UNT is setting precedents in the development and implementation of innovative, renewable energy technologies to reduce the carbon footprint and build a green economy. Researchers bring extensive expertise in biological sciences, chemistry, engineering, and business to harness the unique properties of plants, bacteria and various bioagents to advance next generation, earth sustainable solutions that outperform their non-renewable counterparts. “Green” bioproducts based on renewable plant sciences can not only be recycled but genuinely renewed and re-used for multiple applications — from compostable soil, biodegradable packaging, and flame retardant coatings, to industrial bioplastics, solar cells and fuel. Projects bridge research in diverse areas such as microbial biochemistry; polymer nanocomposites and materials design; plant lipid metabolism; metabolic engineering; sustainable policy; and ethics. Renewable research initiatives expand economic opportunities and equip future generations with the tools to protect the environment and human health.

- Facilities include specialized biology labs; automated, climate controlled greenhouses and environmental growth chambers; polymer laboratories; and advanced characterization and processing equipment for both theoretical and applied studies, from atomic to macro scales
- Novel alliances between plant and biological scientists, engineers and chemists: 1) modify plants to produce fibers for “ready-to-use” products that don’t need heavy, chemical processing after harvesting; 2) develop green chemistry and biotechnology approaches to remove heavy metals/contaminants from industrial effluents; 3) design compost models to better degrade bioplastics; 4) develop foams using environmentally benign manufacturing; and 5) design new lubricants and organic semiconductors for solar cells and electronic devices
- Diverse intellectual partnerships with leading industries, businesses, environmental organizations, universities and government agencies, including the U.S. Department of Agriculture, the Environmental Protection Agency, Dow Chemical, Proctor and Gamble, and the U.S. Army

Representative Faculty

Michael Allen, Assistant Professor of Biological Sciences: environmental microbiology and bio-technology

Brian Ayre, Associate Professor of Biological Sciences: plant physiology; and carbon transport

Althea Arnold, Assistant Professor of Engineering Technology: building information modeling and energy use data

Adam Briggle, Assistant Professor of Philosophy and Religion: environmental ethics and public policy

Witold Brostow, Regents Professor of Materials Science and Engineering: polymeric materials design

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: plant lipid metabolism and function

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

Justin Youngblood, Assistant Professor of Chemistry: design and synthesis of new organic electronic materials for photovoltaics

Aaron Roberts, Assistant Professor of Biological Sciences: molecular ecology and toxicology

Todd Spinks, Director of the Office of Sustainability: strategic program development; sustainability initiatives; mitigation of global climate change effects; and governmental operations

Thomas Scharf, Associate Professor of Materials Science and Engineering: biolubrication

Vijay Vaidyanathan, Associate Dean of the College of Engineering; and Associate Professor of Engineering Technology: instrumentation for monitoring bio-degradation
Select Research Resources

Advanced Polymer Laboratories
www.unt.edu/LAPOM
UNT houses two advanced polymer laboratories: The Laboratory of Advanced Polymers and Optimized Materials (LAPOM) specializes in the development of materials, components and coatings with predefined mechanical, tribological, thermophysical and dielectric applications. The Polymer Mechanical and Rheology Laboratory focuses on structure property relationships to increase the reliability of materials using thermally controlled new equipment and sophisticated instruments.

Environmental, Microbiology and Biotechnology Lab
www.biol.unt.edu/~allenm
Systems biology techniques are used to study fundamental scientific questions in the fields of environmental microbiology and genetics and develop biological solutions. Knowledge gained is applied to the engineering of new approaches to address environmental issues.

Zero-energy Research Laboratory
The new, 1,200 square-foot facility, currently under construction, is a living space and also a working laboratory designed to test emerging, sustainable technologies and materials to achieve a net-zero consumption of energy in buildings. The structure is expandable to include multiple alternative energy sources such as solar and wind to support a wide range of research; no other university in the nation offers this resource.

CART: Center for Advanced Research and Technology
research.unt.edu/cart
CART is one of the most advanced university research facilities in the nation for cross analysis of materials, from atomic to macro scales, with a suite of sophisticated instruments used for true 3-D characterization, processing, and cross-disciplinary analysis. A new NSF funded, university Nanofabrication Analysis and Research facility will house CART next to a clean room so that materials can be synthesized, tested and transferred in close proximity, creating a powerful combination of capabilities in one location.

Office of Sustainability
sustainable.unt.edu
The Office promotes environmental sustainability through four primary action areas: research, outreach, operations, and teaching. Developments include the Climate Action Plan, which seeks to reduce greenhouse gas emissions, curb energy consumption across UNT and reach carbon neutrality; power grid infrastructures based on wind and electrical energy technologies; sustainable green spaces; an active recycling program; and tech transfer assistance to commercialize new technologies.

Center for Plant Lipid Research
www.chem.unt.edu/~chapman
The Center’s laboratories focus on basic and applied aspects of research in the regulation of plant lipid metabolism. Scientists use contemporary cellular, biochemical, and molecular genetic approaches to study how lipids influence the growth and development of plants and discover new products and uses for plant derived lipids and their potential public benefit.

Contributing Research Clusters:

- Renewable Bioproducts
  renewablebioproducts.unt.edu
- Signaling Mechanisms in Plants
  plantsignaling.unt.edu
- Renewable Energy and Conservation
  reac.unt.edu