



Washington

WASHINGTON · UNIVERSITY · IN · ST · LOUIS

Biology & Biomedical Sciences

ACADEMIC PROGRAM GUIDELINES

Programs in Cell & Molecular Biology

Developmental Biology

Molecular Cell Biology

Molecular Genetics & Genomics

**Molecular Microbiology &
Microbial Pathogenesis**

GUIDELINES TO THE PROGRAMS IN CELL AND MOLECULAR BIOLOGY

Overview of the Programs in Cell and Molecular Biology

Graduate training in Cell and Molecular Biology at Washington University is offered by the Programs in Cell and Molecular Biology in the Division of Biology and Biomedical Sciences. There are four Programs within this umbrella group. The Programs in Cell and Molecular Biology are overseen by a **Governing Committee**, which is comprised of the directors of the Program Steering committees, ad hoc faculty, and graduate student representatives. The four individual programs are organized around central disciplines in Cell and Molecular Biology. Each program is administered by a **Steering Committee**, which is comprised of 4-12 faculty who oversee graduate training once a student decides to specialize in one of these areas. The four programs are:

Developmental Biology

Molecular Cell Biology

Molecular Genetics & Genomics

Molecular Microbiology and Microbial Pathogenesis

The goal of the Programs is to provide students with the best possible training for careers as research scientists in Cell and Molecular Biology. Students enter one of the four Programs in Cell and Molecular Biology based upon their interests. The appropriate Steering Committee takes on the responsibility for advising each matriculating student. Program affiliations may be changed during the course of the first semester, providing the student is in good academic standing and has the approval of the program directors involved and their admissions committees. Following the completion of at least one semester, students in good academic standing are free to transfer from one Division program to another following a discussion with both Program Directors.

Graduate training formally is divided into two stages: pre-candidacy and candidacy. Students usually complete the requirements for candidacy, which include courses, qualifying examination during the second year as well as a thesis proposal in the fall semester of the third year. The qualifying examination consists of a written research proposal in the student's field of interest followed by an oral examination on the proposal. In addition, some programs include a written examination following the advanced elective courses. Please see specific guidelines for your program. Once the student becomes a candidate for a Ph.D. degree, training consists of directed thesis research under a mentor of the student's choice.

Typically a graduate student begins the program in late August and enrolls in two **core courses**, Nucleic Acids and Fundamentals of Molecular Cell Biology, during the first semester. To learn about various areas of research within the Programs in Cell and Molecular Biology, students choose three **research rotations**, each about three months in duration, in the first year. During the rotations, students undertake small research projects and evaluate labs in which to conduct thesis research. During the second semester, students select one or two courses from a menu of **advanced elective courses**. Two advanced electives are required to achieve candidacy. Students may also take **special topic courses** at any time during their studies. Five credits worth are required prior to graduation and include two-credit courses led by faculty on particular subjects and one-credit journal club courses which focus on the current literature. All students are required to take a special topic course in ethics. All special topic courses place emphasis on student presentations to help develop oral presentation skills.

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Students usually take the qualifying examination in spring of their second year (at the beginning of the second year for MSTP students), after which they form a thesis committee. The thesis committee consists of faculty of the student's choosing and assists the mentor in guiding the student's thesis research. A formal thesis proposal is presented to the thesis committee before Dec. 31 of the third year (second year for MSTP). Students are encouraged to complete and defend their dissertations no later than the end of their fifth year (third year for MSTP).

Overall the program is designed to provide the student with the multiple skills required to be an effective research scientist, including (i) an ability to propose, discuss, and critically evaluate ideas, (ii) an understanding of important concepts in Cell and Molecular Biology, (iii) an ability to conceive experiments that will test hypotheses, (iv) the technical skill to conduct experiments, and (v) an ability to explain experiments and concepts effectively, in both written and oral presentations. An outline of a typical student's course of study is on the following page.

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Outline of Typical Ph.D. Student's Program

YEAR	SEMESTER	MAJOR ACTIVITIES
1	Fall	<p>Arrive between June and Aug 15. Orientation 3rd week of Aug^a. Meet with adviser and steering committee; plan rotations and coursework; begin first rotation.</p> <p>Take core curriculum courses: Nucleic Acids and Protein Biosynthesis; Fundamentals of Molecular Cell Biology</p>
	Spring-Summer	<p>Winter: Second rotation. Spring: Third rotation.</p> <p>Take one or two advanced elective courses^b.</p> <p>Take special topic courses as interest dictate.^c A special topic course in ethics must be completed by the end of the second year.</p> <p>Summer: Choose thesis adviser and begin thesis research.</p> <p>Genetic Students – Complete Qualifying Exam by July 31.</p>
2	Fall	<p>Complete advanced elective course requirements</p> <p>Take special topic courses as interest dictate. A special topic course in ethics must be completed by the end of the second year.</p> <p>Teaching Assistantship (Fall or Spring Semester).</p>
	Spring-Summer	<p>Choose a thesis committee.</p> <p>Take special topic courses as interest dictate. A special topic course in ethics must be completed by the end of the second year.</p> <p>Submit topic for qualifying exam by May 15 (not applicable to Microbiology students-refer to the Microbiology Qualifying Exam Guidelines for specifics)</p> <p>* Complete qualifying exam by July 31 *^d (Microbiology-refer to Qualifying Exam guidelines for specific guidelines)</p> <p><u>See specific program guidelines for qualifying examinations</u></p> <p>*(MCB students complete the qualifying exam in the semester they are not TA'ing.)</p>
3	Fall	<p>Complete thesis proposal by Dec. 31.</p> <p>Take special topic courses as interest dictate.</p> <p>Thesis research</p>
	Spring-Summer	<p>Take special topic courses as interest dictate.</p> <p>Thesis research.</p>
4		<p>Take special topic courses as interest dictate.</p> <p>Thesis research.</p>
5		<p>Complete and defend thesis.</p>

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^aSome students arrive early to begin rotation in summer. Students with little research experience are encouraged to take this opportunity.

^bAdvanced electives may be chosen from among:

Advanced Genetics	Foundations in Immunology
Molecular Basis of Plant Development	Developmental Biology
Molecular Microbiology	Molecular Recognition
Macromolecular Structure	Macromolecular Interactions
Systems Cell and Molecular Biology	Computational Molecular Biology
Statistical Thermodynamics of Macromolecular Interactions	

^cSpecial topic courses are 1 or 2 credit courses that emphasize student oral presentations. Both journals clubs (1 credit) and topic courses that include some didactic material (may be 2 credits) will count toward a total 5 credit requirement. Two of the five credits must be earned in special topic courses. A special topic course in ethics must be completed by the end of the second year.

^dThe qualifying exam consists of a written and oral presentation of a research proposal not on the thesis topic and an oral examination on the proposal and background knowledge appropriate for a Ph.D. candidate in the field.

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Outline of Typical MSTP Student's Program

YEAR	SEMESTER	MAJOR ACTIVITIES
1	Late Summer/Fall	<p>Orientation.</p> <p>Meet with MSTP and appropriate Steering Committee to plan coursework.</p> <p>Core curriculum courses: MSTP students are expected to have completed Fundamentals of Molecular Cell Biology during the first year of Medical School. MSTP students are not required to take Nucleic Acids and Protein Biosynthesis, however, they will be responsible for the course material for the Qualifying Exam.</p> <p>Take one or two advanced elective courses.^a</p> <p>Choose thesis advisor and begin thesis research.</p> <p>Teaching Assistantship (Fall or Spring).</p>
	Spring-Summer	<p>Complete advanced elective requirement.^a</p> <p>Take special topic courses as interest dictate.^b A special topic course in ethics is taken in the second year.</p> <p>Submit topic for qualifying exam by June 15.^c</p> <p>Complete qualifying exam by August 31.</p> <p>Genetic students – complete qualifying exam by July 31.</p> <p>Developmental Biology and Molecular Cell Biology students see individual guidelines.</p>
2	Fall	<p>Take special topic courses as interest dictate.</p> <p>Choose a thesis committee and meet to propose thesis by December 31.</p>
	Spring-Summer	<p>Take special topic courses as interest dictate. A special topic course in ethics must be completed by the end of the second year.</p> <p>Thesis research.</p>
3	Fall	<p>Take special topic courses as interest dictate.</p> <p>Thesis research.</p>
	Spring-Summer	<p>Take special topic courses as interest dictate.</p> <p>Complete and defend thesis.</p>
4		Return to Medical School.

^aMSTP students are required to take two advanced elective courses. In some programs, one advanced elective course from the Medical School curriculum can be used towards this requirement. Please consult your program director.

^aAdvanced electives may be chosen from among:

Advanced Genetics	Foundations in Immunology
Molecular Basis of Plant Development	Developmental Biology
Molecular Microbiology	Molecular Recognition
Macromolecular Structure	Macromolecular Interactions
Systems Cell and Molecular Biology	Computational Molecular Biology
Statistical Thermodynamics of Macromolecular Interactions	

^b Special topic courses are 1 or 2 credit courses that emphasize student oral presentations. Both journals clubs (1 credit) and topic courses that include some didactic material (may be 2 credits) will count toward a total 5 credit requirement. Two of the five credits must be earned in special topic courses. A special topic course in ethics must be completed by the end of second year.

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^cThe qualifying exam consists of a written and oral presentation of a research proposal not on the thesis topic and an oral examination on the proposal and background knowledge appropriate for a Ph.D. candidate in the field.

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Developmental Biology

Dr. Kerry Kornfeld, Co-Director
Department of Molecular Biology and Pharmacology
Campus Box 8103
747-1480

Dr. Jim Skeath, Co-Director
Department of Genetics
Campus Box 8232
362-0535

The various research groups in this program study problems in embryonic development and cell and tissue differentiation in a variety of model systems, ranging from the vertebrate nervous system to slime molds and yeasts. Genetic (both classical and molecular), cell biological, immunological, and biochemical approaches are utilized to elucidate the molecular mechanisms that underlie many key processes of development. Research areas include embryo and tissue organization, cell-cell and cell-matrix interactions, and control of cell fate, differentiation, tissue specific gene expression, and pattern formation.

Among the Advanced Electives listed on page 4, students must select both Developmental Biology (BIO 5352) and Advanced Genetics (BIO 5491) in addition to whichever other courses are of potential interest.

Molecular Cell Biology

Dr. Maurine E. Linder, Program Director
Department of Cell Biology & Physiology
Campus Box 8228
362-6040

The goal of research within this program is to explain the mechanisms of the fundamental processes of cell biology in molecular terms. Such processes include cell motility and proliferation, the trafficking of molecules into and out of cells, adhesion of cells to matrix and to each other, receptor-ligand interactions, the transport of molecules and information across membranes, and cell signalling. A common theme which unites these diverse endeavors is the desire to push the limits of our understanding of these processes to the highest possible molecular resolution.

Students will take the Advanced Cell Biology (Bio 5384) and another advanced elective from those listed on page 4, subject to the approval of the Molecular Cell Biology steering committee.

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Molecular Genetics & Genomics

Dr. Tim Schedl, Co-Director
Dept of Genetics, Campus Box 8232
Phone 362-6162

Dr. Jim Skeath, Co-Director
Department of Genetics, Campus Box 8232
362-0535

This program encompasses research-addressing questions of how genes are inherited, modified, expressed and regulated. All of the favorite model organisms used in modern genetic analysis are represented in this program, including phage and viruses, bacteria, yeast and fungi, nematodes, *Drosophila*, algae, plants, and mice. This program is rounded out by an additional strength in human molecular genetics, a research area of increasing importance.

Students must take the Advanced Genetics class as well as the Genomics class for their two advanced elective courses. Please note: Molecular Genetics and Genomics students are required to register for the Molecular Genetics Journal Club (Bio 5235) for two semesters and must participate in the journal club for an additional semester. Students in the program are required to complete four rotations and are encouraged to carry out rotation in at least two different research areas (model organism genetics, human genetics, genomics). While flexibility exists within the system, in general rotations should last for eight weeks and abide by the following schedule: rotation 1 - September through October; rotation 2 - November until the middle of January; rotation 3 - middle of January to mid/late March; rotation 4 - mid/late March through June.

Molecular Microbiology and Microbial Pathogenesis

Dr. Tamara Doering, Co- Program Director
Department of Molecular Microbiology
Campus Box 8230, phone 747-5597

Dr. Joseph Vogel, Co-Program Director
Department of Molecular Microbiology
Campus Box 8230, phone 747-1029

The Molecular Microbiology and Microbial Pathogenesis Program includes three major areas of research:

Molecular Microbiology Research in the molecular genetics and physiology of microbial organisms, including the study of the mechanism of fundamental processes such as gene regulation and protein synthesis and processing.

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Virology	Research in the molecular genetics of animal and plant viruses, especially the study of the mechanism of virus replication, gene expression, and latency during infection by DNA, RNA and retroviruses.
Microbial Pathogenesis	Research in the molecular biology and biochemistry of pathogenic bacteria, fungi, protozoa, helminths and viruses, with emphasis on mechanisms of virulence and host-parasite interactions.

The Molecular Microbiology and Pathogenesis, Molecular Virology, and Foundations in Immunology courses are considered central to the Molecular Microbiology and Microbial Pathogenesis Program. Students may choose any two advanced electives from those listed on page 4, subject to the approval of the Molecular Microbiology & Microbial Pathogenesis steering committee.

1. Advising

Timely and good advice often can be very important to graduate students. Students in the Programs in Cell and Molecular Biology should take advantage of advice from a number of sources, both informally from faculty and students and more formally from appointed advisors that meet with the student at appropriate intervals.

Student Mentors

Each first-year student is assigned a student from the second- or third-year class to act as mentor. The student mentor may serve as a first source for answers to many questions but also may encourage the student to meet with a faculty adviser where appropriate.

Faculty Advising

Steering committees will provide advising for first-year and second-year students who have not yet designated a laboratory they wish to join. Each student will be assigned an adviser either on the committee or from a group of advising volunteers. To register or to drop or add courses, students must obtain their adviser's signature. In addition to individual advising sessions, each student will meet briefly with the Steering Committee once per semester to discuss progress and address any questions the student may have.

The committees will meet with any student who has not yet completed a thesis proposal no less than once a semester, although an individual adviser can be appointed to advise each student. These meetings will usually occur just before the beginning of each semester. Once a student has completed a thesis proposal, advising will no longer be required, since the thesis committee takes over this responsibility. However, students should feel free to consult their previously assigned advisers as they see fit.

2. Formal Courses

The following courses are generally required for all students in the Programs in Cell and Molecular Biology. However, as flexibility is a hallmark of graduate training in the programs, the Governing Committee may choose to waive some requirements in unusual cases.

2.1. Core First-Year Courses

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Students normally take two core courses during their first fall semester in the programs: Nucleic Acids and Protein Biosynthesis (Bio 548) and Fundamentals of Molecular Cell Biology (Bio 5068). A grade of B- or better in these courses is one of the requirements to achieve candidacy. Students in any program may defer taking some core courses until the second year, with consent of the Governing Committee or their Steering Committee.

2.2. Advanced Elective Requirements

Students in the programs complete two advanced elective requirements by the end of their fourth semester (second semester for MSTP) in the program. Subject to the approval of the program steering committee, students may select from among the following courses to fulfill the advanced elective requirement.

Advanced Genetics	Foundations in Immunology
Molecular Basis of Plant Development	Developmental Biology
Molecular Microbiology & Pathogenesis	Molecular Recognition I & II
Macromolecular Structure	Macromolecular Interactions
Advanced Cell Biology	Computational Molecular Biology
Statistical Thermodynamics of Macromolecular Interactions	

2.3. Special Topic Courses, Tutorials and Journal Clubs

During the course of graduate studies, students in the programs take five credits of special topic courses, tutorials, or journal clubs. Two of these credits must be earned in special topic courses. A special topic course in ethics must be completed by the end of the second year. The purposes of this requirement are (i) to provide close student-faculty interactions in a format that is less didactic than standard lecture courses; (ii) to allow students to study current research topic in great depth; and (iii) to provide students with a mechanism to learn speaking skills. Thus, a large component of these courses include coaching in oral presentation.

Special topic courses that include some didactic material and an examination may count for two credits. Courses that consist mainly of student presentations will count for one credit. Normally a student will receive one credit in a regular journal club for regular participation and for one presentation. To count, a journal club must either be in the University Course Listings or on an approved list maintained by the Governing Committee. One of the five credits may be in a student-run journal club on the approved list.

Special topic courses are organized by one or several faculty on a specific research topic. Students are encouraged to approach faculty with proposals for special topic courses. For example, faculty may identify several special topic related to some area of current research interest and assign students to give presentations on each subject. A special topic course also might include some presentations by outside speakers or faculty at Washington University with expertise in the area. Guidelines for journal clubs and special topic courses are available from the Governing Committee and detail the requirements for journal clubs to be approved.

3. Research Lab Rotations

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At the beginning of the first semester, students, with the advice of their advisors and the Governing Committee, plan laboratory rotations. In general, students complete three laboratory rotations, each three months long, by the summer of their first year in the program, at which time they select a thesis mentor. The *Faculty Research* book provides a description of research opportunities available for rotations. Students are urged to discuss possible rotation projects with as many potential advisors as possible, before making their selections.

[Students are prohibited from conducting rotations in laboratories where they have been previously employed. However, previous employment would not prevent the student from pursuing thesis work in such a laboratory.] Also, before deciding on a particular laboratory, the student should develop an outline of the proposed work with the faculty member. The Division Office provides students with a Rotation Form for this purpose. The form should be completed by the student with the rotation mentor's help and returned to the Division Office at the start of each rotation. A second part of the form is completed at the end of the rotation to provide the Governing Committee with an evaluation of the rotation experience.

The purpose of the rotations is to broaden the student's research experience and to expose the student to available opportunities before a thesis preceptor and problem are selected. *It should be recognized by both student and rotation mentor that significant research accomplishment is not a requirement for a successful rotation, nor should the rotation be prolonged significantly beyond the normal three-month period to meet particular research objectives. Students may choose to end a rotation at any time, should they find it desirable to move on to the next rotation.*

During the rotation, the student should take advantage of the one-on-one relationship with the faculty member to discuss science as it is carried out in the lab, and to evaluate together the approach to research. Students should explore these contacts carefully during rotations, mindful that selection of a good mentor who will provide the personal instruction required to master experimental science is the most important decision they will make in graduate school.

4. Teaching Requirement

Acquisition of teaching skills is an important component of training as an effective scientist. Each student in the Programs in Cell and Molecular Biology participates in a formal graduate or undergraduate course as a Teaching Assistant for one or two semesters, depending on the workload of the assignment. Every effort is made to assign students to courses that are appropriate to their backgrounds and interests and to ensure that students receive significant first-hand experience of teaching in a formal classroom setting. Teaching normally is done during the first or second semester of the second year in graduate school.

5. Qualifying Examination

Refer to program specific Qualifying Exam Guidelines.

6. Thesis Committee and Thesis Proposal

6.1. Purpose of the Thesis Committee

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The purpose of the thesis committee is to advise the student in his or her thesis research and to provide the student with a readily accessible source of advice and constructive criticism during the dissertation research. To achieve these goals, it is imperative that thesis committees meet early in a student's term and that they meet with the student at least once a year to offer suggestions and ascertain progress. The thesis committee should actively monitor the student's progress toward completion of a thesis by no later than the end of the student's fifth year, and preferably sooner. A thesis committee's ultimate responsibility is to act in the student's best interest, by ensuring that the research undertaken will lead to an acceptable dissertation and a Ph.D. degree.

6.2. Constitution of the Thesis Committee

Students should choose their thesis committees during their second year. The thesis committee consists of five faculty members and the thesis preceptor. The University requires that the final dissertation defense committee be composed of four faculty from the student's program and two others from any of the other programs, or from departments outside the Division. All members of the committee must be members of the Washington University faculty and must hold regular academic appointments in the University. A quorum of four members including the thesis adviser is needed for any pre-defense meeting. The student and preceptor nominate these committee members subject to approval by the Program Director. The committee members are selected for their expertise in areas on which the research will touch, and for their willingness to contribute advice and meet at least once per year. The committee is chaired by a faculty member other than the thesis preceptor, and the chairperson should be designated in advance of the proposal, based on his or her willingness to be responsible for the committee's activities. The student and preceptor should view the committee system as a source of objective criticism and expert advice. At the time of the thesis defense, the thesis committee serves as the defense committee. The addition of committee members or changes of committee composition should be made no later than six months before the defense date.

6.3. Timing of the Thesis Proposal

Students are encouraged to present a thesis proposal during their second year, but should complete the proposal no later than December 31 of their third year (second year for MSTP students) in the Division. If the student anticipates that he or she will not be able to meet this deadline, the thesis advisor must write a letter to the Steering Committee by November 1, explaining the situation and indicating when the student can be expected to propose. Final approval of the thesis proposal by the thesis committee must take place by the end of the student's third year, or the student will no longer remain in good academic standing and will lose registration privileges for the following semester.

6.4. Thesis Proposal

The thesis proposal should include a statement of purpose and rationale for the project, an outline of the methods to be used and an assessment of their feasibility, a summary of the work

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performed already, an idea of the potential outcome, and alternative plans for high risk portions of the project. Although these are all essential components of a proposal, it is not intended that the proposal be lengthy, and preliminary data, while desirable, need not be profuse or conclusive. Thesis proposals require a cogent, but scholarly written assessment of the field and a testable hypothesis with possible branch points to be in the hands of the committee one week prior to an oral presentation. A single-spaced proposal, with references, of five-ten pages is appropriate. The thesis proposal meeting provides a student with guidance in selecting appropriate research goals and is not a test that the student must pass or fail. When the thesis proposal has been approved and has been reported to the graduate school, the Dean writes the student informing that he or she has been advanced to doctoral candidacy.

6.5. Thesis Committee Meetings

During the thesis proposal, emphasis should be given to the student's understanding of the research proposed and the likelihood that it will allow the student to produce a thesis in a timely manner. Toward this end, it is customary for the thesis adviser, although present, not to participate in the discussion except where specifically requested to do so by a thesis committee member. For both the proposal and for subsequent thesis committee meetings, the committee will meet briefly to prepare its recommendations with the student absent. On occasion, the committee may also choose to meet with the student in the absence of the thesis adviser.

After the thesis proposal, thesis committees will meet with students no less than once a year. Scheduling of the meetings should be done by the student. In the event that a student does not schedule timely meetings, the thesis committee chairperson will schedule thesis committee meetings. The thesis committee may choose to meet more often than once per year, if it finds more frequent meetings appropriate. After each meeting, the thesis committee chairperson will be responsible for ensuring that recommendations of the committee are communicated to the student.

7. Nature and Format of the Thesis and Thesis Defense

The program is designed with the goal that students complete their thesis research and prepare, present, and defend a Ph.D. dissertation four to five years from the time they begin the program. The dissertation must be based upon an original investigation which result in a significant contribution to knowledge in Cell and Molecular Biology. Subject to approval of the thesis committee, the dissertation may include reprints of published work of which the student is an author, but where published material is included, a prefatory introduction should describe the extent of the candidate's contribution to both the experimental work and the preparation of the manuscript. When published material constitutes a significant fraction of the dissertation, it is desirable that a separate Introduction that describes the background to the research and a Discussion that describes its significance be written for the dissertation itself.

In order to assure that the dissertation will meet with general approval of the thesis committee, and to provide the required notice to the graduate school of the oral defense, the student will present an outline of the dissertation to the thesis committee six months before the defense date, and meet with the committee to discuss the outline and gain its approval. Once a date for the defense has been set, the Division Office should be notified promptly.

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The thesis committee must read and approve the dissertation prior to the oral defense. To allow adequate time for remedy of potential problems, a complete draft of the dissertation must be given to the thesis committee at least two weeks prior to the date of the defense. Unless otherwise requested by the student and adviser and agreed to by the thesis committee, the format of the defense will be a public seminar followed by a closed session with the entire thesis committee.

8. Students' Responsibility to Meet Program Requirements

Graduate students in the Programs in Cell and Molecular Biology are responsible for completing the requirements of the program in a timely fashion. In particular, the requirements for courses, preliminary examinations, thesis proposals, and thesis committee meetings are important components of graduate training and should be regarded seriously. In the event that a student has trouble meeting any requirement, he or she should request consideration of the situation by the Governing Committee, which may agree to waive or delay the requirement.

9. Transfer From and To Outside Programs

Students are free to transfer to the Programs in Cell and Molecular Biology from any other program in the Division of Biology and Biomedical Sciences provided they are “in good academic standing”. Students who transfer will be expected to meet all of the normal requirements of the programs, although special exceptions may be granted in rare cases by the Governing Committee. Students in the Programs in Cell and Molecular Biology also are free to transfer from the programs to an outside program, with the approval of both program directors and provided a qualifying examination committee or program steering committee has not recommended against the student continuing in the Ph.D. program. Transfer is accomplished most easily during the first year, but can be done at later times if necessary.

10. MSTP Students

Students who join the Programs in Cell and Molecular Biology from the Medical Scientist Training Program generally take the Fundamentals of Molecular Cell Biology course as part of the 1st Year Medical School Curriculum. They are not required to take the Nucleic Acids and Protein Biosynthesis course for credit, however, they will be held responsible for the material covered in this course on the qualifying exam. MSTP students generally meet all other requirements in the Programs in Cell and Molecular Biology, except where requirements are specifically waived by the Governing Committee.