BOTANY AND PLANT PATHOLOGY

Undergraduate Studies
Botany and plant pathology are concerned with the study of plants at all levels of biological organization, from molecular and cellular processes to the global ecosystem. This breadth of field reflects the wide range of issues and problems that confront plant biologists. In addition to addressing fundamental questions in plant biology, plant scientists in the 21st century will be called upon to provide information useful for producing food, fiber, and medicine for an increasing population, and for increasing our understanding of the diversity of plant and ecological systems and their interactions with humans. Students studying botany and plant pathology at OSU receive the basic science background necessary for such contributions, and may choose to focus in a particular area within plant science.

The undergraduate program in the Department of Botany and Plant Pathology is designed for students who wish to receive a BS in Botany degree and for students pursuing degrees in other fields that require a knowledge of plant biology. For example, students who have an undergraduate major in biology or environmental sciences may wish to emphasize botany courses in their upper-division course work.

Completion of the undergraduate curriculum in botany can qualify students for graduate work in various areas of plant biology and plant pathology, and for positions in state and federal agencies, and industries concerned with plants and their products.

Prospective botany majors should obtain a strong background in the biological and physical sciences at the high school level. Specifically recommended are a minimum of three years of high school mathematics, including algebra, geometry, and some exposure to trigonometry, one year of chemistry, one year of biology, one year of physics, and courses designed to develop computer and writing skills. Students without an adequate background in mathematics and science may make up these deficiencies early in their college careers.

Graduate Studies
The Department of Botany and Plant Pathology offers graduate programs in the following areas of concentration: ecology, genetics, genomics and computational biology, molecular and cellular biology, mycology, plant pathology, plant physiology, and systematics.

Students with majors in any one area may incorporate into their programs minors in other areas within the department or in other departments and colleges. Integrated minors, and interdisciplinary programs in plant physiology, molecular and cellular biology, genetics, and environmental sciences are also available.

The MS and PhD degrees offered by the Department of Botany and Plant Pathology require, in addition to coursework, research resulting in presentation and defense of a thesis. A nonthesis MS degree also is available. PhD candidates must pass a written and oral preliminary examination upon completion of their course work. In addition, PhD students are required to be a teaching assistant for two quarters.

Inquiries concerning graduate studies can be forwarded to the chairperson of the department's Graduate Studies Committee (Andrew.Jones@oregonstate.edu (john.fowler@oregonstate.edu)).

Additional details available at http://bpp.oregonstate.edu/content/graduate-programs.

Undergraduate Programs
Major
• Botany (http://catalog.oregonstate.edu/college-departments/agricultural-sciences/botany-plant-pathology/botany-bs-hbs)
  Options:
  • Comprehensive Botany (http://catalog.oregonstate.edu/college-departments/agricultural-sciences/botany-plant-pathology/botany-bs-hbs/comprehensive-botany-option)
  • Customizable (http://catalog.oregonstate.edu/college-departments/agricultural-sciences/botany-plant-pathology/botany-bs-hbs/customizable-option)
• Molecular, Cellular, and Genomic Botany (http://catalog.oregonstate.edu/college-departments/agricultural-sciences/botany-plant-pathology/botany-bs-hbs/molecular-cellular-genomic-botany-option)
• Plant Pathology (http://catalog.oregonstate.edu/college-departments/agricultural-sciences/botany-plant-pathology/botany-bs-hbs/plant-pathology-option)

Minor
• Botany (http://catalog.oregonstate.edu/college-departments/agricultural-sciences/botany-plant-pathology/botany-minor)

Graduate Programs
Major
• Botany and Plant Pathology (http://catalog.oregonstate.edu/college-departments/agricultural-sciences/botany-plant-pathology/botany-plant-pathology-ma-ms-phd)

Minor
• Botany and Plant Pathology (http://catalog.oregonstate.edu/college-departments/agricultural-sciences/botany-plant-pathology/botany-plant-pathology-graduate-minor)

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Faculty
Professors Behrenfeld, Cuffettì, Dolja, Fowler, Ingham, Johnson, Liston, McCune, Mundt, Pscheidt, Spatafora, Stone, Tyler, Wolpert
Associate Professors Chang, Goyer, Jaiswal, Jones, Megraw, Milligan, Ocampo, Parke, Santamaria
Assistant Professors Anderson, Busby, Dung, Frost, Graff, Hagerty, Hardison, KC, LeBoldus, Luh, Naithani, Westberry
Senior Instructor Putnam
Instructors Curtis, Link-Perez, Smyth
**Recommended:**

- and the natural environment. (Bacc Core Course)

**Explores the diverse roles played by fungi in relation to human civilization.**

**BOT 324. **FUNGI IN SOCIETY. (3 Credits)

- Recommended: One course in biological sciences.

**Attributes:**

- Intensive Course)

- of online information resources in plant evolutionary biology. (Writing

- origins, classification, and evolutionary relationships of the major groups

- Global perspective of plant biodiversity with a focus on evolutionary

**BOT 323. **FLOWERING PLANTS OF THE WORLD. (3 Credits)

- Recommended: One year of college biology

**BOT 324. **FUNGI IN SOCIETY. (3 Credits)

- Recommended: One course in biological sciences.

**BOT 325. **INTERSECTIONS BETWEEN PLANTS AND HUMANITY. (3 Credits)

- The unique attributes of plants—including aspects of their biochemistry, growth, structure, and physiology—have influenced all aspects of life on earth, from biogeochemical cycles to the rise and expansion of human civilizations. Plants are sources of medicines, stimulants, hallucinogens, fibers and woods, resins and latex, oils and waxes; plants have inspired technological innovation, exploration, and exploitation of people and the environment. This course critically examines the intersections of plants with society and technology by exploring the roles plants have played in both historical and modern contexts. (Bacc Core Course)

**Attributes:**

- CSST – Core, Synthesis, Science/Technology/Society

**Recommended:** One course in biological sciences and junior standing.

**BOT 331. **PLANT PHYSIOLOGY. (4 Credits)

- Survey of physiological processes in plants, including photosynthesis and plant metabolism, mineral nutrition and ion uptake processes, plant cell/water relations, regulation of plant growth and development, and transpiration and translocation. Lec/lab. (Bacc Core Course)

**Attributes:**

- CPBS – Core, Pers, Biological Science

**BOT 332. **LABORATORY TECHNIQUES IN PLANT BIOLOGY. (3 Credits)

- Training in basic laboratory skills, including the principles and procedures

- Analysis and interpretation

- Laboratory experiences in the manipulation and observation of physiological processes in plant systems. Analysis and interpretation of physiological data generated in experimentation with plant systems. Training in basic laboratory skills, including the principles and procedures involved in the use of common items of laboratory instrumentation. Lab.

**Recommended:** BOT 331 or Bi 314

**BOT 341. **PLANT ECOLOGY. (4 Credits)

- Study of higher plants in relation to their environment. The relationship of plant physiology and reproduction to environmental factors; competition and other species interactions; the structure, dynamics and analysis of vegetation. Field trips. Lec/lab.

**Recommended:** BOT 321 and (Bi 213 or Bi 213H)

**BOT 350. **INTRODUCTORY PLANT PATHOLOGY. (4 Credits)

- Symptoms, causal agents, diagnosis, and prevention of plant diseases, with emphasis on fungi, bacteria, nematode, and virus pathogens. Lec/ lab.

**Recommended:** Bi 213 or Bi 213H

**BOT 401. **RESEARCH. (1-16 Credits)

- This course is repeatable for 16 credits.

**BOT 403. **THESIS. (1-16 Credits)

- This course is repeatable for 16 credits.

**BOT 405. **READING AND CONFERENCE. (1-16 Credits)

- This course is repeatable for 16 credits.

**BOT 406. **PROJECTS: CURATORIAL ASSISTANT. (1-6 Credits)

- Students assist with curatorial projects in the OSU Herbarium. Admission is by application to the Department of Botany & Plant Pathology.

**Recommended:** This course is repeatable for 6 credits.

**BOT 407. **SEMINAR. (1 Credit)

- Section 1: Departmental seminar. Section 2: Lichens and Bryophytes Research (1). Weekly one-hour meetings for reporting and discussion of active research projects, discussion of proposal research, review and discussion of recent literature, and mini-workshops on particular problems. Normally graded P/N.

**Equivalent to:** Bi 407H, BOT 407H

**This course is repeatable for 16 credits.**
Prerequisites:

- Botany and Plant Pathology Research (1).
- Weekly one-hour meetings for reporting and discussion of active research projects, discussion of proposal research, review and discussion of recent literature, and mini-workshops on particular problems. Normally graded P/N.

Attributes: HNRS – Honors Course Designator

Equivalent to: BOT 407

This course is repeatable for 16 credits.

**BOT 407. GENETIC ENGINEERING OF MICROORGANISMS. (3 Credits)**

Functional genomics describes a set of conceptual approaches and associated laboratory techniques that rely on large-scale DNA sequence datasets to investigate the function of, and interactions between, genes as well as their RNA/protein products. This course will provide an overview of these techniques, including a) approaches to predicting protein function based on sequence analysis, b) large-scale genetic approaches to identifying novel genotype-phenotype associations, and c) transcriptomic, proteomic and metabolomic approaches that reveal gene functions by measuring changes in abundance/modification of associated RNA transcripts, proteins and metabolites.

**Prerequisites:** BI 311 with C- or better or BI 311H with C- or better and (BI 314 [C-] or BI 314H [C-])

**BOT 408. WORKSHOP. (1-16 Credits)**

This course is repeatable for 16 credits.

**BOT 410. INTERNSHIP. (1-16 Credits)**

This course is repeatable for 16 credits.

**BOT 413. FOREST PATHOLOGY. (3 Credits)**

Effects of diseases on forest ecosystems. Recognition of important groups, prediction of pathogen responses to environmental changes, and management strategies for protection of forest resources. Field trips. Lec/lab. CROSSLISTED as FOR 413.

**Prerequisites:** BI 204 with C or better or BI 212 with C or better or BI 212H with C or better or BI 213 with C or better or BI 213H with C or better

**Equivalent to:** FOR 413

**BOT 414. AGROSTOLOGY. (4 Credits)**

Classification and identification of grasses, with emphasis on the modern system of grass classification; laboratory practice in keying grass specimens to genus and species. Lec/lab.

**Recommended:** BOT 321

**BOT 416. AQUATIC BOTANY. (4 Credits)**

Taxonomy and ecology of aquatic vegetation, emphasizing freshwater and marine algae and the submersed vascular plants. Morphology, physiology, and classification of the algae; morphological and physiological adaptations of aquatic vascular plants; and primary production in aquatic ecosystems. Laboratory practice in the identification of local taxa. Field trips. Lec/lab.

**Recommended:** BI 213 or BI 213H

**BOT 425. FLORA OF THE PACIFIC NORTHWEST. (3 Credits)**

Vascular plant identification, terminology, and diagnostic characteristics of plant families. Lab emphasizes the use of keys for identification to the species level and ability to recognize by sight those plant families found in the Pacific Northwest. Field trips. Lec/lab.

**Recommended:** BOT 321

**BOT 440. FIELD METHODS IN PLANT ECOLOGY. (4 Credits)**

Concepts and tools for describing, monitoring, and experimenting on vegetation. Combines Web-based material, field experience at the student's location, and student projects.

**Recommended:** Course in ecology and a course in statistics.

**BOT 442. PLANT POPULATION ECOLOGY. (3 Credits)**

Ecological aspects of plant form and reproduction; demography and population modeling; species interactions, including competition, mutualism, and herbivory. Lec/lab.

**Recommended:** BOT 341

**BOT 458. ECOSYSTEMS GENOMICS. (3 Credits)**

Genomic approaches used to understand species interactions with a focus on plant-associated microbes. Learning the conceptual framework and computational techniques of genomics to study the ecology of plant-microbe interactions at the ecosystem level.

**Prerequisites:** BI 311 with D- or better and BI 314 [D-]
BOT 488. ENVIRONMENTAL PHYSIOLOGY OF PLANTS. (3 Credits)
Introduces students to mechanisms of plant responses to environmental change caused by humans, including atmospheric, nutrient, water, and global climate factors. Concepts are built around principles of plant environment relations. Lec/lab.
Recommended: One course in plant physiology or one course in ecology.

BOT 499. SPECIAL TOPICS. (0-16 Credits)
Equivalent to: BOT 499H
This course is repeatable for 16 credits.

BOT 499H. SPECIAL TOPICS. (1-16 Credits)
Attributes: HNRS – Honors Course Designator
Equivalent to: BOT 499
This course is repeatable for 16 credits.

BOT 501. RESEARCH. (1-16 Credits)
Graded P/N.
This course is repeatable for 16 credits.

BOT 503. THESIS. (1-16 Credits)
This course is repeatable for 999 credits.

BOT 505. READING AND CONFERENCE. (1-16 Credits)
This course is repeatable for 16 credits.

BOT 507. SEMINAR. (1-16 Credits)
Section 1: Departmental seminar (F, W, S). Section 2: Communication in Ecology (F). Section 3: Community and Habitat Analyses (W). Section 4: Lichens and Bryophytes Research (S). Weekly one-hour meetings for reporting and discussions of proposal research, review and discussion of recent literature, and mini-workshops on particular problems. Graded P/N.
This course is repeatable for 16 credits.

BOT 508. WORKSHOP. (1-16 Credits)
This course is repeatable for 16 credits.

BOT 510. INTERNSHIP. (1-16 Credits)
This course is repeatable for 16 credits.

BOT 513. FOREST PATHOLOGY. (3 Credits)
Effects of diseases on forest ecosystems. Recognition of important groups, prediction of pathogen responses to environmental changes, and management strategies for protection of forest resources. Field trips. Lec/lab. CROSSLISTED as FOR 513.
Equivalent to: FOR 513
Recommended: BI 204 or BI 212 or BI 212H or BI 213 or BI 213H

BOT 514. AGROSTOLOGY. (4 Credits)
Classification and identification of grasses, with emphasis on the modern system of grass classification; laboratory practice in keying grass specimens to genus and species. Lec/lab.
Recommended: BOT 321

BOT 516. AQUATIC BOTANY. (4 Credits)
Taxonomy and ecology of aquatic vegetation, emphasizing freshwater and marine algae and the submergent vascular plants. Morphology, physiology, and classification of the algae; morphological and physiological adaptations of aquatic vascular plants; and primary production in aquatic ecosystems. Laboratory practice in the identification of local taxa. Field trips. Lec/lab.
Recommended: BI 213 or BI 213H

BOT 525. FLORA OF THE PACIFIC NORTHWEST. (3 Credits)
Vascular plant identification, terminology, and diagnostic characteristics of plant families. Lab emphasizes the use of keys for identification to the species level and ability to recognize by sight those plant families found in the Pacific Northwest. Field trips. Lec/lab.
Recommended: BOT 321

BOT 540. FIELD METHODS IN PLANT ECOLOGY. (4 Credits)
Concepts and tools for describing, monitoring, and experimenting on vegetation. Combines Web-based material, field experience at the student's location, and student projects.
Recommended: Course in ecology and a course in statistics.

BOT 542. PLANT POPULATION ECOLOGY. (3 Credits)
Ecological aspects of plant form and reproduction; demography and population modeling; species interactions, including competition, mutualism, and herbivory. Lec/lab.
Recommended: BOT 341

BOT 543. PLANT COMMUNITY ECOLOGY. (3 Credits)
The structure, diversity, and successional dynamics of terrestrial plant communities; methods of analysis. Lec/lab.
Recommended: BOT 341 or equivalent.

BOT 547. NUTRIENT CYCLING. (3 Credits)
Reviews and discusses ecosystem-level biogeochemical concepts for terrestrial and freshwater ecosystems, primarily by reading and discussing classic and current literature to determine the state-of-knowledge and uncertainties associated with it. Topics will include root nutrient uptake mechanisms, soil chemical and biochemical transformations in different soil and ecosystems, measuring soil solution and watershed fluxes, soil organic matter formation and structure, the meaning of sustainability, the concept of N saturation in terrestrial ecosystems, and the use of natural abundance and tracer isotopes in ecosystem biogeochemistry. While forest biogeochemical processes will be emphasized, desert, aquatic, wetland, and prairie ecosystems will also be explored. CROSSLISTED as SOIL 547.
Equivalent to: SOIL 547
Recommended: College-level chemistry and biology and one class in ecology (eg. BI 370) and/or soils (eg. SOIL 205)

BOT 550. PLANT PATHOLOGY. (5 Credits)
Causal agents of plant disease, diagnosis, pathogenesis, epidemiology, and disease management principles and strategies. Field trip. Lec/lab/rec.
Recommended: BI 213 or BI 213H

BOT 552. PLANT DISEASE MANAGEMENT. (4 Credits)
Analysis of host, pathogen, and environmental factors influencing the increase and spread of plant disease. Epidemiological theory will be used as a basis for developing and evaluating principles and concepts of plant disease management. Lec/lab/rec. Offered alternate years.
Recommended: BOT 350 or BOT 550

BOT 553. PLANT DISEASE DIAGNOSIS. (3 Credits)
Diagnosis of plant diseases and identification of causal agents. Laboratory practice in identification techniques. Observation of symptoms exhibited by diseased plants in greenhouse and field locations. Field trips. Lec/lab. Offered alternate years in summer term.
Recommended: BOT 350 or BOT 550

BOT 554. BIOLOGY OF NEMATODES. (4 Credits)
Survey of basic biology and biodiversity of nematodes. Includes taxonomy, identification, life cycles, ecology and pathology, and interaction with other organisms. Lec/lab. Offered alternate years.
This course is repeatable for 4 credits.
Recommended: Plant pathology
BOT 556. PHYLOGENETICS. (4 Credits)
Explores the theory and practice of modern phylogenetic analysis. Emphasis placed on tree reconstruction algorithms, assessment of statistical support, and contemporary issues in phylogenetics. Lab will focus on the use of phylogenetic software and the analysis of molecular data sets. Lec/lab.
Recommended: ST 511

BOT 558. ECOSYSTEMS GENOMICS. (3 Credits)
Genomic approaches used to understand species interactions with a focus on plant-associated microbes. Learning the conceptual framework and computational techniques of genomics to study the ecology of plant-microbe interactions at the ecosystem level.
Recommended: BI 311 and BI 314

BOT 560. FUNCTIONAL GENOMICS. (3 Credits)
Functional genomics describes a set of conceptual approaches and associated laboratory techniques that rely on large-scale DNA sequence datasets to investigate the function of, and interactions between, genes as well as their RNA/protein products. This course will provide an overview of these techniques, including a) approaches to predicting protein function based on sequence analysis, b) large-scale genetic approaches to identifying novel genotype-phenotype associations, and c) transcriptomic, proteomic and metabolomic approaches that reveal gene functions by measuring changes in abundance/modification of associated RNA transcripts, proteins and metabolites.
Recommended: (BI 311 or BI 311H) and (BI 314 or BI 314H)

BOT 561. MYCOLOGY. (5 Credits)
A broad taxonomic survey of the fungi. Topics include life histories, systematics, ecology, genetics, and ethnomycology. Participation on field trips and the submission of a specimen collection are required. Lec/lab.
Recommended: (BI 211 or BI 211H) and (BI 212 or BI 212H) and (BI 213 or BI 213H)

BOT 565. LICHENOLOGY. (4 Credits)
Biology of lichens; includes structure, life histories, classification, and ecology. Field trip fee. Lec/lab. Offered alternate years.
Recommended: (BI 213 or BI 213H) and two botany courses.

BOT 566. BRYOLOGY. (4 Credits)
Biology of bryophytes; includes structure, life histories, classification, and ecology. Field trip fee. Lec/lab. Offered alternate years.
Recommended: (BI 213 or BI 213H) and two botany courses.

BOT 570. COMMUNITY STRUCTURE AND ANALYSIS. (4 Credits)
Quantitative methods for the analysis of biotic communities, including community concepts, estimation of community composition parameters, theoretical aspects of multivariate methods of analyzing species-importance data, and overview of multivariate tools; hands-on computer analysis of data sets. Lec/lab.

BOT 575. COMPARATIVE GENOMICS. (4 Credits)
Principles of comparative genomics. Methods for genome assembly and annotation. Genomic approaches for the study of structural change, whole genome duplication, gene family evolution, gene networks, gene regulation and epigenetics. Lab topics include the analysis of next generation sequencing data and conducting comparative genomic analyses. Lec/lab. CROSSTOLED as MCB 575.
Equivalent to: MCB 575
Recommended: Basic working knowledge of cell and molecular biology and genetics. BI 314 and (BI 311 or CSS 430)

BOT 576. INTRODUCTION TO COMPUTING IN THE LIFE SCIENCES. (3 Credits)
Introduction to management of large datasets (e.g., nucleic acids, protein), computer programming languages, application of basic mathematical functions, and assembly of computational pipelines pertinent to life sciences. CROSSTOLED as MCB 576.
Equivalent to: MCB 576
Recommended: Cell and molecular biology or genetics. Familiarity with text editing software and unix/linux operating system is advantageous.

BOT 580. PHOTOSYNTHESIS AND PHOTOBIOLOGY. (3 Credits)
Explores the diverse use of light in biological systems, with particular emphasis on photosynthesis. Lectures will discuss the nature of light, light in the natural environment, light absorption in biological systems, use of light energy for photosynthesis, communication, defense, motility, and vision, as well as deleterious effects of light and its use for global monitoring satellite systems.
Recommended: One course in plant physiology or ecology

BOT 588. ENVIRONMENTAL PHYSIOLOGY OF PLANTS. (3 Credits)
Introduces students to mechanisms of plant responses to environmental change caused by humans, including atmospheric, nutrient, water, and global climate factors. Concepts are built around principles of plant environment relations. Lec/lab.
Recommended: One course in plant physiology or ecology

BOT 590. SELECTED TOPICS IN MYCOLOGY. (1-3 Credits)
Advanced topics in mycology through analysis of current literature. Detailed study of an aspect of mycology beyond those covered in regular classes. Seminar and discussion format.
This course is repeatable for 16 credits.
Recommended: BOT 461 or BOT 561

BOT 599. SPECIAL TOPICS. (0-16 Credits)
This course is repeatable for 16 credits.

BOT 601. RESEARCH. (1-16 Credits)
Graded P/N.
This course is repeatable for 16 credits.

BOT 603. THESIS. (1-16 Credits)
This course is repeatable for 999 credits.

BOT 605. READING AND CONFERENCE. (1-16 Credits)
This course is repeatable for 16 credits.

BOT 607. SEMINAR. (1 Credit)
Section 1. Departmental seminar. This course is repeatable for 16 credits.

BOT 608. WORKSHOP. (1-16 Credits)
This course is repeatable for 16 credits.

BOT 651. MOLECULAR BASIS OF PLANT PATHOGENESIS. (3 Credits)
Analysis of current concepts in the physiology, biochemistry, and genetics of host-parasite interactions. Topics covered include specificity, recognition, penetration, toxin production, altered plant metabolism during disease, resistance mechanisms and regulatory aspects of gene expression during host-parasite interactions. Offered alternate years. CROSSTOLED as MCB 651.
Equivalent to: MCB 651
Recommended: BOT 550
BOT 668. PLANT DISEASE DYNAMICS. (4 Credits)
Evaluation of processes affecting the dynamics of plant disease and pathogen populations through analysis of current literature. Students will be expected to conduct extensive reading and analysis of literature and to meet with the instructor for small group discussions. Offered alternate years.
Recommended: BOT 550 and ST 412

BOT 691. SELECTED TOPICS-PLANT ECOLOGY. (1-3 Credits)
Recent advances and developing problems in plant ecology, with critical evaluation of current literature. Topics vary from year to year.
This course is repeatable for 99 credits.
Recommended: Graduate-level ecology.

BOT 692. SELECTED TOPICS: PLANT PATHOLOGY. (1-3 Credits)
Selected topics concerning plant pathogens and plant disease processes, emphasizing current literature and theory. Topics vary from year to year.
This course is repeatable for 99 credits.
Recommended: BOT 550

BOT 699. SPECIAL TOPICS. (1-16 Credits)
This course is repeatable for 16 credits.