

Undergraduate Program in Plant Science



Why study plants?

Plants have long been linked with human existence and play major roles in every aspect of human life from their production of vital oxygen, a food source, fuel production, discovery of natural products for medicinal drug discovery, adding aesthetic value and much more. Given that plants are critical in various aspects of the survival of humans and the planet, the research and study of plants will always remain critical and necessary. Plant Biology is the scientific study of plant physiology and cell biology, molecular biology and genetics, including ecology and evolution. Applied plant research covers the study of plant pathogens, biofuels, pharmaceutical discoveries, or any area that focuses on plants and its environment for human application.

The Undergraduate Plant Science Program at Rutgers

The Plant Science program at Rutgers is designed for students with career interests in areas related to food, fuel and fiber, turfgrass, natural products, plant breeding, plant pathology, and plant disease resistance. Independent research is a central theme in this program: students can have field or laboratory experiences with a faculty member on a specific research topic in plant-related investigations. There are four program goals for students completing the Bachelor of Science in Plant Science:

1. Describe basic knowledge about plant structure and function, fundamentals of plant growth and physiology, and principles of horticulture [technical proficiency];
2. Summarize broadly the role of plants in agriculture, society and the environment [context]
3. Communicate, in written and oral forms, plant science knowledge to peers and others in society [communication]; and
4. Critically formulate hypotheses, interpret data, and apply basic principles and practices of plant science to solve fundamental and practical problems [critical thinking].

The curriculum offers three options:

- **Natural Products** – emphasizes historical and cultural botany, economic botany, indigenous and modern medicinal plants, and practical plant production.
- **Horticulture and Turf Industry** – for students who intend to pursue business careers in the plant industries
- **General Research** – for students who intend to pursue research careers or graduate study



The curriculum also offers **five minors** (Plant Science, Agroecology, Horticultural Therapy, Medicinal and Economic Botany, and Public Garden Management) and **four certificate programs** (Plant Biosecurity, Horticulture Therapy, Medicinal and Economic Botany, and Turfgrass Science).

Facilities

Students in our program have access to various resources that will assist in graduating with a degree in Plant Biology. Most faculty members in the department of Plant Biology are housed in Foran Hall on Cook Campus. Foran Hall houses the School of Environmental and Biological Sciences Core Facility, which offer instruments that can be used to enhance research (bioimaging, biosensing, flow cytometry, real-time PCR, and high throughput screening) in the field of Plant Biology. The Genome Cooperative at SEBS located in Foran Hall provides collaborative opportunities in genome studies to develop novel research and teaching resources. The department has numerous teaching labs that house computers and equipment for fundamental research. The Stephen and Lucy Chang Science Library located in Foran Hall provides access to computers, online journal and books, and hard copy journals and magazines related to SEBS research areas.



The department also has joint faculty from the Department of Ecology, Evolution and Natural Resources and the Department of Biochemistry and Microbiology. Students can also have access to faculty and facilities at several outlying research stations:

- Rutgers Horticultural Research Farms I and II (North Brunswick, NJ)
- Rutgers Plant Science Research and Extension Farm (Adelphia, NJ)
- Philip E. Marucci Center for Blueberry and Cranberry Research (Chatsworth, NJ)
- Rutgers Fruit and Ornamental Research and Extension Center (Cream Ridge, NJ)
- Rutgers Agricultural Research and Extension Center (Upper Deerfield, NJ)
- Rutgers Gardens



Experience-based Education at SEBS

All SEBS students have to fulfill an experienced based education component that provides valuable applied skills to the students. Students can either choose to do an internship with local companies and programs or they can conduct independent research through a faculty mentorship program. Many of our students have participated in summer internship programs at local industries such as chemical companies, golf courses, landscape facilities, greenhouse productions, and outlying research stations as mentioned in the facilities accessible to students registered in the Plant Science program. Students interested in gaining research skills in both fundamental and applied areas can conduct independent projects with faculty who provide invaluable mentorship in gaining lab bench skills, critical thinking and/or field based research. Research areas include natural products, plant breeding, turf research, plant growth, and plant pathology.

Career Opportunities for Graduates

Graduates with Plant Science degrees can apply for jobs in various plant related fields such as horticulture, plant production, farming, turf industry, chemical industries, seed companies, education, pharmaceutical companies, plant biotechnology companies, plant breeding, and plant research.



Faculty and Research Interests

The faculty of the Department of Plant Biology consists of over 50 members with research and teaching emphasis in areas of Molecular Biology, Biotechnology, Natural Products, Plant Breeding and Genetic Improvement, Plant Diversity, Plant Management, Plant Pathology, and Horticultural Engineering. We also have a strong extension component that seeks to provide service to plant industries locally and globally.



Current Faculty and Research Expertise

Gary Altman - Horticultural Therapy, People-Plant Relationships, Rehabilitation Counseling, Vocational Rehabilitation, Vocational Evaluation and Return to Work Coordination, Green Industry Job Development/Job Placement

Sonia Arora - Medicinal plants, ethnopharmacology, structural bioinformatics, computer aided drug design, nutraceuticals, natural products & human health

Faith Belanger – plant pathology/molecular biology/biotechnology: turfgrass molecular biology, endophyte interactions, fungal endophyte/grass interactions

Joan Bennett – fungal genetics, mycology, mycotoxins, volatile organic compounds

Thierry Besançon – weed science: blueberry, cranberry, vegetables, wine grapes, fruit crops

Stacy Bonos – plant breeding and genetic improvement, perennial grasses for turf and biofuel, inheritance of disease resistance and stress tolerance, molecular and traditional breeding approaches

Rong Di – molecular biology/biotechnology: molecular biology, biotechnology, nutraceuticals, biofuels

Juan Dong – plant cell and development/molecular genetics: cell polarity, asymmetric cell division, stomatal development and patterning

Edward Durner – plant management: applied physiology, statistics, CSA management, student farms, organic food production, *Physalis* production, statistical analysis

Matt Elmore – weed science: turfgrass, landscape, pastures, and forages

Andrea Gallavotti – plant development/molecular biology: maize genetics and functional genomics, plant architecture, meristem development

Thomas Gianfagna – postharvest pathology and physiology of fruit and cut flowers, plant natural products and human health, endophytic fungi, mechanisms of disease resistance

Joseph Goffreda – plant breeding and genetic improvement: peach, nectarine, apple, and apricot breeding

Ann Gould – plant pathology: woody and herbaceous ornamental crop pathology

Joseph Heckman – plant management: soil, soil fertility, soil testing, mineral nutrition, plant health, organic farming, organic farming history, compost, traditional food systems

Bradley Hillman – plant pathology/molecular biology/biotechnology: plant and fungal virology; fungal molecular biology; biocontrol

Joshua Honig – plant molecular biology/plant breeding: DNA genotyping, DNA fingerprinting, DNA sequencing, genetic linkage mapping, marker assisted selection (MAS), turfgrass breeding

Bingru Huang – turfgrass stress physiology, biochemistry, molecular biology

Donald Kobayashi – plant bacteriology: biological control, bacterial genomics, bacterial/fungal interactions, biotechnology

Norman Lalancette – plant pathology: tree fruit pathology, epidemiology and plant disease control

Eric Lam – epigenetics, programmed cell death, stress tolerance, renewable biomass, duckweed, RNA therapeutics

Michael Lawton – disease resistance, fungal and bacterial pathogens, Fusarium head blight, toxins, programmed cell death, *Phycomitrella patens*, functional genomics.

Pal Maliga – molecular biology/biotechnology/plant breeding and genetic improvement: plastid molecular biology

John McLaughlin – yeast genetics, plant pathology, trichothecene mycotoxins, ribosome inactivating proteins

Thomas Molnar – plant breeding and genetic improvement: ornamental and edible tree crops with a current focus on large-bracted dogwoods and hazelnuts

James Murphy – turfgrass management, turf edaphology, adaptation of turfgrass species and cultivars to traffic stress

Peter Oudemans – plant pathology: blueberry/cranberry, *Colletotrichum*, *Phylospora*, *Coleophoma*, GIS, NEWA

Nrupali Patel - Plant Pathology, Molecular Biology, bacterial-fungal interactions, emerging plant bacterial diseases

Ilya Raskin – biotechnology/phytochemistry: natural products, dietary supplements, functional foods, plant diversity, pharmacognosy, international development, biodiversity

Mark Robson – pesticide toxicology, human and ecological risk assessment

James Simon – plant diversity/natural products/plant breeding and genetic improvement: new crop development, plant domestication of high value crops, non-timber forest species, sustainable development of indigenous resources

Lena Struwe – global plant diversity and evolution, biogeography and spatial patterns, historic and contemporary ethnobotany, sustainable bioprospecting of natural products

Nilgun Tumer – molecular biology/biotechnology/biochemistry: molecular biology, cellular translation, viral infection

Dan Ward – pomology: cultural practices, crop management for fruit crops

James White – plant pathology, symbiosis, endophytic microbes, nutritional endosymbiotic systems, associative nitrogen fixation

Qing-Li Wu – natural products chemistry, plant medicine

Andrew Wyenandt – *Phytophthora capsici* and anthracnose fruit rot control in bell and other peppers, cucurbit powdery and downy mildew control, fungicide resistance management, fungicide resistance guidelines, basil downy mildew control

Ning Zhang – fungal ecology, phylogenetics and genomics, molecular detection of fungal pathogens



Advising

Plant Science students have a Faculty Advisor in the Department of Plant Biology. The Faculty Advisor meets with students to guide them in academic and professional pursuits. Advisors can discuss student's specific area of interest, course plans and specializations, research prospects, internships, career paths, and the potential for graduate education. The Faculty Advisor can also provide advice on admission to the program.

Graduation Requirements for the Plant Science Major

Plant Science is an undergraduate major offered at the School of Environmental and Biological Sciences (SEBS). All students majoring in Plant Science are required to satisfy SEBS core requirements, as listed at the following website: <https://sebs.rutgers.edu/core/>

Want to know more? See our website for major requirements & the curriculum

<https://plantbiology.rutgers.edu/undergrad/plantbiology/>

Still want to know more? Contact one of our advisors:

Dr. Nrupali Patel, Director (General Advising, Major and Minor Programs)

Mr. Gary Altman (Horticultural Therapy)

Dr. Rong Di (Plant Biosecurity)

Dr. Josh Honig (Turf Industry)

Dr. Donald Kobayashi (General Advising)

Dr. James Simon (Medicinal and Economic Botany)

npatel@sebs.rutgers.edu

gla32@sebs.rutgers.edu

rongdi@sebs.rutgers.edu

josh.honig@rutgers.edu

dkob@sebs.rutgers.edu

jimsimon@sebs.rutgers.edu