

Molecular Genetics & Genomics, PhD

Degree Requirements

Molecular Genetics & Genomics

The Molecular Genetics and Genomics is a graduate training program at WashU, housed under the Roy and Diana Vagelos Division of Biology and Biomedical Sciences (DBBS).

Advances in genetics and genomics over the past two decades have revolutionized our understanding of development, homeostasis, and disease and ushered in a new era of personalized medicine. Much remains, however, to be learned about fundamental genetic, genomic, and epigenetic mechanisms and how alterations to these processes perturb development and homeostasis and lead to disease. For example, how are specific genes turned on in defined cell types to drive specific outcomes and how does perturbation to regulated gene expression lead to disease, such as cancer and neurodevelopmental disorders? How do seemingly identical cells employ distinct genetic regulatory networks to create the diversity of cell types found in our body and brain? How do coding and non-coding mutations alter gene function and drive evolution and disease? How can we leverage powerful new genetic tools to cure disease? Uncovering answers to these fundamental questions places genetics and genomics at the forefront of biomedical research and the quest to clarify the genetic and genomic regulatory mechanisms that normally control organismal development and homeostasis, but when perturbed drive disease.

Laboratories in the Molecular Genetics and Genomics (MGG) program leverage forward and reverse genetics and genomic and computational approaches to address key outstanding questions in all areas of biomedical research with a focus on human disease. Integrating wet and dry bench approaches, students in the MGG program advance our understanding of the genetic, cellular, and molecular basis of how cells, tissues, and organs develop and function and how alterations in these processes lead to disease. MGG laboratories at WashU have been at the vanguard of human molecular genetics, the Human Genome Project, and in developing new genetic and genomic technologies that clarify how genetic changes alter gene function. MGG laboratories further apply these methods across many areas, including cancer biology, neuroscience, developmental biology, and more. Students interested in leveraging the power of genetic and genomic approaches to learn about fundamental biological mechanism and their application to human biology will find scores of laboratories within the program in which to pursue their doctoral research.

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 credits
- **Degree Length:** 7 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 in regards 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, student 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

Program Required Courses

- BBS 5491 Advanced Genetics
- BBS 5488 Genomics

Two Semesters of Journal Clubs

MGG students are required to take two semesters of BBS 5235 Genetics Journal Club. Students may petition the Program Directors for exceptions.

Two Advanced Electives

In general, MGG students select two of the following courses:

- BBS 5480 Nucleic Acids & Protein Biosynthesis
- BBS 5075 Introduction to Coding and Statistical Thinking for Genetics and Genomics
- BBS 5068 Fundamentals of Molecular Cell Biology

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.