

## Undergraduate Program in Plant Biology



### 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 Biology Program at Rutgers

The Plant Biology 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 Biology:

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:

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



The curriculum also offers **six minors** (Agriculture and Food Systems, 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 and Pathology are housed 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 Biology 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 Biology 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

**Albert Ayeni** – weed management, sustainable crop production, international collaborations in Agriculture and Rural Development

**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

**Bruce Clarke** – plant pathology: turfgrass pathology, ectotrophic root infecting fungi

**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

**Chaim Frenkel** – post harvest biology, cold stress, natural products, vanilla

**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, *Physcomitrella patens*, functional genomics.

**Thomas Leustek** – metabolic control and engineering of plant metabolism, sulfur assimilation, nutrition, sensing, amino acid biosynthesis and regulation

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

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

**William Meyer** – plant breeding and genetic improvement: turfgrass breeding

**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

**Thomas Orton** – plant breeding and genetic improvement: vegetable crops; extension in value-added systems development

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

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

**Alexander Poulev** – natural product chemistry/biotechnology/natural products: isolation and purification, chromatography, mass spectrometry, structural determination

**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

**Nicholi Vorsa** – plant breeding, genetic improvement, fruit quality, polyphenolics, blueberry and cranberry breeding, genetic mapping

**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 Biology 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 Biology Major

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

**Check out this website for major requirements and curriculum options:**  
<http://plantbiology.rutgers.edu/undergrad/plantbiology/curriculumrequirements.html>

**Want to know more? Visit our webpage:** <http://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. Ann Gould (General Advising)

Dr. James Simon (Medicinal and Economic Botany)

[npatel@sebs.rutgers.edu](mailto:npatel@sebs.rutgers.edu)

[gl32@sebs.rutgers.edu](mailto:gl32@sebs.rutgers.edu)

[rongdi@sebs.rutgers.edu](mailto:rongdi@sebs.rutgers.edu)

[josh.honig@rutgers.edu](mailto:josh.honig@rutgers.edu)

[dkob@sebs.rutgers.edu](mailto:dkob@sebs.rutgers.edu)

[ann.gould@rutgers.edu](mailto:ann.gould@rutgers.edu)

[jimsimon@sebs.rutgers.edu](mailto:jimsimon@sebs.rutgers.edu)