Plant Biology

See Environmental Horticulture, on page 323; Plant Biology, on page 509; and Plant Biology (A Graduate Group), on page 511.

Plant Biology

(College of Biological Sciences)

William J. Lucas, Ph.D., Chairperson of the Department
Anne B. Britt, Ph.D., Vice Chairperson of the Department

Graduate Program. See Plant Biology (A Graduate Group), on page 511.

Department Office. 1002 Life Sciences 530-752-0617; http://www.plb.ucdavis.edu

Advising. 1023 Sciences Laboratory Building; 530-752-6012; hps@ucdavis.edu/

Committee in Charge of the Major
Bo Liu, Ph.D.
Anne Britt, Ph.D.
Steven Theg, Ph.D.

Faculty

Faculty includes members of the Departments of Plant Biology, Molecular and Cellular Biology, and Evolution and Ecology in the College of Biological Sciences.

Primary Department Members
Siobhan Brady, Associate Professor
Anne Britt, Ph.D., Professor
Luca Comai, Ph.D., Professor
S. P. Dinesh-Kumar, Professor
John J. Harada, Ph.D., Professor
Academic Senate Distiguished Teaching Award
Stacey Harmer, Ph.D., Professor
Bo Liu, Ph.D., Professor
William J. Lucas, Ph.D., Professor
Julin Maloof, Ph.D., Professor
Sharman O'neill, Ph.D., Professor
Neelima Singha, Ph.D., Professor
Venkatesan Sundaram, Ph.D., Professor
Steven M. Theg, Ph.D., Professor

Secondary Department Members
Judy Callis, Ph.D., Professor
Academic Senate Distiguished Teaching Award
James A. Doyle, Ph.D., Professor
Marilyn E. Etzler, Ph.D., Professor
Charles S. Gasser, Ph.D., Professor
J. Clark Lagarias, Ph.D., Professor
Marcel Rejmanek, Ph.D., Professor
Raymond J. Rodriguez, Ph.D., Professor
Irwin Segel, Ph.D., Professor

Emeriti Faculty

Michael Barbour, Ph.D., Professor Emeritus
David E. Bayer, Ph.D., Professor Emeritus
Deborah Canington, Ph.D., Lecturer
Academic Federation Excellence in Teaching Award
Paul A. Castelfranco, Ph.D., Professor Emeritus
Deborah P. Delmer, Ph.D., Professor Emerita
Emanuel Epstein, Ph.D., Professor Emeritus
Richard H. Falk, Ph.D., Professor Emeritus
Donald W. Kyhos, Ph.D., Professor Emeritus
Terence M. Murphy, Ph.D., Professor Emeritus
Thomas L. Ross, Ph.D., Professor Emeritus
Academic Senate Distiguished Teaching Award
Alan J. Stemler, Ph.D., Professor Emeritus
Kenneth Wells, Ph.D., Professor Emeritus

Affiliated Faculty

John L. Bowman, Ph.D., Professor
Andrew Groover, Ph.D., Adjunct Associate Professor
Joel Ledford, Ph.D., Academic Coordinator

The Major Program

As organisms that sequester carbon and convert solar energy to usable forms, plants are the primary source of food on the planet as well as important buffers against climate change. The Plant Biology major focuses on fundamental aspects of how plants function as organisms and interact with their environment. A wide variety of scientific disciplines are integrated within the Plant Biology major, including physiology, cell and molecular biology, development, genetics, and genomics.

The Program. The plant biology major consists of a Biosciences core covering the general principles of biology plus four plant-specific classes dealing with advanced aspects of plant biology including physiology, development, and anatomy. Two required electives allow students to tailor the degree to suit their interests. Independent research in a laboratory setting is a requirement, and majors in Plant Biology are guaranteed this opportunity. Because of the value of plants as a model system for research in many related genetics, cell biology, and biochemistry, Plant Biology makes an excellent minor or second major for student in these fields.

Career Alternatives. A degree in Plant Biology serves as an excellent launching point for a wide range of career options, including domestic and international opportunities in business, research and teaching in both governmental and private sectors. The program is excellent preparation for students wishing to enter graduate or other professional schools, including medicine, law [particularly environmental or patent law] or journalism. Plant biologists can work in the laboratory, in the field, in botanical gardens or nurseries, in agricultural companies, or in biotechnology, pharmaceutical, energy or chemical industries, or in the area of environmental protection.

A.B. Major Requirements:

Preparatory Subject Matter.......................... 34

Biological Sciences 2A-2B-2C.......................... 14
Chemistry 2A-2B-2C-2D.............................. 16
Statistics 13 or 100 or 102 or Plant Sciences 120.............................. 4

Depth Subject Matter............................. 41-42

Biological Sciences 101................................ 4
Plant Biology 102 or 108.............................. 3
Evolution and Ecology 140 or Plant Biology 116.............................. 4-5
Plant Biology 105, 111, 112, 117........................ 15
Additional upper division units in Plant Biology or related natural science courses.............................. 13

Total Units for the Major.......................... 75-76

Recommended


For students with interests in specialized areas of plant biology (e.g., plant cultural botany, ecology, systematics and evolution, morphological, plant physiology, etc.), certain substitutions, including courses in other departments, may be allowed upon prior consultation with a Plant Biology major adviser.

B.S. Major Requirements:

Preparatory Subject Matter.......................... 55-65

Biological Sciences 2A-2B-2C.......................... 14
Chemistry 2A-2B-2C.............................. 15
Chemistry 8A-8B or 118A-118B-118C.............................. 6-12
Mathematics 7A or 7B-7C or 21A-21B (21C recommended).................. 8-12
Physics 7A-7B-7C.............................. 12

Recommended

Biology Sciences 20Q

Depth Subject Matter............................. 43-46

Biology Sciences 101, 102, 104, 105, 110, 104 or equivalent........................ 10-13
92. Internship (1-12)  
Internship—3-36 hours. Prerequisite: consent of instructor. Technical and/or professional experience on or off campus will be required.  (P/NP grading only.)

98. Directed Group Study (1-5)  
Prerequisite: consent of instructor. For upper division students. (P/NP grading only.)

99. Special Study for Undergraduates (1-5)  
Prerequisite: consent of instructor.  (P/NP grading only.)

Upper Division  
For questions about courses numbered 102 through 126, see the Plant Biology Department office in 1002 Life Sciences. For questions concerning courses numbered 127, 140 through 188 and 196, see the Plant Science Advising Center in 1220 Plant and Environmental Sciences.

102. California Flora (5)  
Lecture—3 hours; laboratory—8 hours. Prerequisite: Plant Sciences 2, Biological Sciences 1C, 2C, or equivalent course in Plant Science. Survey of the flora of California, emphasizing recognition of important vascular plant families and genera and use of taxonomic keys for species identification. Current understanding of evolutionary relationships among families. Principles of plant taxonomy and phylogenetic systematics. One Saturday field trip. (Same course as Plant Sciences 102.) GE credit: SciEng | SE, VL. — S. (S.) Potter

105. Developmental Plant Anatomy (5)  
Lecture—3 hours; laboratory—6 hours. Prerequisite: Biological Sciences 2C or other similar preparation in plant biology. Restricted to 50 students; split equally into two lab groups. Structural anatomy of vascular plants. Training in basic tissue sectioning, staining, and use of the compound microscope. GE credit. SciEng | SE. — F. (F.) O'Neill

108. Systematics and Evolution of Angiosperms (5)  
Lecture—3 hours; laboratory—6 hours. Prerequisite: Biological Sciences 1A, 1B, 1C, or 2A, 2B, 2C. Diversity and classification of angiosperms (flowering plants) on a worldwide scale, and current understanding of the origin of angiosperms and evolutionary relationships and trends within them based on morphological and molecular evidence. (Same course as Evolution and Ecology 108.) GE credit: SciEng | SE. — S. (S.) Doyle

111. Plant Physiology (3)  
Lecture—3 hours. Prerequisite: Biological Sciences 2A, 2B, and 2C, Chemistry 118B or 88 and Physics 7C (either may be concurrently). Plant Biology 105 recommended. The plant cell as a functional unit. The processes of absorption, movement, and utilization of water and minerals. Water loss, translocation, photosynthesis, respiration. — F. (F.) Dehesh, Lucas

11D. Problems in Plant Physiology (1)  
Discussion—1 hour. Prerequisite: course 111 concurrently. Discussion of problems and applications relating to principles presented in course 111. Students will be assigned problems each week showing novel applications of the principles described in course 111 and will prepare answers to be delivered orally during the class period. (P/NP grading only.) — F. (F.) Dehesh

112. Plant Growth and Development (1)  
Lecture—3 hours. Prerequisite: Sciences 2A, 2B, and 2C, Chemistry 118B or 88, Biological Sciences 101. Introduction to the mechanisms and control systems that govern plant growth and development and the responses of plants to the environment. Strong emphasis on vegetative development of flowering plants. GE credit: SciEng | GQ, SE, SL. — W. (W.) Harada, Sundaresan

11D. Problems in Plant Growth and Development (1)  
Discussion—1 hour. Prerequisite: course 112 concurrently. Discussion of problems and applications relating to principles presented in course 112. Students will be assigned problems each week showing novel applications of the principles described in course 112. This course will prepare students to be delivered orally during class period. (P/NP grading only.) — W. (W.) Harada, Sundaresan

113. Molecular and Cellular Biology of Plants (3)  
Lecture—3 hours. Prerequisite: Biological Sciences 2A, 2B, 2C. Biological Sciences 101. Molecular and cellular aspects of the growth and development of plants and their response to biological and environmental stresses. Primary focus on processes unique to plants. Experimental approaches will be emphasized. GE credit: QL, SL, VL. — S. (S.) Harada

113D. Problems in Molecular and Cellular Biology of Plants (1)  
Discussion—1 hour. Prerequisite: course 113 concurrently. Discussion of topics and applications related to principles presented in course 113. Assigned topics each week show novel applications of the principles discussed in course 113; discussion topics during class period. (P/NP grading only.) — S. (S.) Harada

116. Plant Morphology and Evolution (5)  
Lecture—3 hours; laboratory—3 hours. Prerequisite: Introduction to plant biology (e.g., Biological Sciences 2C, Plant Sciences 2). Introduction to the form, development and evolution of vascular plants. Emphasis given to the form and development of reproductive structures in flowers and seed-producing plants as a basis for determining evolutionary relationships. Not open for credit to students who have completed Plant Sciences 116. (Same course as Plant Sciences 116.) GE credit: SciEng | SE, VL. — W. (W.) Jernstedt

117. Plant Ecology (4)  
Lecture—3 hours; fieldwork—3 hours. Prerequisite: Biological Sciences 1A, 1B, 1C, or 2A, 2B, 2C. Plant Biology 111 recommended. The study of the interactions between plants, plant populations and vegetation types and their physical and biological environment. Special emphasis on California. Four field study trips and brief analysis of a class project required. (Same course as Evolution and Ecology 117.) — F. (F.)

119. Population Biology of Invasive Plants and Weeds (3)  
Lecture—2 hours; laboratory—3 hours. Prerequisite: Biological Sciences 1A, 1B, 1C, or 2A, 2B, 2C. Introductory statistics recommended. Origin and evolution of invasive plant species and weeds, reproduction and dispersal, seed ecology, modeling population dynamics, interactions between invasive species, native species, and crops, biological control. Laboratories emphasize design of competition experiments and identification of native and exotic species. (Same course as Evolution and Ecology 119.) GE credit: SciEng | SE. — S. (S.) Rejmanek

123. Plant-Virus-Vector Interaction (3)  
Lecture—3 hours. Prerequisite: Biological Sciences 2A, 2B, 2C. Biological Sciences 115, 119; course 105. Topics in viral infection and modern approaches to the interdiction of viral movement. (Same course as Entomology 123 and Plant Pathology 123.) Offered in alternate years. GE credit: SE, SL, WE. — W. (W.) Lucas, Gilbertson, Ullman

126. Plant Biochemistry (3)  
Lecture—3 hours. Prerequisite: Biological Sciences 103 or 105. The biochemical basis of photosynthesis, cellular processes and metabolic pathways. Discussion of methods used to understand plant processes, including use of transgenic plants. (Same course as Molecular and Cellular Biology 106.) GE credit: SciEng | SE, SL. — W. (W.) Callis, Tian

143. Evolution of Crop Plants (4)  
Lecture—3 hours; discussion—1 hour. Prerequisite: Plant Sciences 2 or Biological Sciences 1C or 2C. Origins of crops and agriculture, including main

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**Fall 2011 and on Revised General Education (GE): AH—Arts and Humanities; SE—Science and Engineering; SS—Social Sciences; ACCH—American Cultures; DD—Diversity; OL—Oral Skills; QU—Quantitative; SL—Scientific; VL—Visual; WC—World Cultures; WE—Writing Experience**

**Pre-Fall 2011 General Education (GE): ArtHum—Arts and Humanities; SciEng—Science and Engineering; SocSci—Social Sciences; DomDiversity—Domestic Diversity; Writing—Writing Experience**

**Quarter Offered:** F=fall, W= Winter, S= Spring, Su=Summer; 2017/2018 offering in parentheses
methodological approaches, centers of crop biodiversity, dispersal of crops, genetic and physiological differences between crops and their wild progenitors, agriculture practiced by other organisms, and role and ownership of crop biodiversity. GE credit: SciEng or SocSci, Div Writ | SE or SS, VL, WE. — S. (J. Gepts)

148. Introductory Mycology (4)
Lecture—2 hours; laboratory—6 hours. Prerequisite: Biological Sciences 1A, 1B, 1C. Limited enrollment. Systematics, ecology, evolution, and morphology of fungi. Importance of fungi to humans. (Same course as Plant Pathology 148.) GE credit: SE. — F. MacDonald, Rizzo

189. Experiments in Plant Biology: Design and Execution (3)
Laboratory/discussion—6 hours. Prerequisite: Biological Sciences 1A, 1B, 1C, or 2A, 2B, 2C, or the equivalent courses in Plant Sciences, and consent of the instructor. Provides an opportunity for undergraduates to formulate questions and to carry out experiments. Permission may be required. May be repeated for credit for a total of 12 units. (P/NP grading only. — F, W, S. [F, W, S.])

190C. Research Conference in Plant Biology (1)
Discussion—1 hour. Prerequisite: upper division standing in Plant Biology or related discipline; consent of instructor. Introduction to research methods in plant biology. Design of field or laboratory research projects, survey of appropriate literature, and discussion of research by faculty and students. May be repeated for credit. (P/NP grading only. — F, W, S. [F, W, S.])

192. Internship (1-12)
Internship—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Technical and/or professional experience on an off campus supervised by a member of the Plant Biology Department faculty. May be repeated for credit. (P/NP grading only. — F, W, S. [F, W, S.])

194H. Special Study for Honors Students (1-5)
Prerequisite: open only to majors of senior standing on honors list. Independent study of selected topics under the direction of a member or members of the staff. Completion will involve the writing of a senior thesis. (P/NP grading only.)

197T. Tutoring in Plant Biology (1-5)
Discussion—2-6 hours. Prerequisite: upper division standing and consent of instructor. Assisting the instructor by tutoring students in one of the Department’s regular courses. May be repeated for credit. (P/NP grading only. — F, W, S. [F, W, S.])

198. Directed Group Study (1-5)
Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5)
Prerequisite: consent of instructor. (P/NP grading only.)

Professional

396. Teaching Assistant Training Practicum (1-4)
Prerequisite: graduate standing; consent of instructor. Practical experience in acting as teaching assistant in Plant Biology courses. Learning activity: hands on experience in preparing for and conducting discussions, guiding student laboratory work, and the formulation of questions and topics for examinations. May be repeated for credit. (S/U grading only. — F, W, S. [F, W, S.])

Plant Biology (A Graduate Group)

Neelima Sinha, Ph.D., Chairperson of the Group
Graduate office, 227A Life Sciences
530-752-9287; Fax 530-752-8822
http://pbi.ucdavis.edu/

Faculty
Diane Beckles, Ph.D., Associate Professor
(Plant Sciences)
Alan Bennett, Ph.D., Professor (Plant Sciences)
Alison Berry, Ph.D., Professor (Plant Sciences)
Arnold Bloom, Ph.D., Professor (Plant Sciences)
Eduardo Blumwald, Ph.D., Professor (Plant Sciences)
Richard Bostock, Ph.D., Professor (Plant Pathology)
Kent Bradford, Ph.D., Professor (Plant Sciences)
Sibahle Brading, Ph.D., Associate Professor
(Plant Biology)
Anne Britt, Ph.D., Professor (Plant Biology)
Patrick Brown, Ph.D., Professor (Plant Sciences)
Judy Colli, Ph.D., Professor (Molecular and Cellular Biology)
Academic Senate Distinguished Teaching Award
Claire Costley, Ph.D., Assistant Professor
(Plant Biology)
Gitta Cooker, Ph.D., Assistant Professor
(Plant Pathology)
Lucy Comai, Ph.D., Professor (Plant Biology)
Douglas Cook, Ph.D., Professor (Plant Pathology)
Carlos Crisosto, Ph.D., Professor (Plant Sciences)
Abhaya Dandekar, Ph.D., Professor (Plant Sciences)
Katayoon Dehesh, Ph.D., Professor (Plant Biology)
Theodore DeJongh, Ph.D., Professor (Plant Sciences)
Savithramma Dinesh-Kumar, Ph.D., Professor (Plant Biology)
Georgia Drakakaki, Ph.D., Assistant Professor (Plant Sciences)
Paul Geps, Ph.D., Professor (Plant Sciences)
Matthew Gilchrist, Ph.D., Assistant Professor
(Plant Biology)
Thomas Gradziel, Ph.D., Professor (Plant Sciences)
Andrew Groover, Ph.D., Assistant Professor
(Plant Biology)
John Harada, Ph.D., Professor (Plant Biology)
Academic Senate Distinguished Teaching Award
Stacey Harmer, Ph.D., Professor (Plant Biology)
Kentaro Inoue, Ph.D., Professor and Associate
Dean (Chemical and Material Engineering)
Judy Jernestedt, Ph.D., Professor (Plant Sciences)
Daniel Klenkentstein, Ph.D., Professor (Plant Sciences)
John Labavitch, Ph.D., Professor (Plant Sciences)
Clark Lagarias, Ph.D., Professor
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Bo Liu, Ph.D., Professor (Plant Biology)
William Lucas, Ph.D., Professor (Plant Biology)
Julin Maloof, Ph.D., Professor (Plant Biology)
Karen McDonald, Ph.D., Professor and Associate
Dean (Chemical and Material Engineering)
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Richard Michelmore, Ph.D., Professor
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Sharmann O’Neill, Ph.D., Professor (Plant Biology)
Kyaw Tha Paw, Ph.D., Professor
(Land, Air and Water Resources)
Daniel Potter, Ph.D., Professor (Plant Sciences)
Marcel Rejmanek, Ph.D., Professor
(Evolution and Ecology)
Eliska Rejmankova, Ph.D., Associate Professor
(Plant Biology)
James Richards, Ph.D., Professor
(Land, Air and Water Resources)
Pamela Ronald, Ph.D., Professor (Plant Pathology)
Jeffery Ross-Ibarra, Ph.D., Associate Professor
(Plant Sciences)
Johanna Schmitt, Ph.D., Professor
(Evolution and Ecology)
Ken Shackell, Ph.D., Professor (Plant Sciences)
Neelima Sinha, Ph.D., Professor (Plant Biology)
Dina St. Clair, Ph.D., Professor
(Plant Sciences)
Venkatesan Sundaresan, Ph.D., Professor
(Plant Sciences)
Steve Tieg, Ph.D., Professor (Plant Biology)
Li Tian, Ph.D., Associate Professor (Plant Sciences)
M. Andrew Walker, Ph.D., Professor
(Viticulture and Enology)
John Yoder, Ph.D., Professor (Plant Sciences)
Florence Zakharov, Ph.D., Assistant Professor
(Plant Sciences)
Philipp Zerbe, Ph.D., Assistant Professor
(Plant Biology)

Emeriti Faculty
Don Durzan, Ph.D., Professor (Plant Sciences)
David Gilchrist, Ph.D., Professor Emeritus
(Plant Pathology)
Donald J. Nevins, Ph.D., Professor (Plant Sciences)
Donald Phillips, Ph.D., Professor (Plant Sciences)
Carlos Quirós, Ph.D., Professor (Plant Sciences)
Michael Reid, Ph.D., Professor (Plant Sciences)
M.W. Silk, Ph.D., Professor Emeritus
(Land, Air and Water Resources)
T. Hisao, Ph.D., Professor Emeritus
(Land Air Water Resources)

Affiliated Faculty
Carlos Crisosto, Ph.D., Pomologist and Specialist
(Plant Sciences)
Andrew Groover, Ph.D., Associate Adjunct Professor
(Plant Biology)
Cai-Zhong Jiang, Research Plant Physiologist
(Crops Path & Genetic Research)
Takao Kasuga, Ph.D., Molecular Geneticist
(Plant Pathology)
Ann Powell, Ph.D., Professional Research Biochemist
(Plant Sciences)
Alan Rose, Ph.D., Associate Project Scientist
(Molecular & Cellular Biology)
Thomas Tai, Ph.D., Associate in the Agricultural
Experiment (Plant Sciences)
Allen Van Deynze, Ph.D., Professional Researcher
(Plant Sciences)

Graduate Study. The Graduate Group in Plant Biology offers programs of study and research leading to the M.S. and Ph.D. degrees. The program prepares students for careers in teaching and research at universities and colleges, government and industrial laboratories. The graduate curriculum provides both a breadth in the discipline and in-depth study and research in one of the areas of specialization: cell and developmental biology; environmental and integrative biology; molecular biology, biochemistry and genomics; and systematic and evolutionary biology. These areas of specialization permit individual study and research into diverse aspects of plant biology, including anatomy, biochemistry, biotechnology, cell biology, cytology, developmental biology, ecology, genetics, genomics, molecular biology, morphology, paleobotany, physiology, population biology, systematics, and weed science. The graduate adviser, the major professor, and the student will design a program of advanced courses to meet individual academic needs within one of the specializations.

Preparation. For both the M.S. and Ph.D. programs, a level of scholastic development equivalent to that of a Bachelor’s degree in biological sciences from a recognized college or university is required. Courses in the following areas are considered to be prerequisite to the advanced degrees in Plant Biology: biology, inorganic chemistry, organic chemistry, introductory physics, genetics, plant development and structure, biochemistry, introductory plant physiology, calculus, introductory statistics, ecology/systematics/evolution, and cell biology. Limited deficiencies can be made up after admission.

Graduate Adviser. Contact the Group office.