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 a group of faculty who oversee graduate training once a student decides to specialize in one of these areas. The four programs are:

- Developmental, Regenerative & Stem Cell Biology
- Molecular Cell Biology
- Molecular Genetics & Genomics
- Molecular Microbiology and Microbial Pathogenesis
GUIDELINES TO THE PROGRAMS IN CELL AND MOLECULAR BIOLOGY

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 typically choose three research rotations, each two 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 depending on their program. Students may also take special topic courses if required during the first three years of studies. Depending on the program three to five credits worth are required prior to graduation and include two-credit courses led by faculty on particular subjects and two one-credit journal club courses which focus on the current literature. All students are required to take a special topic course in ethics.

Students usually take the qualifying examination during their second year (first laboratory 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 (or pre-proposal) is presented to the thesis committee by June 30th of the second year (first laboratory year for MSTP students) and the thesis proposal must be fully approved before Dec. 31 of the third year (second laboratory year for MSTP). Students are encouraged to complete and defend their dissertations no later than the end of their fifth year (fourth 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.
Outline of Typical Ph.D. Student's Program

<table>
<thead>
<tr>
<th>YEAR</th>
<th>SEMESTER</th>
<th>MAJOR ACTIVITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fall</td>
<td>Arrive between June and Aug 15. Orientation 3rd week of Aug(^a). Meet with adviser and steering committee; plan rotations and coursework; complete first two rotations by the end of the semester (approximately 2 months each). Take core curriculum courses: Nucleic Acids and Protein Biosynthesis; Fundamentals of Molecular Cell Biology.</td>
</tr>
<tr>
<td></td>
<td>Spring-Summer</td>
<td>Winter- complete third rotation (approximately 2 months) and choose a thesis lab. Take advanced elective course Molecular Microbiology and Microbial Pathogenesis (BIOL 5392). Take Special Topics in Microbial Pathogenesis (BIOL 5217) that includes literature review, statistics and experimental design, and grant writing methods. March 1st: Choose thesis adviser and begin thesis research.</td>
</tr>
<tr>
<td>2</td>
<td>Fall</td>
<td>In the Fall or Spring of year 2, complete second advanced elective of choice(^b). A special topic course in ethics must be completed by the end of the second year. Teaching Assistantship including teaching pedagogy workshops (Fall or Spring Semester). Complete Qualifying Exam (proposal written in the Fall, exam scheduled for Fall of 2nd year).</td>
</tr>
<tr>
<td></td>
<td>Spring-Summer</td>
<td>Choose a thesis committee and complete thesis proposal (or pre-proposal) between June 1st and September 1st. Take journal clubs or special topics courses as interest dictate. A special topic course in ethics must be completed by the end of the second year.</td>
</tr>
<tr>
<td>3</td>
<td>Fall</td>
<td>Take journal clubs or special topics courses as interest dictate. Thesis research.</td>
</tr>
<tr>
<td></td>
<td>Spring-Summer</td>
<td>Take journal clubs or special topics courses as interest dictate. Thesis research.</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>Thesis research.</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>Complete and defend thesis.</td>
</tr>
</tbody>
</table>

\(^a\)Some students arrive early to begin rotation in summer. Students with little research experience are encouraged to take this opportunity.

\(^b\)Advanced electives may be chosen from among:
- Advanced Genetics
- Immunobiology I & II
- Molecular Basis of Plant Development
- Developmental Biology
- Molecular Microbiology
- Molecular Recognition
GUIDELINES TO THE PROGRAMS IN CELL AND MOLECULAR BIOLOGY

Macromolecular Structure  Macromolecular Interactions  Molecular, Cell and Organ Systems
Computational Molecular Biology  Statistical Thermodynamics of Macromolecular Interactions

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. A special topic course in ethics must be completed by the end of the second year.

The 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.
**GUIDELINES TO THE PROGRAMS IN CELL AND MOLECULAR BIOLOGY**

**Outline of Typical MSTP Student's Program**

<table>
<thead>
<tr>
<th>YEAR</th>
<th>SEMESTER</th>
<th>MAJOR ACTIVITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 2 Medical School</td>
<td></td>
<td><strong>Core curriculum courses:</strong> 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, a comprehensive understanding of the course material is assumed for the Qualifying Exam. Students needing remedial assistance should seek out additional reading materials from the course. MSTP students in the MMMP program are expected to enroll in the advanced elective course Molecular Microbiology and Microbial Pathogenesis (BIOL 5392). Most students take this in the Spring of the first year of medical school, instead of the Medical Microbiology course. Students are also encouraged to take Special Topics in Microbial Pathogenesis (BIOL 5217) that includes literature review, statistics and experimental design, and grant writing methods. Students who do not take this course in the first year of medical school should take in during the first year of graduate school. This course must be completed prior to taking the QE.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>1</strong> Fall</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Spring-Summer</td>
</tr>
<tr>
<td>2</td>
<td>Fall</td>
<td>Take journal clubs or special topics courses as interest dictate.</td>
</tr>
<tr>
<td></td>
<td>Spring-Summer</td>
<td>Take journal clubs or special topics courses as interest dictate. A special topic course in ethics must be completed by the end of the second year. Thesis research.</td>
</tr>
</tbody>
</table>
GUIDELINES TO THE PROGRAMS IN CELL AND MOLECULAR BIOLOGY

| 3 | Fall       | Take journal clubs or special topics courses as interest dictate. Thesis research. |
|   | Spring-Summer | Take journal clubs or special topics courses as interest dictate. Complete and defend thesis. |
| 4 |            | Return to Medical School. |

"MSTP 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.

Advanced electives may be chosen from among:
- Advanced Genetics
- Molecular Basis of Plant Development
- Molecular Microbiology
- Macromolecular Structure
- Molecular, Cell and Organ Systems
- Statistical Thermodynamics of Macromolecular Interactions
- Immunobiology I & II
- Developmental Biology
- Molecular Recognition
- Macromolecular Interactions
- Computational Molecular Biology

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.

The 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.
Molecular Microbiology and Microbial Pathogenesis

Dr. L. David Sibley, Program Director
Department of Molecular Microbiology
Campus Box 8230, phone 362-8873

Microbiology Steering Committee:

<table>
<thead>
<tr>
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</tr>
</tbody>
</table>

Ex officio members

Stephen Beverley 747-2630 beverley@borcim.wustl.edu

The Molecular Microbiology and Microbial Pathogenesis Program include two major areas of research:

Molecular Microbiology  Research in the physiology, biochemistry, ecology, and evolution of microbial organisms, including cell structure, growth, and development, gene regulation, cell signaling, cell cycle dynamics, environmental, population and community dynamics, and bioenergetics.

Microbial Pathogenesis  Research in molecular and biochemical aspects of pathogenic bacteria, fungi, protozoa, helminths and viruses, with emphasis on mechanisms of virulence, host defense systems, emerging infections, and host-pathogen interactions.

The Molecular Microbiology and Microbial Pathogenesis course (Bio 5392) is considered central to the Molecular Microbiology and Microbial Pathogenesis Program, and is a required advanced elective. The program also features a grant writing workshop, taken as part of a special topics course during the first year. This course provides critical skills in grant writing that will be important for the Qualifying Exam and thesis proposal. Students will also take another advanced elective of their choosing from those listed on page 4, subject to the approval of the Molecular Microbiology & Microbial Pathogenesis steering committee.
GUIDELINES TO THE PROGRAMS IN CELL AND MOLECULAR BIOLOGY

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 committee members will meet twice a year to discuss progress and otherwise advise (a) students in the first few years of graduate school until the thesis proposal has been approved and (b) students in their fifth year and beyond. To register or to drop or add courses, students must obtain a signature from the Steering Committee advisors or the Program Director. Meetings with members of the Steering Committee will occur just before the beginning of each semester and students are expected to be available during this time period. Once a student has completed a thesis proposal, meetings with the Steering Committee will not be required during years 3 and 4 of graduate school. Beginning in the middle of the 5th year (fourth year for MSTP students), students will again meet with members of the Steering Committee at least once per semester in order to discuss the progress toward graduation and future plans. Students needing extra time to complete the thesis will be expected to get permission from their thesis committees and/or the Steering Committee.

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
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 complete two advanced electives requirements by the end of their fourth semester in the program. Subject to the approval of the program steering committee, students are expected to enroll in Molecular Microbiology & Microbial Pathogenesis (BIOL 5392) and a second elective chosen from among the following courses in addition to any required electives by the program:
2.3. Special Topics in Microbial Pathogenesis Bio 5217

During the Spring of the first year of graduate school, students are expected to enroll in this special topics course that focuses on critical review of the literature, statistics and experimental design and grant writing. Exercises will include identifying key unanswered questions from the literature, formulating hypotheses, developing Specific Aims and developing the research plan for a proposal. Students will develop and write a NIH-style proposal with critiques and input from faculty. This course is expected to provide critical skills useful in applying for fellowships and in completing the Qualifying Exam.

2.4 Special Topic Courses, Tutorials and Journal Clubs

During the course of graduate studies, students in the MMMP program are required to take four credits of special topic courses, tutorials, or journal clubs. Two of these credits will be earned in the special topic course described above. A special topic course in ethics must be completed by the end of the second year, for one additional credit. 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 four 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

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 two months long. Rotations will commence the summer before the first semester
GUIDELINES TO THE PROGRAMS IN CELL AND MOLECULAR BIOLOGY

(late August at the latest) and should be completed by March 1\textsuperscript{st} of the first year. Typically students will complete two rotations in the Summer/Fall and a third one beginning in early January. Students should have chosen a thesis mentor and joined a lab by March of the first year. The DBBS Website 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 possible thesis projects with the faculty member, including a discussion to assure that adequate support will be available for the project from the laboratory for the duration of the project. The Division Office provides students with a Rotation Form for this purpose, and further discussions with potential mentors are encouraged. 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 two 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

Effective communication of information and concepts is a critical skill for biomedical research scientists. While much of the teaching that scientists engage in is through one-on-one interactions with individuals in the laboratory, all scientists must be able to deliver lectures to a wide audience (from peers in the field to neophytes with a limited understanding of the nuances of the topic), and scientists in faculty positions will often teach courses to undergraduate and graduate students. Therefore, DBBS students must demonstrate the ability to effectively communicate complex ideas and concepts to groups of individuals at various levels of understanding. To develop these critical communication skills, DBBS students will:

- Complete the TA orientation and three approved workshops offered by the Teaching Center by the end of the 2\textsuperscript{nd} year of graduate studies
- Serve as a Teaching Assistant in a DBBS-approved graduate or undergraduate course for 1 or 2 semesters. The TA assignment will include giving lectures and/or leading lab sessions. The TA is usually completed in the 2\textsuperscript{nd} year of graduate studies.
- Deliver a minimum of four oral presentations at journal clubs, seminars, scientific conferences, and retreats. Presentations given as part of a TA assignment, lab meetings or thesis committee meetings will not satisfy this requirement.
5. Qualifying Examination

Specific Qualifying Exam Guidelines will be distributed to students during the first year.

6. Thesis Committee and Thesis Proposal

6.1. Purpose of the Thesis Committee

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 every six months to offer suggestions and ascertain progress. The thesis committee should actively monitor the student's progress toward completion of a thesis by the end of the student's fifth year. Permission to extend beyond this time period will require that the committee and student provide documentation on progress to date, an outline of additional studies needed, and a timeline for completion. 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. Conflict of Interest Policy

Research funding from sources that have intellectual property interests in the research, or in which the PI has personal financial interest, may create a real or perceived conflict of interest, given the dual roles of the principal investigator in obtaining funding for the lab and as a mentor for graduate students. Issues of paramount importance are (i) the ability to publish results in a timely fashion; (ii) the ability to communicate research results openly, especially to members of the thesis committee; and (iii) academic rights to publish and speak freely, especially as related to a graduate student's thesis and defense.

Statement of policy.
The following principles should apply to any situation involving a graduate student supported by funding that is associated with a confidentiality agreement:

The limitations and nature of the confidentiality agreement must be fully disclosed to and approved by the student, the thesis committee, and the DBBS Associate Dean for Graduate Affairs;

The confidentiality agreement must not place an unreasonable burden or delay in publication or reporting at scientific meetings;

The confidentiality agreement must not delay the writing or defense of the thesis.

The complete policy can be viewed at on the second page of the Thesis Affiliation form: http://dbbs.wustl.edu/curstudents/StudentForms/Pages/StudentForms.aspx

6.3. Constitution of the Thesis Committee
GUIDELINES TO THE PROGRAMS IN CELL AND MOLECULAR BIOLOGY

Students should choose their thesis committees during their second year. The thesis committee normally consists of four faculty members and the thesis preceptor, although the student may hold the initial thesis proposal meeting with a total of four members (three plus the mentor). 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. It is expected that all members of the committee will be present at the defense and the University requires at least five signatures from members present at the defense. 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.

6.4. Timing of the Thesis Proposal

It is expected that students will complete the thesis proposal by between June 1st of the second year of graduate school and no later than September 1st during the third year of graduate school (end of the first or beginning of the second laboratory years for MSTP students). In the event that the thesis project is not yet fully defined, students will be expected to hold a pre-proposal meeting with their advisor and committee to discuss possible projects, followed by a thesis proposal meeting within 6 mos. Final approval of the thesis proposal by the thesis committee must take place by Dec 31st of the student’s third year (second laboratory year for MSTP students), or the student will no longer remain in good academic standing.

6.5. 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 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 and must be in the hands of the committee one week prior to an oral presentation. A single-spaced proposal, with references, of no more than 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.

Format
•Proposal should be in standard NIH format.
GUIDELINES TO THE PROGRAMS IN CELL AND MOLECULAR BIOLOGY

• AIMS page follows standard format
  - Define the system and the major problem to be studied. Explain the significance of the project in terms of broad goals (what will be gained from completion of this project).
  - Provided a framework for what is known from prior work, and from your preliminary data.
  - Identify key gaps in knowledge that will be filled by this proposal.
  - Identify the Hypothesis being tested, or the discovery potential for the project.
  - Provide an outline of the aims with sufficient detail to appreciate the experimental approach.

• Proposal should be single-spaced 5-6 pages may be adequate, 10 pages maximum (including figures and references).
  - Specific Aims page...maximum one page!
  - 1-2 pages of Background (your system)-Significance (your question-approach)
  - 1-2 pages of the most critical preliminary data (should establish feasibility or support the hypothesis being tested)
  - 3-6 pages of a well developed Experimental plan (~ 1-2 pages per AIM)
    o Induce a summary of the approach, analysis, and interpretation.
    o Discuss possible pitfalls and/or alternatives.
  - Include figures (and legends) and formatted references (only those essential to understanding the rationale for the proposal).

6.6. 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, students are expected to meet with their committee every 6 mos. (a quorum of 4 members including the advisor is required to hold a meeting). 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. After each meeting, the thesis committee chairperson will be responsible for ensuring that recommendations of the committee are communicated to the student.


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 that result in a significant contribution to knowledge in Molecular Microbiology and Microbial Pathogenesis. Subject to approval of the thesis committee, the dissertation may include reformatted text 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.

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
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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.

11. Publications

There is no specific requirement for publication to receive the Ph.D. However, high quality, peer-reviewed publications are an important determinant for a student’s career. Similarly, the process of writing and submitting a manuscript and responding to reviewer critiques is an essential part of a student’s training. Therefore, the publication record is one of several important and appropriate measures to be used by a thesis committee in evaluating a Ph.D. candidate. It is generally expected that students will have submitted and/or published one or more first author manuscripts in peer-reviewed journals at the time of the defense.

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