



Biochemistry, Biophysics, & Structural Biology, PhD

Degree Requirements

Biochemistry, Biophysics, & Structural Biology

The Biochemistry, Biophysics, & Structural Biology Program is a graduate training program at WashU, housed under the Roy and Diana Vagelos Division of Biology and Biomedical Sciences (DBBS).

The BBSB program brings together scientists who are interested in a quantitative understanding of biological systems from single molecules to whole organisms. Students investigate topics such as protein structure and dynamics, the molecular mechanisms of nucleic acid and cytoskeletal motors, membrane ion channels, metabolic enzyme function and trafficking, immunological signaling, and more. This work informs our understanding of biological processes including DNA repair, muscle function, metabolic regulation, transcription regulation, cancer, and mechanisms of infectious diseases caused by bacteria and viruses. BBSB faculty on both campuses share ties with DBBS programs such as Microbiology, Cell Biology, Immunology, and Plant and Microbial Biosciences. The program spans three interrelated areas:

- *Biochemistry* seeks to explain the molecular basis of biological phenomena through chemical principles, focusing on interactions and transformations of biomolecules. Examples include enzymology, ligand binding studies, metabolite analyses, and the effects of post-translational modifications.
- *Biophysics* applies physical principles and quantitative models to explain, predict, and experimentally test biological systems, at the molecular level and across scales. Examples include computational modeling, fluorescence and other modalities of spectroscopy, single-molecule approaches, as well as thermodynamic and kinetic analyses.
- *Structural Biology* determines the three-dimensional structures of biological macromolecules and complexes to understand their functions and mechanisms. Examples of approaches include cryo-electron microscopy and X-ray crystallography.

To earn a PhD at within the Roy and Diana Vagelos Division of Biology and Biomedical Sciences at Washington University, a student must complete all courses required by their department; maintain satisfactory academic progress; pass the qualifying examination; complete all requirements for doctoral candidacy; create a Research

Advisory Committee (RAC); submit a Title, Scope, and Procedure Form; fulfill residence and Mentored Experience Requirements; write, defend, and submit a dissertation; and apply for program completion (graduation) via Workday Student.

Program Requirements

- **Total Units Required:** 36 units
- **Degree Length:** Seven years
 - Students are expected to maintain satisfactory academic progress in accordance with academic milestones. Students entering their seventh year in the program will receive a warning letter with regard to reaching their stated degree length. Students entering their eighth year in the program will be required to obtain permission from the Associate Dean of Graduate Education. Across DBBS programs, the average time to degree is 5.6 years.
- **Note:** Students must be enrolled in 9 graduate credits each semester to retain full-time status. As students complete their coursework, if enrolled in fewer than 9 graduate credits, they must enroll in a specific Biology & Biomedical Sciences research graduate course to maintain full-time status. Prior to completing 36 credit units, students will enroll in BBS 5900 Research for research credit; after completing 36 credit units, students will enroll in BBS 9000 Full-Time Graduate Research/Study, which will show 0 credit units but fulfills full-time status. Students should follow advising instructions to ensure proper enrollment prior to Add/Drop.
- Continued support is guaranteed for the duration of the student's graduate studies, provided that the student maintains satisfactory progress toward completion of the degree.
- **Grade Requirement:** Required courses generally consist of four to nine courses in areas fundamental to the student's program. Students are expected to maintain a B average in graduate courses.

Required Courses

DBBS Required Courses

- BBS 5098 Graduate Research Fundamentals
- BBS 5011 Ethics & Research Science

BBSB Specific Requirements

- BBS 5357 Chemistry and Physics of Biomolecules
- Four semesters of BBS 5469 Biochemistry, Biophysics, and Structural Biology Seminar

Students complete a peer-review seminar series in which they present their current work and receive feedback on both their science and their presentation.



9 Credit Units of Advanced Electives

Courses must be offered through DBBS or through the Chemistry, Physics, or Mathematics departments as 5000-level or above graduate courses unless otherwise approved by program directors. MSTP students may use their medical courses to satisfy this requirement.

Three Journal Clubs

DBBS and WashU have journal clubs on a variety of topics aligned with student interests. Participating students present at least once per semester for credit and will receive feedback. Students are encouraged to continue participation in journal clubs throughout their graduate experience.

Laboratory Rotations

Selecting a thesis advisor is the most important decision a student makes in graduate school. To help each student make an informed, thoughtful choice, the Division builds in flexibility to explore options. Students usually participate in three lab rotations during their first year. Additional rotations can be arranged, and rotation lengths are flexible. Students usually begin their thesis research by the end of their first year.

Scientific Scholarship

Keeping abreast of scientific developments is critical for faculty and students alike. The Division offers many ways to stay current. More than 15 weekly biology seminars provide excellent opportunities to meet outstanding scientists from outside Washington University. Several annual symposia bring internationally recognized speakers to campus. Journal clubs meet weekly for students, postdoctoral fellows, and faculty to present and discuss current scientific literature. A number of Interdisciplinary Research Pathways allow students to enhance their PhD program. Program retreats allow for informal interaction among students and faculty. The Division also provides funds for each student for professional development.