

Plant Cellular and Molecular Biology

Plant biology has traditionally focused on the study of plant life to understand how plants survive, grow, develop and flourish as well as the functions they perform, how they reproduce and have evolved, where they fit in the ecosystem, and the many ways that humans use them, such as for food, fiber, fuel, and medicines. As human population growth places increasing demands on agriculture and plant products, the need for basic knowledge of plant processes and the genetic manipulation of those processes has increased. One of the many challenges for our future is to deepen our knowledge and exploit new technologies to create and enhance plant products to be used by humans in an environmentally compatible way.

Plant biology at Ohio State has responded to these and other challenges to become a leading player in the modern revolution in molecular biology. To this end, our Department and undergraduate major were renamed to Plant Cellular and Molecular Biology (PCMB) in 2004. Undergraduate students are invited to work with our faculty to study plants from the molecular level to the cellular and whole plant level, including development and physiology. PCMB faculty at Ohio State teach and carry out research in many areas, including the regulation of gene expression and protein synthesis, signal transduction and development, genomics, cell biology, metabolism and bioenergetics, molecular responses to biotic and abiotic stress, circadian rhythms, and plant biotechnology.

Pursuing Plant Cellular and Molecular Biology at Ohio State
PCMB majors should have a background in English, math, chemistry, and physics as well as biology when they enter Ohio State. Students should have reasonable skill in writing as well as computer literacy.

Many plant biologists were first attracted to their research specialty by their experience in science fairs and similar competitive events. High school students should watch for opportunities to attend workshops at colleges and universities, or to assist professors with their research.

All Ohio State freshman applicants are considered within a competitive admission process for the Columbus campus. The primary criteria for admission are the completion of the applicant's high school college preparatory program, performance in that program as indicated by class rank and/or grade-point average, and performance on either the ACT or SAT. Upon admission to the university, students can declare a major in anthropology within the College of Biological Sciences. Interested students should contact the undergraduate advisor for PCMB and an Undergraduate Student Academic Services (USAS) counselor.

Plant Cellular and Molecular Biology Requirements

Freshmen should begin planning their course of study with an adviser in the department as soon as they enter the university. Most begin by completing at least 50 credit hours of prerequisites, including general biology, general

and organic chemistry, calculus and two quarters of physics. In most cases there are honors sections of these courses for qualifying students. The exact number of credits and specific prerequisites will depend in part on the quality of high school preparation. As a result of testing, a student might be placed into math or science courses at higher levels and thus move more rapidly into the PCMB courses.

Having completed the required supportive courses, students, in consultation with their faculty advisers, plan a major tailored to their particular background and interests. The Plant Cellular and Molecular Biology major is composed of a minimum of 40 credit hours in biological sciences at the 200 level or above. A core curriculum is required, consisting of General Plant Biology, Introductory Biochemistry and General Genetics. The major also requires laboratory experience. Additional electives should total at least 25 credit hours in PCMB courses as well as 15 other credits chosen from electives in approved courses from other departments. Choose electives that you are interested in. Talk to other students, the undergraduate adviser and to PCMB faculty to find out which courses are for you as well as those that are recommended for your particular goals. A student planning to enter graduate school to study plant molecular biology would probably select a different set of courses than a student planning to work in a biotechnology laboratory. Majors are urged to consult Department advisers often as they move through the program to clarify their objectives and refine their course selections and research plans.

Co-Curricular Opportunities

Ohio State offers many opportunities for students to learn and grow outside of the classroom. These range from cooperative education (co-op) and internships to study abroad programs to student organizations. Co-ops and internships place students in professional environments while they are Ohio State students. Ohio State offers more than 100 study abroad programs in 40 countries around the world. In addition, there are hundreds of student organizations on campus to meet the interests of a diverse student population.

Specific opportunities for students interested in Plant Cellular and Molecular Biology include a Plant Biology student club and an honorary student organization which enhance learning opportunities and the quality of the undergraduate experience for plant biology students. These clubs provide chances for students to interact with faculty, discuss careers and research areas with scientists from the Ohio State campus and beyond, and participate in service activities.

Plant biology students may take courses at Ohio State University's "Island Campus," Stone Laboratory. Located on Gibraltar Island in Put-in-Bay harbor on Lake Erie, this freshwater biological field station and research laboratory

For more information, check these web sites:

Plant Cellular and Molecular Biology:

www.biosci.ohio-state.edu/~plantbio/plantbio.html

College of Biological Sciences: www.biosci.ohio-state.edu

Ohio State: www.osu.edu

Admissions: <http://undergrad.osu.edu>

Multicultural Center: <http://multiculturalcenter.osu.edu>

Curriculum Sample

This is a sample list of the classes a student will take to pursue a degree in Plant Biology. Since university students need more than specific education in a narrow field, they also will take classes to complete the General Education Curriculum (GEC). The GEC will allow students to develop the fundamental skills essential to collegiate success across major programs. Course work options satisfying the GEC often come from a variety of academic areas of study allowing students to tailor their GEC toward their interests. Note: This sample represents one of several possible paths to a degree in Plant Biology. Consult the departmental web site, www.biosci.ohio-state.edu/~plantbio/plantbio.html, for details on each specific track.

Freshman Year:

Biological Sciences Survey	1
General Chemistry	15
General Biology	10
Mathematics	5
GEC (English composition)	5
GEC (foreign language)	15
Freshman Seminar	1
Total hours	52

Sophomore Year:

Organic Chemistry	6
Calculus	10
General Plant Biology	5
PCM major course	5
GEC (foreign language)	5
GEC (social sciences)	10
GEC (arts and humanities)	10
Total hours	51

Junior Year:

Physics	10
Introduction to Biological Chemistry	5
PCM Biology major courses	10
General Genetics	5
GEC (arts and humanities)	10
GEC (second writing)	5
Total hours	45

Senior Year:

Research	5
Introduction to Statistics	5
PCM Biology major courses	10
Electives	15
GEC (social sciences)	5
GEC (arts and humanities)	5
Total hours	45

offers introductory and upper-level courses suitable for undergraduate students in biological sciences.

Get Your Hands “Dirty” - Check out Lab Research

No other learning experience can match the value of a “hands-on” research project. PCMB students are encouraged to take advantage of meaningful research opportunities tailored to undergraduates. Lab-based work can stimulate curiosity and analytic skills, provide experiential learning that enhances understanding of course-based material, and offer direct experience that helps in deciding on future paths. To learn more about different opportunities and research programs, consult with an undergraduate adviser and with faculty, and also visit the PCMB website.

Honors & Scholars Programs

The Honors Program in the Colleges of the Arts and Sciences provides high-ability students opportunities to pursue challenging academic programs. Honors students in Plant Cellular and Molecular Biology are especially encouraged to meet with their faculty adviser on a regular basis to develop an enhanced curriculum that includes honors courses and seminars, upper-division courses, and a collaborative research experience.

The Ohio State Scholars Programs feature residential communities for students who share academic interests and career goals. The Biological Sciences Scholars Program emphasizes hands-on research, with individualized advising and significant lab and field experience. The Health Sciences Scholars Program is focused on preparing students for careers in health sciences and health care.

Career Prospects in Plant Cellular and Molecular Biology

Students with a bachelor’s degree in PCMB may find job opportunities as laboratory technicians in industrial laboratories and academic environments. Potential employers include academic institutions, government agencies, pharmaceutical, chemical, and biotechnology companies.

A major in plant cellular and molecular biology provides excellent preparation for graduate study in biology and agriculture. An MS or a PhD can lead to attractive positions in industry and academia. Many plant biologists teach and conduct research at colleges and universities after obtaining a PhD degree. Most PhD students, as part of their training, serve as research and teaching assistants and thereby earn a large part of their living and educational expenses while they are in graduate school.

A BS in plant cellular and molecular biology combined with other courses can provide additional career options such as in journalism, scientific writing, pharmaceuticals, medicine, health care, biotechnology law, and education.

Careers based in business or industry often yield higher salaries than in educational or governmental institutions. Chemical and biotechnology companies are a major source of employment for those with a background in plant cellular and molecular biology.

For more information about careers, call or write the Arts and Sciences Career Services Office, 06 Denney Hall, 164 West 17th Avenue, Columbus, Ohio 43210-1371, (614) 292-1868. Additional career information is available from the American Society of Plant Biologists web site at www.aspb.org.

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