MICROBIOLOGY GRADUATE PROGRAM

The Microbiology Graduate Program (*http://microbiology.mit.edu*) is an MIT-wide program designed to provide students with broad exposure to modern areas of microbial science and engineering and depth in the chosen area of thesis work. The study of microbes has been critical in our current understanding of basic biological processes, evolution, and the functions of the biosphere, and has contributed to numerous fields of engineering. Microbes have the amazing ability to grow in extreme conditions, to grow slowly or rapidly, and to readily exchange DNA. They are essential for life as we know it but can also be agents of disease. They are instrumental in shaping the environment, in evolution, and in modern biotechnology. Microbes are amenable to virtually all modern approaches in science and engineering. As such, they provide natural engineering laboratories for creating new capabilities for industry (e.g., pharmaceuticals, chemicals, energy) and are the foundation of pioneering efforts in synthetic biology, i.e., building life from its component parts. Effective study of microbes and their applications demands multiple interdisciplinary approaches that cross all scales of biological organization, from molecules to vast ecosystems.

Research in microbiology takes place throughout MIT and involves more than 45 faculty in the Schools of Science and Engineering, including Biology; Biological Engineering; Chemical Engineering; Chemistry; Civil and Environmental Engineering; Earth, Atmospheric and Planetary Sciences; Electrical Engineering and Computer Science; Materials Sciences and Engineering; and Physics. Many labs take multiple approaches to studying and manipulating microbial systems and the expertise and research covers a wide range of areas, including biochemistry, biofuels, biotechnology, cell and molecular biology, chemical and biological engineering, computational biology, ecology, environmental biology, evolutionary biology, genetics, genomics, geobiology, immunology, pathogenesis, structural biology, synthetic biology, systems biology, and virology.

Interdisciplinary training in microbiology is in increasing demand in both public and private sectors. This program provides a broad exposure to underlying elements of modern microbiological research and engineering as well as in-depth research experience in specific areas of microbiology. Program graduates will be prepared to work in a range of fields in microbial science and engineering, and will have excellent career options in academia, industry, and government.

Curriculum

The Microbiology Graduate Program offers a Doctor of Philosophy in Microbiology (*https://catalog.mit.edu/degree-charts/phd-microbiology*). The training program includes required coursework, elective coursework to provide depth in a specific area of interest or additional breadth in training, laboratory rotations, teaching, training in the ethical conduct of research, qualifying exams, and thesis research. All coursework must be taken for a letter grade, and students must receive a grade of B minus or better.

During their first year, students rotate through the labs of three MIT faculty who participate in the Microbiology Graduate Program. These rotations provide students broad exposure to microbiology research and are intended to help students select a lab for their thesis research by the end of the first year. Given the interdisciplinary nature of the program and many research programs, students may be able to work jointly with more than one research supervisor.

Learning to effectively communicate scientific ideas is an important skill. Students in the Microbiology program improve their communication skills by serving as a teaching assistant for one semester in an undergraduate or graduate subject related to microbiology, typically in the second year. Assignments are made in the summer of the first year.

Additionally, all students participate in training in the responsible conduct of research in the spring term in conjunction with the National Institute of Environmental Health Sciences Toxicology Training Grant run through the Department of Biological Engineering. Students are required to obtain 12 hours of training in their first year; those who cannot complete all 12 hours in the first year are required to make up the missed hours in the second year.

Students proceed to PhD candidacy after successful completion of a qualifying exam, typically during the second year or early in the third year. The exam consists of a written research proposal in the style of a grant or fellowship application based on their planned thesis project and an oral defense of that proposal.

Student Advising

In the first year, students will be advised by members of the graduate committee. Once students join a thesis lab, the research mentor will be the primary advisor. Early in the second year, students will form a thesis committee and meet at least annually. The thesis committee will consist of faculty with expertise in the student's area of research and who collectively provide the breadth expected by the program and advice on research. In addition, the thesis committee provides advice on coursework to ensure that students have the appropriate breadth and depth for their educational program. In later years, the graduate and thesis committees provide students with advice on career options.

Financial Support and Fellowships

Students in the program will be financially supported throughout their training. This support includes full tuition, stipend, and MIT Student Health Insurance Plan (*https://catalog.mit.edu/mit/graduate-education/medical-requirements*). During the first fall and spring terms, students are supported by the Microbiology program with a fellowship. Starting with the first summer term and in subsequent years, students will be supported as research assistants

in their thesis lab. Although they will receive support, students are strongly encouraged to apply for fellowships.

Inquiries

For further information, email the Microbiology Graduate Program (*microbiology@mit.edu*), Room 68-120C.