

Molecular Genetics & Genomics, PhD

Molecular Genetics & Genomics

The graduate program in Molecular Genetics and Genomics provides an ideal interdisciplinary training environment for students interested in exploring basic questions in biology. Students and faculty members in the program employ genetic and genomic approaches to investigate questions in genetics, cell biology, development, and physiology. Common themes include research aimed at identifying and characterizing the genes and the genetic and molecular networks that control fundamental genetic and cellular processes; deciphering how defects in gene function disrupt these processes and lead to disease; and devising genetic and molecular methods to identify and treat diseases.

Doctoral Candidacy

To earn a PhD at Washington University, a student must complete all courses required by their department; maintain satisfactory academic progress; pass certain examinations; fulfill residence and Mentored Experience Requirements; write, defend, and submit a dissertation; and file an Intent to Graduate. For a general layout of doctoral degree general requirements in Arts & Sciences, including an explanation of Satisfactory Academic Progress, students should review the Doctoral Degree Academic Information page of the Arts & Sciences *Bulletin*.

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.
 - **Note:** Students must be enrolled in 9 graduate credits each semester to retain full-time status. As students complete their course work, if enrolled in fewer than 9 graduate credits, they must enroll in a specific Arts & Sciences graduate course that will show 0 units but does count as full-time status. Students should connect with their department 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.

Required Courses

This generally consists of four to nine courses in areas fundamental to the student's program. Students are expected to maintain a B average in graduate courses.

DBBS Required Courses

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

Program Required Courses

- Biol 5491 Advanced Genetics
- Biol 5488 Genomics
- Biol 5235 Genetics Journal Club

Two Advanced Electives

- Biol 5075 Fundamentals of Biostatistics for Graduate Students (*recommended for students with little or no programming experience*)
- Biol 5483 Human Genetic Analysis
- Biol 5068 Fundamentals of Molecular Cell Biology
- Biol 548 Nucleic Acids & Protein Biosynthesis
- Biol 5224 Molecular, Cell and Organ Systems
- Biol 5495 Computational Molecular Biology

In addition to the listings above, students may also take the following additional courses as appropriate:

- Biol 5352 Developmental Biology
- Biol 5312 Macromolecular Interactions
- Biol 5392 Molecular Microbiology & Pathogenesis
- Biol 5053 Immunobiology I
- Biol 5054 Immunobiology II

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.

Qualifying Examinations

Progress toward the PhD is contingent upon the student passing examinations that are variously called *preliminary*, *qualifying*, *general*, *comprehensive*, or *major field exams*. The qualifying process varies according to the program. In some programs, it consists of a series of incremental, sequential, and cumulative exams over a considerable time. In others, the exams are held during a relatively short period of time. Exams may be replaced by one or more papers. The program, which determines the structure and schedule of the required examinations, is responsible for notifying the Office of Graduate Studies, Arts & Sciences, of the student's outcome, whether successful or unsuccessful.

Program-specific information: In Year 2, students must pass a Qualifying Exam (QE). Following a successful QE defense, students will identify and finalize their committee and complete their thesis proposal by December 31 of Year 3.

Mentored Experience Requirements

Doctoral students at Washington University must complete a department-defined Mentored Experience. The Mentored Experience Requirement is a doctoral degree milestone that is notated on the student's transcript when complete. Each department has an established Mentored Experience Implementation Plan in which the number of units that a student must earn through Mentored Teaching Experience(s) and/or Mentored Professional Experience(s) is defined. The Mentored Experience Implementation Plans outline how doctoral students within the discipline will be mentored to achieve competencies in teaching at basic and advanced levels. Some departments may elect to include Mentored Professional Experiences as an avenue for completing some units of the Mentored Experience Requirement. Doctoral students will enroll in LGS 6XXX Mentored Teaching Experience or LGS 7020 Mentored Professional Experience to signify their progression toward completing the overall Mentored Experience Requirement for the degree.

The Doctoral Dissertation

A Research Advisory Committee (RAC) must be created no later than the end of the student's third year; departments may set shorter timelines (e.g., by the end of the student's second year) for this requirement. As evidence of the mastery of a specific field of knowledge and of the capacity for original scholarly work, each candidate must complete a dissertation that is approved by their RAC.

A Title, Scope & Procedure Form for the dissertation must be signed by the committee members and by the program chair. It must be submitted to the Office of Graduate Studies, Arts & Sciences, at least 6 months before the degree is expected to be conferred or before beginning the fifth year of full-time enrollment, whichever is earlier.

A Doctoral Dissertation Guide & Template that give instructions regarding the format of the dissertation are available on the website of the Office of Graduate Studies, Arts & Sciences. Both should be read carefully at every stage of dissertation preparation.

The Office of Graduate Studies, Arts & Sciences, requires each student to make the full text of the dissertation available to the committee members for their review at least 1 week before the defense. Most degree programs require 2 or more weeks for the review period; students should check with their faculty.

The Dissertation Defense

Approval of the written dissertation by the RAC is necessary before the student can orally defend their dissertation. The Dissertation Defense Committee that observes and examines the student's defense consists of at least five members, who normally meet these criteria:

- Three of the five must be full-time Washington University faculty members or, for programs offered by Washington University-affiliated partners, full-time members of a Washington University-affiliated partner institution who are authorized to supervise PhD students and who have appropriate expertise in the proposed field of study; one of these three must be the PhD student's primary thesis advisor, and one may be a member of the emeritus faculty. A fourth member may come from inside or outside the student's program. The fifth member must be from outside the student's program; this fifth member may be a Washington University research professor or lecturer, a professor from another university, or a scholar from the private sector or government who holds a doctorate and maintains an active research program.
- Three of the five normally come from the student's degree program; at least one of the five must not.

All committees must be approved by the Office of Graduate Studies, Arts & Sciences, regardless of whether they meet the normal criteria.

The committee is appointed by the Office of Graduate Studies, Arts & Sciences, upon the request of the degree program. The student is responsible for making the full text of the dissertation accessible to their committee members for their review in advance of the defense. Faculty and graduate students who are interested in the subject of the dissertation are normally welcome to attend all or part of the defense but may ask questions only at the discretion of the committee members. Although there is some variation among degree programs, the defense ordinarily focuses on the dissertation itself and its relation to the student's field of expertise.

Submission of the Dissertation

After the defense, the student must submit an electronic copy of the dissertation online to the Office of Graduate Studies, Arts & Sciences. The submission website requires students to choose among publishing and copyrighting services offered by ProQuest's ETD Administrator. The degree program is responsible for delivering the final approval form, signed by the committee members at the defense and then by the program chair or director, to the Office of Graduate Studies, Arts &

Sciences. Students who defend their dissertations successfully have not yet completed their PhD requirements; they finish earning their degree only when their dissertation submission has been accepted by the Office of Graduate Studies, Arts & Sciences.

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