Biochemistry, Molecular Biology & Biophysics Graduate Program Goals and Outcomes Assessment

Program background

The Biochemistry, Molecular Biology and Biophysics (BMBB) graduate program is an interdisciplinary program supported by the College of Biological Sciences and the Medical School of the University of Minnesota. It provides a broad research-based education involving faculty from BMBB as well as other departments in the College of Biological Sciences, the Medical School, the College of Science and Engineering, the College of Food, Agricultural and Natural Resources Sciences, and the College of Veterinary Medicine.

The BMBB graduate program studies molecular mechanisms of basic biological functions using an integrated approach that encompasses biochemistry, chemistry, biophysics, genomics, molecular biology, proteomics, and structural biology. Special foci are how biological processes go awry in diseases including cancer, diabetes, heart disease, and infectious diseases such as HIV/AIDS. The program emphasizes four areas: synthetic biology and biotechnology, molecular biology, metabolic and systems biology, and chemical and structural biology. Students must demonstrate a minimum level of competence in these four areas, but emphasize the area most related to their thesis research.

While graduate training in a BMBB laboratory involves first-year coursework and associated second-year preliminary examinations, the focus is thesis research. Laboratory-based exploration coupled with journal clubs, seminars, scientific meetings and retreats, career counseling and scientific ethics constitutes the major components of the program. PhD graduates from the University of Minnesota either obtain full-time employment immediately after graduation or pursue advanced training in academic or corporate postdoctoral positions.

BMBB program goals

Our graduates can conduct independent scientific research in biochemistry, critically evaluate biochemical research and clearly communicate their knowledge of biochemistry.

BMBB program learning outcomes

At the time of receiving the PhD degree, students will:

- Able to think logically, articulate their thoughts, and critically evaluate experimental data and the scientific literature.
- Have a general knowledge of biological science, and deeper understanding of the field related to their thesis research.
• Able to set up, obtain and interpret data from various scientific experiments.
• Able to communicate scientific information effectively in writing and orally.

Achieving the learning outcomes

1. Able to think logically, to articulate their thoughts, and critically evaluate experimental data and the scientific literature.

   Students choose their thesis advisors, and work in their laboratories as graduate research assistants. Students report their research progress and related research published by others in regular laboratory meetings, and their advisors and other laboratory members provide constructive critiques.

2. Have a knowledge of biological science, and deeper understanding of the field related to their thesis research.

   Students complete core courses which provide fundamental knowledge including BioC8001 Biochemistry: Structure, Catalysis & Metabolism and BioC8002 Molecular Biology & Regulation of Biological Processes. Students choose elective courses to obtain advanced knowledge concentrated in one of the four BMBB supporting tracks: synthetic biology and biotechnology (BioT), molecular biology (Mol), metabolic and systems biology (SysB), or chemical and structural biology (CSB).

3. Able to set up, obtain and interpret data from various scientific experiments

   Students obtain one-on-one training of experimental skill from their advisors and other laboratory members.

4. Able to communicate scientific information effectively in writing and orally.

   Students write mini-review focusing on the field of their thesis research, and the preliminary written exam before writing their PhD thesis. Advisors and BMBB program faculties in students committees provide critiques to help students to develop scientific writing skill. Students in 3rd, 4th and 5th years presents their research results in departmental student seminar series, and students committee provide evaluation of research progress and presentation. BMBB program provides travel awards for students to present their research results at conferences. Students build networks in their research field at conferences.

Evaluation of Student Progress

Normal progress toward the PhD degree by full-time graduate students includes the following:
1. Selection of the thesis advisor by the May term of the 1st year. An advisor-lab contract must be submitted.
2. Completion of all laboratory rotations reports by the end of May Term of the 1st year. Each rotation advisor will submit an evaluation on behalf of the student.
3. Completing all required courses with a minimum GPA of 3.0.
4. Passing the Written Preliminary Examination. This will be conducted and evaluated by the student’s preliminary committee members.
5. Passing the Oral Preliminary Examination. This will be conducted and evaluated by the student’s preliminary committee members.
6. Performing all teaching assignments and other departmental functions satisfactorily, including presenting seminars. Students in the classes for which graduate students teach will fill out evaluations on behalf of the teaching assistant’s performance. After a student’s yearly seminar, their committee chair will submit an annual evaluation of the student’s progress.
7. Making satisfactory progress in research. In order to assist students and provide feedback on research achievement, a periodic progress review must be conducted:
   • Students must present a research seminar during their 3rd, 4th, and 5th years in the program. Second year students should present their thesis topic during their student seminar in BioC 8084. Fifth-year students have the option of presenting their research in Journal Clubs, but must obtain written approval from the DGS.
   • The research seminar should be advertised and open to all members of the program. The seminar should be preceded by an abstract that is circulated to the graduate program members.
   • The students’ committee members should attend the seminar. A minimum of 3 members of the graduate committee must be present for the progress review. The advisor should also be present and participate fully in the discussions involved in the research review process. It is the student’s responsibility to ensure that this requirement is fulfilled and must schedule a committee meeting as soon as possible after the seminar if it is not.
   • Following the seminar, the committee will meet with the student to discuss the student’s thesis project. A written evaluation of student progress will be submitted by the committee chair within one week of the presentation. The adviser may submit his/her own evaluation, but this submission is optional.
   • Students also submit a Progress to Degree/End of Year Report.

Plans for review of the goals and outcomes statement

The BMBB graduate program coordinating committee, which includes student representatives, wrote this goals and outcomes statement. It was approved by the graduate faculty. This document will be reviewed by the Directors of Graduate Studies every two years and, if needed, discussed by the BMBB graduate program’s coordinating committee. Any changes will be approved by the graduate faculty.