

Plant Science

Plant science will have a huge impact on the development of renewable solutions for agriculture, human nutrition, land remediation, and next generation products and energy technologies. As climate change threatens ecosystems and the number of world consumers grows, it will become increasingly important to harness the renewable potential of plants as an alternative to finite, petroleum resources. UNT scientists are making groundbreaking discoveries in the regulation of plants' growth, development, and resistance to disease, weather, pests, adverse environmental conditions, and other stresses. Understanding the signaling mechanisms in plants—how plants communicate at the cellular level—is a hallmark area of research expertise, with internationally renowned scientists working in cell biology, biochemistry, genetics, metabolomics and informatics. Cutting edge infrastructure includes a new Life Sciences Complex with world-class laboratories, instrumentation, and greenhouses. This portfolio of resources is augmented by a commitment to interdisciplinary exchange in a range of areas, from chemical imaging to metabolic engineering and biotechnology.

- **Renowned scientists constitute hallmark expertise in the signaling mechanisms of plants, with applications in crop protection, cancer treatment, biofibers, alternative sugars, and “green” materials and nutrition**
- **Substantial federal funding from the National Science Foundation, the U.S. Department of Agriculture, the National Institutes of Health, the U.S. Department of Energy, and various corporations and foundations**
- **New, LEED-Gold certified, Life Sciences Complex featuring state-of-the-art “open” research laboratories and climate controlled greenhouses for advanced plant research**
- **Cutting edge research at the intersection of cell biology, genetics, and engineering includes focus in plant metabolomics, lipid signaling, molecular genetics, hormonal and stress signaling in plant defense, and toxicology**

Representative Faculty

Brian G. Ayre, Associate Professor of Biological Sciences: *plant physiology and biotechnology; nutrient transport; long-distance signaling in plant development; and genomic approaches to phloem development and function*

Rajeev Azad, Assistant Professor of Biological Sciences and Mathematics: *bioinformatics and computational biology, including genetic variations and metagenomics*

Stevens Brumbley, Associate Professor of Biological Sciences: *plant metabolic engineering, including the development of sugarcane for bio-plastics, alternative sugars, and industrial chemicals*

Kent Chapman, Director of the Center for Plant Lipid Research; and Regents Professor of Biological Sciences: *lipid signaling; bioenergy; plant oils; and lipid metabolism*

Rebecca Dickstein, Professor of Biological Sciences: *symbiotic nitrogen fixation; molecular biology and protein biochemistry of enzymes and nodule structures; and molecular genetics of mutants*

Nandika D'Souza, Professor of Mechanical and Energy Engineering and Materials Science and Engineering: *renewable “green” materials and manufacturing; biofibers; engineered polymers; and biocomposites based on domestic plants*

Ron Mittler, Professor of Biological Sciences: *stress signaling in plants to enhance resistance against drought, salinity and temperature*

Vladimir Shulaev, Professor of Biological Sciences: *plant metabolomics and signaling with applications in crop protection, cancer treatment, and nutrition*

Jyoti Shah, Professor of Biological Sciences: *molecular genetics of defense responses in plants; and hormonal signaling in plant defense*

Barney Venables, Professor of Biological Sciences: *environmental chemistry; toxicology; and bioactive lipids*



Select Research Resources

Life Sciences Complex

www.biol.unt.edu/lsc

The new, state-of-the-art, LEED-Gold certified building provides extensive facilities for plant science research, including four, climate controlled, rooftop greenhouses. The building also houses biochemistry, developmental physiology and genetics, and molecular biology to support exchange of expertise across areas. Additional features include a research aquatics lab with freshwater and saltwater facilities, “open” research laboratories, offices, and meeting spaces.

Center for Plant Lipid Research and Plant Signaling Shared Facilities

www.biol.unt.edu/~chapman

This group of laboratories focuses on basic and applied aspects of research in the regulation of plant lipid metabolism. Affiliated scientists use contemporary cellular, biochemical, and molecular genetic approaches to understand how lipids influence the growth and development of plants. Efforts also contribute to the discovery of new products and uses for plant derived lipids and their potential public benefit.

The Samuel Roberts Noble Foundation

www.noble.org/Index.html

The Noble Foundation is a world renowned, independent, nonprofit institute specializing in plant research with close relationships to UNT faculty researchers and students. Headquarters are located in close proximity to the UNT campus in Ardmore, Oklahoma. The Foundation assists farmers and ranchers through direct operations and conducts plant science research and agricultural programs to enhance agricultural productivity regionally, nationally, and internationally.

Department of Chemistry research facilities

www.chem.unt.edu/facilities/index.html

The Department maintains an extensive range of modern instrumentation to facilitate sophisticated research in areas such as chemical synthesis, spectroscopy, computational chemistry, materials and surface science, and chemical analysis. Instruments include NMR spectrometers, UV/Vis/NIR electronic absorption, Raman spectroscopy, FT-IR spectrometers, atomic absorption spectrometers, X-ray diffractometers, Auger spectroscopy, photoemission, and microwave spectroscopy, with additional instruments and facilities available at the UNT Discovery Park.

Greenhouse Complex at Discovery Park

Located at the UNT Discovery Park, the greenhouse supports UNT’s research clusters and diverse projects by various scientists and engineers. The expandable infrastructure is equipped with high ceilings to grow sugarcane and other tall plants, water and electricity, climate controls, headhouse storage, and an adjoining laboratory.

CART: Center for Advanced Research and Technology

research.unt.edu/cart

CART is one of the most advanced university facilities in the nation for research involving materials synthesis and analysis, from atomic to macro scales. CART features sophisticated equipment used for true 3-D characterization, processing, and cross-disciplinary analysis adjacent to a clean room so that materials can be synthesized, tested, and transferred in close proximity under controlled conditions, creating a powerful combination of capabilities in one location. UNT is among an elite group of public institutions nationwide to offer these open access resources.

Contributing Research Clusters:

Signaling Mechanisms in Plants

plantsignaling.unt.edu

Renewable Bioproducts

renewablebioproducts.unt.edu