

# CELLULAR AND MOLECULAR PHYSIOLOGY, PHD

Researchers in the Department of Physiology (<http://physiology.bs.jhmi.edu/>) integrate many disciplines to understand the functions of individual systems within a whole organism and the mechanisms that produce and sustain life. Faculty tackle issues such as the molecular control of cell membrane activities, intercellular and intracellular communication, coordinated cell signaling for organ development, and mammalian embryonic development. They use computational methods, genetics, and post-genomic strategies to study these issues in a variety of organisms, from bacteria and yeast to zebrafish, mice, and people. Faculty participate in a number of graduate programs, including the program in Cellular and Molecular Physiology.

## Why Physiology?

Every modern branch of biomedical research has its physiological roots.

The Department of Physiology has a long-standing tradition of excellence. Our faculty, trainees, and staff seek to understand how the human body works from the head down to the toes and everything in between. Together, we exploit the range of available model systems to understand physiological processes at a mechanistic and integrated level in health with the explicit goal of understanding human disease and identifying potential therapeutics.

## Postdoctoral Training

Students who have already been awarded the Ph.D. or M.D. degree may be accepted for postdoctoral research work with members of the faculty.

## Admission Requirements

December 8 is the deadline for the receipt of ALL application materials for August admission into the CMP graduate program.

At the time of entry into the program, you must have completed a bachelor's or higher degree. Ordinarily this degree will be in biology, physics, chemistry, mathematics, or engineering, or some combination of these, but exceptions will be made. Scientific research experience is not required but is now common among applicants to our program. Such experience is to your advantage and is widely available to undergraduates willing to take the initiative. If you are planning ahead, consider searching out an experience of this kind.

Regardless of the degree major, the following are entrance requirements: Physics: one year college level course is required; two years of study are recommended. Chemistry: two years are required, and three recommended, of college level courses with laboratory, including inorganic, organic, and physical chemistry. Biology: two years of college level courses, with laboratory. Mathematics: through differential and integral calculus.

Foreign applicants must take the Test of English as a Foreign Language Exam (TOEFL).

In addition to the above, official transcripts or certified records from all university (undergraduate and graduate) study and three letters of recommendation from at least two faculty members who are acquainted with the applicants academic work are required to complete the application for admission. While these requirements will apply for the

large majority of applicants, exceptions will be made for unusually well-qualified candidates.

Applications are due by December 8th for August admission. A full application should be completed online. ETS Institutional code: 5316 for TOEFL scores.

The requirements for the application are as follows: (removed detailed information on what these items are)

- Completed Online Application
- Curriculum Vitae
- Statement of Interest and Career Objectives
- Undergraduate Transcripts
- Three (3) Letters of Recommendation
- Application Fee

**NOTE: GRE scores are no longer required and if submitted, will not be used in our decision-making process!**

## How to Apply

To ensure that all required documents are properly submitted, closely follow the directions found at Graduate Program Application Instructions (<https://www.hopkinsmedicine.org/som/education-programs/graduate-programs/admissions/on-campus-programs/>).

For more information, please visit our Graduate Admissions (<https://www.hopkinsmedicine.org/som/education-programs/graduate-programs/admissions/>) page.

When applying for our program you can also apply for up to **four** PhD programs in JHU-SOM and pay for only **one** application fee.

## Program Requirements

### First Year

The first year curriculum, capped by the program's own Organ Physiology course, is comprehensive in scope and provides each student with an incredible foundation of scientific knowledge. Through three 10-week rotations, students select a lab to perform their dissertation research working in a field that excites their curiosity and in an environment that is both nurturing and challenging.

From start to finish, students' communication skills are continuously honed through regular presentations to the department. Every trainee is encouraged to apply for fellowships and awards, and other career building opportunities.

### Courses

In general, students must successfully complete the following basic science courses, given by the School of Medicine:

- Analyses of Macromolecules: Energetics, Structure and Function
- Current Physiology
- Molecular Biology and Genomics
- Principles of Genetics
- Pathways and Regulation
- Cell Structure and Dynamics
- Organ Physiology
- Research
- Primary Source Readings and Analysis

**Rotations**

- Three laboratory rotations to occur September - beginning of June. Thesis lab decided after rotations.

- Appraise and evaluate their own skills and professional interests
- Contribute to the scientific community and society at large

**Second Year****Electives**

Four electives must be completed as a part of the degree requirements. These electives can be completed at any time prior to graduation, while enrolled in the CMP program. The selection of these courses is influenced by a student's dissertation project and made in consultation with their mentor. One elective credit is 12-24 classroom hours and must be approved by the Program Director.

**Thesis Proposal & Committee**

The first thesis meeting must occur no later than August 15th at the end of the second year. A thesis proposal, typically in the format of an NIH fellowship application, is prepared for the first meeting of a student's thesis committee. Thesis meetings are to occur yearly or more frequently, if needed.

**Examinations****Graduate Board Oral Examination**

Each student must pass an oral qualifying exam, which must occur by the end of March of the second year in the program. The goals of the exam are to test the depth and breadth of knowledge as covered in the first-year coursework and to examine the student's ability to design and interpret experiments.

**Doctoral Dissertation**

Usually in year four or five, the student's thesis committee agrees that the student is nearing completion of their research. When a student receives a "final phase" check at the thesis committee meeting, they are expected to complete any remaining experiments, write their thesis, and get approval from their mentor and reader (another faculty member from the thesis committee) within 6 months. Following completion of the dissertation, the student will present their work at an open seminar. Typically, the student's research is published in one or more scholarly journals prior to the dissertation being written.

**Mission Statement**

To develop agile, independent scientists who identify important scientific gaps, establish creative, mechanistic hypotheses, and execute experimental strategies that are comprehensive, cutting edge, and push their field forward.

**Learning Objectives**

Upon successful completion of the PhD in Cellular and Molecular Physiology, students will have mastered the following competencies:

- Demonstrate a deep understanding of core concepts within physiology at a cellular and molecular resolution
- Accurately analyze and apply scientific knowledge to answer questions within their research discipline
- Identify and formulate critical questions and innovative approaches to advance their scientific field
- Analyze and interpret data with responsibility and integrity
- Explain and present complex scientific concepts clearly and effectively in written and oral forms
- Develop a career action plan