should be read by CMB Faculty and Students in conjunction with the current *Graduate and Professional Bulletin* of Colorado State University and the Code of the Cell and Molecular Biology Graduate Program. It has been written to emphasize certain policies contained in the Bulletin and to outline Policies and Procedures specific for the CMB Graduate Program.

**Colorado  
State  
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## 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.

## INTERNATIONAL 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. They must also identify a faculty member who has sufficient funding to support a student research project to act as their advisor. The admissions committee must approve this relationship before the student is admitted to the program.

## SELECTION OF ADVISOR AND GRADUATE COMMITTEE

The Program Director with input from the Academic Committee will advise students concerning course work during the first year. If a student is admitted with direct support from a faculty member, the faculty member will serve advisor co-advise on course selection. After registering, a graduate student must obtain approval from the Academic Committee or his/her advisor 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 generally 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 advisor 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 advisor 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 within three months of selecting an advisor 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. Completion of the progress report form.** This form can be found on the CMB website and should be initiated at the time of the first GAC meeting and updated annually. Part 1 comprises sections describing progress in courses, professional development, teaching, mentoring, presentation skills and outreach. In Parts 2 and 3, the student and advisor are each asked to assess the student's development and progress. In part 4 the student should summarize their research progress. The first research summary should be prepared at the time of the first GAC meeting and should describe the student's future research goals. Subsequent research reports 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. The GAC are asked to sign the progress report and a copy should be provided to the CMB coordinator within one week of its completion. Students failing to submit an annual progress report to the CMB program coordinator will have a hold placed on their registration.
- 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 evaluate the presentation as part of the progress report.

### LABORATORY ROTATIONS FOR FIRST YEAR STUDENTS

The advisor-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 generally 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 advisor 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. At the end of each rotation the student should meet with the advisor to discuss their performance and the advisor will complete a Rotation Report that will be shared with the student and the CMB Program Coordinator. The Rotation Report form can be found on the CMB website.

Entering students will participate in an orientation program (CM510) that will begin during the week prior to the first day of classes and also in intensive laboratory-based training (CM502). 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 made in consultation with the Academic Committee and/or Program Director. Students will begin the first rotation in early October after completion of CM502. The second rotation begins in early January. The final rotation begins in early March and 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 advisor.

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. The Admissions Committee must approve the advisor's plan to support the student's stipend and/or research project prior to admission of the student. 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 the advisor and the signed progress 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, achieve a B or higher in all core courses 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 advisor 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 \$1910. 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 \$1910 per month or the level set by the departmental program of their advisor if that is greater than \$1910 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 advisor 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 advisor.

## 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 graduate courses in Molecular Regulation of Cell Function (BC565) and Molecular Genetics (BC 563) as well as CM510 (Introduction to CMB), CM502 (Techniques in Cell and Molecular Biology) and GRAD550 (STEM Communication). Second, third, and fourth year students must enroll in a graduate seminar (CM 793), in which each student presents his/her thesis research and CMB Seminar (CM792) in which invited speakers present their research. Appropriate courses to complete the elective requirements for Ethics, Statistics and Writing, 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

<i>Course No.</i>	<i>Title</i>	<i>Credits</i>
BC 565	Molecular Regulation of Cell Function	4
BC 563	Molecular Genetics	4
GRAD550	STEM Communication	1
CM502	Techniques in Cell & Molecular Biology	2
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
Ethics Elective*	At least 1 credit in Ethical Conduct of Science	1-3
Electives **	At least 4 credits in regular graduate level courses	variable
		<b>30</b>

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

## COURSES REQUIRED FOR THE Ph.D. DEGREE

<i>Course No.</i>	<i>Title</i>	<i>Credits</i>
BC 565	Molecular Regulation of Cell Function	4
BC 563	Molecular Genetics	4
CM 510	Introduction to Cell & Molecular Biology	1
CM502	Techniques in Cell & Molecular Biology	2
GRAD550	STEM Communication	1
CM 792	Cell and Molecular Biology Seminar	4
CM 793	Graduate Seminar (2 <sup>nd</sup> , 3 <sup>rd</sup> , 4 <sup>th</sup> years)	3
CM 799	Dissertation	variable
Ethics Elective*	At least 1 credit in Ethical Conduct of Science	1-3
Topics Elective*	At least 2 credits in a Topics/Literature Review class	2
Statistics Elective*	At least 3 credits in graduate level Statistics	3-4
Writing Elective*	At least 1 credit in a graduate level Writing	1-3
Other Electives **	At least 6 credits in regular graduate courses	<u>variable</u>
		<b>72</b>

## COURSES REQUIRED FOR THE CANCER BIOLOGY SPECIALIZATION

CMB students may elect to specialize in Cancer Biology which leads to a Specialization noted on their transcript. At least five credits must be selected from courses below:

<i>Course No.</i>	<i>Title</i>	<i>Credits</i>
ERHS 611	Cancer Genetics	2
ERHS 510	Cancer Biology	3
VS 780	Cancer Biology Clinical Practicum	2
EHRHS 733	Environmental Carcinogenesis	3

In addition, students specializing in Cancer Biology may satisfy the CM792 seminar requirement by attending Clinical Oncology Seminar/Journal Club.

Any variation from the required courses 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 students during the first term they are registered.

\* Ethics, Statistics and Topics Electives: Acceptable courses are listed below. Others may be substituted with approval of the Graduate Advisory Committee.

\*\* Electives: Cell and Molecular Biology courses listed below, possible elective courses offered by other departments listed below, and on the CMB website. Other courses may be required by the Graduate Advisory Committee.

## ETHICS, TOPICS, STATISTICS & WRITING ELECTIVES

### Ethics Electives:

All CMB Students must take at least 1 credit covering Ethical Conduct of Science.

CM666(3cr)	Science & Ethics	Spring
CM/BC601(1cr)	Responsible Conduct in Biochemistry	Spring
MIP654 (1cr)	Research Policies & Regulations	Fall
GRAD544(1cr)	Ethical Conduct of Research	Fall/Spring

### Topics Electives:

CMB Ph.D. Students must take at least 2 credits of graduate level Topics/Literature Analysis classes. CM700 is preferred but other courses may be substituted.

CM700 (1cr)	Critical Analysis of the Literature	Fall/Spring
MIP700 (1cr)	Topics in Microbiology, Immunology & Pathology	Fall/Spring
BC692CV (1cr)	Topics in Animal Development	Spring
HES796 (1cr)	Group Study	Fall/Spring
BMS796a/NB796c (1cr)	Topics in Neuroscience	Fall/Spring
BC711 (1cr)	Adv. Topics in Structural Biology	Fall/Spring
BC763 (1cr)	Adv. Molecular Genetics Topics	Fall/Spring
BSPM502 (1cr)	Topics in Plant Pathology	Fall
CBE707 (1cr)	Adv. Topics in Biochemical Engineering	Fall
CHEM651(var)	Special Topics in Chemistry	Fall/Spring
FSHN650 (2 cr)	Recent Developments in Human Nutrition	Fall/Spring
SOCR730 (1cr)	Topics in Plant Breeding & Genetics	Fall
HORT601 (2cr)	Current Topics in Root & Rhizosphere Biology	Spring

### Statistics Electives:

CMB Ph.D. students must take at least 3 credits of graduate level Statistics.

STAT511(4cr)	Design & Data Analysis for Researchers I	Fall
STAT512 (4cr)	Design & Data Analysis for Researchers II	Spring
STAT540 (4cr)	Data Analysis & Regression	Fall
ERHS542 (3cr)	Biostatistical Methods for Qualitative Data	Fall
ERHS544/STAT544 (3cr)	Biostatistical Methods for Quantitative Data	Spring
VS562 (3cr)	Applied Data Analysis	Spring
VS733 (4cr)	Advanced Veterinary Epidemiology	Spring

Courses listed under the STAA prefix may also be considered and can be taken online or on campus

<http://www.stat.colostate.edu/statprostudents/statdistance/statcourses/statcoursedescriptionsstaa.html>

### Writing Electives:

CMB Ph.D. students must take at least 1 credit of courses covering Scientific Writing. These may focus on grant writing and/or manuscript writing. The writing elective should be completed prior to taking the preliminary exam.

CM640 (3cr)	Creative Science Writing	Spring
CM7011 (2cr)	Planning Research & Grant Proposals	Fall/Spring
MIP666 (3cr)	Writing Scientific Manuscripts	Fall
MIP680 (1cr)	Grant Writing	Spring
BC701(1cr)	Grant Proposal Writing & Reviewing	Fall
BIOM750/NB771 (1cr)	Writing, Submitting & Reviewing Grants	Fall
BSPM530/SOCR530(1cr)	Scientific Writing	Spring
BZ544 (2cr)	Presenting Research in Biology	Fall
HES700 (3cr)	Professional Skills in Bioenergetics	Fall

## CMB PREFIX COURSES

### FALL

CM502(2cr)	Techniques in Cell and Molecular Biology
CM510 (1cr)	Introduction to Cell & Molecular Biology
CM581A2 (1cr)	Next Generation Sequencing Platforms and Libraries
CM595(var)	Independent Study
CM699 (var)	Thesis
CM700(1cr)	Critical Analysis of the Literature
CM792 (1cr)	Cell & Molecular Biology Seminar
CM793 (1cr)	Graduate Seminar
CM784(var)	Supervised College Teaching
CM795 (var)	Independent Study
CM799 (var)	Dissertation

### SPRING

CM595(var)	Independent Study
CM640 (3cr)	Creative Science Writing
CM/PL666 (3cr)	Science and Ethics
CM699 (var)	Thesis
CM700(1cr)	Critical Analysis of the Literature
CM792 (1cr)	Cell & Molecular Biology Seminar
CM793 (1cr)	Graduate Seminar
CM784(var)	Supervised College Teaching
CM795 (var)	Independent Study
CM799 (var)	Dissertation
CM581A1 (1cr)	Nucleic Acids for Non-Life Scientists

## OTHER ELECTIVES

CMB faculty have interests aligned with several different research fields. Students wishing to gain additional training in one of these areas may find the lists of electives below helpful. This list is not exhaustive and other courses may be applied towards the degree if the Program Director and/or the student's advisory committee approves.

### Regulation of Gene Expression

Many of the courses offered through the [BMB Department](#) (BC prefix) are pertinent to this research focus.

BC511 Structural Biology I  
BC611 Structural Biology II  
BC663 Gene Expression  
BC 665 Advanced Cell Biology  
BC512 Principles of Macromolecular Structure  
BC665A Advanced Topics Cell Reg. Microscopic Methods  
MIP543 RNA Biology  
MIP570 Functional Genomics  
CS580 Programming for the Life Sciences  
CS548 Bioinformatics Algorithms  
BSPM540 Understanding Genomes  
BZ576 Genetics of Model Organisms (fall, even yrs)

### Infectious Disease

Many of the courses offered through the [MIP Department](#) are pertinent to this research focus.

MIP540 Biosafety in Research Laboratories  
MIP530 Advanced Molecular Virology  
MIP636 Mechanisms of Viral Infection and Diseases  
MIP533 Epidemiology of Infectious Disease  
MIP555 Principles and Mechanisms of Disease  
MIP628 Immunity to Infection

### Cancer Biology

Many of the courses offered through the [EHRS Department](#) are pertinent to this research focus

ERHS 530 Radiological Physics and Dosimetry I.  
ERHS 532 Epidemiologic Methods.  
ERHS 542 Biostatistical Methods for Qualitative Data.  
ERHS 544/STAT 544 Biostatistical Methods for Quantitative Data.  
ERHS 550 Principles of Radiation Biology.  
ERHS 630 Radiological Physics and Dosimetry II.  
ERHS 640 Advanced Epidemiology.  
ERHS 701 Advanced Diagnostic Imaging Modalities.  
EHRS 714 Radiation Therapy Physics.  
ERHS 721 Radiation Oncology.  
ERHS 751 Advanced Radiation Biology I.  
ERHS 753 Advanced Radiation Biology II.  
ERHS 770 Radiation Biology Basic to Tumor Therapy.  
MIP 651 Immunobiology.  
VS 750 Clinical and Applied Pharmacology.

### Plant Biology

Many of the courses offered through the [Program in Plant Molecular Biology](#) are pertinent to this research focus.

BSPM 510 Insect Plant Disease Relationships  
BSPM 526 Evolutionary Ecology  
BSPM 540 Understanding Genomes  
BSPM 550 Advanced Molecular - Plant Microbe Interactions  
BZ555 Reproduction in Higher Plants (Spring, even yrs)

BZ 570 Molecular Aspects of Plant Development  
BZ 572 Phytoremediation  
BZ 642 Plant Metabolism  
FSHN 508 International Nutrition and World Hunger  
FTEC 578 Phytochemicals and Probiotics for Health  
HORT 571 Soil-Plant-Water Relations/ Water Stress  
HORT 575 Plant Germplasm Conservation  
HORT 675 Plant Stress Physiology  
HORT 580 Phytochemicals to Improve Human Health, multiple campuses  
SOCR 535 Origin and Evolution of Cultivated Plants  
SOCR 540 Soil-Plant Nutrient Relationships  
SOCR 720 Advanced Plant Breeding  
SOCR 725 Quantitative Inheritance in Plant Breeding  
SOCR 730 Topics in Plant Breeding and Genetics, Pat Byrne  
SOCR 731 Plant Breeding Data Management, Scott Haley  
BSPM/SOCR 740 Plant Molecular Genetics, Leon van Eck/ Nora Lapitan

### **Metabolic Regulation**

Many of the courses offered through the [FSHN](#) and [HES](#) Departments are pertinent to this research focus.

BMS 500 Mammalian Physiology I  
BMS501 Mammalian Physiology II  
BMS 631 Mechanisms of Hormone Action  
BMS 632 Metabolic Endocrinology  
BMS 640 Reproductive Physiology and Endocrinology  
CHEM 541 Organic Spectroscopy  
CHEM 566 Bioinorganic and Biomedical Chemistry  
NB 501 Cellular and Molecular Neurophysiology  
NB 750 Physiology of Ion Channels  
VS 628 Physiology and Pathophysiology  
VS 750 Clinical and Applied Pharmacology  
ERHS 502 Fundamentals of Toxicology  
ERHS 510 Cancer Biology  
ERHS 602 Toxicologic Pathology  
FSHN 675 Regulation of Energy Intake  
FSHN 504 Micronutrients (online course).  
FSHN 505 Nutrition and Physical Activity in Aging(online course).  
FSHN 540 Nutrigenomics and Advanced Lipid Metabolism  
FSHN 550 Advanced Nutritional Science I  
FSHN 551 Advanced Nutritional Science II  
FSHN/HES 630 Integrative Exercise and Nutrition Metabolism  
FTEC 578 Phytochemicals and Probiotics for Health  
HES 610 Exercise Bioenergetics  
HES 704 Advanced Topics in Human Bioenergetics  
HES 710 Exercise in Disease Prevention  
HES 730 Cardiovascular Pathophysiology  
HES 735 Human Cardiovascular Control  
HES 793 Bioenergetics Seminar

### **Neuroscience and Molecular Physiology**

Many of the courses offered through the [Molecular and Cellular Integrative Neurosciences Program](#) are pertinent to this research focus.

NB500 Readings in Cellular Neurobiology  
BMS500 Cellular and Molecular Neurophysiology  
NB793 Neuroscience Seminar Disc.

NB796 Journal Club  
NB771 Grant Writing  
BMS503/NB503 Developmental Neurobiology  
NB505 Neuronal Circuits, Systems & Behavior  
NB793 Neuroscience Seminars Discussion  
BMS545 Neuroanatomy  
NB600 Adv. Psy.-Sensation & Perception  
NB750 Physiology of Ion Channels

### **Reproductive and Developmental Biology**

Many of the courses offered through the [BMS Department](#) are pertinent to this research focus.

BMS 500 Mammalian Physiology I  
BMS 501 Mammalian Physiology II  
BMS 631 Mechanisms of Hormone Action  
BMS 632 Metabolic Endocrinology  
BMS 640 Reproductive Physiology and Endocrinology

### **Genomics and Computational Biology**

This is a rapidly growing area at CSU and more courses are likely to be available soon....

MIP570 Functional Genomics  
CS425 Introduction to Bioinformatics Algorithms  
CS580 Programming for the Life Sciences  
CS548 Bioinformatics Algorithms  
BSPM540 Understanding Genomes  
CS580A4 Linux as a Computational Platform  
CM581A2 Next Generation Sequencing Platforms & Libraries  
MATH532 Mathematical Modeling of Large Datasets  
MATH676 Topological Data Analysis  
GRAD510 Fundamentals of High Performance Computing  
GRAD511 High Performance Computing and Visualization  
STAT600 Statistical Computing  
BIOM400 Biomolecular Kinetics and Cell Dynamics  
BZ381A1 Bioinformatics and Genomics  
BZ 571, Molecular and Genome Evolution  
BZ 578 Genetics of Natural Populations  
MIP577 Computer Analysis in Population Genetics

### **Career Development**

#### *Business & Management*

MGT450/BIOM580 Biomedical Entrepreneurship  
MGT 305 Fundamentals of Management  
MGT 320 Contemporary Management Principles/Practices  
MGT 325 Leadership Communication  
BMS610A Managing a Career in Science

#### *Safety, Philosophy & Ethics*

MIP540 Biosafety in Research Laboratories  
PHIL564 Animal Ethics  
HIST463 Science and Technology in Modern History

#### *Scientific Journalism & Communication*

JTC372 Web Design and Management  
JTC 461 Writing about Science, Health & Environment  
JTC 464 Technical Writing

JTC 465 Specialized and Technical Editing  
JTC 501 Process and Effects of Technical Communication  
JTC 660 Communication in Technology Transfer  
JTC 662 Communicating Science and Technology  
GRAD550 Science Communication  
MIP666 Writing Scientific Manuscripts

The English Department offers a [Portfolio Option in Non-Fiction](#) which may be of interest to CMB students attracted to scientific writing as a career.

### **Teaching**

CMB students are encouraged to work towards a [Graduate Teaching Certificate](#) through The Institute for Learning and Teaching (TILT).

## SAMPLE CURRICULUM – M.S.

This is based on a Plan A - M.S. degree requiring a thesis. It may be possible to complete the requirements in fewer than four semesters. 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

CM510	Introduction to CMB	1cr
CM502	Techniques in CMB	2cr
GRAD580	STEM Communication	1cr
BC563	Molecular Genetics	4cr
CM595	Thesis	Variable

### Second Semester

BC565	Molecular Regulation of Cell Function	4cr
CM792	Seminar	1cr
	Ethics Elective	1-3cr
CM795	Thesis	Variable

### Third Semester

CM793	Graduate Seminar	1cr
CM699	Thesis	Variable
	Electives	Variable

### Fourth Semester (if needed)

CM699	Thesis	Variable
	Electives	Variable

## SAMPLE CURRICULUM – Ph.D.

A Ph.D. degree requires 72 credits of which 37 credits are at the 500 level or above in regular course work.

### First Semester

CM510	Introduction to CMB	1cr
CM502	Techniques in CMB	2cr
GRAD580	STEM Communication	1cr
BC563	Molecular Genetics	4cr
CM595	Thesis	Variable

### Second Semester

BC565	Molecular Regulation of Cell Function	4cr
CM792	Seminar	1cr
	Ethics Elective	1-3cr
	Statistics Elective	3-4cr
CM795	Thesis	Variable

### Third Semester

CM793	Graduate Seminar	1cr
CM795	Thesis	Variable
	Writing Elective	1-3cr
CM700	Critical Analysis of the Literature	1 cr
	Electives	Variable

### Fourth Semester and beyond

CM795	Thesis	Variable
	Electives	Variable
CM700	Critical Analysis of the Literature	1cr
CM792	CMB Seminar	1cr
CM793	Graduate Seminar	1cr

## 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 and is conducted by the student's Graduate Advisory Committee that is chaired by his/her advisor. 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.

### Timing

The comprehensive preliminary exam is to be administered by the end of the 5<sup>th</sup> semester in the graduate program (Fall semester of 3<sup>rd</sup> year) by which time the student should have completed all of the required classes. For students transferring from MCIN, the preliminary exam should be completed by the end of the 5<sup>th</sup> semester after enrolling at CSU. For students transferring from other programs (e.g. Resident/PhD students) the timeframe for completing the preliminary exam should be defined through discussion with the GAC and the CMB Program Office notified of the expected date of completion. Failure to comply with these requirements will result in the CMB Graduate Education Office placing a hold on registration. Exceptions may be made in extraordinary circumstances but must be approved by the CMB Academic Committee and the CMB Program Director. The student is responsible for notifying the CMB Program Office of intent to hold the examination. In addition, the student will provide the CMB Program Office with documentation (copies of the GS16 form, the proposal and the examiners' evaluation) upon completion of the exam, regardless of the outcome.

A summary of the examination process is provided below:

Early Fall Semester of 2 <sup>nd</sup> year	All 2 <sup>nd</sup> year students should attend a Preliminary Exam Information Meeting during which the format and timing of the CMB Preliminary Exam will be discussed.
Fall or Spring Semester of 2 <sup>nd</sup> year	The student should prepare a research proposal on their own project, either as part of a grant writing class and/or in close collaboration with the primary advisor. This proposal should be shared with the examination committee at least one week ahead of a Pre-Exam Committee Meeting along with a copy of the "Guidelines for the Comprehensive

	Preliminary Exam” (this document).
Spring/Summer of 2 <sup>nd</sup> year or Early Fall of 3 <sup>rd</sup> year	A Pre-Exam Committee Meeting should be held at which the first research proposal will be approved / discussed. In addition, the role of the advisor, chair of the committee and format and date of the exam will be finalized. This committee meeting may also double as the student’s annual committee meeting.
7 weeks prior to the exam (and <u>before</u> the last week in October)	The student should provide the examination committee with a one page document describing the Specific Aims of their independent proposal.
6 weeks prior to the exam	The committee should provide comments on the specific aims to the student (by email).
4 weeks prior to the exam	Any revisions to the Specific Aims should be approved by the examination committee (by email). The CMB Office should be notified of intent to take the examination and the date. The student should allow 2-3 weeks of full time effort to complete the proposal.
1 week prior to the exam	The final independent proposal should be handed to each committee member for evaluation, along with a copy of the preliminary examination evaluation form. The student will also provide the committee with a completed Assistance Form detailing the contributions of others to the proposal.
Day of the Exam (must be completed by end of Fall semester in the 3 <sup>rd</sup> year)	Student and committee meet for the oral examination. Committee members provide their written evaluation forms to the chair after the exam.
Within 2 days after the exam	The original, signed GS16 form must be submitted to the Graduate School. Copies of GS16 and the proposal will be provided to the CMB Office. Copies may be electronic.
Within 1 week after the exam	The chair of the committee will provide the student, other committee members and the CMB office with a summary statement describing the student’s performance in the examination.

### **Preliminary Exam Information Meeting**

During the fall semester, all second year CMB students should attend an information meeting during which the format and timing of the CMB preliminary exam will be discussed.

### **Preparation**

In order to pass the preliminary exam the student must be able to independently formulate a hypothesis and design experiments to test this hypothesis. In addition, the student needs to be able to concisely and coherently convey their ideas to the examiners both orally and on paper. To develop these skills prior to the examination the student should prepare a research proposal (Thesis Proposal) on their own project in collaboration with the primary advisor and/or as part of a grant writing class. This proposal should be shared with the examination committee prior to the Pre-Exam Meeting to allow them to evaluate whether the student is adequately prepared for the examination and familiarize

themselves with the student's research area.

### **Pre-Examination Committee Meeting**

Once the student has completed the Thesis Proposal on their own research and it has been approved by the primary advisor and/or received a passing grade in a grant writing class, they should arrange the Pre-Examination Committee Meeting. This committee meeting may also serve as the student's annual committee meeting and all committee members should be present. In addition, the CMB Program Director (or Chair of the CMB Academic Committee) should attend this meeting in order to describe the CMB Preliminary Exam and the purpose of the meeting to the Committee. The purpose of the Pre-Exam Meeting is:

- (i) To Approve the Thesis Proposal. The committee should determine whether the Thesis Proposal meets expectations and demonstrates that the student is ready for the Preliminary Examination. The student may present the proposal orally as part of CM793 or during the committee meeting, if desired. If the proposal does not meet expectations, the committee should provide detailed guidance as to what is needed to bring it up to standard.
- (ii) To Select a Chair of the Examination Committee. The chair will communicate directly with the student during preparation of the independent proposal and provide a comprehensive written evaluation after the examination. The Chair of the Examination Committee may be the primary advisor if the rest of the committee agrees.
- (iii) To Define the Role of the Primary Advisor(s). The Committee as a whole will determine whether the student's major advisor(s) may be present for the oral examination, whether they may actively participate in the examination, and whether they may vote as to whether the student passes or fails the exam. If the committee decides to exclude the primary advisor(s) from the exam process then an alternate examiner should be identified from among the CMB Faculty. In this case, it may be necessary to file a GS9A form with the Graduate School in order to include the temporary member of the committee.
- (iv) To Establish Acceptable Practices during the Writing Process. Although the primary advisor may NOT collaborate with the student on the independent proposal, the committee may specify whether the proposal can be discussed with peers, whether the student may obtain assistance with English language editing (this should generally only be considered for those students with English as a second language or a disability such as dyslexia), and may also provide a list of acceptable topics.
- (v) To Determine a Date and Time for the Examination.

The decisions made at this meeting should be documented on the form provided (Pre-Examination Form, Page 4 of these guidelines) and the student should provide the CMB Office with a copy.

### **Format of the Proposals**

Both the Thesis Proposal and the Independent Proposal should be in the format of an NIH R03/R21 application and use the template provided on the CMB Program Website. The entire document should not exceed 7 single-spaced pages including 1 single-spaced page allocated to the Specific Aims. Margins should be no less than 0.5" and the font should be no smaller than 11pt Arial. The main proposal should be divided into Significance, Innovation and Approach sections. Figures should be embedded in the text and have a font size of no smaller than 8 pt. Use of color figures is acceptable and encouraged. References are not included in the 7 page limit. If a grant writing course specifies a different format for the Thesis Research Proposal then that format is acceptable for that document, but the Independent Proposal should still follow the guidelines outlined above.

### **Preparation of the Independent Proposal**

The independent proposal should be prepared by the student, without discussion of the approach or hypothesis with the advisor(s). The student should rely on the literature and their own background knowledge to develop a strong, original hypothesis and design an experimental approach to test it. Potential pitfalls and alternative approaches should be considered and the techniques proposed should be appropriate and state-of-the-art. The experimental approach

should rely mainly on techniques other than those the student routinely uses in their own research. For example, if the student's research project extensively utilizes ELISA assays and flow cytometry, these types of assay may not form the bulk of the experiments in the proposal, although they need not be completely avoided. Additional guidelines are provided on the CMB Program Website.

The proposal should be written in English. Students who feel they are deficient in their written language skills are encouraged to consult the CSU Writing Center for assistance. Students are also cautioned that the proposal should be an original, independently prepared document. Plagiarism of ideas or inappropriate use of passages from published documents will result in immediate dismissal from the PhD program.

At the time the proposal is submitted to the committee, the student should also submit the Assistance Form (Page 5) describing the contributions of other individuals (if any) during the preparation of the proposal.

### **Evaluation of the Specific Aims**

The committee or advisor may provide the student with a list of four or five acceptable areas of study if they wish but experimental approaches and specific problems to be addressed should not be discussed. The committee is asked to evaluate the Specific Aims before the student prepares the main proposal. Comments and suggestions should be communicated to the student by email ~6 weeks prior to the oral examination. In particular the committee should:

- (i) Evaluate whether the student is proposing research in a relevant area that is neither too close, nor too far from their own area of expertise. For example, a student working on replication of HIV-1 could propose to investigate replication of an alphavirus, or perhaps examine immunity to HIV-1, but it would be inappropriate to focus on the replication of a related retrovirus such as FIV. Equally, it would be unsuitable for this student to propose experiments on plant pollination as this topic has no obvious connection to the student's chosen field of study. The committee is encouraged to use their discretion to determine whether aims are appropriate. Finally, the proposal should not overlap significantly with other projects in the laboratory supervised by their major advisor. In general, the subject matter of the proposal should be close enough to the student's own area that the knowledge garnered will enhance the student's understanding of their own research.
- (ii) Give the student guidance regarding the scope of the specific aims and make suggestions that could help focus the proposal. For example, if the student proposes too broad a study the committee members could suggest which Aims should be discarded and which expanded.

The committee should not overtly suggest better experimental approaches or better hypotheses; although it is acceptable to ask that the student formulate another hypothesis and develop new specific aims if those submitted are considered unacceptable.

### **The Examination**

At the start of the oral examination the student will give a ~20min presentation covering the material in the independent proposal. The committee will then question the student to determine how well they understand the literature in their chosen field of study as well as the background information relevant to the written proposal. The committee will also test the student's ability to think creatively and communicate their ideas orally. In addition to the material presented in the proposal, the student can expect to be questioned on material taught in BC563 and/or BC565 or other graduate classes they have completed, as well as on material they presented in the Thesis Proposal. The CMB Program Director should be invited to attend the Preliminary Exam as an impartial observer and in an advisory capacity.

### **Overall Evaluation**

An evaluation form is provided on the CMB Graduate Program Website. The independent proposal should not be evaluated as if it were being considered for funding. One goal of the preliminary exam is to ascertain whether the student understands their chosen field of study sufficiently that they can formulate an interesting and original hypothesis and develop a means to test it. The exam also tests the student's ability to communicate their ideas

effectively orally and on paper. The written proposal, the oral presentation and the student's performance in the questioning period will all be evaluated.

### **Failing the Examination**

The student must pass both the written and oral parts of the examination in order to pass the preliminary exam. If performance in either portion is inadequate, the student fails the examination. In this case, if the committee agrees, the exam may be administered a second time no sooner than two months and no later than four months from the date of the original examination. The requirements to pass the second exam should be clearly defined by the committee and may include rewriting the proposal, taking additional classes and/or repeating the oral defense. If the student fails the second examination they will be immediately dismissed from the Ph.D. program.

### **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. The CMB Program should be noted as the student's affiliation in all publications.

### **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.

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