

HUMAN GENETICS AND MOLECULAR BIOLOGY, PHD

Ph.D. Program

The Johns Hopkins Human Genetics Training Program provides a training in all aspects of human genetics and genomics relevant to human biology, health and disease.

The overall objective of the Human Genetics program is to provide our students with a strong foundation in basic science by exposure to a rigorous graduate education in genetics, genomics, molecular biology, cell biology, biochemistry and biostatistics as well as a core of medically-related courses selected to provide knowledge of human biology in health and disease. Advances in human genetics and genomics continue at an astounding rate and increasingly they are being integrated into medical practice. The Johns Hopkins Predoctoral Training Program in Human Genetics (HG) aims to educate highly motivated and capable students with the knowledge and experimental tools that will enable them to answer important questions at the interface between genetics and medicine. Ultimately, our trainees will be the leaders in delivering the promise of genetics to human health.

The Human Genetics Program has also partnered with the Johns Hopkins Bloomberg School of Public Health (JHSPH) and the National Human Genome Research Institute (NHGRI) in establishing the Maryland Genetics, Epidemiology, and Medicine Training Program (MD-GEM). Funded by the Burroughs Wellcome Fund, MD-GEM takes a multidisciplinary approach by combining the expertise of all three institutions, to foster the development of a new generation of scientists.

Interested Human Genetics students can participate in this additional training.

This program is also offered as training for medical students in the combined M.D./Ph.D. program. Students apply to the combined program at the time of application to the M.D. program. (See section entitled Medical Scientist Training Program).

Research Facilities

Research laboratories are well equipped to carry out sophisticated research in all areas of genetics. The proximity to renown clinical facilities of the Johns Hopkins Hospital, including the Department of Genetic Medicine, and Oncology Center provides faculty and students with access to a wealth of material for study. Computer and library facilities are excellent. Because the program in human genetics is a university-wide activity, supporting facilities are extensive.

Financial Aid

The program is supported by a limited number of teaching assistantships and predoctoral training funds from the National Institutes of Health. These fellowships, which are restricted to United States citizens and permanent United States residents, cover tuition and provide monthly stipends and are awarded to essentially all students in the program. Students are encouraged, however, to apply for fellowships from outside sources (e.g., the National Science Foundation, Howard Hughes Medical Institute) before entering the program.

Applicants for admission should show a strong academic foundation with coursework in biology, chemistry and quantitative analysis. Applicants

are encouraged to have exposure to lab research or to data science. A bachelor's degree from a qualified college or university will be required for matriculation. We no longer require GREs to be taken.

The Human Genetics site (<https://bcmb.bs.jhmi.edu/>) has up-to-date information on "How to Apply (<https://bcmb.bs.jhmi.edu/how-to-apply/>)." For questions not addressed on these pages, please email Sandy Muscelli, the program administrator, at muscelli@jhmi.edu.

Program Requirements

The program includes the following required core courses: Molecular Biology and Genomics, Cell Structure, Computational Bootcamp, Pathways and Regulation, Human Genetics, Evolving Concept of a Gene, Basic Mechanisms of Disease, Genomic Technologies, Rigor and Reproducibility in Research, Molecular Mechanisms of Disease and Systems, Genes and Mechanisms of Disease, some of which are listed in the entries of the departments of Cell Biology, Molecular Biology and Genetics, Biological Chemistry and Cell Biology. Numerous elective courses are available and are listed under sponsoring departments.

Our students must take a minimum of four electives, one of which must provide computational/statistical training.

Our students also take a two-week course in July at the Jackson Labs in Bar Harbor, Maine entitled "Human and Mammalian Genetics and Genomics: The McKusick Short Course" which covers the waterfront from basic principles to the latest developments in mammalian genetics. The faculty numbers about 50 and consists roughly in thirds of JAX faculty, Hopkins faculty and "guest" faculty comprising outstanding mammalian geneticists from other US universities and around the world.

The courses offered by the faculty of the program are listed below. All courses are open to graduate students from any university program as well as selected undergraduates with permission of the course director.

Students must complete three research rotations before deciding on their thesis lab. They must also participate in the Responsible Conduct of Research sessions offered by the Biomedical Program; starting at year 3, students must attend at least two Research Integrity Colloquium lectures per year.

Our students participate in weekly journal clubs, department seminars, monthly Science & Pizza presentations as well as workshops given twice a year on diversity, identity and culture.

At the end of the second year, students take their Doctoral Board Oral Examination. Annual thesis committee meetings must be held following successful completion of this exam.

Average time for completion is 5.5 years.

Code	Title	Credits
ME.710.700	Advanced Topics in Human Genetics	1.5
ME.710.702	Molecular Mechanisms Of Disease	1
ME.710.737	Introduction to Computational Genetics	1
ME.710.738	Human Genetics: Consequences of Mendelian Transmission	0

Graduates from the Human Genetics program pursue careers in academia, medicine, industry, teaching, government, law, as well the private sector. Our trainees are encouraged to explore the full spectrum of professional venues in which their training may provide a strong foundation. Driven by curiosity and a desire for excellence, our trainees

stand out as leaders in the chosen arenas of professional life. They are supported in the development of their career plans by a program faculty and administration who are dedicated to their success, and by a myriad of support networks across the Johns Hopkins University, many of which are provided by the Professional Development Career Office of the School of Medicine.