Physiology

See Anatomy, Physiology and Cell Biology (APC), on page 539; Human Physiology (HPH), on page 405; Molecular, Cellular, and Integrative Physiology (A Graduate Group), on page 433; and Neurobiology, Physiology, and Behavior, on page 443.

Plant Biology

See Agricultural Management and Rangeland Resources, on page 143; Crop Science and Management, on page 218; Environmental Horticulture, on page 296; Plant Biology, on page 471; Plant Biology (A Graduate Group), on page 473; and Vegetable Crops, on page 539.

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 473.

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

Advising. 1023 Sciences Laboratory Building; 530-752-0410; http://www.biosci.ucdavis.edu/BASC

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, Assistant Professor
Anne Britt, Ph.D., Professor
Luca Comai, Ph.D., Professor
Katayoon Dehesh, Ph.D., Professor
S. P. Dinshah-Kumar, Professor
John J. Harada, Ph.D., Professor
Karen McCall, Professor
Julin Maito, Ph.D., Professor
Sharan O'Neill, Ph.D., Professor
Neelima Sinha, Ph.D., Professor
Venkatesan Sundaresan, Ph.D., Professor
Steven M. Thog, Ph.D., Professor

Secondary Department Members

Judy Callis, Ph.D., Professor
Academic Senate Distinguished Teaching Award
James A. Doyle, Ph.D., Professor
Marilynn E. Etzler, Ph.D., Professor
Charles S. Gasser, Ph.D., Professor
J. Clark Lagarias, Ph.D., Professor
Marc Rappaport, Ph.D., Professor
Raymond L. Rodriguez, Ph.D., Professor
Emeriti Faculty

David E. Bayer, Ph.D., Professor Emeritus
Bruce A. Bonner, Ph.D., Professor Emeritus
Deborah Carrington, Ph.D., Lecturer
Academic Federation Excellence in Teaching Award
Paul A. Castlefranco, Ph.D., Professor Emeritus
Deborah P. Delmar, Ph.D., Professor Emerita
Emanuel Epstein, Ph.D., Professor Emeritus
Richard H. Falk, Ph.D., Professor Emeritus
Donald W. Kyhos, Ph.D., Professor Emeritus
Norma J. Lang, Ph.D., Professor Emerita
Terence M. Murphy, Ph.D., Professor Emeritus
Thomas L. Rast, Ph.D., Professor Emeritus

Academic Senate Distinguished Teaching Award
Alan J. Stember, Ph.D., Professor Emeritus
Larry N. Vanderhoef, 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 Feddema, 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 plant 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 molecular genetics, cell biology, and biochemistry, Plant Biology makes an excellent minor or second major for students 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 envi-
ronmental or patent law) or journalism. Plant biolo-
gists can work in the laboratory, in the field, in the forest, in bycas, or nurseries, in agricul-
tural companies, or in biotechnology, pharmaceuti-
cal, 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........................................... 10
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.................................. 5
Evolution and Ecology 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., agricultural botany, ecology, sys-
tematics and evolution, morphology, plant physiol-
ology, etc.), certain substitutions, including courses in
other departments, may be allowed upon prior con-
sultation 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 17A-17B or Math 21A-21B-21C (21C recommended). .. 8-12
Physics 7A-7B-7C......................................... 12

Recommended

Biological Sciences 20Q

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

Biological Sciences 101, 105 (or 102-103D, 104 or equivalent). 10-13
Statistics 100 or 102 or 104................................ 4
Plant Biology 105, 111, 112................................. 11
Research internship: Plant Biology 92, 99, 189, 192, 199 or equivalent........ 3
Restricted electives........................................ 15

Upper division courses in plant biology or other fields relevant to the student’s interest chosen from the lists below. The student’s academic adviser may approve additional
courses as “restricted electives” at their discretion.

Total Units for the Major................................. 98-111

Course Lists

Ecology

Environmental Science and Policy 121, 123, 124, 150C, in Bio 155A or 155E, Evolution and
Ecology 101, 131, 138, Hydrologic Science 124; Plant Biology 117, 119, Plant Pathology 150; Plant Science
112, 130, 131, 134, 135, 142, 144.

Evolution and Diversity


Plant Genetics

Evolution and Ecology 100, 102; Molecular and Cellular Biology 161, 164; Plant Biology 113; Plant Pathology 123; Plant Sciences 152.

Plant Physiology, Development, and Molec-
ular Biology

Biotechnology 160, 161A, 161B; Molecular and Cellular Biology 112; Plant Biology 113, 126; Plant Pathology 123, 130; Plant Sciences 153, 157, 158.

Master Adviser. Steve Theg, Plant Biology Department
office in 2165 Life Sciences

Minor Program Requirements:

Minor Requirements.................................... 18

Upper division units, including at least one course from each of the following four

(a) Anatomy and Morphology: Evolution and Ecology 140; Plant Biology 105, 116
(b) Physiology and Development: Plant Pathology 111, 112, 123; Plant Pathology 130
(c) Evolution and Ecology: Evolution and Ecology 100; Plant Biology 102, 108, 117, 143
(d) Biochemistry and Molecular Genetics: Biotechnology 150; Plant Biology 113, 126; Plant Sciences 152, 154, 171, 172

Minor Adviser. Same as for major above.

Honors and Honors Programs. Students on the honors list may elect to include a maximum of 5 units of 194H in their major programs. Refer to the Aca-
demic Information chapter and the appropriate College section for Honors List information.

Graduate Study. Consult the Plant Biology Gradu-
ate Group listing.

Courses in Plant Biology (PLB)

Lower Division

90X. Plant Science Seminar (1-4)
Prerequisite: consent of instructor. Examination of a special topic in a small group setting. Not open for credit to students who have completed course Plant Sciences 90X. (Former course Plant Sciences 90X.)

92. Internship (1-12)
Internship—3-36 hours. Prerequisite: consent of instructor. Technical and/or professional experience on or off campus. Supervised by a member of the Plant Biology faculty. (P/NP grading only.)

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

99. Special Study for Undergraduates (1-5)
Prerequisite: consent of instructor. Examination of a special topic in a small group setting. Not open for credit to students who have completed course Plant Sciences 90X. (Former course Plant Sciences 90X.)

Upper Division

For questions about courses numbered 102 through 126, see the Plant Biology Department office in 1002 Life Sciences. Courses numbered 102 through 126 are offered year-
ningly. Each course 102 through 126 will be assigned problems each week showing novel applications of principles described in course 111. Students will be assigned problems each week showing novel applications of the principles described in course
112 and will prepare answers to be delivered orally during class period. (P/NP grading only.)

102. California Floristics (5)

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, VL | Div || I.)

108. Systematics and Evolution of
Angiosperms (5)
Lecture—3 hours; laboratory—6 hours. Prerequisite: Biological Sciences 1A, 1B, or 3A, 3B, 2C, Diversity and classification of angiosperms (flower-
ing plants) on a world scale, and current understand-
ing of the origin of angiosperms and evolutionary relationships and trends within them based on mor-
phological and molecular evidence. (Same course as Evolution and Ecology 108.) GE credit: SciEng.—
III. (III.) Doyle

111. Plant Physiology (3)
Lecture—3 hours. Prerequisite: Biological Sciences 1C, 2A, 2B, 2C, Chemistry 88 and Physics 7C (either may be taken concurrently). Plant Biology 105 recommended. The plant cell as a functional unit. The processes of absorption, movement, and storage of water and minerals. Water loss, translo-
cation, photosynthesis, respiration. (I.) Dehesh, Lucas

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

112. Problems in Plant Growth and Development (1)
Discussion—1 hour. Prerequisite: course 112 concurre-
ently. 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 and will prepare answers to be delivered orally during class period. (P/NP grading only.)

113. Molecular and Cellular Biology of Plants (3)
Lecture—3 hours. Prerequisite: Biological Sciences 1A and 1C, or 2A, 2B, 2C; 101; Biological Sciences 102 or 105 recommended. Molecular and cellular aspects of the growth and development of plants and their response to abiotic and environ-
mental stresses. Primary focus on processes unique to plants. Experimental approaches will be empha-
sized. GE credit: QL, SL, VL.—III. (III.) Harada

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

116. Plant Morphology and Evolution (5)
Lecture—3 hours; laboratory—6 hours. Prerequisite: intro-
ductive plant biology (e.g., Biological Sciences 1C, or 2A, 2B, and 2C); plant anatomy recom-
manded (e.g., Plant Biology 105). Introduction to the form, development and evolution of vascular plants. Emphasis given to the form and development of reproductive structures in ferns and seed-producing plants as a basis for determining evolutionary rela-
tionships. GE credit: SciEng.—II. (II.) Jernstedt

Quarter Offered: I-Fall, II-Winter, III-Spring, IV-Summer; 2015-2016 offering in parentheses.

Fall 2011 and on Revised General Education (GE): AH—Arts and Humanities; SCiEng—Science and Engineering; SS—Social Sciences; Div—Domestic Diversity; WR—Writing Experience
117. Plant Ecology (4)  Lecture—3 hours; fieldwork—3 hours. Prerequisite: Biological Sciences 1A, 1B, 1C, or 2A, 2B, 2C. Plant Biology 181. Reading: recommended for study of the interactions between plants, plant populations or vegetation types and their physical and biological environment, with special emphasis on California. Four full-day field trips and brief write-up of class project required. [Same course as Evolution and Ecology 117.]—I. (I)

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, reproductive and dispersal, seed ecology, modeling of population dynamics, interactions between invasive species, native species, and crops, biological control. Laboratories emphasize design of competition experiments and identification of weedy species. [Same course as Evolution and Ecology 119.] GE credit: SciEng | SE — III. (III) Rejmanek

123. Plant-Virus-Vector Interaction (3)  Lecture—3 hours. Prerequisite: Biological Sciences 2A, Biological Sciences 101; course 105, Plant Pathology 120, and Entomology 100 recommended. Analysis of interactions necessary for viruses to infect plants. Interactions among insect vectors and host plants involved in the plant-virus life cycle. Evolutionary aspects of the molecular components 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 — I. (I) Lucas, Gibberellin, Ullman

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

143. Evolution of Crop Plants (4)  Lecture—3 hours; discussion—1 hour. Prerequisite: Plant Science 2 or Biological Sciences 1C or 2C. Origins of crops and agriculture, including main technological 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, Wrt | SE or SS, SL, WE — III. (III) Gepts

148. Introductory Mycology (4)  Lecture—2 hours; laboratory—6 hours. Prerequisite: Biological Sciences 1A, 1B, 1C. Systematics, ecology, evolution, and morphology of fungi. Importance of fungi to humans. [Same course as Plant Pathology 148I] GE credit: SE — I. 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 experimental approaches to current questions in plant biology and to carry out their proposed experiments. May be repeated for credit for a total of 12 units. (P/NP grading only.)—I, II, III, (I, II, III)

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.)—I, II, III, (I, II, III)

192. Internship (1-12)  Internship—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Technical and/or professional experience for credit. Supervised by a member of the Plant Biology Department faculty. May be repeated for credit. (P/NP grading only.)

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 result in 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.)—I, II, III, (I, II, III)

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.)—I, II, III, IV (I, II, III, IV)

Plant Biology (A Graduate Group)

Kentaro Inoue, Ph.D., Chairperson of the Group

Group Office. 227A Life Science 530-752-2991; Fax 530-752-8822

http://biocs3.ucdavis.edu/GradGroups/PhB/

Faculty

Diane Beckles, Ph.D., Associate Professor
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 Brown, Ph.D., Professor (Plant Sciences)
Siobhan Brady, Ph.D., Assistant Professor
Anne Britt, Ph.D., Professor (Plant Biology)
Patrick Brown, Ph.D., Professor (Plant Sciences)
Judy Callis, Ph.D., Professor/Vice Chair (Molecular and Cellular Biology)
Gitta Coaker, Ph.D., Associate Professor (Plant Pathology)
Luca Comai, Ph.D., Professor (Plant Biology)
Douglas Cook, Ph.D., Professor (Plant Pathology)
Carlos Crisosto, Ph.D., Professor (Plant Sciences)
Abhayadendra Das, Ph.D., Professor (Plant Sciences)
Katayoon Dehesh, Ph.D., Professor (Plant Biology)
Theodore Degrange, Ph.D., Professor (Plant Sciences)
Savithramma Dinesh-Kumar, Ph.D., Professor (Plant Sciences)
Jorge Drakakaki, Ph.D., Assistant Professor (Plant Sciences)
Jorge Dubcovsky, Ph.D., Professor (Plant Sciences)
Charles Gasser, Ph.D., Professor
(P/Molecular and Cellular Biology)
Paul Gepts, Ph.D., Professor (Plant Sciences)
Edmund Gilbert, Ph.D., Assistant Professor
(Plant Sciences)
David Gilchrist, Ph.D., Professor (Plant Pathology)
Sham Goyal, Ph.D., Agronomy Specialist
(Plant Sciences)
Thomas Gradziel, Ph.D., Professor (Plant Sciences)
Andrew Groaver, 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 (Plant Sciences)
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(Plant Sciences)
Judy Jernstedt, Ph.D., Professor (Plant Sciences)
Daniel Kliemstein, Ph.D., Professor (Plant Sciences)
John Labavitch, Ph.D., Professor (Plant Sciences)
Clark Lagarias, Ph.D., Professor
(Molecular and Cellular Biology)
J. Heiner Lieth, Ph.D., Professor (Plant Sciences)
Bo Liu, Ph.D., Professor (Plant Biology)
William Lucas, Ph.D., Professor/Chair
(Plant Biology)
Julin Maloof, Ph.D., Professor
(Plant Biology)
Mark Matthews, Ph.D., Professor
(Viticulture and Enology)
Karen McDonald, Ph.D., Professor and Associate Dean
(Chemical Engineering and Materials Science)
Richard Michelmore, Ph.D., Professor
(Plant Sciences)
Terence Murphy, Ph.D., Professor (Plant Biology)
David Neale, Ph.D., Professor (Plant Sciences)
Sharan O'Neill, Ph.D., Professor (Plant Biology)
Kyaw Thu Paw, Ph.D., Professor
(Land, Air and Water Resources)
Anne Powell, Ph.D., Associate Researcher
(Plant Sciences)
Carlos Quiros, Ph.D., Professor (Plant Sciences)
Marcel Rejmanek, Ph.D., Professor
(Evolution and Ecology)
Eliska Rejkmanova, Ph.D., Professor
(Environmental Science and Policy)
Pamela Ronald, Ph.D., Professor (Plant Pathology)
Alan Rose, Ph.D., Project Scientist
(Molecular and Cellular Biology)
Jeffery Ross-Ibarra, Ph.D., Assistant Professor
(Plant Sciences)
Ken Shackel, Ph.D., Professor (Plant Sciences)
Neelima Sinha, Ph.D., Professor (Plant Biology)
Dina St. Clair, Ph.D., Professor
(Plant Sciences)
Venkatesh Sundaresan, Ph.D., Professor
(Plant Biology)
Thomas Tai, Ph.D., Associate in the Agricultural Experiment Station
(Plant Scientist)
Steve Theg, Ph.D., Professor (Plant Biology)
Li Tian, Ph.D., Assistant Professor (Plant Sciences)
Allan Van Deynze, Ph.D., Professional Researcher
(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)
Emeriti Faculty

Don Durzan, Ph.D., Professor (Plant Sciences)
David Gilchrist, Ph.D., Professor Emeritus
(P/Molecular and Cellular Biology)
Donald J. Nieves, Ph.D., Professor (Plant Sciences)
Donald Phillips, Ph.D., Professor (Plant Sciences)
Carlos Quiros, Ph.D., Professor (Plant Sciences)
Michael Reud, Ph.D., Professor (Plant Sciences)
M W Silk, Ph.D., Professor Emeritus
(Land, Air and Water Resources)
T Hsiao, Ph.D., Professor Emeritus
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Affiliated Faculty

John Bowman, Ph.D., Professor (Plant Biology)