GRADUATE MOLECULAR BIOLOGY AND BIOCHEMISTRY PROGRAM

GENERAL INTRODUCTION

DOCTOR OF PHILOSOPHY

The Molecular Biology and Biochemistry (MB&B) Department supports a graduate program with emphasis in molecular genetics, molecular biology, biochemistry, and molecular biophysics. The MB&B graduate program is designed to lead to the degree of doctor of philosophy. The graduate program is an integral part of the departmental course offerings. Graduate students serve as teaching assistants in undergraduate courses, generally during their first two years. The emphasis of the program is on an intensive research experience culminating in a dissertation. The program of study also includes a series of courses covering the major areas of molecular biology, biochemistry, and biophysics; journal clubs in which current research is discussed in an informal setting; practica designed to introduce first-year students to the research interests of the faculty; and several seminar series in which either graduate students or distinguished outside speakers participate. The low student-faculty ratio (2.5:1) allows programs to be individually designed and ensures close contact between the student and the faculty.

MASTER OF ARTS

The MB&B Department offers graduate work leading to the degree of Master of Arts through the BA/MA program. The program has a strong research orientation, but also includes course work, seminars, and, in some cases, teaching. Students interested in the BA/MA program should declare their intention to do so early in their senior year to permit the design of an acceptable program with both the major department and a research advisor within that department. The MB&B Department may also grant the degree of Master of Arts to students in the PhD program who do not complete the PhD.

COURSES

DOCTOR OF PHILOSOPHY

Ideally, incoming students will have completed courses in general biology, cell and molecular biology, genetics, biochemistry, general chemistry, organic chemistry, physical chemistry, and calculus. Deficiencies in any of these areas would normally be made up in the first year on a case by case basis. A core curriculum of graduate courses in the following areas is given on a “two-year cycle:

- molecular genetics,
- the cell cycle,
- biological spectroscopy,
- bioinformatics and functional genomics, and
- molecular, biochemical, and cellular bases of cancer and other human diseases.

Additional molecular biology course electives are also available in some years. Within this general framework, an individual program of study tailored to fit the student’s background and interests is designed in consultation with the graduate committee and the student’s advisor. Graduate students must take at least 3.0 credits of ‘lecture-style’ courses in order to be eligible to take the Stage I Qualifying examination, which is generally taken in January of the second year of study.

MASTERS OF ARTS

BA/MA students enroll in at least three credits per semester, typically following the pattern in the chart below:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First Year</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MB&amp;B 500-Level Elective</td>
<td></td>
<td>1.0</td>
</tr>
<tr>
<td>MB&amp;B549</td>
<td>Advanced Research Seminar, Graduate</td>
<td>0.25</td>
</tr>
<tr>
<td>MB&amp;B585 or MB&amp;B507</td>
<td>Seminar in Molecular Biology</td>
<td>0.25</td>
</tr>
<tr>
<td>or MB&amp;B585</td>
<td>or Molecular Biophysics Journal Club I</td>
<td></td>
</tr>
<tr>
<td>MB&amp;B557</td>
<td>Research Seminars in Molecular Biology</td>
<td>0.25</td>
</tr>
<tr>
<td></td>
<td>Hours</td>
<td>1.75</td>
</tr>
<tr>
<td>Spring</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MB&amp;B 500-Level Elective</td>
<td></td>
<td>1.0</td>
</tr>
<tr>
<td>MB&amp;B550</td>
<td>Advanced Research Seminar, Graduate</td>
<td>0.25</td>
</tr>
<tr>
<td>MB&amp;B586 or MB&amp;B508</td>
<td>Seminar in Molecular Biology</td>
<td>0.25</td>
</tr>
<tr>
<td>or MB&amp;B508</td>
<td>or Molecular Biophysics Journal Club II</td>
<td></td>
</tr>
<tr>
<td>MB&amp;B558</td>
<td>Research Seminars in Molecular Biology</td>
<td>0.25</td>
</tr>
<tr>
<td></td>
<td>Hours</td>
<td>1.75</td>
</tr>
<tr>
<td><strong>Total Hours</strong></td>
<td></td>
<td>3.5</td>
</tr>
</tbody>
</table>

With permission from the department, students who received credit in 300-level MB&B electives that were not used to fulfill major requirements for their BA degree may apply them towards their MA degree requirements.

PROGRESS AND QUALIFYING EXAMS

DOCTOR OF PHILOSOPHY

The criteria for admission to candidacy for the PhD will be performance in courses, aptitude for research, a written qualifying examination at the end of the third semester, and the oral defense of an original research proposal by the middle of the fourth semester.

MASTER OF ARTS

MB&B’s BA/MA students are expected to submit and orally defend a formal thesis document that describes the research they have carried out in partial fulfillment of the Master’s degree requirements, and to give an oral presentation on their research in our graduate seminar series. MB&B’s BA/MA students are
expected to complete at least one summer of full-time research (in addition to two semesters of research along with required coursework).

**TEACHING**

**DOCTOR OF PHILOSOPHY**

PhD candidates in the MB&B department are expected to participate as teaching assistants (TAs) in undergraduate courses for at least their first 3 semesters. If available, some students may then receive research assistant stipends (RAs) from extramural grants for the remainder of their PhD studies; otherwise, students may continue to receive TA stipends with associated teaching responsibility for the remainder of their PhD studies.

**MASTER OF ARTS**

There are no requirements to TA for the BA/MA program.

**RESEARCH**

**DOCTOR OF PHILOSOPHY**

PhD students will normally complete two lab rotations during their initial two semesters, with the goal of being exposed to a broad range of research techniques and topics in molecular biology. Students generally select one of these rotation labs to pursue their PhD thesis work by the end of the first year, and will begin working on their thesis project during the first summer. The overarching goals of the research experience are to: (i) develop expertise in research methodologies; (ii) develop expertise at the cutting edge of a scientific field, including mastery of relevant literature; (iii) to contribute to the advancement of the field, typically culminating in two published papers in international peer-reviewed scientific journals; (iv) to become effective presenters of scientific data, in the context of their own published manuscripts, seminar presentations, written reports and thesis documents; evaluating published data in journal clubs and coursework, and by presenting at a professional scientific meeting. The MB&B department offers research opportunities across a broad range of topics, including but not limited to:

- control of DNA replication
- mechanism of protein secretion
- global regulations of ribosomal biogenesis in the yeast S. cerevisiae
- mechanisms of DNA replication and repair
- protein-protein and protein-nucleic-acid interactions
- the structural dynamics of nucleic acids and proteins
- chromosome structure and gene expression
- UV resonance Raman spectroscopy of biological macromolecules
- biological assembly mechanisms
- protein fiber formation in disease
- enzyme mechanisms
- the olfactory system and new frontiers in genome research
- elucidation of membrane protein function by x-ray crystallography

**MASTER OF ARTS**

MA students will continue research they began as undergraduate students in a particular lab. In addition to coursework, MA students will pursue a thesis topic over the course of one year towards generation of publishable data that addresses important scientific questions in the field. Towards this end, MA students will develop expertise in cutting edge methodologies in molecular biology and chemistry, extensively read the literature relevant to their thesis project, and present their results at a departmental seminar. MA students often contribute their data towards publication of a co-authored, peer-reviewed journal article, but this is not a formal requirement for the degree.

**CONCENTRATIONS**

PhD students can pursue interdisciplinary specializations within the context of their PhD studies. Molecular Biology and Biochemistry offers two interdisciplinary paths in the areas of Molecular Biophysics (http://www.wesleyan.edu/molbiophys) and Informatics and Modeling (https://www.wesleyan.edu/imcp). Specialization in these areas is achieved through course work, seminars, journal clubs, and dissertation work performed under the guidance of program faculty. Follow the links for more information [provide links]. There are no formal tracks for the MA degree, although working within the lab of a participating faculty member will provide some of the same learning opportunities as described for the Molecular Biophysics and Informatics and Modeling programs.

**THESIS/DISSERTATION/DEFENSE**

**DOCTOR OF PHILOSOPHY**

The most important requirement is a PhD thesis, an original contribution to the field that merits publication. The candidate will receive advice and guidance from their advising committee but must demonstrate both originality and scientific competence. Normally, the candidate will choose a thesis topic during the second year of graduate work in consultation with faculty mentors. Students will select a thesis committee consisting of three additional faculty members, chosen by the student and thesis advisor, with at least two of these members being from the MB&B department. Thesis committee meetings must be scheduled at least once per year in order to provide committee members with updates on progress towards the degree. This committee determines when sufficient experimental work has been completed to begin defense of the thesis (written thesis and oral defense), and this committee serves as the final examination committee that must approve the final written document and its defense.

**MASTER OF ARTS**

Like the PhD thesis, the written MA thesis must be written and orally defended, typically after one year of intense study and research with their faculty mentor(s). Students will select a thesis committee consisting of two additional faculty members, chosen by the student and thesis advisor, with at least one of these members being from the MB&B department. Upon completing the research goals for the thesis, and in consultation with their thesis advisor and thesis committee, students will begin writing their MA thesis document and schedule an oral defense. The thesis committee serves as the final examination committee that must approve the final written document and its defense.

**ADDITIONAL INFORMATION**

For additional information, please visit the department website (http://wesleyan.edu/mbb/grad_studies).