

# RESEARCH: The Annual Report

**2018:** Discovery Through Collaboration



RESEARCH.UNT.EDU



UNIVERSITY OF NORTH TEXAS®



## WHO WE ARE

Since 1890, the University of North Texas has been a catalyst for discovery and innovation. Today, UNT is ranked a Tier One research university by the Carnegie Classification — a recognition that speaks to its quality and impact.

A growing research university, UNT is at the forefront of new ideas and technologies that address scientific, environmental and societal problems. Building on more than 125 years of excellence, UNT is leveraging key assets strategically. Nationally and internationally recognized for its scholarship in all fields — from fine arts to technology, humanities to life sciences, music to entrepreneurship — UNT is committed to the creation and advancement of innovative research, art and scholarship. Together, faculty and student researchers are pushing the boundaries of science and technology. They are bringing solutions-based research to industry and the marketplace while creating a pipeline for technology transfer and industry partnerships.



## EXCELLENCE RECOGNIZED

**13 NATIONAL SCIENCE FOUNDATION CAREER AWARD RECIPIENTS,**  
 UNT faculty who have earned the most prestigious recognition given by the NSF for young researchers on the rise.

**7 FULBRIGHT HONORS**  
 Two Fulbright scholarship grant recipients were named this year; four UNT students earned Fulbright U.S. Student Program awards for English Teaching Assistantships; and one student received a Fulbright-Hays Doctoral Dissertation Research Abroad Fellowship.

**4 NATIONAL ACADEMY MEMBERSHIPS**  
 — one in Engineering, one in the Sciences and two Inventors.

**72 ACADEMIC PROGRAMS RANKED AMONG THE NATION'S TOP 100,**  
 including 17 ranked in the Top 100 by *U.S. News & World Report*.

**1,600 FACULTY MEMBERS**  
 Many UNT faculty are experts in their fields and have earned honors such as National Science Foundation CAREER awards, Fulbrights and Guggenheim fellowships, National Medal of Arts honors, and Grammy, Emmy and Pulitzer nominations.

## TIER ONE RESEARCH

**With a reputation as a hub for creativity and innovation, it's no surprise UNT was reaffirmed this year as a Tier One research university by the Carnegie Classification.**

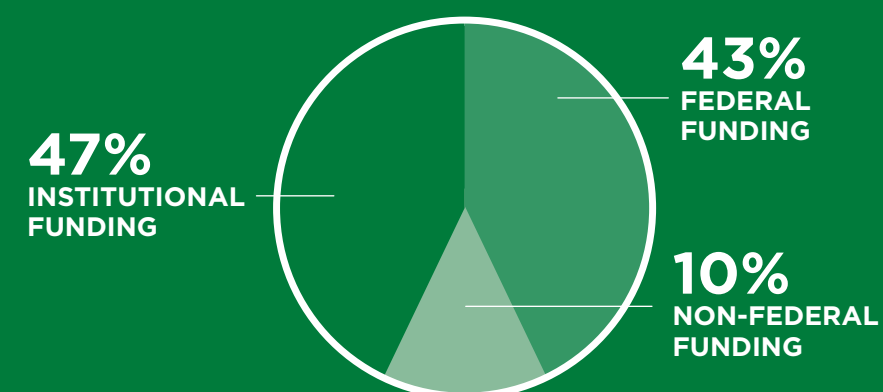
The Carnegie Classification of Institutions of Higher Education™ reaffirmed UNT's standing as a Tier One research university — an achievement recognizing the university's efforts to grow its research enterprise and commitment to rise toward national prominence — in its 2018 report.

With only 131 universities included in the classification — Doctoral Universities: Very High Research Activity — UNT is ranked among the nation's most elite research institutions in the top tier. This reaffirmation is a testament to the university's commitment to discovering solutions for the challenges of the 21st century — and UNT has made significant strides. In just the last year, UNT has acquired six patents, has executed several licenses and is currently negotiating more agreements. UNT faculty continue to cross the bounds of disciplines by utilizing a solutions-focused thought process that involves the in-depth consideration of future problems. UNT was first elevated to the Carnegie R1 category in 2015.

"Our reaffirmation as a Tier One research university by the Carnegie Classification is a testament to the hard work and dedication of our outstanding faculty and staff to provide our students the best education and to help them succeed," UNT President Neal Smatresk says. "This recognition speaks to the quality and impact of the research being conducted at UNT, and it is further evidence of our continued progress toward national prominence as a leading research university."

## GROWING RESEARCH ENTERPRISE

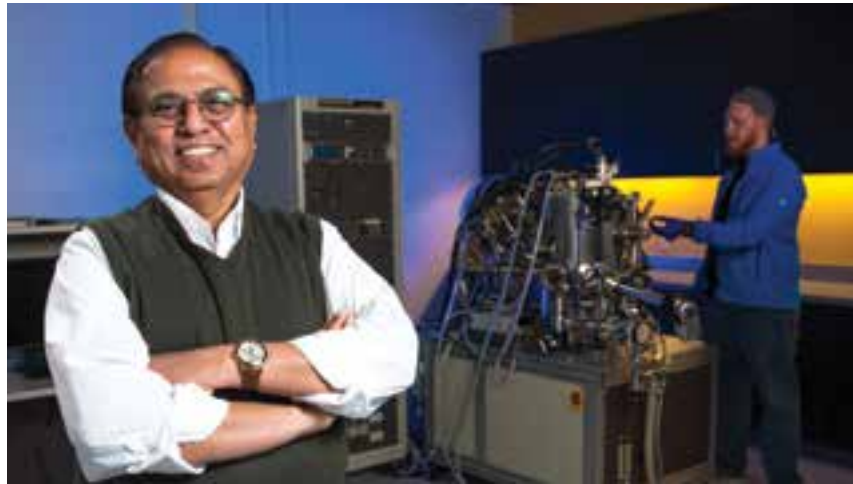
**\$44M FY 18 TOTAL RESEARCH EXPENDITURES**



**+21.4% FEDERAL FUNDING FROM 2017 TO 2018**

# RESEARCH HONORS

UNT's 1,600 talented faculty members, many of whom are experts in their fields, have earned numerous prestigious honors and awards this year.



## LIFETIME ACHIEVEMENT AWARD

Narendra Dahotre, interim vice president of research and innovation and a Distinguished Research Professor in the College of Engineering, has received the Society of Manufacturing Engineers Eli Whitney Productivity Award for lifetime achievement in manufacturing engineering.

A member of the National Academy of Inventors, Dahotre, above, is internationally recognized in his field for his pioneering contributions to the understanding and engineering of laser materials in processing and manufacturing. A former chair of the Department of Materials Science and Engineering, he has generated funding for his research in excess of \$9 million from government and industrial organizations.

In his current role as interim vice president, he facilitates research projects that have been funded by the federal government, including UNT's work with the Army Research Office and Army Research Lab for a tactical shelters project and a ballistics

project, respectively. He also oversees the management of UNT's shared instrumentation facilities across campus and works with the advisory groups and directors for each facility.

Dahotre, who has worked with laser processing for more than 25 years, has received 18 U.S. patents and has published more than 270 articles in professional journals. He is the author of four books and editor of 13 other books that focus on laser materials processing and manufacturing and surface engineering.

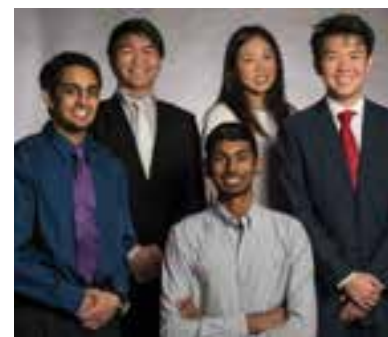
He is a fellow of nine national and international societies, including the American Society of Materials, American Society of Mechanical Engineers, American Association of Advancement of Science, and the Society of Manufacturing Engineers. He also is a founding editor-in-chief of the *International Journal of Additive and Subtractive Manufacturing* and editor of the *Journal of Lasers and Optics*.

## REGENERON SCIENCE TALENT

Ashwin Kumar, Ted Zhao, Sarah Zou, Abhishek Mohan and Tan Yan (from left), students in UNT's Texas Academy of Mathematics and Science (TAMS), were named semifinalists in the 2018 Regeneron Science Talent Search, one of the nation's most prestigious pre-college science competitions.

Kumar worked to improve the longevity and performance of titanium medical implants, Mohan investigated targeted delivery of drugs used to treat cancer using non-toxic silver nanoparticles, Yan developed an algorithm for medical devices to detect electroencephalograms to warn epilepsy patients of seizures, Zhao created a peptide that destabilizes a protein that contributes to cardiomyopathies resulting in heart attacks, and Zou worked to increase the energy storage of supercapacitors for consumer electronics and electric vehicles.

TAMS is the nation's first early college entrance residential program for gifted high school students.



## FULBRIGHT SCHOLAR GRANTS

Two UNT professors have been named award winners in the prestigious Fulbright U.S. Scholar Program.

Dan J. Kim, professor of information technology and decision sciences, earned a Fulbright U.S. Scholar grant to research how the creation of new online technologies is affected by different cultural norms and if that has changed in today's technology-driven environment.

The grant has allowed Kim to travel to Korea University Business School, the top private university in South Korea, this spring. There, he's spending a six-month stint teaching and researching along with other world-class scholars.

Darrell Hull, associate professor of educational psychology, is using his Fulbright grant to travel to Jamaica to study "unattached" youth — older adolescents and young adults who are unemployed and are not in school or any training programs.

Hull is working with a team of Caribbean psychologists to develop culturally valid measures to evaluate positive youth development programs for developing countries in the region. While in Jamaica this year, he is lecturing on Item Response Theory as a means to psychometrically validate measures, statistical computation with R, observational studies and field trial design and analysis at the University of the West Indies — Mona Campus.



## BIOLOGIST ELECTED TO ROYAL SOCIETY

Richard Dixon, University Distinguished Research Professor in UNT's Department of Biological Sciences, was recently elected into the United Kingdom's Royal Society, the oldest scientific organization in the world dedicated to the understanding and advancement of science. The Royal Society is similar to the United States' National Academy of Sciences, of which Dixon also is a member. Only 14 Texans are fellows of the Royal Society.

"I am originally from the U.K., so my election into the Royal Society is especially exciting for me," says Dixon, who over the past three decades has become known as a world leader in plant science.

A world leader in the field of plant-specialized metabolism and in creating innovative bio-based solutions, Dixon also is a member of the American Association for the Advancement of Science, the National Academy of Inventors and the American Society of Plant Biologists.

He has published more than 480 papers and chapters on his research in international journals, and he has been named by the Institute for Scientific Information as one of the 10 most-cited authors in the plant and animal sciences — with his work being cited more than 70,000 times. He is currently working on a method to make alfalfa a more environmentally friendly feed for cattle.

Dixon is the founding director of UNT's BioDiscovery Institute and currently serves as its associate director.

"By learning how to engineer plants, we can start to develop, manipulate and tailor them to our needs for new solutions," Dixon says. "We're trying to improve plants to make them useful for farmers, for industry and for human health."



## POLITICAL SCIENCE AWARD

The American Political Science Association presented the Frank J. Goodnow Award to John Ishiyama, University Distinguished Research Professor of political science. The highest career award in the discipline, it honors service to the community of teachers, researchers and public servants who work in the political science field.

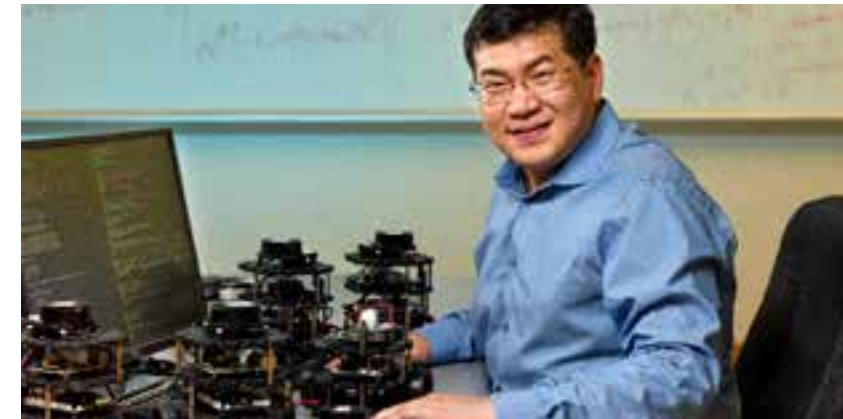
During his career, Ishiyama has published eight books and more than

150 journal articles and book chapters. He also has served on the American Political Science Association board and various committees and was editor in chief of the *American Political Science Review* from 2012 to 2016. He is passionate about promoting undergraduate research, particularly for students from under-represented groups and first-generation college and low-income students.

## HIGHLY CITED RESEARCHERS

Biological sciences professors Richard Dixon and Vladimir Shulaev are among the top one percent of researchers in their field to be cited by other researchers according to Clarivate Analytics, a company helping companies and universities sort and examine big data and apply it to their research needs. Since 1988, Dixon's research on plant and animal sciences has been cited more than 70,000 times, 21,706 in the last five years alone. Shulaev's research focuses on metabolomics and its application to cancer development, synthetic biology and precision medicine.

Political science professor Idean Salehyan is recognized by the American Political Science Association as one of the most cited faculty members in his field. Salehyan, a peace studies researcher, is in the top three most-cited political science researchers in his graduation cohort (2005-2009).



## PRESTIGIOUS POWE AWARD

College of Engineering assistant professor Tao Yang earned the prestigious 2018 Ralph E. Powe Junior Faculty Enhancement Award from the Oak Ridge Associated Universities for his research into the future of electrical distribution microgrids. UNT has had 11 Powe award recipients since 1991.

Traditionally, electricity is provided through one central distribution network, meaning a problem in one area will affect the entire grid.

Yang's research led to his designing a microgrid that has its own generator and draws power from renewable energy sources currently in use on campus. His microgrid would continue to work if the rest of campus lost power.

The Powe award, aimed at enhancing the research and professional growth of young faculty, is awarded to professors teaching engineering, sciences, mathematics, policy management or education.

## DISTINGUISHED EDUCATOR

Regents Professor Victor Prybutok was recently awarded the 2018 Decision Sciences Institute's Lifetime Distinguished Educator Award.

Prybutok, vice provost for graduate education and dean of the Toulouse Graduate School, received the award for exceptional contributions to teaching and learning in the disciplines of decision sciences over the course of a career. During his time in higher education, Prybutok has published over 200 journal articles and given more than 300 presentations worldwide. He has served as dissertation chair for more than 40 doctoral students.

The Decision Sciences Institute is a global society of 1,800+ business school scholars dedicated to creating, developing, fostering and disseminating knowledge to improve managerial decisions and decision-making involving systems and people.

## TECH TITANS AWARD

Renee Bryce, professor in the Department of Computer Science and Engineering, earned the 2018 Tech Titans of the Future-University Level Award, which included a \$25,000 prize. The award honors Dallas-Fort Worth area higher education institutions that encourage and support students in pursuing engineering- and technology-related disciplines.

Bryce, right, was recognized for creating the Bug Catcher and Bug Wars programs that have engaged thousands of high school and college students both in DFW and nationally to expose them to the tech field. Bug Catcher is a software-testing competition system where students compete to find the most bugs in problem sets as quickly as possible. Bug Wars provides opportunities for undergraduate students to work on research related to emerging technologies.



## IBM MAINFRAME WINNER

College of Business senior Anna McKee for the second year in a row won IBM's Master the Mainframe challenge in North America. In the competition, students from around the world must master the skills used by mainframe systems programmers. McKee, the first woman to win last year, also was ranked in the top three of competitors globally for both years. She had to come up with creative solutions to real-life computing problems and coding errors. For the final task in both years' projects, she created a coding solution based on loose requirements, challenging her to use innovation and research.

About 17,000 high school and college students participated in the competition. McKee is double majoring in business computer information systems and decision sciences.

# INSTITUTES OF RESEARCH EXCELLENCE

UNT's Institutes of Research Excellence bring together a critical mass of faculty collaborating on projects designed to create a stronger platform for interdisciplinary research and partnerships with industry to create solutions and further contribute to the North Texas region's economic growth.



## ADVANCED ENVIRONMENTAL RESEARCH INSTITUTE (AERI)

AERI features a thriving interdisciplinary research team exploring fascinating questions about our environment and uses basic and applied research to find solutions to complex problems. The team conducts research in a wide array of areas related to local, regional, national and international environmental problems. From 2015 to 2017, AERI scholars published more than 300 peer-reviewed papers and received several million dollars in grants from the National Science Foundation, the National Institutes of Health, the National Oceanic and Atmospheric Administration, the Gulf of Mexico Research Initiative and various other public and private sector entities. AERI is led by Samuel F. Atkinson, Regents Professor of biology.

940-369-5555 // AERI@unt.edu // 1155 Union Circle #310559, Denton, Texas 76203-5017



## ADVANCED MATERIALS AND MANUFACTURING PROCESSES INSTITUTE (AMMPI)

AMMPI brings together a diverse group of faculty members who are focused on structural materials, functional materials, computational tools and advanced manufacturing processes. The strength of the institute's members lies in designing high-performance materials for the aerospace, automotive and energy sectors. Since its formation in 2015, AMMPI has received \$17 million in grants and awards from national agencies such as the National Science Foundation, Army Research Laboratory, and U.S. Department of Defense and private companies. AMMPI is led by Rajiv Mishra, University Distinguished Research Professor of materials science and engineering.

940-369-8438 // AMMPI@unt.edu // UNT Discovery Park Annex, 3940 N. Elm St., Denton, Texas 76207-7102



## BIODISCOVERY INSTITUTE (BDI)

BDI delivers research solutions to underpin the use of plants, forest products and other biomass for the production of biopolymers, new bio-based materials for construction and transportation, biofuels and bioactive small molecules with applications in both agriculture and health care. In its first two years of operation, researchers in BDI took in more than \$5.4 million in federal, non-profit and corporate funding. BDI researchers are supported by grants and contracts from the U.S. Department of Energy, the U.S. Department of Agriculture, the National Science Foundation and several companies in the ag-biotechnology industry space. BDI is led by Kent D. Chapman, Regents Professor of biochemistry.

940-565-2491 // BDI@unt.edu // 1155 Union Circle #305220, Denton, Texas 76203-5017



## JIM MCNATT INSTITUTE FOR LOGISTICS RESEARCH (JMI)

JMI's research team provides the capability to develop effective solutions to complex problems confronting public and private organizations. Specialties include business logistics, economics, information technology, geographic information systems, transportation and operations research. Since its formation in 2015, JMI has received several large grants and awards from corporations and government agencies. JMI also leads the North American Strategy for Competitiveness (NASCO) University Consortium. JMI is led by Brian Sausser, Associate Professor of logistics and Director of the Complex Logistics Systems Laboratory.

940-369-8666 // JMI@unt.edu // 1155 Union Circle #311396, Denton, Texas 76203-5017



## SEED OIL RESEARCH

Ana Alonso, associate professor of biological sciences, is leading a research project to study a unique type of seed oil produced by the pennycress plant. The research is supported by the Department of Energy Office of Biological and Environmental Research.

Alonso, who also is a member of UNT's BioDiscovery Institute, is attempting to optimize the amount of seed oil produced per plant through traditional cross-breeding methods and bioengineering. When properly processed, the common pennycress can produce 100 gallons of oil per acre and can be further processed into aviation fuel.

Growing pennycress also could one day provide farmers with a biodiesel money crop in winter fields that are normally empty.



## ■ STUDYING GLOBAL ENVIRONMENTAL CHANGE

Alexandra Ponette-González, left, is a biophysical geographer specializing in global environmental change and terrestrial ecosystem dynamics. She heads UNT's Ecosystem Geography Laboratory, where she and her research group study interactions between humans, the atmosphere and the biosphere in the context of a changing environment.

Along with research assistant Jenna Rindy, Ponette-González uses UNT's Materials Research Facility to investigate the role of city trees as urban air filters — that is, their potential to capture and remove harmful soot particles from the atmosphere.

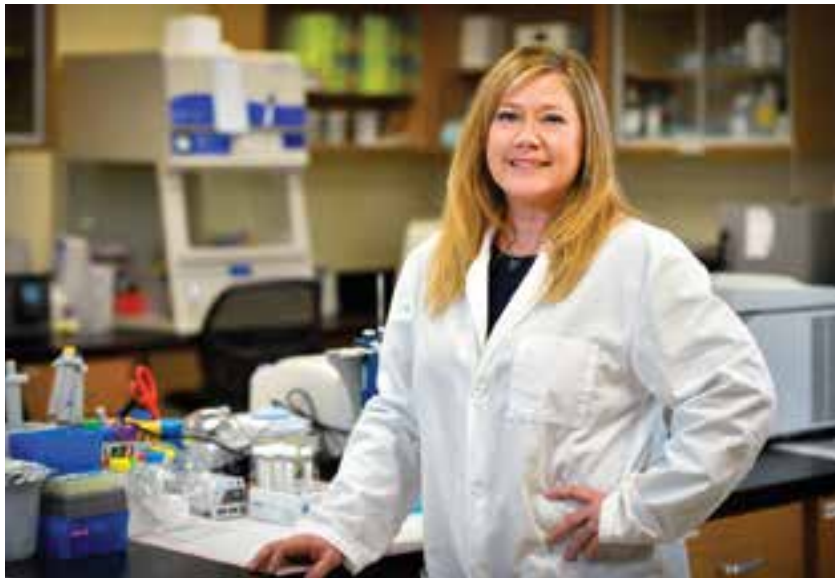
"Jenna used the scanning electron microscope in the MRF to examine the density of small leaf hairs called trichomes — what makes a leaf feel fuzzy — on the leaves of two oak tree species we are studying," Ponette-González, who is an associate professor of geography and the environment, says. "We are interested in determining if post oak trees have more leaf hairs on their leaves than live oak trees, as this can affect the extent to which tree leaves capture pollution."

The research is funded by the Geography and Spatial Sciences program at the National Science Foundation as part of a more than \$535,000 five-year CAREER grant awarded to Ponette-González in 2016.

"Our research also will determine how the buildings, infrastructure and green spaces that surround city trees affect their capacity to filter the air so that we can make concrete recommendations on where to plant trees within cities," Ponette-González says.

# INNOVATIVE RESEARCH

Through research support from corporations and national agencies, student and faculty researchers work together across disciplines tapping into partnerships with other universities and industry leaders to make new discoveries and create innovative solutions that will improve the world and sustain the future.



## OBESITY AND AIR POLLUTION

A cardiovascular toxicology researcher in the College of Science has found that exposure to certain air pollutants may cause increased weight gain in the body. In her study, funded by a \$438,000 grant from the National Institutes of Health, biological sciences assistant professor Amie Lund is investigating how air pollution from automobile and diesel exhaust can affect the growth and signaling of fat cells called adipocytes.

Lund has determined these pollutants trigger responses in the body that can lead to increased adipocyte growth, as well as cardiovascular disease.

“People often think of genetics and diet as the root causes of obesity,” Lund says. “But external factors such as environmental pollutants stress the systems of our bodies. And since our bodies are a system of many systems, something that affects one can affect all.”

## CYBERSECURITY

Hassan Takabi, assistant professor of computer science and engineering, recently received more than \$1 million in grants from the National Science Foundation.

The first grant awarded for \$515,974 will be spent developing a computer defense against malicious insiders who leverage basic computer access into unauthorized computer entry. Takabi is designing the system to supplement

access control systems. It won't just lead malicious users to fake files; it also will allow them to be traced to their origin.

The second grant for \$499,581, in collaboration with Eduardo Blanco, assistant professor of computer science and engineering, will be used to develop instructional modules and hands-on lab exercises that will merge data science and analytics with cybersecurity.

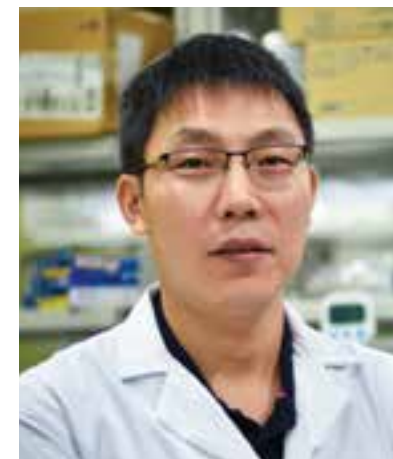
## MEDICAL STENT THAT BIODEGRADES

The College of Engineering received a \$2 million grant from the National Institutes of Health to develop a biodegradable medical stent.

Medical stents — small tubes used to widen passageways within the body — are traditionally made of anti-corrosion polymers or metals such as stainless steel, but the permanent presence of these stents can cause problems such as the re-narrowing of an artery or other large blood vessel and clotting.

“Our stents will be made of a new zinc-based biomaterial that provides strength, biocompatibility and full biodegradability that matches the body's natural healing process,” says Donghui Zhu, associate professor of biomedical engineering.

The stents also will be more cost-effective because they will decrease the likelihood that patients will need a replacement stent, tissue graft or bypass surgery.



## SAFE DRIVING

In her latest study, funded by a \$300,000 grant from the U.S. Federal Highway Administration, Yu-Luen Ma, professor of insurance and risk management in the G. Brint Ryan College of Business, and her team studied usage-based insurance or pay-as-you-drive-and-you-save. Coupled with GPS devices, smartphones, data analytics and other telematics technology, these plans allow insurers to monitor driving behavior in real time and reward individuals for driving safely.

The team discovered that the more telematics data insurers have about how far individuals drive, how they behave behind the wheel and when they travel, the more effective insurers are at calculating the policyholder's crash risk and insurance rates. This would not only save low-risk drivers money, but also could save companies as they could be undercharging customers as much as 31 percent since they don't fully factor driving behavior into insurance premiums. Policyholders would have the ability to lower costs by driving fewer miles, driving more safely and driving outside of peak times — which could lead to less congestion, traffic accidents and air pollution.



## BUILDING NEXT-GENERATION ARMY SHELTERS

Researchers at UNT have built a stronger and safer tactical shelter for military personnel. Engineering professors and students recently completed a two-year project funded by the U.S. Army's Natrick Soldier Research, Development and Engineering Center to build a prototype of an improved shelter.

“The military wants to develop a next-generation shelter using new technology to achieve a lighter weight and higher strength, at a lower cost,” says Cheng Yu, professor of engineering technology and director of UNT's Structural Testing Lab.

UNT worked with collaborators at Northeastern University and the University of Southern Mississippi to develop the basic materials and construction of the prototype.

“Creating an improvement to the outdated shelter is a big problem requiring multiple investigators from different areas to work on,” says Sundeeep Mukherjee, associate professor of materials science, adding the project spans three departments in UNT's College of Engineering. “The multi-dimensional collaborative approach we are developing also will advance the research capacity of the university.”

Researchers created walls of corrugated cold-formed steel and polymer composite panels with an energy-efficient spray polyurethane foam insulation in between, which they say has achieved a much lighter-weight, stronger structure that could be produced at a far lower cost.





## ADDRESSING MENTAL HEALTH DISPARITIES

Angie Cartwright, assistant professor in the Department of Counseling and Higher Education, center, and Chandra Carey, associate professor and interim chair in the Department of Rehabilitation and Health Services, right, along with Peggy Ceballos, associate professor in the Department of Counseling and Higher Education, left, have been awarded a four-year, \$1.3 million grant from the

U.S. Department of Health and Human Services. They will address health disparities by enhancing the delivery of culturally competent mental health services to underserved communities and will focus on providing counseling services in integrated care settings and on increasing the number of mental health counselors who work with underserved communities.

Cartwright and Carey also have been awarded a separate grant of \$350,000 from the Texas Higher Education Coordinating Board to build clinical partnerships and assist with the delivery of culturally competent counseling services and the recruitment and retention of students from underserved populations.

## NSF EMERGING FRONTIER GRANT

Through a \$2 million grant from the National Science Foundation, physics researchers Arup Neogi, far right, a University Distinguished Research Professor, and professor Arkadii Krokhin, disproved the Rayleigh Reciprocity Theorem.

“Imagine a room where a conversation is taking place between two people,” Neogi says. “I speak to you and you hear me. You speak to me and I hear you. This works even if we switch places. That is Rayleigh’s theory of sound and reciprocity.”

They disproved the theory by taking into account the viscosity of fluid, not just air. Based on the revised theory, they created a nonreciprocal acoustic device that allows sound to move through the device much more easily in one direction than in the other.

Their research was published by the *Physical Review Letters* journal. The collective of authors include UNT researchers Ezekiel Walker and Hyeonu Heo; Ph.D. students Andrii Bozhko and Yurii Zubov; and colleagues from Mexico and China.



## DISCOVERING STRONGER ALLOY

UNT postdoctoral researcher Saurabh Nene, a research associate with the Center for Friction Stir Processing, published his findings about designing a new steel-like alloy that is five times stronger than conventional steel in a recent edition of *Nature’s Scientific Reports*.

Under the guidance of Rajiv Mishra, University Distinguished Research Professor, Nene works with the Department of Materials Science and Engineering to give the metal its unique yield strength. He created the alloy by combining iron, manganese, cobalt, chromium and silicon through induction melting, casting and friction stir processing.

## SEED OIL FOR LUBRICANT

Diana Berman, assistant professor of materials science and engineering and researcher in UNT’s Advanced Materials and Manufacturing Processes Institute, and Kent Chapman, director of UNT’s BioDiscovery Institute, are working with seed oil from the Chinese violet cress, a potential lubricating oil that is on par with, if not better than, petroleum oil. Collaborating with Huazhong Agricultural University, Indiana University-Purdue University at Indianapolis, and the University of Nebraska-Lincoln, Chapman and Berman are examining the oil from different perspectives.

Berman and Chapman of UNT; Edgar Cahoon and Rebecca Cahoon of UNL; Robert Minto of Indiana University-Purdue University at Indianapolis; along with Xiangjun Li, Juan Ling, Wei Zhang and Saiyun Li of the Huazhong Agricultural University in Wuhan, China, co-authored a study on the discovery in the Aug. 27, 2018, journal *Nature Plants*.



## USING PLANT GENES FOR SUSTAINABLE AGRICULTURE

Since joining UNT in 2000, professor of biochemistry and molecular biology Rebecca Dickstein has not only increased the scientific community’s understanding of plant biology, signaling, genetics and symbiotic

nitrogen fixation in the legume *Medicago truncatula*, but also the number of funded research projects that delve into those topics.

Most recently, Dickstein is one of seven scientists who are part of a four-year, \$5 million grant from the National Science Foundation — \$483,405 of which was awarded to UNT — to identify and study key plant genes required for mutually beneficial relationships between microbes in the soil and *Medicago truncatula*, a close relative of alfalfa. The researchers are studying genes that are essential for symbiotic nitrogen fixation with rhizobia and for the beneficial interaction with symbiotic fungi, which are crucial to sustainable agriculture.

“We originally started this forward genetics project without knowing exactly which genes we would identify, but knowing that they would be significant because they are essential for *Medicago* to sustain the symbiosis,” says Dickstein, who earned her Ph.D. in biochemistry

from Johns Hopkins University.

In addition to Dickstein, who is a co-PI, the project includes scientists from the Noble Research Institute, the Boyce Thompson Institute, Clemson University and the University of Georgia. It also reunites Dickstein with her former Ph.D. student Catalina Pislariu, now a professor at Texas Woman’s University.

Dickstein says this collaboration has increased the quality and rigor of the research.

“The benefit of working with other scientists is that you don’t necessarily have to have all the resources,” she says. “You have the benefit of their experience, expertise and resources, as well as your own. That’s huge.”

## SEDATION ALTERNATIVES FOR CANCER PATIENTS

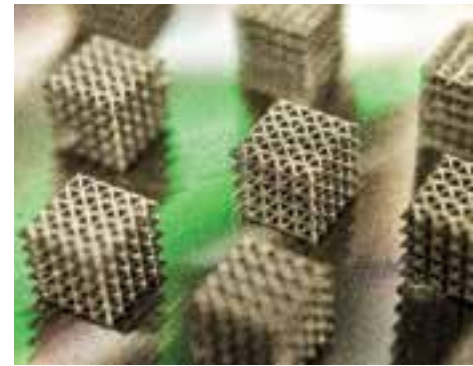
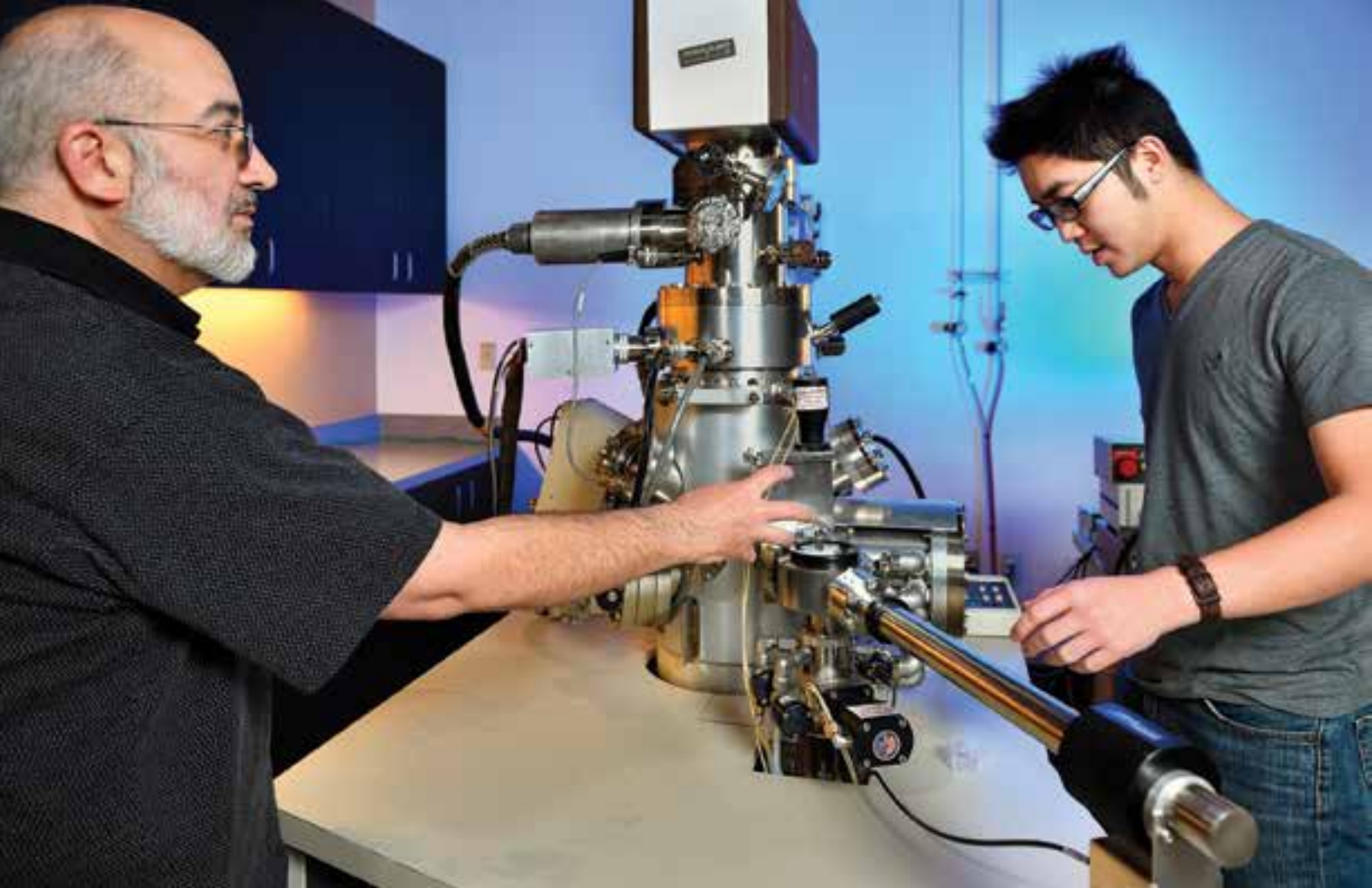
Manish Vaidya, associate professor of behavior analysis, is investigating alternatives to anesthesia using motion monitoring and behavioral methods in a game to teach young patients to stay mostly motionless while awake for radiation therapy.

The project — PROMISE, or Pediatric Radiation Oncology with Movie-Induced Sedation Effect — is funded by a \$900,000 grant from the Cancer Prevention and Research Institute of Texas to UT-Southwestern and UNT.

Vaidya and graduate student Maria Otero are part of an interdisciplinary team of radiation oncologists, computer scientists and a pediatric psychologist working on the problem. He is testing PROMISE on healthy children under age 10 in a child-friendly lab at UNT.

“Our goal is to minimize sedation in children undergoing radiotherapy to improve quality of life,” Vaidya says.





### ADDITIVE MANUFACTURING LABORATORY

At UNT, researchers are exploring the possibilities of additive manufacturing using the highly advanced Additive Manufacturing Laboratory (AML), which opened in November. The lab, located adjacent to the Materials Research Facility, has two distinct laser-based additive manufacturing systems to allow for a range of activities including research in manufacturing science and applied research and development in manufacturing engineering. The lab is one of the key assets leveraged in UNT's new Center for Agile and Adaptive Additive Manufacturing (CAAAM), which is being established to move Texas further along in advancing additive manufacturing technologies and meeting the growing demands for high-performance and efficient advanced materials.

### BIOMEDICAL ENGINEERING BUILDING

UNT's College of Engineering is adding a new 26,250-square-foot building to its Discovery Park campus to house the Department of Biomedical Engineering and enable distance learning through connectivity and audiovisual equipment. The new space will not only add more labs, equipment and classrooms, but also expand the research and teaching areas. The facilities, scheduled to open in fall 2019, will contain two large research labs, three teaching labs and three classrooms, one of which will be tiered and seat nearly 200 students. The cutting-edge technology will include an Anatomage 3D dissection table that will provide virtual reality human bodies for students and researchers, expanding areas of research and learning.

### GENOMICS CENTER

Part of the university's BioDiscovery Institute, the Genomics Center, an in-house laboratory located in the Life Sciences Complex, provides high-quality, low-cost DNA and RNA sequencing, as well as computational and statistical analysis of genetic data. Recently, the center introduced robotics to assist with sample preparation and increase sequencing throughput and consistency. The lab enables UNT to work closely with business and industry leaders, while also giving students the opportunity to work in one of the newest frontiers of science. Since opening in 2016, the Genomics Center has sequenced more than 3 trillion bases of DNA and provided initial funding and experimental design consultation support to more than 30 research labs at UNT.

### ART BUILDING

The new Art Building housing the College of Visual Arts and Design opened in fall 2018. The expansion project is scheduled for completion in spring 2019 and includes the new four-story, 133,000-square-foot addition, plus a renovation of the 84,500-square-foot existing building. These buildings will be connected by a courtyard and sky bridges. The college's new home base will be a series of world-class facilities, including a 19,000-square-foot, multipurpose courtyard with landscaping and seating; a new gallery with extensive research and study space; 181 spaces for the delivery of educational programs; and archival, teaching and exhibit spaces for the Texas Fashion Collection.

## STATE-OF-THE-ART SPACES

**UNT opens new facilities as part of a commitment to enable faculty, students and external research partners to conduct high-level, solutions-based research and drive innovation and creation across disciplines.**

### MATERIALS RESEARCH FACILITY

Researchers from across the UNT campus, other universities and industries use the more than two dozen instruments at the university's Materials Research Facility (MRF), pictured above, to multi-dimensionally fabricate, characterize and analyze a wide range of materials. Projects span numerous areas of expertise in disciplines such as engineering, materials science, physics, chemistry and biology.

The research collaborations in these laboratories are at the cutting-edge of cross-disciplinary synthesis, characterization and analysis. From the atomic to the macro length scales, the MRF located in UNT's Discovery Park, the North Texas region's largest research park, is one of the most advanced university research facilities in the nation for materials analysis. The facility offers a suite of powerful analytical instruments used for true 3D characterization and processing with an adjoining cleanroom so that materials can be synthesized, tested and controlled in close proximity.

**23 CENTERS & INSTITUTES**

**342 LABS & CREATIVE SPACES**

# STARTUP MINDSET

In addition to helping encourage entrepreneurs and guide the startup community across the North Texas region, the university is supporting faculty and students in converting their collaborative research discoveries into useful, marketable products and helping to protect and commercialize intellectual property developed at UNT.

## COMMERCIALIZATION AND LICENSING

UNT places a high value on the impact its research imparts on the world. That impact can come from multiple activities including building startup companies, training leaders for science and engineering growth, publication of fundamental research, licensing technology that creates products and services, and providing services to different communities that serve needs unmet or otherwise lacking throughout our world. With the growth of research at UNT, the Office of Innovation and Commercialization is expanding its efforts in licensing technology and economic development to encourage faculty's impact across the research, academic, business and social environments.

UNT faculty have been crossing the bounds of disciplines for years utilizing a solutions-focused thought process that involves the in-depth consideration of future problems. Through group activity, they've been able to drive innovation to propel industry and society forward.

"By working together, UNT is challenging what is known — and what is possible," says Michael Rondelli, associate vice president for innovation and commercialization. "We are bringing disparate techniques together and looking at things from many angles, both inside and outside the box. This allows for the creation of new ideas, new information and new solutions."

## ENTREPRENEURSHIP AND INNOVATION

UNT is growing a sustainable, business accelerator platform throughout the North Texas region, thanks to leadership from Jon McCarry at UNT's Murphy Center for Entrepreneurship and Innovation. McCarry is working to make the center a go-to resource for businesses, as well as UNT students, faculty, staff and alumni. In working to build a collaborative environment that facilitates the development of new business ventures that strengthens the prospects of early-stage companies in the North Texas region, the Murphy Center supports efforts to commercialize university assets. By building a strong ecosystem, UNT students have access to a range of services and opportunities to realize their potential.

Working with UNT's Office of Innovation and Commercialization, McCarry recently began discussions with venture capital firms eager to provide opportunities to students and access leading technologies developed by the university. Additionally, the Murphy Center has begun hosting international Venture Capital Forums, providing eligible alternative investment firms early- to growth-stage companies and institutional investors sector-focused private market events where industry practitioners present and discuss strategies and concerns alongside related UNT faculty and graduate students. These efforts support students' access to opportunities and build pathways to commercialization for UNT research.

"I'd like to see the Murphy Center become a leading resource for the North Texas region — partnering with a range of ventures, from innovative ideas to early-stage growth companies, while also building bridges with the investor community at large," McCarry says. "If we're doing our job correctly, new opportunities are blooming in concert with a vibrant environment. We want our innovative companies to keep their roots in the North Texan region and inspire others."

## UNT AND INSPECTIR JOIN FORCES IN THE WAR ON DRUGS

UNT College of Science chemistry professor Guido Verbeck and InspectIR Systems LLC are collaborating to commercialize a system for detecting drugs by analyzing a person's breath.

"Using a mini mass spectrometer and special filters, my device can detect and identify chemical molecules in a gas," Verbeck says. "That means it can literally smell and identify substances on your breath."

Verbeck is working with John Redmond and Tim Wing, founders of InspectIR, on a breathalyzer for commercial release that will detect any number of drugs.

"With opioid abuse at an all-time high, it is imperative to get a device on the market that can detect drug use on the spot," Redmond says.

The breathalyzer is about to enter the market and will initially test for tetrahydrocannabinol or THC, the principal psychoactive constituent of cannabis.

"We are based in Frisco, so UNT's new campus here will allow InspectIR and Dr. Verbeck to engage in a working relationship and collaboration for more expedient research, design and development," Redmond says.





## EMPOWERING ENTREPRENEURS IN THE REGION

UNT is a founding collaborator in Inspire Frisco, a public/private program focused on the development of the innovation ecosystem across the North Texas region. The innovation ecosystem, which encourages startup companies across a region, also reduces transaction costs for all players who are involved in the startup ecosystem, allowing for faster growth and fewer failures from issues that are not product related. Inspire Frisco provides mentoring, education and networking events for entrepreneurs at UNT's Inspire Park in Frisco, as well as distinct programming to bring together all of the stakeholders in the ecosystem including entrepreneurs, employees, financiers, suppliers, customers and service providers. Each month, Inspire Frisco provides free networking events around a speaker series at UNT's Inspire Park. Additionally, UNT provides mentoring services for free to scalable, technology-focused startups through Inspire Frisco.

"The goal is to help startups get to a point where they can attract investors and also help businesses that are ready to scale up," says Steven Tudor, assistant director of licensing in UNT's Office of Innovation and Commercialization, pictured left with Jon McCarry, senior director of the Murphy Center for Entrepreneurship and Innovation, center, and Michael Rondelli, associate vice president for innovation and commercialization, right.

"We are laying groundwork and building relationships," says Tudor, who explains that these relationships will develop as UNT grows its presence in Collin County, with a new branch campus scheduled to break ground in 2022. "UNT will soon have a larger physical presence, and those relationships will be valuable to our students and faculty who are looking for jobs and collaborators."

UNT opened Inspire Park as a business incubator space in October. Classroom space is providing opportunities for hands-on problem solving and partnership-based educational opportunities for the business community as well. Inspire Park also supports corporate collaborations in leased spaces. UNT is looking for collaboration opportunities with companies that will help advance its mission at Inspire Park, leveraging their business expertise and the university's research resources to create a larger impact across the North Texas region.



## NETDRAGON DIGITAL RESEARCH CENTRE

UNT's NetDragon Digital Research Centre offers students and faculty sponsored research and technology development opportunities, online courses, internships and learning opportunities for students.

UNT has joined forces with Digital Train Limited, a leader in internet and mobile internet educational content and delivery, to launch its NetDragon Digital Research Centre this year. Digital Train Limited, one of many companies owned by NetDragon founder Dejian Liu, left with UNT President Neal Smatresk, provided \$500,000 as startup funding to launch the centre and provide seed money for initiatives. The centre will provide unique opportunities for student internships and faculty training, technology development, sponsored research across multiple disciplines and deployment of online courses to further enrich student learning experiences.

The centre is directed by Thomas D. Parsons, National Academy of Neuro-psychology fellow, professor in the College of Information and founding director of UNT's Computational Neuropsychology and Simulations Lab.



## INSPIRE PARK

Unanimous approval of UNT's new "public-public" partnership with the City of Frisco and its Frisco Economic and Community Development corporations is making way for what will ultimately be a branch campus to serve at least 5,000 students, providing higher education and research opportunities for future generations.

Currently, UNT teaches about 1,600 students in Collin County each semester — about 1,200 at UNT at Frisco's Hall Park location, which opened in spring 2019, and about 400 at the Collin Higher Education Center in McKinney. As one of the fastest-growing cities

in the nation, Frisco's population seeks convenient higher education opportunities in a complex, forward-looking corporate ecosystem. Construction on the UNT branch campus is scheduled to start no later than March 2022. A master plan for the initial site will be developed with representatives from Frisco.

Inspire Park is a 50,000-square-foot building on 4.8 acres in Frisco located in close proximity to the future campus. Currently, Inspire Park operates as a business incubator for startup companies, as well as classroom and meeting space for several classes in Frisco.

# UNT

EST. 1890

Office of Research and Innovation  
1155 Union Circle #310979, Denton, Texas 76203-5017

Nonprofit  
Organization  
U.S. Postage  
PAID  
Denton, TX 76201  
Permit No. 455



***“Our reaffirmation as a Tier One research university by the Carnegie Classification is a testament to the hard work and dedication of our outstanding faculty and staff to provide our students the best education and to help them succeed. This recognition speaks to the quality and impact of the research being conducted at UNT, and it is further evidence of our continued progress toward national prominence as a leading research university.”***

***— UNT President Neal Smatresk***

**Learn more about partnering with UNT at [research.unt.edu](https://research.unt.edu).**