

Plant and Microbial Biology

College of Natural Resources (<http://nature.berkeley.edu/site>)

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Department Website: Plant and Microbial Biology
(<http://plantbio.berkeley.edu>)

Overview

The Department of Plant and Microbial Biology consists of the Division of Plant Biology and the Division of Microbial Biology. Programs at both the undergraduate and graduate levels have been designed to offer students maximum flexibility in defining their own areas of interest. In addition to departmental resources that are available in Koshland Hall, the facilities of the College of Natural Resources Biological Imaging Facility and the United States Department of Agriculture Plant Gene Expression Center are available for the programs of the department.

The Division of Plant Biology

The Division of Plant Biology program emphasizes basic research and its application to plants and promotes the design of plant biotechnologies. With an increasing awareness of environmental problems, global changes, and emerging food needs, plants are a focal point for new research initiatives and educational training programs. Understanding the biology of plants, their development, their responses to the environment, and the impact of human activities on the plant biosphere are many of the challenges that will continue to fuel the expansion of plant biology research well into the 21st century.

The Division of Microbial Biology

The Division of Microbial Biology was established within the department to provide a focus for microbial biology at UC Berkeley. There is a growing awareness that microbes and microbial activities are essential to maintaining a high quality of life for all eukaryotes. Moreover, understanding the microbial world is necessary if we are to comprehend the global ecosystem, evolutionary history, and diversity of life on earth. The 21st century will bring a new understanding of the workings of the global ecosystem and a wealth of new technologies derived from the microbial world. The new microbial biology research programs are designed to meet this challenge.

Undergraduate Program in Genetics and Plant Biology

The department's undergraduate program in genetics and plant biology has been developed as a broadly based program emphasizing the study of plants from the molecular and genetic to organismal levels. Lower division courses are intended to produce a foundation in biological and physical sciences as preparation for advanced study at the upper division level.

The department offers several laboratory classes that focus further on the subject matter and introduce students to the latest techniques in genetics and plant biology. The department offers research opportunities in departmental research laboratories to qualified undergraduate students. These are provided in the form of Honors Research (PMB H196) or Supervised Independent Study and Research (PMB 99 and PMB 199).

Lower Division

1. Biology 1A, 1AL, 1B
2. Chemistry 1A, 1AL, 3A, 3AL, 3B, 3BL
3. Mathematics 16A, 16B, or equivalent year of calculus
4. Physics 8A
5. Statistics 2, 20, 131A, or other approved course
6. 15 units of approved Humanities and Social Sciences electives
7. 8 units of Reading and Composition

Upper Division

1. PMB 101L, C107L, 135, 150, 160
2. Five approved Plant Biology Track Courses totaling at least 15 units

For further details and requirements, please see the Genetics and Plant Biology major requirements checklist, available on the department's website (<http://pmb.berkeley.edu/sites/default/files/users/GPB%20Checklist%20F12.pdf>) .

Undergraduate Program in Microbial Biology

Microbial biology is a pivotal field of study because microbes are the dominant life form and represent the overwhelming majority of the biomass on the planet. Microbes have fundamental roles in maintaining the health of the biosphere; they degrade environmental pollutants, they supply essential nutrients and chemicals directly to multicellular organisms, and they engage in numerous beneficial symbioses with higher organisms. By the same token, infectious diseases regulate populations of plants and animals, and outbreaks recur in human societies on a global scale. Microorganisms are the evolutionary precursors of chloroplasts and mitochondria, the energy-producing centers of plants and animals, so even the study of evolutionary biology is not complete without an understanding of microbial biology.

Furthermore, the full diversity of the microbial world is poorly known, because many unique organisms and biochemical processes remain to be discovered. The renewed appreciation of the relevance of microbes to all life means that there is an increasing demand in government and industry for employees with knowledge and skills related to microbial biology. The microbial biology (MB) major is designed for students interested in competing for such positions, for pre-med and pre-vet students, for students interested in biology in general, and for students interested in pursuing postgraduate education in biology.

Lower Division

1. Biology 1A, 1AL, 1B
2. Chemistry 1A, 1AL, 3A, 3AL, 3B, 3BL
3. Mathematics 16A, 16B, or equivalent year of calculus
4. Physics 8A
5. Statistics 2, 20, 131A, or other approved statistics course
6. 15 units of approved Humanities and Social Science electives
7. 8 units of Reading and Composition.

Upper Division

1. Biochemistry (MCB 102, 100A, 100B, or 110)
2. PMB C112
3. PMB C112L
4. PMB C148
5. 2 core electives from pre-approved list
6. 4 courses from Microbial Biology course list

For further details and requirements, please see the Microbial Biology major requirements checklist, available on the department's website (<http://pmb.berkeley.edu/sites/default/files/users/MB%20Checklist%20F12.pdf>) .

For more information on the Graduate Group in Microbiology, see the full description under "Microbiology (<http://bulletin.berkeley.edu/archive/2013-14/departmentsandsubjects/microbiology>) " in this *Berkeley Bulletin*.

Graduate Program in Plant Biology

The Graduate Program in Plant Biology is designed to train students in modern research areas of plant biology. Students' courses of study are designed individually, in light of their interests and career goals. The graduate program features an introductory seminar (Faculty Research Review), six five-week core course modules, and additional special topic courses and seminars in areas of faculty specialties. The department has research expertise in the following areas: molecular, cellular, genetic, biochemical, physiological, developmental, and structural biology, and plant-microbe interactions. The core courses cover plant developmental genetics, genomics and computational biology, plant diversity and evolution, plant cell biology, plant biochemistry, and plant systems biology.

Prospective students for the graduate program in plant biology are expected to demonstrate academic excellence and potential for independent scientific research. Students are expected to have a basic background in chemistry, physics, mathematics, and biology equivalent to those in the undergraduate program. An admissions committee composed of five members of the department will review applications and make recommendations to the full department on admissions matters. Recommendations for admission will be based on a demonstration of academic excellence and potential for independent scientific research as shown by grades in university-level undergraduate and graduate courses, letters of recommendation, written statements of academic and professional goals, and other evidence of academic accomplishment. Scores on standardized tests, such as the Graduate Record Examination (GRE), will be required of all applicants. Students seeking detailed information about matters such as admission, curriculum, and courses of financial support should contact the student affairs assistant or the graduate adviser.

Graduate Program in Microbiology

The Department of Plant and Microbial Biology administers the Graduate Group in Microbiology, which awards the PhD degree in Microbiology at Berkeley. A graduate group is an interdepartmental group of faculty who offer a program in an area that crosses departmental boundaries. The Graduate Group in Microbiology is composed of 52 faculty from diverse departments. The graduate program features an introductory seminar (Faculty Research Review), six five-week core course modules, and additional special-topic courses and seminars in areas of faculty specialties. The core course modules are Microbial Genetics, Genomics and Computational Biology, Microbial Diversity and Evolution, Cell Structure and Function, Microbial Physiology, and Microbial Ecology.

PLANTBI 10 Plants, Agriculture, and Society 2 Units**Department:** Plant and Microbial Biology**Course level:** Undergraduate**Term course may be offered:** Fall**Grading:** Letter grade.**Hours and format:** 2 hours of Lecture per week for 15 weeks.

Changing patterns of agriculture in relation to population growth, the biology and social impact of plant disease, genetic engineering of plants: a thousand years of crop improvement and modern biotechnology, interactions between plants and the environment, and effects of human industrial and agricultural activity on plant ecosystems. Knowledge of the physical sciences is neither required nor assumed.

Instructors: Staskawicz, David Zilberman

PLANTBI 11 Fungi, History, and Society 3 Units**Department:** Plant and Microbial Biology**Course level:** Undergraduate**Term course may be offered:** Spring**Grading:** Letter grade.**Hours and format:** 2 hours of lecture, 1 hour of discussion/ demonstration, and 3 optional weekend field trips.

Fungi have interacted with humans in both positive and negative ways throughout history. These interactions have included production of foods, medicines, fuels, plant and animal diseases, decay, allergies, and mind-altering drugs.

Instructors: Bruns, Taylor

PLANTBI 13 Genetic Revolutions 3 Units**Department:** Plant and Microbial Biology**Course level:** Undergraduate**Term course may be offered:** Spring**Grading:** Letter grade.**Hours and format:** 2 hours of Lecture and 1 hour of Discussion per week for 15 weeks.

Genetic discoveries have changed our lives. All are controversial. Especially changed are human physical and mental health, agriculture, social systems, and worldviews. Having many DNA-sequenced genomes, including human, accelerates discovery. This course will study the science, history, and philosophical implications behind past discoveries and will contemplate future genetic revolutions.

Instructor: Freeling

PLANTBI 20 Introduction to the Plant Sciences at Berkeley 1 Unit**Department:** Plant and Microbial Biology**Course level:** Undergraduate**Term course may be offered:** Fall**Grading:** Offered for pass/not pass grade only.**Hours and format:** 1 hour of lecture/discussion per week plus field trips.

This course will include discussions on the academic path (courses) needed for the Genetics and Plant Biology major; an introduction to resources and facilities for studies of the plant sciences at Berkeley, such as the University Herbarium and the Botanical Garden; an exploration of plant science related careers, including presentations from guest speakers who work in organic farming, government, and Cooperative Extension; talks by faculty about their current research, and information about how to do research in a lab.

Instructor: Feldman

PLANTBI 22 Microbes Make the World Go Around 2 Units**Department:** Plant and Microbial Biology**Course level:** Undergraduate**Term course may be offered:** Fall**Grading:** Letter grade.

Although often unseen, microbes are everywhere! This course covers the role that microbes, including archaea, bacteria, protists and fungi, play in terrestrial, marine and extreme environments and their effect on the geochemistry of the earth. In addition, we will explore the profound effects