UNIVERSITY OF
NORTH TEXAS
Discover the power of ideas.

research clusters

transformational, integrative and high impact

During the legislative session of 2009, the State of Texas approved an ambitious plan to support its seven emerging research universities, including the University of North Texas, into the ranks of National Research Universities. In April 2010, UNT submitted a ten-year "Strategic Plan for Research" to the State that envisions the university as a comprehensive research institution with the aspiration to be ranked as a Carnegie Very High Research Activity University. The Plan centers on the following:

- facilitating and maximizing the success of current faculty
- hiring highly accomplished senior and junior faculty
- expansion of research space, infrastructure, and funding
- enhanced research collaborations and partnerships
- increased philanthropic funds for research (to be matched by the State)
- increase in number and quality of doctoral students
- improved quality of the freshmen class

As part of the implementation of the research plan, UNT has created fifteen research clusters and has selected six additional strategic areas for investment. These clusters engage faculty from a wide range of disciplines—from fine arts, humanities, and education to sciences, engineering, and business. This publication presents an overview of the UNT research clusters and areas of strategic investment.

Warren Burggren,
Provost and Vice President for Academic Affairs

Vish Prasad,
Vice President for Research and Economic Development

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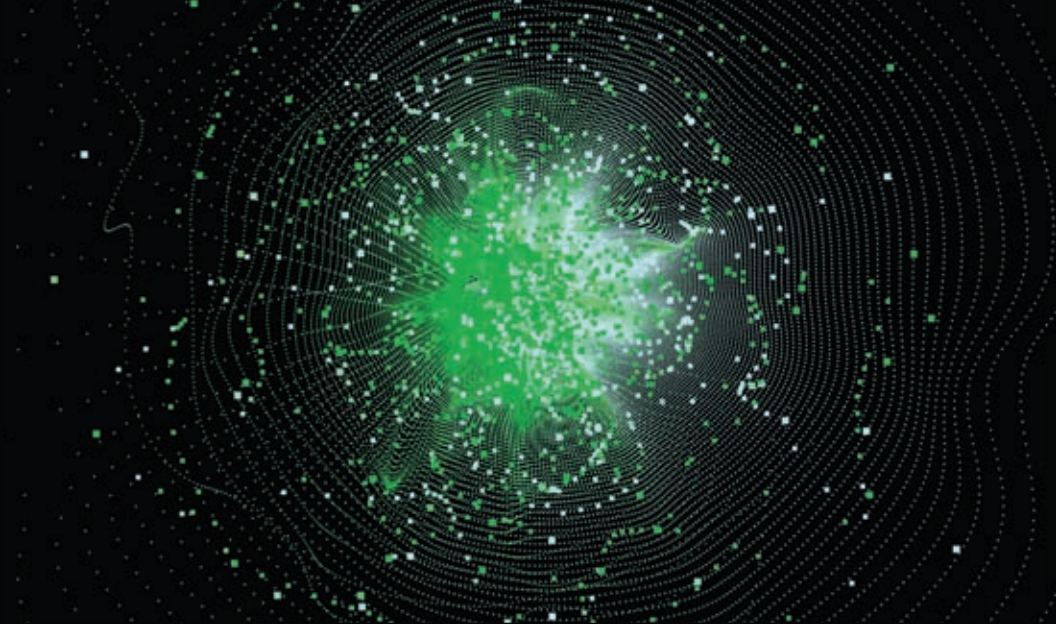


researchclusters

transformational, integrative and high impact

At the University of North Texas, research is aimed at solving complex scientific, technological, environmental, and societal problems through interdisciplinary collaborations and innovation. UNT has hired and expects to continue hiring a significant number of senior and junior faculty in the coming years through capacity building exercises at the departmental level as well as through research clusters and other strategic research areas. As UNT rapidly expands its research enterprise, it also plans to grow from the 2010 enrollment of 36,000 to 45,000 by 2016. UNT's expansion plan includes construction of many new research and academic buildings as well as expansion of its student union. UNT has also built a state-of-the-art stadium where renewable energy will be supplied by three wind turbines. Expansions are occurring at both UNT's main campus and Discovery Park. UNT is also committed to expand diversity and build extensive international collaborations and partnerships. These transformations will provide UNT students with excellent opportunities for education, research, and extra-curricular activities, and its researchers with exceptional research facilities and capability for technology transfer and incubation.

Learn more: research.unt.edu/clusters

UNT research clusters

Bio/Nano-Photonics

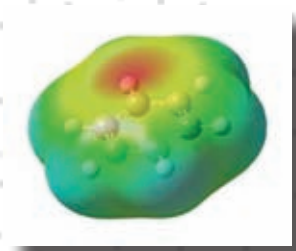
Revolutionizing medical, energy, and other fields based on nano, molecular, and macromolecular optoelectronic materials and devices

photonics.unt.edu

Complex Logistics Systems

Transforming public-private logistics through the research and development of affordable, resilient, and sustainable solutions for large-scale logistics networks spanning the supply chain

logisticsresearch.unt.edu



Computational Chemical Biology

Using computational science and modeling, and simulation to tackle chemical problems and advance research within the pharmaceutical and biomedical industries, with applications to molecular biology and biochemistry

c3b.unt.edu

Consumer Experiences in Digital Environments

Developing social and economic strategies for global digital networks that impact consumer decision-making, consumption, and experiences in retail, merchandising, hospitality, and tourism

digitalconsumer.unt.edu

Developmental Integrative Biology

Expanding the physiology and genetics of development as a base for pure and applied health-related research

developmentalbiology.unt.edu

Hazards and Disaster Research to Respond to Global Crisis

Providing real world solutions to the complex challenges of domestic and global disaster planning, response, and recovery through research and innovative multidisciplinary collaboration

disasterresearch.unt.edu

Human Security, Democracy, and Global Development

Finding evidence-based solutions to prevent political violence, improve governance, and address global poverty

humansecurity.unt.edu


courtesy of Joshua Lawton

Initiative for Advanced Research in Technology and the Arts

Exploring emerging technologies and new media for novel interactions between the arts, engineering, and sciences

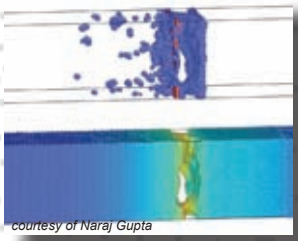
iarta.unt.edu

UNT research clusters

Knowledge Discovery from Digital Information

Developing innovative technologies to process and analyze massive amounts of digital information—from terabyte to petabyte

kddi.unt.edu

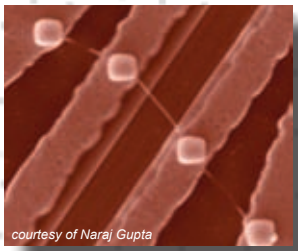


courtesy of Naraj Gupta

Materials Modeling

Advancing the theory and design of materials through modeling and simulation across length and time scales for application in electronics, health, energy, the environment, and other disciplines

mmrc.unt.edu

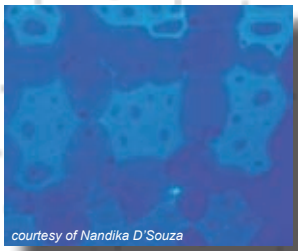


courtesy of Naraj Gupta

Multi-scale Surface Science and Engineering

Engineering surfaces, from the atomic to macro length scales, for the discovery of new science and products critical for current and next-generation applications

surfaces.unt.edu



courtesy of Nandika D'Souza

Renewable Bioproducts

Creating green solutions for the life cycle of consumer and industry products using plants, bacteria, and other bioagent materials

renewablebioproducts.unt.edu

Renewable Energy and Conservation

Conducting research in renewable power generation, smart grid transmission, and buildings to develop energy and technology strategies to address next generation conservation needs

reac.unt.edu

Signaling Mechanisms in Plants

Harnessing the ways plant cells communicate to find solutions for energy, agriculture, nutrition, and medicine

plantsignaling.unt.edu

Sub-Antarctic Ecosystems and Biocultural Conservation

Integrating ecological sciences and environmental philosophy to understand and preserve the biocultural diversity of the sub-Antarctic ecoregion

subantarctic.unt.edu

Additional Strategic Areas of Research

- Advanced Bio-Sensor Technology, Development, and Applications
- Computational Life Sciences and Complex Bio-Environmental Systems
- Entrepreneurship
- Forensic and Investigative Science and Technology Instrument Development
- South Asian Media, Culture, and Arts
- STEM Research and Education

courtesy of Julie West

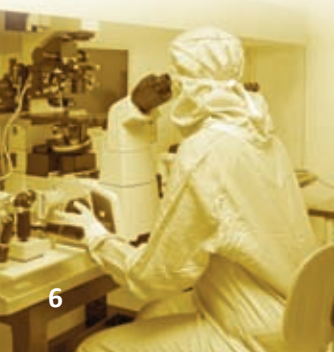
Bio/Nano-Photonics

Revolutionizing medical, energy and other fields based on nano, molecular and macromolecular optoelectronic materials and devices

photonics.unt.edu
photonics@unt.edu

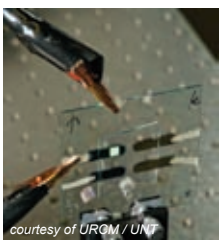
Bio-photonics, nano-photonics and bio-nano-photonics are contemporary fields that draw upon the expertise of research from physics, materials science, chemistry, electrical engineering, biology and medicine to form the basis for a whole range of novel technologies. Highly trained **Bio/Nano-Photonics** researchers examine how light can be used to develop new materials and devices with significant applications in medicine, telecommunications, energy and many other fields—from using nano-prisms and metal atoms in cancer research to designing new sustainable lighting sources for homes and businesses.

Researchers use the Center for Advanced Research and Technology (CART), one of the most advanced university research facilities in the nation for cross-analysis of materials, from atomic to macro scales. The facility offers a suite of sophisticated instruments used for true 3-D characterization and processing, including a Dual Beam Scanning Electron Microscope; a 3-D, Local Electrode Atom Probe; an X-ray Photoelectron Spectrometer; and a High-Resolution Analytical Transmission Electron Microscope. Central to the **Bio/Nano-Photonics** research is a new, state-of-the-art, class 10,000/100 cleanroom facility located next to CART. This creates a powerful facility for materials synthesis and device fabrication and their characterization and analysis in a controlled environment. UNT is among an elite group of public institutions nationwide to offer these open access resources. Industry partners such as Texas Instruments, L3 Communications, Raytheon, DRS and the Center for Commercialization of Fluorescence Technology increase the total available brainpower, utility of facilities and analytical tools.




courtesy of URCM / UNT

courtesy of Mohammad Omary


courtesy of URCM / UNT

UNT Researchers Include

Tae-Youl Choi, Assistant Professor
of Mechanical and Energy Engineering
nanofabrication

Zhibing Hu, Regents Professor of Physics
biopolymer research

Yuankin Lin, Associate Professor of Physics
and Electrical Engineering
photonic bandgap materials

Arup Neogi, Professor of Physics
semiconductor photonics

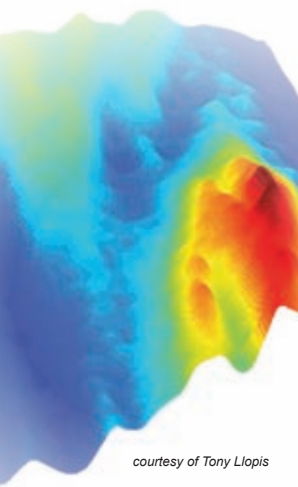
Mohammad Omary, Professor of Chemistry
molecular photonics

Douglas Root, Associate Professor of Biological Sciences
bioimaging

Francis D'Souza, Professor of Chemistry
and Materials Science and Engineering
synthesis of novel porphyrin, fullerene, and graphene based systems

Representative Research

- Acoustical metamaterials: cloaking in hypersonic and ultrasonic regime
- Biomedical engineering using nanophotonics
- Bio-molecular imaging: live single cell imaging using nonlinear optical spectroscopy
- Conjugation of quantum dots into polymer crystals
- Custom molded biopolymers
- Diagnosis of oral cancer tissues using photodynamic therapy sensitizers
- Drug delivery and cancer photothermal therapy
- Nanofabrication using micro-electro-mechanical systems (MEMS) technology and focused ion-beam lithography
- Organic and inorganic light-emitting diodes, photovoltaics, and field-effect transistors
- Single molecule imaging and manipulation of myosin
- Single photon source: photon engineering using metal nanoparticles in light emitting diodes


courtesy of Tony Llopis

Facilities and Resources

- Center for Advanced Research and Technology (CART)
- Cleanroom and Nanofabrication Facility (NARF)
- College of Engineering, University of Texas at Arlington
- Laboratory of Imaging Mass Spectrometry
- Spectroscopy and Nanophotonics Laboratory
- UNT Health Science Center, Fort Worth, Texas

Complex Logistics Systems

Transforming public-private logistics through the research and development of affordable, resilient, and sustainable solutions for large-scale logistics networks spanning the supply chain

logisticsresearch.unt.edu
logistics@unt.edu

Logistical processes spanning the supply chain incorporate tremendous complexity and require substantial public and private sector investments. UNT is nationally recognized as a hub of expertise in logistics and supply chain management, offering an exceptional base of faculty and professional resources, as well as comprehensive programs that incorporate leading edge research, technologies, and practices across the entire field. Research performed by the **Complex Logistics Systems** cluster focuses on process design, network optimization, and execution of freight and passenger flows from the source of supply to delivery to the end-user. Areas of excellence include: aviation and motor carrier safety; network optimization and planning; financial management; inventory management and demand forecasting; costing and pricing of logistics and transportation; risk management; systems design and analysis; transportation planning and public policy; aviation management; freight and infrastructure planning; emergency response and humanitarian logistics; and modeling and simulation methods. The cluster leverages these strengths with partnerships in the public and private sectors to transform the complex supply chains used to source and distribute goods on a global basis.

Logistics management has become a source of competitive advantage and value creation in companies throughout Texas and the United States. UNT's location in the Dallas/Fort Worth (DFW) metroplex offers superior advantages for the cluster. The Alliance Global Logistics Hub, Love Field, DFW International Airport, and the Dallas Logistics Hub make DFW one of the major distribution centers for North America. Texas boasts the nation's largest rail and road networks; three of the nation's Class One freight railroads, over 600 motor carriers, and 55 air cargo carriers have operations in the metroplex. Working alliances with business leaders benefit the industry and create meaningful opportunities for UNT students and faculty to develop, advance, and apply knowledge in the field.

UNT Researchers Include

Terry Clower, Associate Professor of Economics
economic development; impact assessment; transportation systems; and housing

Pam Donovan, Assistant Professor of Logistics
air transportation; and logistics management

Ted Farris, Professor of Logistics
supply chain mapping; cash-to-cash; transportation operations; and regulation

Steve Joiner, Lecturer of Logistics
aviation operations; and infrastructure

Ila Manuj, Assistant Professor of Logistics
risk and complexity management in global supply chains; and inter-organizational learning

David McEntire, Professor of Emergency Administration and Planning
community preparedness; disaster response coordination; and international disaster relief

Terry Pohlen, Associate Professor of Logistics
financial management; costing and price; and transportation policy and infrastructure

Wesley Randall, Assistant Professor of Logistics
supply chain performance; supply chain finance; and risk modeling

Steve Swartz, Associate Professor of Logistics
transportation safety; project/ disaster logistics; and supply chain synchronization

Representative Research

- Inter-organizational learning: understanding how third-party logistics companies learn from their customers and using this information to develop solutions
- Macro mapping service supply chains as a basic benchmark for research by others
- Modeling of multi-echelon reparable inventory management systems
- Performance-based logistics: managing complex supply chains to fulfill end-user requirements
- Private-public partnerships to support future transportation infrastructure requirements
- SmartSUPPLY GPS-based geo-tracking and tracing of vehicles and shipments using smart phone technology
- Supply network optimization assisted by data acquisition and communication: identifying potential missing elements between logistical omniscience and logistical omnipotence
- Transportation safety: creating better decision making/behavioral models in motor carrier and aviation industries
- Supply chain complexity: developing a comprehensive scale for measuring supply chain complexity

Facilities and Resources

- Center for Logistics Education and Research
- Dallas/Fort Worth Roundtable of the Council of Supply Chain Management Professionals
- International Supply Chain Risk Management Network
- Murphy Center for Entrepreneurship
- North Texas Commission Logistics Committee
- PACCAR Technology Institute

Computational Chemical Biology

Using computational science, modeling and simulation to tackle chemical problems and advance research within the pharmaceutical and biomedical industries, with applications to molecular biology and biochemistry

c3b.unt.edu
c3b@unt.edu

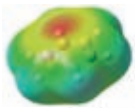
UNT has developed a strong and highly recognized computational chemistry research program, with specific expertise in electronic structure methods and applications. Within this domain, molecules and their properties are simulated, and computational methods are used to identify promising new chemical materials and processes. UNT computational scientists are among the leading chemists and engineers, recognized for their national and international research profiles and award-winning contributions to their fields.

The **Computational Chemical Biology** research cluster draws on this talent base as well as the advanced facilities and outstanding resources of several UNT centers to bring innovative modeling and simulation solutions to the pharmaceutical, toxicology and biomedical arenas. Facilities include high performance computing clusters and a wide selection of visualization software to advance all aspects of computational research. A unique, interdisciplinary focus integrates chemistry with cutting-edge theory and simulation, and experiment with characterization. A key component of the cluster's strategy is to expand existing areas of strength in computational research and assemble an interdisciplinary team to provide senior scientific leadership and conduct applied research while also being actively engaged in the development of new computational strategies at the forefront of scientific computing. To this end, adding expertise in areas such as biochemical modeling, chemical biology modeling, and code/method development will expand alliances and resources across disciplines.

Representative Research

- Computational development coupled with bioinformatics analysis: biological pathways of bacteria
- Computational modeling of homogenous catalysis: methodology and applications
- Development of computational methods
- Electronic structure calculations
- Gultathione synthetase metabolism
- Interaction of carbon dioxide with proteins

UNT Researchers Include



Wes Borden, Welch Chair and Distinguished University Research Professor of Chemistry
electronic structure calculations

Tom Cundari, Regents Professor of Chemistry
computational studies of enzymes

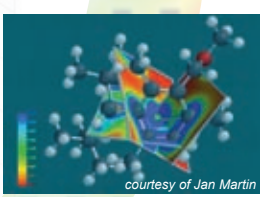
Qunfeng Dong, Assistant Professor of Biological Sciences and Computer Science and Engineering
bioinformatics

Jan Martin, Distinguished University Research Professor of Chemistry
computational thermochemistry and spectroscopy

Angela Wilson, Regents Professor of Chemistry
quantum chemistry

Facilities and Resources

- The **Center for Advanced Scientific Computing and Modeling** (CASCaM) has established collaborations with computational chemists and engineering faculty to advance research in the development of novel modeling techniques—from the atomic to continuum scale, and from theory to applications in biology, chemistry, engineering, and material science.
- Collaboration with the **Materials Modeling** research cluster brings expertise in areas such as multi-scale and mesoscale modeling, computational fluid dynamics, continuum modeling, and atomistic material simulations. This team has spawned numerous collaborative grants that combine the forces of UNT's modeling and experimental communities.
- The **TALON** supercomputer features high performance computing clusters supported by high-speed networks, high performance storage, and advanced software. Availability of TALON has greatly increased the computation resources available to UNT researchers.
- The **Institute of Applied Science** (IAS) and the **Computational Epidemiology Research Laboratory** (CERL) provide facilities for science-based, interdisciplinary environmental research in biology, aquatic ecology, geology, anthropology, computer science, and other disciplines.



courtesy of Jan Martin

Consumer Experiences in Digital Environments

Developing social and economic strategies for global digital networks that impact consumer decision-making, consumption, and experiences in retail, merchandising, hospitality, and tourism

digitalconsumer.unt.edu
digitalconsumer@unt.edu

With more than 2 billion Internet users of digital information and communication in 2011, networks are transforming 21st century consumer-business relationships. Advances in technology, information access, digital engagement, and the infusion of entertainment significantly influence consumer encounters with retail, merchandising, hospitality, and tourism industries—among the largest and fastest growing sectors in the world. Yet these industry giants confront huge challenges to develop analytical tools to understand, manage, effectively predict, and assess the digital impact on consumer experiences. Understanding the influence of digital information and consumption on consumer decision-making is a critical element for business innovation and economic and societal wellbeing.

The **Consumer Experiences in Digital Environments** cluster offers a solid foundation to advance intellectual inquiry and address gaps in understanding these complex network/consumption relationships. It includes faculty expertise in areas such as behavioral economics, digital knowledge analytics, networked information and retrieval, digital and international retailing, and hospitality and tourism. UNT is the first institution of higher learning to focus on global consumer experiences and specifically to conduct interdisciplinary research across retail, merchandising, hospitality, and tourism. An extensive infrastructure promotes cluster research, including an advisory board of distinguished leaders; an internationally recognized visiting scholar's program; enriched educational and professional development exchange with local, national and international partners; and a commitment on behalf of UNT to substantially grow this area with an investment in innovative technologies and resources, and strategic faculty appointments.

Facilities and Resources

- Ben E. Keith Lecture Series
- Creating Consumer Experiences Symposium
- Cyber Cemetery
- J.C. Penney Lecture Series
- RAVE: Research and Visualization Environment
- TALON: High Performance Computing System
- UNT Libraries, Digital Projects Unit

UNT Researchers Include

Judith C. Forney, Professor of Merchandising
cross national comparisons; market/product experiences; and global consumer experiences

Cathy Hartman, Librarian IV
digital collections and preservation; metadata; and Web archiving

Ann T. Jordan, Professor of Anthropology
business and urban anthropology

HaeJung Kim, Associate Professor of Merchandising
future retail paradigm and consumer engagement in social network systems

Jiyoung Kim, Assistant Professor of Merchandising
online consumer behavior

Young Hoon Kim, Assistant Professor of Hospitality Management
web marketing; and consumer behavior in tourism

Dee K. Knight, Associate Professor of Merchandising
global consumers; employee work experience; and digital retailing

William E. Moen, Associate Professor of Information and Library Sciences
digital knowledge analytics; and networked information and retrieval

Sanjukta Pookulangara, Assistant Professor of Merchandising
emerging technologies; and e-commerce for retailers and consumers

Zheng (Phil) Xiang, Assistant Professor of Hospitality Management
tourism; marketing; e-commerce; and information technology

Kiseol Yang, Assistant Professor of Merchandising
digital retailing; and mobile shopping services

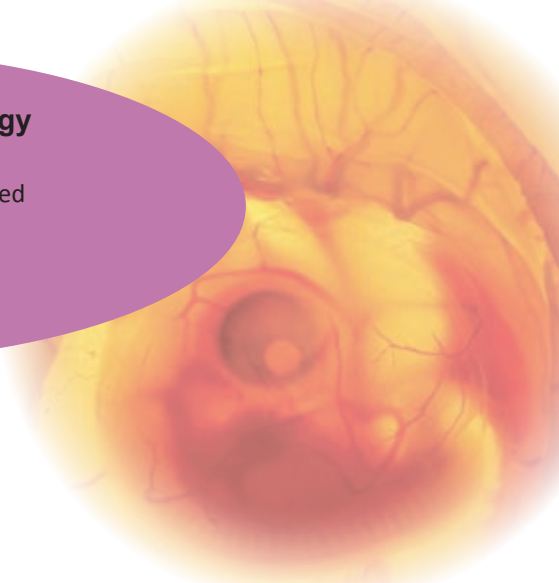
Representative Research

- Consumer motivations for Facebook connections with retailers
- Culture and social media
- Electronic point of consumer experiences
- Identification and development of digital library interface models
- Impacts of modality and culture on attitudes toward mobile advertising
- Role of smartphones in mediating travel experiences
- Search engine use for travel planning
- Value creation for mobile shopping services

Developmental Integrative Biology

Expanding the physiology and genetics of development as a base for pure and applied health-related research

developmentalbiology.unt.edu
developmentalbiology@unt.edu



The study of how organisms develop, from gene to environment, is widely viewed as one of the most exciting and promising fields of contemporary biology. Focusing on developmental integrative biology, the **Developmental Integrative Biology** cluster employs a highly collaborative approach to exploring developmental physiology from the molecular to organismal levels; the relationship between physiological genomics and developmental processes; and interactions between genes and the environment as they influence cellular, physiological, morphological, and behavioral development.

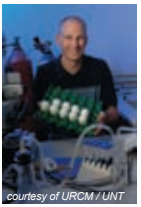
New methodologies at the cellular and molecular level, combined with a burgeoning interest in physiological development and environmental biology, enable the cluster to explore a mechanistic understanding of the developing organism. The cluster also expands on its foundation in comparative animal physiology and genetics to conduct research to better understand development and associated human disease such as heart disease, blood clotting disorders, and tissue trauma. Through the use of diverse animal models, the cluster collectively aims to identify major unifying principles of developmental integrative biology.

Facilities and Resources

- Comparative and Evolutionary Developmental Physiology Lab
- Fundamental Neuroscience Laboratories
- Life Sciences Complex
- TALON: High Performance Computing System
- Zebrafish Genetics Lab


courtesy of URCM / UNT


courtesy of Perkins+Will


courtesy of URCM / UNT

Representative Research

- Bioenergetics of growth and development and effects of environmental change on metabolism using marine and freshwater fishes; techniques include respirometry, microcalorimetry, and quantitative fluorescent microscopy
- Bioinformatics and biological data analysis
- Control of neural stem cell proliferation and differentiation, and the role of primary cilia in neuron survival using mouse model; techniques include immunohistochemistry, cell culture, morphometry, and in situ hybridization
- Developmental cardiovascular and respiratory physiology, focusing on perinatal and postnatal changes in circulation and respiration in birds; techniques include in vitro myograph, immunohistochemistry, and immunoblotting
- Developmental genetic responses to anoxia and hypoxia; and embryogenesis and gonad function using *C. elegans* and zebrafish models
- Physiology and genetics of adult and developmental hemostasis and thrombosis using zebrafish model
- Physiology of embryonic heart, lungs and kidneys, and their integrated regulation using lower vertebrate, avian, and mammalian embryos

UNT Researchers Include

Warren Burggren, Professor of Biological Sciences
respiratory and cardiovascular developmental physiology

Dane Crossley, Assistant Professor of Biological Sciences
developmental cardiovascular physiology

Qunfeng Dong, Assistant Professor of Biological Sciences and Computer Science and Engineering
bioinformatics; and biological data analysis

Edward Dzialowski, Associate Professor of Biological Sciences
respiratory and cardiovascular developmental physiology

Jannon Fuchs, Professor of Biological Sciences
neurobiology

Michael Hedrick, Professor of Biological Sciences
development and evolution of respiratory rhythm

Ione Hunt von Herbing, Associate Professor of Biological Sciences
bioenergetics of growth and development

Pudur Jagadeeswaran, Professor of Biological Sciences
hemostasis

Pamela Padilla, Associate Professor of Biological Sciences
developmental genetics

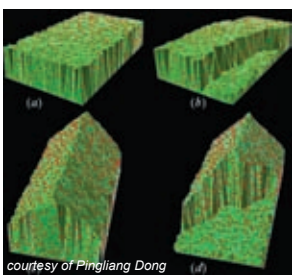
Hazards and Disaster Research to Respond to Global Crises

Providing real world solutions to the complex challenges of domestic and global disaster planning, response, and recovery through research and innovative multidisciplinary collaboration

disasterresearch.unt.edu
disasterresearch@unt.edu

From earthquakes and tsunamis to hurricanes and oil spills, each year disasters and hazards claim lives and property, cripple economies, and leave communities around the world vulnerable long after the crisis occurs. Innovative national and international research strategies and improved practices are needed to address the increasingly complex problem of disaster planning, response and recovery. UNT's research cluster, **Hazards and Disaster Research to Respond to Global Crises**, galvanizes emergency management expertise from across campus, with strong suits in emergency administration, disaster planning, information technology, logistics, and disaster sociology; individuals practicing at the forefront of these and related fields join strategies and resources as a consortium to improve on-the-ground planning and response in four broad research areas: evacuation planning, risk modeling and service delivery, humanitarian logistics, and tourism and disaster.

Critical factors assessed include evacuation costs, planning tools and demographic models, distribution of aid and the logistics network of resources, post-impact damages and the effects of disaster on industries and the economy. There are relatively few disaster research centers in the United States and around the world. The UNT cluster seeks to expand its research base by actively building leadership in strategic areas such as risk analysis, economics and hazards geography. The addition of complementary expertise will leverage the cluster to effectively shape policy and meet the needs of individuals and communities as a national and international center of excellence.



courtesy of Pingliang Dong

courtesy of Jamie Settemeyer

UNT Researchers Include

Sudha Arlikatti, Associate Professor of Public Administration
sustainable hazard mitigation; and disaster response and rebuilding

Terry Clower, Associate Professor of Economics
economic development; impact assessment; transportation systems; and housing

Nicole Dash, Associate Professor of Sociology
evacuation; housing; long term recovery; and social impacts

Pingliang Dong, Associate Professor of Geography
remote sensing and geographic information systems

Linda Holloway, Professor of Rehabilitation, Social Work and Addictions
community rehabilitation; and diversity issues in human service

Shailesh Kulkarni, Associate Professor of Information Technology and Decision Sciences
supply chain networks; and operations research

David McEntire, Professor of Emergency Administration and Planning
emergency management theory; vulnerability reduction; and homeland security

Terry Pohlen, Associate Professor of Logistics
logistics; and distribution of goods

Victor Prybutok, Regents Professor of Information Technology and Decision Sciences
Information systems measurement; quality control; and risk assessment

Zheng (Phil) Xiang, Assistant Professor of Merchandising and Hospitality Management
tourist behavior; information systems; information systems; and social media

Representative Research

- Automated assessment of post-earthquake building damage and road blockage: using light detection and ranging (LiDAR) data and volunteered geographic information (VGI)
- Cross-cultural analysis of unidentified bodies in Haiti
- First responder feasibility study: assessing first responder workplace immunization policies, insurance coverage, and agencies' capacity to administer vaccines
- Gas pipeline explosion and fire
- Small town disaster recovery: examining network stress points within the disaster recovery process, communities as a framework for explaining successful disaster recovery, and related topics
- The forgotten aspects of evacuation: mass care processing and care by host communities
- Update to economic and fiscal impacts of flood prevention improvements in the Dallas, Texas floodway

Facilities and Resources

- Center for Economic Development and Research
- Center for Logistics Education and Research
- Emergency Operations Center Lab
- Federal Emergency Management Agency (FEMA), Region VI
- Survey Research Center

Human Security, Democracy, and Global Development

Finding evidence-based solutions to prevent political violence, improve governance, and address global poverty

humansecurity.unt.edu
humansecurity@unt.edu

Numerous countries around the world have been devastated by the overlapping problems of war, poverty, and oppressive regimes. Peace-building requires multifaceted, holistic strategies to strengthen governance, protect human rights, promote economic development, foster public health, and improve relations with neighbors. The **Human Security, Democracy, and Global Development** cluster is an interdisciplinary endeavor that studies the nexus of economic factors, political institutions, and peace. UNT offers one of the strongest peace and conflict research programs in the U.S., with numerous internationally-recognized faculty members. Political scientists, economists, historians, and geographers, among others, collaborate with agencies such as the World Bank, the U.S. Department of Defense, the United Nations, and the Japan Bank for International Cooperation to develop conflict resolution strategies and shape programs that foster economic development. Additionally, the Castleberry Peace Institute serves as the cluster's institutional home and supports the cluster as a resource for analysis and evaluation of policy options.

The cluster will strategically expand this base of expertise by adopting emerging technologies to collect, analyze, and present data regarding development and security. Statistical methods and qualitative research, augmented by geospatial (GIS) analysis, computational modeling, natural language processing, database management and data visualization, will significantly expand knowledge of human security issues. The advanced complement of tools will help UNT researchers to monitor conflicts as they happen, evaluate the effectiveness of various policy interventions, forecast future unrest, and ultimately expand knowledge about the determinants of security and prosperity. The scope and depth of the cluster's dedicated infrastructure will help make UNT a premier program at the forefront of peace and conflict research.

Facilities and Resources

- Castleberry Peace Institute
- Peace Research Laboratory
- Research and Visualization Environment (RAVE)
- UNT Libraries, Digital Projects Unit

Representative Research

- Climate change and African political stability
- Issue Correlates of War (ICOW)
- Modeling civil conflict management: civil war stabilization, termination, and post-conflict peace duration
- Monitoring human rights abuses
- Social Conflict in Africa Database (SCAD)
- Voices carry: the impact of testimony by victims and witnesses at the International Criminal Tribunal for the former Yugoslavia

UNT Researchers Include

Marijke Breuning, Professor of Political Science
foreign policy; development; and foreign aid

Jacqueline DeMeritt, Assistant Professor of Political Science
human rights; repression; formal and quantitative methods; and international advocacy groups

Andrew Enterline, Associate Professor of Political Science
international conflict; foreign policy; and counterinsurgency

Michael Greig, Associate Professor of Political Science
international conflict; peacekeeping; and mediation

Paul Hensel, Professor of Political Science
international conflict; and conflict management

John Ishiyama, Professor of Political Science
democratization; ethnic politics; and Eastern Europe

Jose Martinez, Assistant Professor of Economics
Mexican migration; economic development; and labor economics

T. David Mason, Regents Professor of Political Science
civil conflict; peace building; and post-conflict transitions

James Meernik, Professor of Political Science
transitional justice; international tribunals; and human rights

Michael McPherson, Associate Professor of Economics
international trade; development; and Africa

David Molina, Associate Professor of Economics
economic development; immigration; and border economies

Joseph Oppong, Professor of Geography
development; public health; and Africa

Idean Salehyan, Associate Professor of Political Science
civil conflict; environmental security; refugees; and Africa


courtesy of Mary Lynn Babcock

Initiative for Advanced Research in Technology and the Arts

Exploring emerging technologies and new media for novel interactions between the arts, engineering, and sciences

iarta.unt.edu
iarta@unt.edu


courtesy of Jenny Vogel


courtesy of Ben Johansen

iARTA faculty across the arts engage engineering and the sciences to explore the potential of new media based on shared technical expertise, creative approaches, and evolving technologies. Collaborative models for trans-disciplinary research are developed. Concepts from diverse disciplines partner to create articulate, hybrid forms of expression: dancers wired with sensors perform an interactive concert; media artists incorporate robotics and surveillance hardware in a social context; musicians compose complex scores based on dynamic mathematical equations; and computer-artists animate visual models from biological data. Experimental process and inquiry energize research and lead to new frontiers. Cluster researchers build and test new tools and technological applications for potential use in artistic, industrial, and commercial contexts. iARTA's affiliate journal, *Moebius*, edited by an international board, generates a critical dialogue linking emergent theory and practice to new mediums.


courtesy of Nitya Kandukuri

Specialized facilities, rehearsal and performance spaces, and computer labs facilitate research in this cluster. The Center for Experimental Music and Intermedia (CEMI) is a suite of six, single-user computer music studios optimized for the generation and manipulation of digital audio, multichannel sound diffusion, live interactive music and intermedia integration. Dance and theatre technology labs accommodate dance and new media performance. The Department of Electrical Engineering houses a Wireless Systems and Sensor Networks (WSSN) Research Laboratory with various hardware, instruments and software.


courtesy of David Stout

Representative Research

- Exploration of the intersection between experimental music and theatre using live performance, video, staging, music technology, and improvisation
- Network performance, live cinema, interactive/immersive audiovisual installations, and robotics
- New media work based on live streaming video, webcam broadcasts, search engines, and Internet exhibitions
- Use of sensor networks for speech and visual signal processing, pattern recognition, and environmental applications
- Visualization and sonification of dynamic data drawn from genetics, astronomy, advanced mathematics, ocean current monitoring, and ecological interactions


courtesy of Melinda Levin


courtesy of Mike Akinwolemiwa and David Jackson

UNT Researchers Include

Mary Lynn Babcock, Associate Professor of Dance and Theatre
choreography; and interactive media

Oscar Garcia, Professor of Electrical Engineering
speech; music; and sound

Melinda Levin, Associate Professor of Radio, Television and Film
documentary producer; director; and editor

Andrew May, Associate Professor of Composition
instrumental; vocal ensemble; and live interactive computer music

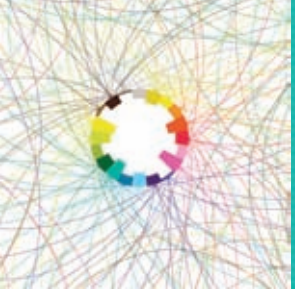
David Schwarz, Associate Professor of Music Theory
psychoanalysis; culture; and music

David Stout, Professor of Composition
audio-visual installation/performance

Jenny Vogel, Assistant Professor of Studio Art
new media art

Jennifer Way, Associate Professor of Art History
art history and cultural studies; historiography; and material culture


courtesy of Ben Johansen



Knowledge Discovery from Digital Information

Developing innovative technologies to process and analyze massive amounts of digital information—from terabyte to petabyte

kddi.unt.edu
kddi@unt.edu

The Web, data repositories, and digital libraries have become society's core information resources, and potential knowledge is embedded in these large digital information stores. Effective use of massive data resources requires new methods for processing masses of poorly organized information into useful and actionable knowledge to address complex scientific and social problems. The **Knowledge Discovery from Digital Information** (KDDI) research cluster advances the design, development, and testing of computational methods and tools to discover and exploit the knowledge available in tera- and peta-byte scale information stores. **KDDI** supports basic and applied collaborative research in the following broad areas: information visualization, machine learning, data mining, natural language processing, Web archiving, digital curation, information retrieval, and image, audio, and video processing.

UNT Researchers Include

Jiangping Chen, Associate Professor of Library and Information Sciences
intelligent information access; and information systems design

Martin Halbert, Dean, UNT Libraries; and Associate Professor of Library and Information Sciences
digital library design and management

Cathy Hartman, Librarian IV
digital preservation

Yan Huang, Associate Professor of Computer Science and Engineering
data mining; and geo-spatial databases

Rada Mihalcea, Associate Professor of Computer Science and Engineering
natural language processing; and information retrieval

William Moen, Associate Professor of Library and Information Sciences
metadata; and digital repositories

Mark Phillips, Librarian III
web archiving; repository architectures; and digital preservation

A synergistic confluence of award-winning faculty and programs provides foundation for the **KDDI** cluster, integrating computer science, information science, and library science approaches across colleges. Computer scientists in the **College of Engineering** bring considerable expertise to the team with pioneering research in data mining, information retrieval, geo-spatial databases and natural language processing. Consistently ranked among the top twenty graduate programs in the nation, the **College of Information** focuses on the intersection of people, information, and technology with special attention to the challenges of digital content management, video analysis, multi-lingual information access, and medical informatics, complemented by an extensive network of professionals at the forefront of their fields. The **UNT Libraries** is among an elite group of research institutes and national libraries internationally recognized for enterprising work in Web harvesting and archiving. Featuring a robust, state-of-the-art digital archive infrastructure, the Libraries can access, store, manage and transfer large quantities of digital information to accommodate a variety of complex research needs. This interdisciplinary expertise and active collaborative will advance **KDDI** research, moving projects from development to adoption with the potential to address social, health, environmental, and scientific problems.

Representative Research

- Analyzing MARC content designation utilization
- CAREER: semantic interpretation with monolingual and cross-lingual evidence
- Classification of the End-of-Term Archives: extending collection development practices to web archives
- Collaborative research: building a large multilingual semantic network for text processing applications
- Collaborative research: word sense and multilingual subjectivity analysis
- High-throughput workflow for computer-assisted human parsing of biological specimen label data
- IOGENE: interface optimization for genealogist
- Mapping historical texts: combining text-mining and geo-visualization to unlock the research potential of historical newspapers
- Portal to Texas History

Collaborating Institutions

- Library of Congress
- Internet Archive
- Institute of Museum and Library Services
- International Internet Preservation Consortium
- MetaArchive Cooperative
- Texas Center for Digital Knowledge

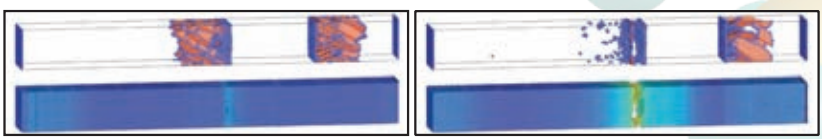
Materials Modeling

Advancing the theory and design of materials through modeling and simulation across length and time scales for application in electronics, health, energy, the environment, and other disciplines

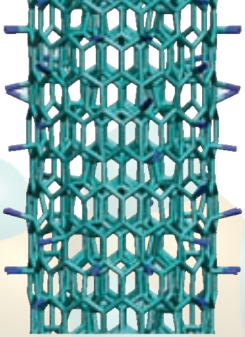
mmrc.unt.edu
mmrc@unt.edu


courtesy of URCM / UNT

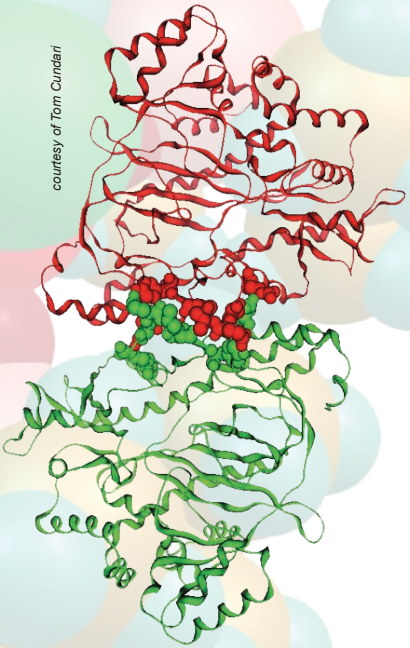
The **Materials Modeling** research cluster (MMRC) draws upon faculty expertise in materials science and engineering, chemistry, physics, and mechanical and energy engineering to bring further advancements in physical modeling and microstructural simulation of new and existing biological and engineering materials. As is well proven, predictive models can greatly help in designing new materials and their properties. UNT researchers use advanced modeling and simulation techniques to improve the design and performance of materials like human tissues, jet engine metals and alloys, semiconductors, and composites for widespread applications. The models developed at UNT span from nano-, micro-, and meso-scales to continuum to predict microstructure and bulk behavior. Current **MMRC** researchers specialize in integrated computational chemical/materials engineering, multiphysics modeling, condensed matter theory and fluid/particle dynamics, as well as atomistic, mesoscale and continuum level modeling of advanced materials for industrial and defense systems, catalysis, alternate energy, and chemical, physical, and biological systems.


courtesy of Niraj Gupta

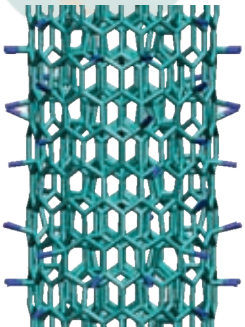
The availability of one of the leading US facilities for materials characterization and analysis at the Center for Advanced Research and Technology (CART) allows UNT materials modeling researchers to actively collaborate with experimentalists and validate their models and simulation techniques. A class 10,000/100 cleanroom is also available to materials researchers for materials synthesis. Their research is supported by the National Science Foundation, Department of Energy, Welch Foundation, Air Force Research Laboratory, and many private and industrial sponsors. Affiliated national centers include an NSF Chemical Bonding Center and a DOE Energy Frontier Research Center. UNT also is the home of TALON, a new high-performance computing facility, and the Center for Advanced Scientific Computing and Modeling (CASCaM), an interdisciplinary center of excellence in advanced scientific computing and modeling with its own dedicated facility (cascam.unt.edu).



courtesy of Jamal Uddin



courtesy of Tom Cundari



UNT Researchers Include

Paul Bagus, Research Professor of Chemistry
surface and cluster modeling

Wes Borden, Welch Chair and Distinguished University Research Professor of Chemistry
electronic structure calculations

Thomas Cundari, Regents Professor of Chemistry
computational inorganic chemistry

Qunfeng Dong, Assistant Professor of Biological Sciences and Computer Science and Engineering
bioinformatics

Jincheng Du, Assistant Professor of Materials Science and Engineering
atomistic simulations of materials

Alan Needleman, Professor of Materials Science and Engineering
continuum mechanics

Yuri Rostovtsev, Assistant Professor of Physics
condensed matter theory

Srinivasan Srivilliputhur, Assistant Professor of Materials Science and Engineering
large scale molecular dynamics

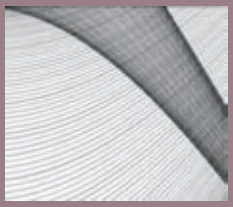
Zhiqiang Wang, Assistant Professor of Materials Science and Engineering
mesoscale modeling

Angela Wilson, Regents Professor of Chemistry
ab initio *quantum chemistry*

Zhenhai Xia, Associate Professor of Materials Science and Engineering
composites; thin film form; and peripheral nerves

Facilities and Resources

- Center for Advanced Scientific Computing and Modeling (CASCaM)
- Computational Materials Modeling Group
- Institute for Science and Engineering Simulation (ISES)
- Research and Visualization Environment (RAVE)
- TALON: High-Performance Computing System



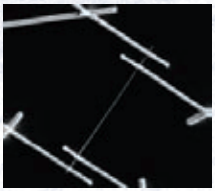
Multi-scale Surface Science and Engineering

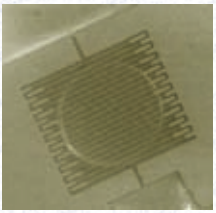
Engineering surfaces, from the atomic to macro length scales, for the discovery of new science and products critical for current and next-generation applications

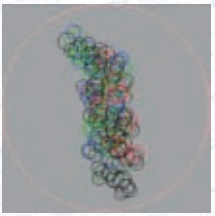
surfaces.unt.edu
surfaces@unt.edu

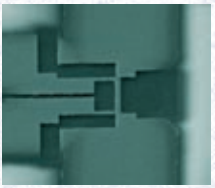
Continued development of nano scale materials and devices requires anaylysis of the properties and performance of surfaces—the natural physical limit of any device or component. Underlying phenomena contributes to surface degradation (e.g. corrosion, wear, creep, and fatigue) due to their interactions with the surrounding environment, often with significant cost to industry and the national economy. The **Multi-scale Surface Science and Engineering** cluster studies these interactions and develops strategies to arrest this process, enhance performance, improve sustainability, and extend the lifetime of materials. Multi-scale engineering of surfaces is critical for current and next-generation applications, ranging from chemical-mechanical polishing of copper in the microelectronics industry to novel high temperature coatings that resist oxidation, wear, and fracture of critical jet engine components, as well as to advanced coatings, and surface texturing for hard tissue bioimplants.

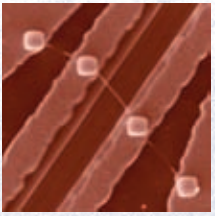
Working with researchers across UNT departments—Materials Science and Engineering, Chemistry, Mechanical and Energy Engineering, and Physics—the **Multi-scale Surface Science and Engineering** cluster offers a unique and innovative research base that combines expertise in surface engineering with experimental multi-scale engineering for materials analysis, from the atomic scale to the macro scale. UNT is one of the few academic institutions that have the requisite organic knowledge and infrastructure-base consisting of both the experimental and computational facilities that can be applied to various sub-disciplines of surface science and engineering.







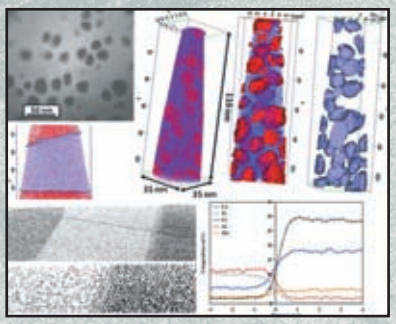




Representative Research

- 'Green' electronic systems
- Ion-solid interactions
- Laser based surface engineering for advanced materials
- Novel strategies for nanofabrication
- Surface engineering nanostructural materials

Surface engineering approaches are being increasingly employed in a wide variety of industries including automotive, aerospace, biomedical, chemical, construction, electronic, petroleum, and power industries for extending existing performance limits and material life-times at reduced costs. Many leading industries invested in this field are based here in Texas, such as Texas Instruments, Raytheon, Lockheed Martin, Poco Graphite, and Halliburton.



UNT Researchers Include

Narendra Dahotre, Professor of Materials Science and Engineering
laser materials interactions; and laser surface engineering

Aleksandra Fortier, Assistant Professor of Mechanical and Energy Engineering
stress analysis in thin films

Jeffry Kelber, Regents Professor of Chemistry
thin film deposition; and plasma processing of surfaces

Thomas Scharf, Associate Professor of Materials Science and Engineering
surface engineering; and nanostructural materials

Guido Verbeck, Assistant Professor of Chemistry
analytical instrument development

Duncan Weathers, Associate Professor of Physics
experimental ion-solid interaction

Cluster researchers utilize cutting edge computational facilities and an advanced suite of processing and materials characterization instruments, many available via the **Center for Advanced Research and Technology** (CART): *research.unt.edu/cart*. These tools allow for precise, three-dimensional, structural and compositional characterization of the same specimen from the micrometer scale to the atomic scale. This in-house capability places this research cluster at a superior level when compared with other efforts around the country that typically focus on one length scale.

Renewable Bioproducts

Creating green solutions for the life cycle of consumer and industry products using plant, bacteria, and other bioagent materials

renewablebioproducts.unt.edu
renewablebioproducts@unt.edu

UNT is setting precedents in the development and implementation of renewable energy technologies to reduce the carbon footprint and build a green economy. The **Renewable Bioproducts** research cluster is based on green chemistries, an emerging discipline of engineering. Novel alliances are forged among plant and biological scientists, engineers, and chemists to develop renewable energy initiatives and innovative projects. Cluster faculty partner both nationally and internationally with academic institutions, industry, and government agencies to bring major advancements in this field. Researchers harness the unique chemical properties of plants, bacteria and various bioagents to achieve ecologically safe, multifunctional biosolutions that outperform their non-renewable counterparts. Traditional "cradle-to-grave" products serve some use and then require disposal or waste-management. Green bioproducts based on renewable plant sciences can not only be recycled for a single purpose but genuinely renewed and re-used for multiple applications. Research spans development and deployment, with sustainable applications including alternative motor oils, solar cells, biodegradable consumer packaging and composite fibers used in the construction of buildings.

UNT Researchers Include

Michael Allen, Assistant Professor
of Biological Sciences
microbial genetics; and biotechnology

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

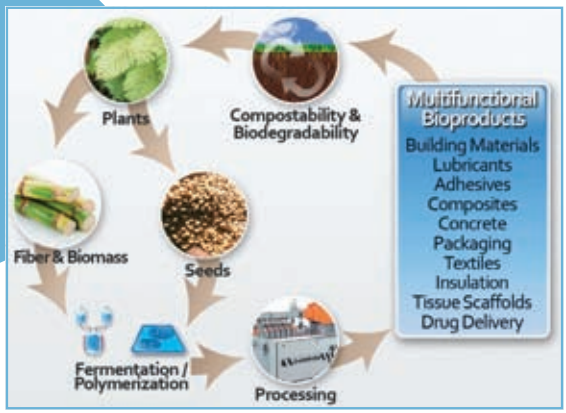
Witold Brostow, Regents Professor
of Materials Science and Engineering
polymeric materials design

Stevens Brumbley, Associate Professor
of Biological Sciences
plant metabolic engineering

Kent D. Chapman, Regents Professor
of Biological Sciences
lipid metabolism and function

Nandika D'Souza, Professor of
Mechanical and Energy Engineering
and Materials Science and Engineering
engineered polymers and composites

Aaron Roberts, Assistant Professor
of Biological Sciences
ecotoxicology



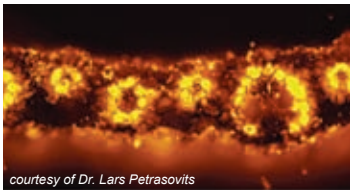
courtesy of Amanda Burgess

Representative Research

- Design compost models to better degrade bioplastics
- Design new lubricants and organic semiconductors for solar cells and electronic devices
- Develop composites using natural fiber reinforcements
- Develop eco-conscious bioplastics from plants and microorganisms
- Develop foams using environmentally benign manufacturing
- Develop green chemistry and biotechnology approaches to remove heavy metals/ contaminants from industrial effluents
- Develop structural insulated panels for modular housing
- Modify plants to produce fibers for “ready-to-use” products that don’t need heavy, chemical processing after harvesting
- Study ecophysiology and toxicology of engineered nanoparticles in water systems

Facilities and Resources

- Center for Advanced Research and Technology (CART)
- Center for Plant Lipid Research
- Environmental, Microbiology, and Biotechnology Lab
- Nanofabrication/Cleanroom Facility
- Polymer Laboratory
- UNT Health Science Center
- UNT Office of Sustainability
- Zero-energy Research Laboratory


courtesy of Dr. Lars Petrasovits


courtesy of URCM / UNT


courtesy of JACOBS

Renewable Energy and Conservation

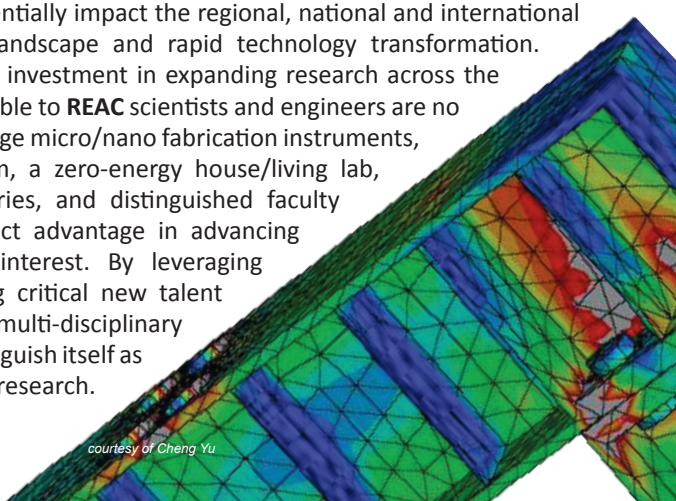
Conducting research in renewable power generation, smart grid transmission, and buildings to develop energy and technology strategies to address next generation conservation needs

reac.unt.edu
reac@unt.edu


courtesy of URCM/UNT

Providing abundant, cheap, renewable energy for homes, businesses and other end users is a global, conservation imperative that requires innovative research strategies across disciplines. Next generation renewable energy and energy conservation system solutions are needed to address critical energy and security issues. The **Renewable Energy and Conservation** (REAC) cluster combines expertise in mechanical and energy engineering, materials science, electrical engineering, engineering technology, and other physical and social science disciplines to develop research in three thrust areas: Distributed Renewable Power Generation, Smart Grid Transmission, and Building Energy Conservation. A focus in these niche areas capitalizes on existing UNT strengths and primes the cluster to strategically expand its base of expertise and funding.

From device development to system modeling and validation, **REAC** serves as a research pipeline for diverse energy and conservation projects, including affordable PV systems and wider utilization of wind power; cost effective, high energy efficient building products; and key grid-tie solutions for wide penetration of distributed renewable energy. The goal of the **REAC** cluster is to form key research teams in a few critical areas that will potentially impact the regional, national and international renewable energy research landscape and rapid technology transformation. UNT has made a considerable investment in expanding research across the university; the resources available to **REAC** scientists and engineers are no exception. Access to cutting-edge micro/nano fabrication instruments, a class 10,000/100 cleanroom, a zero-energy house/living lab, specialized research laboratories, and distinguished faculty gives **REAC** scientists a distinct advantage in advancing research in their areas of interest. By leveraging existing resources and adding critical new talent to its foundation within a multi-disciplinary framework, **REAC** aims to distinguish itself as a leader in sustainable energy research.


courtesy of Cheng Yu

Representative Research

- Atomistic experiments of surface materials used for electronic, energy, environmental, and biomedical applications
- Computational modeling of deformation and fracture processes in structural materials
- Geothermal and ground source heat systems
- 'Green' electronic systems
- Next generation solar cells
- Nano-pore heat and mass transport modulation for simultaneous cooling and protection
- Sensor textiles and sustainable packaging
- Tesla turbine performance
- Theoretical developments in network control, fundamental control theory, system biology/bioinformatics, air traffic flow management, and sensor/vehicle networking
- Zero-energy house and research laboratory tests novel construction designs, building materials, and technologies for "net-zero" energy consumption

wind turbines generate power for UNT's new football stadium

UNT Researchers Include

Jincheng Du, Assistant Professor of Mechanical and Energy Engineering
atomistic modeling; and electronic structures of energy materials

Nandika D'Souza, Professor of Mechanical and Energy Engineering and Materials Science and Engineering
sustainable and structural materials; polymers/biopolymers; and bioproducts

Alexandra Fortier, Assistant Professor of Mechanical and Energy Engineering
reliability analysis of Pb-Free electronic systems

Alan Needleman, Professor of Materials Science and Engineering
computational continuum mechanics

Yong Tao, PACCAR Chair; and Professor of Mechanical and Energy Engineering
innovative high-performance building construction

Yan Wan, Assistant Professor of Electrical Engineering
large-scale network modeling; analysis; and control

Cheng Yu, Associate Professor of Engineering Technology
construction engineering; structural stability; and building hazards mitigation

Facilities and Resources

- Adaptable, Multi-functional Reaction Frame Lab
- Center for Advanced Research and Technology (CART)
- Electrical Engineering Laboratories
- PACCAR Technology Institute
- Polymer Mechanical and Rheology Laboratory
- UNT Office of Sustainability
- Zero-energy Research Laboratory


courtesy of URCM / UNT

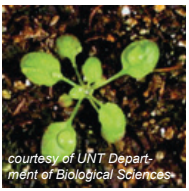
Signaling Mechanisms in Plants

Harnessing the ways plant cells communicate to find solutions for energy, agriculture, nutrition, and medicine

plantsignaling.unt.edu
plantsignaling@unt.edu

Plant science research at UNT addresses some of the most important challenges facing the world. The **Signaling Mechanisms in Plants** research cluster draws upon existing expertise and emerging research strengths in cell biology, biochemistry, genetics, metabolomics and informatics to study how plants use cellular communication—a complex network of molecular signals—in their growth, development and defense responses to stress. Understanding these signaling processes can help regulate crop yield and resistance to pathogens, insects and other adverse environmental conditions. Manipulating signaling mechanisms in plants also will lead to new technologies in agriculture, human nutrition, phytoremediation of environmental toxicants and sustainable energy. The interdisciplinary exchange of ideas guides these advances: cutting-edge cell biology makes use of new imaging techniques, and metabolomic modeling draws upon research from analytical chemistry, genetics and computational sciences. This "systems biology" approach dramatically expands our understanding of living organisms and their environments.

Cluster researchers are recognized as national and international leaders within their respective fields. Collectively, they serve on numerous agency advisory panels and boards and are invited speakers at high-profile research conferences around the world. Annual external research funding includes grants 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. A new, LEED-Gold certified, Life Sciences Complex features state-of-the-art "open" laboratories and climate controlled greenhouses for advanced plant research.


courtesy of UNT Department of Biological Sciences


courtesy of URCM / UNT

Representative Research

- Abiotic and biotic stress tolerances in cotton
- Activators of systemic immunity in crops
- Bioinformatics methods for microbial pathogen detection
- Engineering oil accumulation in vegetative tissues of plants
- Engineering seed value in cotton plants
- Engineering symbiotic nitrogen metabolism in legumes
- Engineering wheat for resistance against diseases
- Mechanisms to control flowering in domesticated cotton and wild progenitors
- Natural fibers and new composite materials from kenaf (Hibiscus cannabis)
- Natural sources of plant lipids for therapeutic modulation of the human endocannabinoid system
- Regulation of crop resistance to phloem-feeding insects
- Regulation of plant growth-yield enhancement
- Support for developing world agriculture and land use; introduce low cost monitoring technologies
- Targeted biomass partitioning to harvested organs

courtesy of UNT Department of Biological Sciences

Facilities and Resources

- Center for Plant Lipid Research
- Samuel Roberts Noble Foundation
- University of Missouri Medical Center

UNT Researchers Include

Brian Ayre, Associate Professor of Biological Sciences
carbon transport in plants

Rajeev K. Azad, Assistant Professor of Biological Sciences and Mathematics
bioinformatics; and computational biology

Kent D. Chapman, Regents Professor of Biological Sciences
lipid metabolism and function

Rebecca Dickstein, Professor of Biological Sciences
symbiotic nitrogen fixation

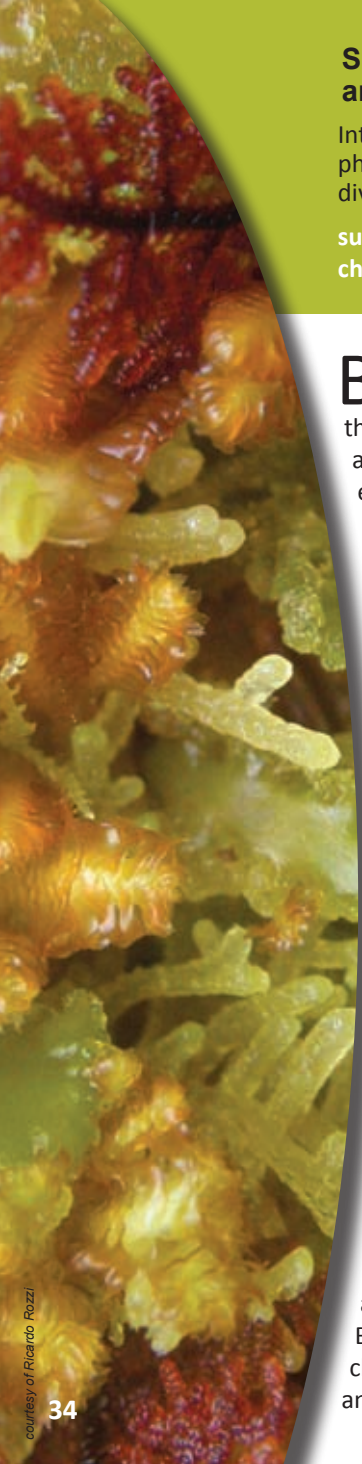
Ron Mittler, Professor of Biological Sciences
stress signaling in plants

Jyoti Shah, Professor of Biological Sciences
plant responses to environmental stress

Vladimir Shulaev, Professor of Biological Sciences
metabolomics; and plant signaling

Barney Venables, Professor of Biological Sciences
environmental chemistry; and toxicology

Guido Verbeck, Assistant Professor of Chemistry
analytical instrument development



courtesy of Ricardo Rozzi

Sub-Antarctic Ecosystems and Biocultural Conservation

Integrating ecological sciences and environmental philosophy to understand and preserve the biocultural diversity of the sub-Antarctic ecoregion

subantarctic.unt.edu
chile@unt.edu

Biocultural conservation emphasizes that the relationships humans have with the environment through their traditions and language is as important to an ecosystem as species and biological diversity. Cultural, ethical, and philosophical perspectives must be combined with empirical scientific research to achieve viable conservation and sustainable development practices. The **Sub-Antarctic Ecosystems and Biocultural Conservation** cluster is a pioneer in the integration of these precepts and a key player in a project of international importance: the preservation of the rich biological and cultural attributes of the Cape Horn Archipelago, located at the southern tip of South America in the sub-Antarctic ecoregion—one of the world's last remaining pristine wilderness areas and the closest continental region to Antarctica.

Cluster researchers are leading experts in wildlife conservation and environmental studies in this region of Chile, with expertise in native and invasive exotic species, freshwater ecology and watershed conservation, environmental policy, ethno-ornithology, ethno-ecology, and ecotourism. Work spans borders as well as disciplines in a context of collaborative research, international partnerships, interdisciplinary education, and public outreach. The Cape Horn Field Station in Omora Ethnobotanical Park serves as an important research hub and laboratory where scholars collaborate with participants ranging from local communities to renowned institutions, including UNESCO. A broader alliance of institutions compose the Sub-Antarctic Biocultural Conservation Program, which supports the cluster and includes UNT, the University of Magallanes, and the Institute of Ecology and Biodiversity in Chile.

Representative Research

- Environmental philosophy, ethno-ecology and biocultural conservation: the study of relationships between regional culture, ecosystems, and biota
- Freshwater ecology and watershed conservation: the study of streams, particularly the ecology and natural history of aquatic insects, and the relationship of local communities with watershed ecosystem services
- Interdisciplinary opportunities for students: experiences in research and field courses, including art exhibitions, film and study abroad programs such as "Tracing Darwin's Path"
- Long-term socio-ecological research: the implementation of bird banding and monitoring programs; and the study and control of harmful species to address the rapid loss and homogenization of biological and cultural diversity
- Miniature forests of Cape Horn: introduction to the lichens, mosses, and unique flora of the region
- Novel ecotourism models: the development of novel ecotourism models to link research with policy and sustainable tourism, including Tourism with a Hand Lens and educational activities


courtesy of Alexandria Poole


courtesy of the Sub-Antarctic Biocultural Conservation Program


courtesy of Alexandria Poole

UNT Researchers Include

Eugene Hargrove, Professor of Philosophy and Religion Studies
environmental ethics and policy

Jaime Jiménez, Professor of Biological Sciences and Philosophy and Religion Studies
biodiversity models and ecotourism

James Kennedy, Regents Professor of Biological Sciences
aquatic ecology and environmental education

Ricardo Rozzi, Professor of Philosophy and Religion Studies
biocultural conservation and environmental philosophy

Facilities and Resources

- Cape Horn Biosphere Reserve, Chile
- Cape Horn Field Station, Puerto Williams, Chile
- Center for Environmental Philosophy, Texas
- Institute of Ecology and Biodiversity, Chile
- Omora Ethnobotanical Park
- University of Magllanes, Chile

additional strategic areas of research

In addition to the fifteen research clusters, UNT has selected six areas for investment and faculty hiring in order to build capacity in strategically-important research domains. Initial faculty searches are already underway in each of these strategic areas, with the possibility of further expansion of the hiring plans in the future.

Advanced Bio-Sensor Technology, Development, and Applications
research.unt.edu/clusters/strategic-areas/bio-sensor

Research aims to represent the niche area of biosensors—technology, development, and applications. Investigations include the design and fabrication of biosensors, low-power sensor interface circuits, distributed intelligent sensor networks, energy-efficient sensor data collection, fusion, bio-security, public health, environmental monitoring, biodiversity, and explosives detection. Superior facilities advance critical applications and include experimental research labs, the Center for Advanced Research in Technology for materials analysis with an adjoining clean room, and a newly acquired anechoic chamber.

Participating Disciplines and Units

- Computer Science and Engineering
- Electrical Engineering
- Engineering Technology
- Physics

Computational Life Sciences and Complex Bio-Environmental Systems

research.unt.edu/clusters/strategic-areas/bio-environmental

Research is directed towards problems in systems biology, biomedical science, toxicology, and epidemiology, with a focus on the development of computer-based modeling, visualization, and analysis of biological processes and biomedical procedures. Cross-disciplinary collaboration supports multi-level expertise, from micro to macro structures, in areas such as computational reproductive toxicology, computational epidemiology, biomedical informatics, biocomputing and computational biology, environmental factors, and scientific computing. Resources include TALON, a UNT-based, high-performance supercomputer; and the Center for Computational Epidemiology and Response Analysis.

Participating Disciplines and Units

- Biological Sciences
- Computer Science and Engineering
- Geography
- Mathematics
- Mechanical and Energy Engineering

Entrepreneurship

research.unt.edu/clusters/strategic-areas/entrepreneurship

This initiative promotes new venture formation in the fields of traditional entrepreneurship, social entrepreneurship, technology transfer, and economic development. Entrepreneurship incorporates a multidisciplinary, conceptual framework to identify innovative approaches to new business models and creative initiatives that address social concerns. Researchers in business management, marketing, accounting, social sciences, public policy, and engineering partner to create, manage, and disseminate knowledge to foster a new generation of business leaders that value the social as well as the profit potential of business.

Participating Disciplines and Units

- Accounting
- Engineering
- Marketing and Logistics
- Management
- Murphy Center for Entrepeneurship

Forensic and Investigative Science and Technology Instrument Development

research.unt.edu/clusters/strategic-areas/forensic

Researchers aim to strengthen multidisciplinary approaches in the forensic sciences through the research and development of detection sensors and instrumentation, with the aim of developing and supplying low-cost, portable forensic instrument technologies to benefit multiple industries, including the medical and criminal justice communities. Resources include the UNT-based Laboratory for Forensic Anthropology and Human Identification; a DNA-focused Genetics Laboratory; a high-performance computing infrastructure; and a Forensic Science program. This initiative intends to promote greater collaborations among the broader science and engineering communities, new technology research, and facility expansion.

Participating Disciplines and Units

- Biological Sciences
- Chemistry
- Electrical Engineering

South Asian Media, Culture, and Arts

research.unt.edu/clusters/strategic-areas/south-asian

UNT hosts a strong body of scholars connected to South Asia by research interests, work collaborations, partnerships, exchanges, and cultural heritage. This initiative intends to consolidate and synergize the multidimensional research occurring across UNT, and to document and advance areas of knowledge unique to South Asia, from art preservation and history to linguistics, environmental ethics and Eastern philosophy. Innovative research partnerships are cultivated among UNT faculty, the burgeoning population of scholars and entrepreneurs based in the Dallas-Fort Worth metroplex, and South Asian collaborators in order to grow expertise, the curriculum, opportunities for exchange, and the reputation of UNT as a national center of South Asian scholarship.

Participating Disciplines and Units

- Anthropology
- Art Education and Art History
- History
- Mayborn School of Journalism
- Linguistics
- Music History, Theory, and Ethnomusicology
- Philosophy and Religion Studies

STEM Research and Education

research.unt.edu/clusters/strategic-areas/stem

This initiative builds on a solid foundation of outstanding science educational programs, distinguished faculty with recognized leadership, a record of successful grant funding, valued partnerships with government/education agencies, industries and community organizations, and an infrastructure committed to innovative educational technology and institutional development. It emphasizes trans-disciplinary research and curricula, new learning environments, engagement, and STEM teaching. One of the major goals of this initiative is to broaden the presence of under-represented groups in STEM fields, including minority, low income, female, urban, rural, and first generation college students.

Participating Disciplines and Units

- Biological Sciences
- Chemistry
- College of Engineering
- Counseling and Higher Education
- Economics
- Educational Psychology
- Learning Technologies
- Mathematics
- Teach North Texas
- Teacher Education and Administration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