PLANT BIOLOGY, ECOLOGY, AND EVOLUTION

The field of plant biology, spans from molecules to ecosystems. The importance of plants to the ecosystem and to humanity can't be underestimated. They regulate global processes and form complex relationships with other organisms, and have intriguing patterns of development and diversity. Plants provide medicinal compounds, shelter, fuel, food, and oxygen, and support the existence of life on Earth. As human populations increase, the need for more and better supplies of food, fiber, and biofuels also increases. The study of plant biology underlies the applied sciences such as agronomy, forestry, natural resource management, horticulture, and plant pathology.

To major in plant biology a student should have a strong interest in life sciences with a good background in chemistry and mathematics. Majors with a BS degree may choose to specialize by taking the Degree Option in Ecology and Evolutionary Biology or the Option in Cell Biology and Molecular Genetics. Graduates with the first option are qualified to hold positions in federal and state agencies in areas such as conservation biology, habitat restoration, environmental biology, and plant inspection. Students taking the second option are qualified for various research positions in private industry, such as plant biotechnology and drug development, and both may qualify for secondary education certification.

Facilities used in undergraduate teaching include well-equipped plant physiology and ecology laboratories, environmental chambers, the 160-acre McPherson Preserve, and a herbarium with over 150,000 plant specimens. Faculty members teach and do research in their specialty areas of plant biology including ecology, population biology, biodiversity, climate change, evolution, physiology, biochemistry, biophysics, taxonomy and systematics, genetics and development, genomics, and cell and molecular biology.

Courses

BOT 1404 Plant Biology (LN)
Description: Basic concepts in the biology of plants from the perspective of structure and function, ecology and evolution, and diversity. Previously offered as BIOL 1404, BIOL 1403, and BISC 1403.
Credit hours: 4
Contact hours: Lecture: 3 Lab: 2
Levels: Undergraduate
Schedule types: Lab, Lecture, Combined lecture and lab
Department/School: Plant Biology Ecol & Evolution
General Education and other Course Attributes: Scientific Investigation, Natural Sciences

BOT 3005 Field Botany
Prerequisites: BIOL 1114 or equivalent.
Description: Botanical field techniques, the vegetation of North America, and the flora of Oklahoma. Terminology of description, use of taxonomic keys, techniques of specimen preservation, field recognition of plant taxa and communities and controlling ecological factors, economic and wildlife significance of dominant taxa, principles of classification and nomenclature. Four weekend field trips required.
Credit hours: 5
Contact hours: Lecture: 3 Lab: 4
Levels: Undergraduate
Schedule types: Lab, Lecture, Combined lecture and lab
Department/School: Plant Biology Ecol & Evolution

BOT 3013 Biological Microtechnique
Prerequisites: BOT 1404 and BIOL 1604.
Description: Techniques for preparation of biological materials for microscopic examination. Previously offered as ZOOL 3013 and ZOOL 4454.
Credit hours: 3
Contact hours: Lecture: 3 Lab: 3
Levels: Graduate, Undergraduate
Schedule types: Lab, Lecture, Combined lecture and lab
Department/School: Plant Biology Ecol & Evolution

BOT 3024 Plant Diversity
Prerequisites: BOT 1404.
Description: Forms and life histories of selected plants with emphasis on some of the less familiar forms. The diversity of plant forms as well as basic similarities in life histories; importance of each form to man and his environment. Field trips required.
Credit hours: 4
Contact hours: Lecture: 2 Lab: 4
Levels: Graduate, Undergraduate
Schedule types: Lab, Lecture, Combined lecture and lab
Department/School: Plant Biology Ecol & Evolution

BOT 3114 Plant Taxonomy
Prerequisites: BOT 1404 or equivalent.
Description: Vocabulary and concepts of plant taxonomy: terminology, keys, nomenclature, documentation, classification, and biosystematics. Emphasis on angiosperm flora of Oklahoma. Field trip fees applied.
Credit hours: 4
Contact hours: Lecture: 2 Lab: 4
Levels: Graduate, Undergraduate
Schedule types: Lab, Lecture, Combined lecture and lab
Department/School: Plant Biology Ecol & Evolution

BOT 3233 Plant Anatomy
Prerequisites: BOT 1404.
Description: Structure of cells, tissues and organs of plants. Consideration of structure as related to ontogeny, phylogeny and function.
Credit hours: 3
Contact hours: Lecture: 2 Lab: 2
Levels: Graduate, Undergraduate
Schedule types: Lab, Lecture, Combined lecture and lab
Department/School: Plant Biology Ecol & Evolution

BOT 3253 Environment and Society (N)
Prerequisites: At least one college level science course strongly recommended.
Description: The environmental impacts of human activities and population growth on the natural world, and possible solutions.
Credit hours: 3
Contact hours: Lecture: 3
Levels: Undergraduate
Schedule types: Lecture
Department/School: Plant Biology Ecol & Evolution
General Education and other Course Attributes: Natural Sciences
BOT 3263 Plants and People (N)
Description: Study of how plant use has changed the course of world history. This includes the uses of plants and plant products for food and beverages, shelter, fiber, and medicinal and pharmaceutical purposes.
Credit hours: 3
Contact hours: Lecture: 3
Levels: Undergraduate
Schedule types: Lecture
Department/School: Plant Biology Ecol & Evolution
General Education and other Course Attributes: Natural Sciences

BOT 3273 Plants and Human Health (N)
Description: Study of plants as a source of medicines, psychoactive compounds and poisons. These topics will be explored in the context of modern western medicine as well as traditional health systems and complementary alternative medicine.
Credit hours: 3
Contact hours: Lecture: 3
Levels: Undergraduate
Schedule types: Lecture
Department/School: Plant Biology Ecol & Evolution
General Education and other Course Attributes: Natural Sciences

BOT 3462 Plant Physiology Laboratory
Prerequisites: BOT 3463 or concurrent enrollment.
Description: Skills in techniques for working with plants, experiments involving nutrition, respiration, photosynthesis, water relations, translocation, hormones, growth and development. Previously offered as BOT 3460.
Credit hours: 2
Contact hours: Lab: 4
Levels: Undergraduate
Schedule types: Lab
Department/School: Plant Biology Ecol & Evolution

BOT 3463 Plant Physiology
Prerequisites: BOT 1404.
Description: Plant subcellular structure, water relations, water absorption and ascent of sap, translocation, gaseous exchange, nutrition, enzymes, respiration, photosynthesis, growth, development, reproduction, tropisms, hormones, dormancy and seed germination.
Credit hours: 3
Contact hours: Lecture: 3
Levels: Graduate, Undergraduate
Schedule types: Lecture
Department/School: Plant Biology Ecol & Evolution

BOT 3553 Fungi: Myths And More
Prerequisites: BIOL 1114
Description: Explores the impact of fungi on beliefs, culture and society via the colorful folklore and myths on fungi and their role in the environment and human affairs, including diseases of plants, animals and humans exemplified by the Great Bengal famine of 1943, The Irish potato famine, 1840’s and the Salem witch trials 1692. Laboratory instruction on use of microscopes, mushroom identification, mechanisms of dispersal, and genetic recombination. (Same course as PLP 3553)
Credit hours: 3
Contact hours: Lecture: 2 Lab: 2
Levels: Undergraduate
Schedule types: Lab, Lecture, Combined lecture and lab
Department/School: Plant Biology Ecol & Evolution

BOT 4023 Community Ecology
Prerequisites: BIOL 3034 or equivalent.
Description: Plant and animal communities, community theory, the role of competition, predation, and demography in structuring plant and animal communities, succession, current controversies in ecology, with emphasis on the primary literature. No credit for students with credit in BOT 5023.
Credit hours: 3
Contact hours: Lecture: 3
Levels: Undergraduate
Schedule types: Lecture
Department/School: Plant Biology Ecol & Evolution

BOT 4123 Ethnobotany
Prerequisites: AGRON 1213, BIOL 1403 or BIOL 1604, HORT 1013, BOT 3024 or consent of instructor.
Description: Uses of plants by past and present cultures for food, fiber, and medicinal purposes. The role of plants in traditional rituals and religious practice.
Credit hours: 3
Contact hours: Lecture: 3
Levels: Graduate, Undergraduate
Schedule types: Lecture
Department/School: Plant Biology Ecol & Evolution

BOT 4214 Ecology of Algae and Aquatic Plants
Prerequisites: BOT 1404 or equivalent recommended. Junior/ senior standing in life or environmental sciences.
Description: Ecology, physiology, evolution, and ecological roles of algae and vascular aquatic plants; problem algal blooms; ecological principles applied to algal biofuels. Laboratory includes basic identification of algae and aquatic plants; field trips required, with fee. No degree credit for students with credit in BOT 5214. Previously offered as BOT 4213.
Credit hours: 4
Contact hours: Lecture: 3 Lab: 3
Levels: Undergraduate
Schedule types: Lab, Lecture, Combined lecture and lab
Department/School: Plant Biology Ecol & Evolution

BOT 4400 Undergraduate Research
Prerequisites: Consent of instructor.
Description: Undergraduate research problems in botany. Offered for variable credit, 1-3 credit hours, maximum of 9 credit hours.
Credit hours: 1-3
Contact hours: Other: 1
Levels: Undergraduate
Schedule types: Independent Study
Department/School: Plant Biology Ecol & Evolution

BOT 4423 Plant Mineral Nutrition
Prerequisites: BOT 3463 or equivalent.
Description: Uptake, translocation, metabolism, and biochemical function of mineral nutrients in higher plants. No credit for students with credit in BOT 5423.
Credit hours: 3
Contact hours: Lecture: 3
Levels: Undergraduate
Schedule types: Lecture
Department/School: Plant Biology Ecol & Evolution
BOT 4990 Independent Study in Botany
Prerequisites: Consent of instructor.
Description: Independent study under the supervision of a faculty member. This will include readings and discussion on a selected topic agreed upon between the student and instructor.
Credit hours: 1-3
Contact hours: Other: 1
Levels: Undergraduate
Schedule types: Discussion
Department/School: Plant Biology Ecol & Evolution

BOT 4993 Senior Honors Thesis
Prerequisites: Departmental invitation, senior standing, Honors Program participation.
Description: A research project under the direction of a faculty member resulting in a written report to be judged by a second faculty member as well. An oral presentation made at a departmental seminar. Required for graduation with departmental honors in botany.
Credit hours: 3
Contact hours: Other: 3
Levels: Undergraduate
Schedule types: Independent Study
Department/School: Plant Biology Ecol & Evolution

BOT 5000 Master's Thesis
Description: Thesis work for the MS degree. Offered for variable credit, 1-6 credit hours, maximum of 6 credit hours.
Credit hours: 1-6
Contact hours: Other: 1
Levels: Graduate
Schedule types: Independent Study
Department/School: Plant Biology Ecol & Evolution

BOT 5023 Community Ecology
Prerequisites: BIOL 3034 or equivalent.
Description: Plant and animal communities, community theory, the role of competition, predation, and demography in structuring plant and animal communities, succession, current controversies in ecology, with emphasis on the primary literature. No credit for students with credit in BOT 4023.
Credit hours: 3
Contact hours: Lecture: 3
Levels: Graduate
Schedule types: Lecture
Department/School: Plant Biology Ecol & Evolution

BOT 5104 Mycology
Prerequisites: Graduate standing.
Description: A systematic study of the fungi, with emphasis on taxonomy, comparative morphology, and fungal biology. Taught in the Department of Entomology and Plant Pathology. (Same course as PLP 5104)
Credit hours: 4
Contact hours: Lecture: 3 Lab: 2
Levels: Graduate
Schedule types: Lab, Lecture, Combined lecture and lab
Department/School: Plant Biology Ecol & Evolution

BOT 5110 Special Topics in Botany
Prerequisites: Consent of instructor.
Description: Special studies in any area of botany. Offered for variable credit, 1-5 credit hours, maximum of 24 credit hours.
Credit hours: 1-5
Contact hours: Other: 1
Levels: Graduate
Schedule types: Independent Study
Department/School: Plant Biology Ecol & Evolution

BOT 5214 Ecology Of Algae
Prerequisites: BOT 1404 or equivalent recommended. Graduate standing.
Description: Ecology, physiology, evolution, and ecological roles of algae and vascular aquatic plants; problem algal blooms; ecological principles applied to algal biofuels. Laboratory includes basic identification of algae and aquatic plants. Field trips required, with fee. No credit for students with credit in BOT 4214. Previously offered as BOT 5213.
Credit hours: 4
Contact hours: Lecture: 3 Lab: 3
Levels: Graduate
Schedule types: Lab, Lecture, Combined lecture and lab
Department/School: Plant Biology Ecol & Evolution

BOT 5423 Plant Mineral Nutrition
Prerequisites: BOT 3463 or equivalent.
Description: Uptake, translocation, metabolism, and biochemical function of mineral nutrients in higher plants. No credit for students with credit in BOT 4423.
Credit hours: 3
Contact hours: Lecture: 3
Levels: Graduate
Schedule types: Lecture
Department/School: Plant Biology Ecol & Evolution

BOT 5533 Multivariate Methods in Community Ecology
Prerequisites: BOT 5023 or BIOL 3034 or other equivalent course work in ecology recommended.
Description: Basic knowledge of statistics desirable. Methods used by ecologists to analyze community data and community patterns, including ordination and modern regression techniques. One weekend field trip required.
Credit hours: 3
Contact hours: Lecture: 3
Levels: Graduate
Schedule types: Lecture
Department/School: Plant Biology Ecol & Evolution

BOT 5210 Research in Botany
Prerequisites: Consent of instructor.
Description: Independent research in any area of botany or plant biology. Offered for variable credit, 1-6 credit hours, maximum of 12 credit hours.
Credit hours: 1-6
Contact hours: Other: 1
Levels: Graduate
Schedule types: Independent Study
Department/School: Plant Biology Ecol & Evolution

BOT 5217 Research in Botany
Prerequisites: Consent of instructor.
Description: Independent research in any area of botany or plant biology. Offered for variable credit, 1-6 credit hours, maximum of 12 credit hours.
Credit hours: 1-6
Contact hours: Other: 1
Levels: Graduate
Schedule types: Independent Study
Department/School: Plant Biology Ecol & Evolution

BOT 5218 Research in Botany
Prerequisites: Consent of instructor.
Description: Independent research in any area of botany or plant biology. Offered for variable credit, 1-6 credit hours, maximum of 12 credit hours.
Credit hours: 1-6
Contact hours: Other: 1
Levels: Graduate
Schedule types: Independent Study
Department/School: Plant Biology Ecol & Evolution

BOT 5220 Research in Botany
Prerequisites: Consent of instructor.
Description: Independent research in any area of botany or plant biology. Offered for variable credit, 1-6 credit hours, maximum of 12 credit hours.
Credit hours: 1-6
Contact hours: Other: 1
Levels: Graduate
Schedule types: Independent Study
Department/School: Plant Biology Ecol & Evolution

BOT 5221 Research in Botany
Prerequisites: Consent of instructor.
Description: Independent research in any area of botany or plant biology. Offered for variable credit, 1-6 credit hours, maximum of 12 credit hours.
Credit hours: 1-6
Contact hours: Other: 1
Levels: Graduate
Schedule types: Independent Study
Department/School: Plant Biology Ecol & Evolution

BOT 5222 Research in Botany
Prerequisites: Consent of instructor.
Description: Independent research in any area of botany or plant biology. Offered for variable credit, 1-6 credit hours, maximum of 12 credit hours.
Credit hours: 1-6
Contact hours: Other: 1
Levels: Graduate
Schedule types: Independent Study
Department/School: Plant Biology Ecol & Evolution

BOT 5223 Research in Botany
Prerequisites: Consent of instructor.
Description: Independent research in any area of botany or plant biology. Offered for variable credit, 1-6 credit hours, maximum of 12 credit hours.
Credit hours: 1-6
Contact hours: Other: 1
Levels: Graduate
Schedule types: Independent Study
Department/School: Plant Biology Ecol & Evolution

BOT 5224 Research in Botany
Prerequisites: Consent of instructor.
Description: Independent research in any area of botany or plant biology. Offered for variable credit, 1-6 credit hours, maximum of 12 credit hours.
Credit hours: 1-6
Contact hours: Other: 1
Levels: Graduate
Schedule types: Independent Study
Department/School: Plant Biology Ecol & Evolution

BOT 5225 Research in Botany
Prerequisites: Consent of instructor.
Description: Independent research in any area of botany or plant biology. Offered for variable credit, 1-6 credit hours, maximum of 12 credit hours.
Credit hours: 1-6
Contact hours: Other: 1
Levels: Graduate
Schedule types: Independent Study
Department/School: Plant Biology Ecol & Evolution

BOT 5226 Research in Botany
Prerequisites: Consent of instructor.
Description: Independent research in any area of botany or plant biology. Offered for variable credit, 1-6 credit hours, maximum of 12 credit hours.
Credit hours: 1-6
Contact hours: Other: 1
Levels: Graduate
Schedule types: Independent Study
Department/School: Plant Biology Ecol & Evolution

BOT 5227 Research in Botany
Prerequisites: Consent of instructor.
Description: Independent research in any area of botany or plant biology. Offered for variable credit, 1-6 credit hours, maximum of 12 credit hours.
Credit hours: 1-6
Contact hours: Other: 1
Levels: Graduate
Schedule types: Independent Study
Department/School: Plant Biology Ecol & Evolution
BOT 5541 Phylogenomics
Description: Current topics in the theory and application of genome and transcriptome sequencing to phylogenetics, prediction of gene function, and evolution of genes.
Credit hours: 1
Contact hours: Other: 1
Levels: Graduate
Schedule types: Discussion
Department/School: Plant Biology Ecol & Evolution

BOT 5553 Molecular Phylogenetic Analysis
Prerequisites: Undergraduate genetics strongly recommended.
Description: Covers the use of molecular sequence data to construct evolutionary trees. It integrates theory and computer applications to answer questions involving species relationships, gene evolution, molecular evolution and morphological change, co-evolution, and biogeographic relationships.
Credit hours: 3
Contact hours: Lecture: 2 Lab: 2
Levels: Graduate
Schedule types: Lab, Lecture, Combined lecture and lab
Department/School: Plant Biology Ecol & Evolution

BOT 5563 Plant Ecological Genetics
Prerequisites: BIOL 3023 and (BIOL 3034 or BIOL 4133).
Description: Basic concepts in plant population and quantitative genetics, focusing on techniques that reveal the genetic structure and the adaptive value of ecologically relevant traits.
Credit hours: 3
Contact hours: Lecture: 3
Levels: Graduate
Schedule types: Lecture
Department/School: Plant Biology Ecol & Evolution

BOT 5573 Physiology of Plant Growth and Development
Prerequisites: BOT 3463 or equivalent.
Description: Molecular mechanisms of growth and development, subcellular organization and function, plant hormones, photomorphogenesis, germination and dormancy, senescence and abscission, plant rhythms.
Credit hours: 3
Contact hours: Lecture: 3
Levels: Graduate
Schedule types: Lecture
Department/School: Plant Biology Ecol & Evolution

BOT 5813 Plant Developmental Genetics
Prerequisites: BIOL 3024 or equivalent.
Description: Discussion of morphogenesis, embryogenesis, gametogenesis, and the regulation of gene expression during plant development. Emphasis on recent genetic, experimental, and molecular studies of development in higher plants.
Credit hours: 3
Contact hours: Lecture: 3
Levels: Graduate
Schedule types: Lecture
Department/School: Plant Biology Ecol & Evolution

BOT 5850 Botany Seminar
Description: Weekly one-hour seminar series of invited and internal speakers. Botany MS and PhD Plant Sciences (Botany) students are required to present a minimum of two seminars, including one on an approved research proposal and one on thesis or dissertation results. Offered for fixed credit, 1 credit hour, maximum of 6 credit hours.
Credit hours: 1
Contact hours: Other: 1
Levels: Graduate
Schedule types: Independent Study
Department/School: Plant Biology Ecol & Evolution

BOT 6000 Doctoral Research
Description: Independent research for the doctoral dissertation. Offered for variable credit, 1-15 credit hours, maximum of 60 credit hours.
Credit hours: 1-15
Contact hours: Other: 1
Levels: Graduate
Schedule types: Independent Study
Department/School: Plant Biology Ecol & Evolution

Undergraduate Programs
- Plant Biology, BS (http://catalog.okstate.edu/arts-sciences/plant-biology-ecology-evolution/plant-biology-bs)
- Plant Biology: Cell Biology and Molecular Genetics, BS (http://catalog.okstate.edu/arts-sciences/plant-biology-ecology-evolution/cell-biology-molecular-genetics-bs)
- Plant Biology:Ecology and Evolutionary Biology, BS (http://catalog.okstate.edu/arts-sciences/plant-biology-ecology-evolution/ecology-evolutionary-biology-bs)

Graduate Programs
Programs of research and study leading to the degrees of Master of Science in Plant Biology and Doctor of Philosophy in Plant Science.

Prerequisites
Applicants for admission must have received a baccalaureate degree from an accredited college and should have had 40 semester hours (or equivalent) in upper-division courses in the biological and physical sciences. A grade-point average of 3.00 (on a 4.00 scale) or above is required for unconditional admission. All applicants are required to submit scores for the Aptitude portion of the Graduate Record Examination.

Prerequisites for graduate degrees include successful completion of courses in the two broad areas of:
1. ecology and evolution, and
2. cell and molecular biology.

Students with an undergraduate major in biology or plant science will have completed a substantial portion of these courses; those with a less closely related major may be required to take some background courses.

Final authority for each student’s plan of study resides with the student’s advisory committee.
Degree Requirements

Demonstrated research competence through submission and acceptance of a thesis or dissertation is required for all plant biology graduate degrees. A minimum of one semester teaching experience is required of all MS and PhD candidates. This requirement may also be satisfied by enrollment in a college teaching practicum course (GRAD 5990 Special Problems in Graduate Education).

All graduate students are expected to attend and participate in all departmental seminars.

The Master of Science Degree

Plans of study must include 30 credit hours including six credit hours of thesis and two credit hours of seminar. At least 21 semester credit hours numbered 5000 or above are required. A minimum of three graduate courses must be taken.

The Doctor of Philosophy Degree in Plant Science

The Department of Plant Biology, Ecology, and Evolution is one of seven departments participating in the multidisciplinary PhD plant science program. Students in this program have great flexibility in research and course work. The student who chooses Plant Biology, Ecology, and Evolution as a home department has a faculty advisor from within the department and will take BOT 6000 Doctoral Research research hours in the department. To receive the PhD in plant science, students must enroll in a total of 90 credit hours beyond the BS or 60 credit hours beyond the MS. No fewer than 36 or more than 60 hours of BOT 6000 Doctoral Research are allowed in the plan of study. Two hours of seminar (BOT 5850 Botany Seminar) must also be included in the plan of study. Students may choose as a specialization area from either cellular and molecular organismal, or ecological plant science. After a PhD candidate has completed most of the course work, qualifying examinations are scheduled that cover major areas of the student's plan of study and relevant subdisciplines of plant science.

Faculty

Andrew Doust, PhD—Associate Professor and Head
Regents Professor: Michael W. Palmer, PhD (emeritus); David W. Meinke, PhD (emeritus)
Professors: Mark Fishbein, PhD; Keith Garbutt, PhD; William J. Henley, PhD; Gerald Schoenknecht, PhD; Ronald J. Tyrl, PhD (emeritus); Linda Watson, PhD
Associate Professors: Janette Steets, PhD; Ming Yang, PhD
Assistant Professors: Henry Adams, PhD
Clinical Instructor: Chris Wood, MS