UNT

RESEARCH

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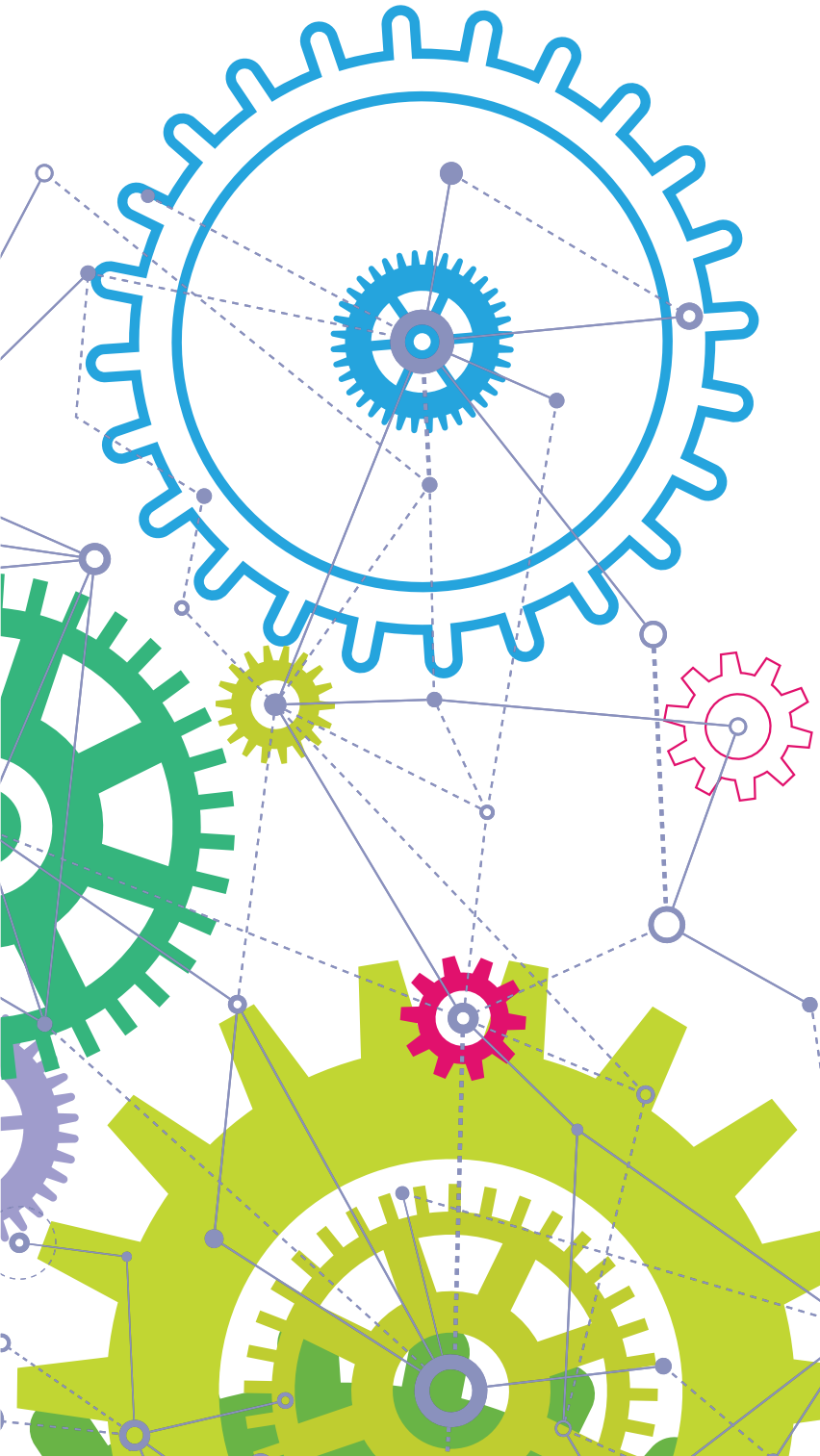

DISCOVERY THROUGH COLLABORATION

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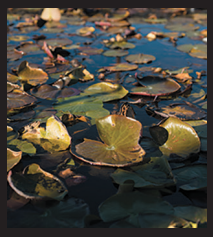
INSTITUTES OF RESEARCH EXCELLENCE



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RESEARCH

KNOWLEDGE. DISCOVERY. INNOVATION.

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24 DISCOVERY THROUGH COLLABORATION

From manufacturing new materials and bio-engineering new plants to understanding the effect of air pollutants on people's health and creating new ways of visualizing data, UNT is where collaboration drives innovation. Researchers work together across disciplines — tapping into partnerships with other universities and industry leaders — to make new discoveries and create innovative solutions to improve the world and sustain the future.

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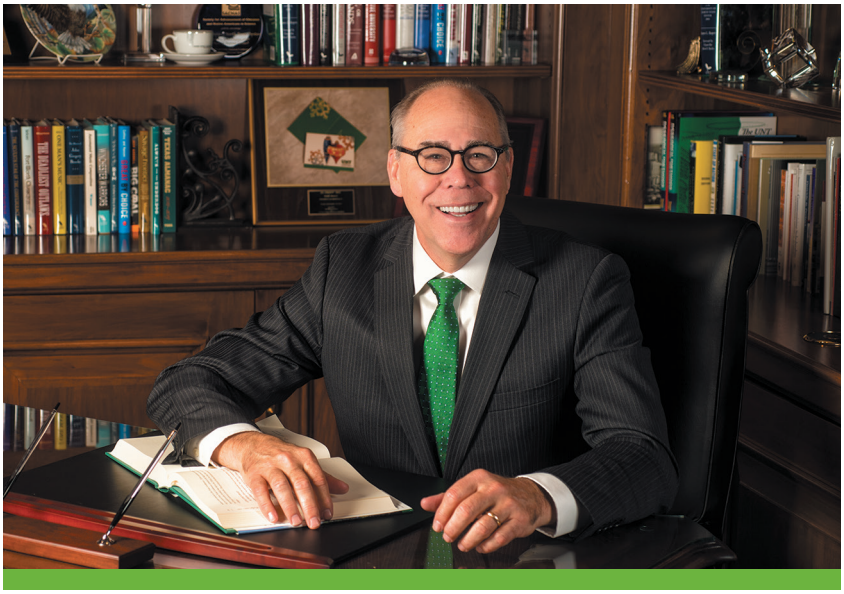

INNOVATING TOGETHER

It's a busy time for faculty and student researchers at the University of North Texas as we continue to look for solutions to many of society's most challenging issues and build a body of work that directly impacts the world around us. Researchers across the university are joining forces to use their combined expertise to drive innovation and fuel discoveries that are changing the shape of industries and our world.

UNT has made significant strides. In just the last year, UNT's Office of Innovation and Commercialization acquired six patents, executed several licenses and currently is in the process of negotiating many more agreements. Mike Rondelli, our associate vice president for innovation and commercialization, leads this tremendous progress, which I know is the cornerstone of our continued success as a pacesetting research university.

In the coming year, our momentum as a research university will continue as we build additional programs that foster innovation and production from our faculty and student researchers. We're entering a new era of research excellence and investing in successful programs like biomedical engineering, one of our fastest-growing programs at UNT. We recently broke ground on a new building for the program at Discovery Park, our 300-acre research park – the largest university research park in the North Texas region.

UNT's creativity and innovation is unparalleled in the state of Texas and greatly contributes to the world around us.

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URCM 12/18 (19-226)

TRENDING @ UNT

BIOLOGIST ELECTED TO ROYAL SOCIETY

WORLD-RENOWNED PLANT RESEARCHER EARNS PRESTIGIOUS RECOGNITION

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 400 papers and chapters on these and related topics 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 66,000 times. Dixon is the founding director of UNT's BioDiscovery Institute and currently serves as its associate director.

Most recently Dixon, with researchers from the institute, discovered ways to alter tannins in alfalfa to improve the environmental footprint of the crop for livestock. Their findings were published in *Nature Plants* journal.

"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."

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.

"For me, it is exciting to look at the impact the services we will provide through this grant will have on our community," Ceballos says.

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.

Cartwright says the grant will result in UNT developing partnerships with more than 20 agencies in the Dallas-Fort Worth area to train therapists in cultural competency. Additionally, 33 UNT master's students will work as interns with community partners who primarily serve Latino and African-American communities.

"This is about the people in these communities getting the help they need," she says. "Our goal is that it extends beyond the interns and reaches the citizens in underserved communities."

OUTREACH FOR ESL STUDENTS AND SCIENCE TEACHERS

Rossana Boyd, director of the Bilingual/ESL Teacher Education programs and principal lecturer in the College of Education's Department of Teacher Education and Administration, recently collaborated on a National Science Foundation grant with the College of Engineering's Nandika D'Souza and the College of Science's Richard Dixon, who are researching whether lignin can become a valuable bioproduct from the biofuels industry.

Boyd conducted outreach to bring Latino science teachers and the English Language Learners they instruct to UNT to learn about the new plant research.

"I want these students to see themselves as scientists," Boyd says.

Read more about Boyd and listen to her discuss her projects at *research.unt.edu*.

NSF EMERGING FRONTIER GRANT

Through a $2 million grant from the National Science Foundation, physics researchers Arup Neogi, a University Distinguished Research Professor, along with professor Arkadii Krokhim, 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."

The two disproved the theory by taking into account viscosity of fluid and not just air. Based on the revised theory, they created a nonreciprocal acoustic device. In one direction sound moves though the device much more easily than in the other direction.

"The applications are endless," Neogi says. "Acoustics, communications and stealth technology are all areas that will benefit from our findings."

Neogi and Krokhin's 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.

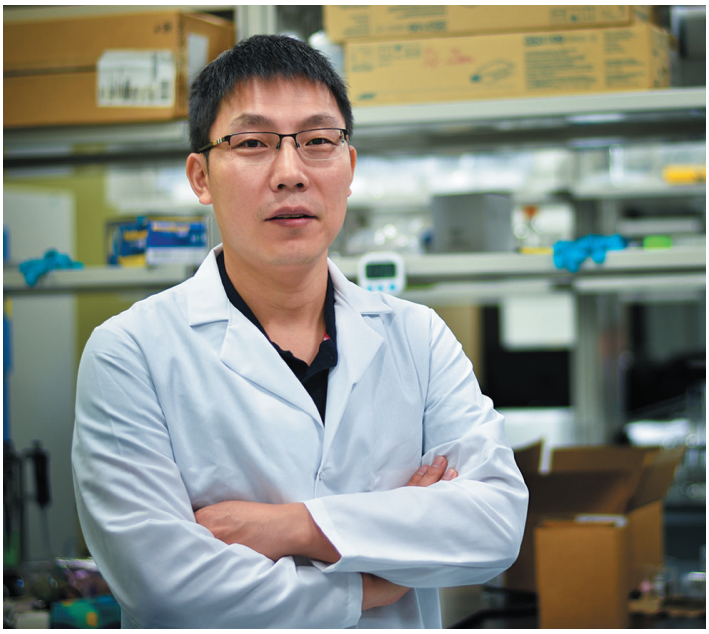
MEDICAL STENT THAT BIODEGRADES

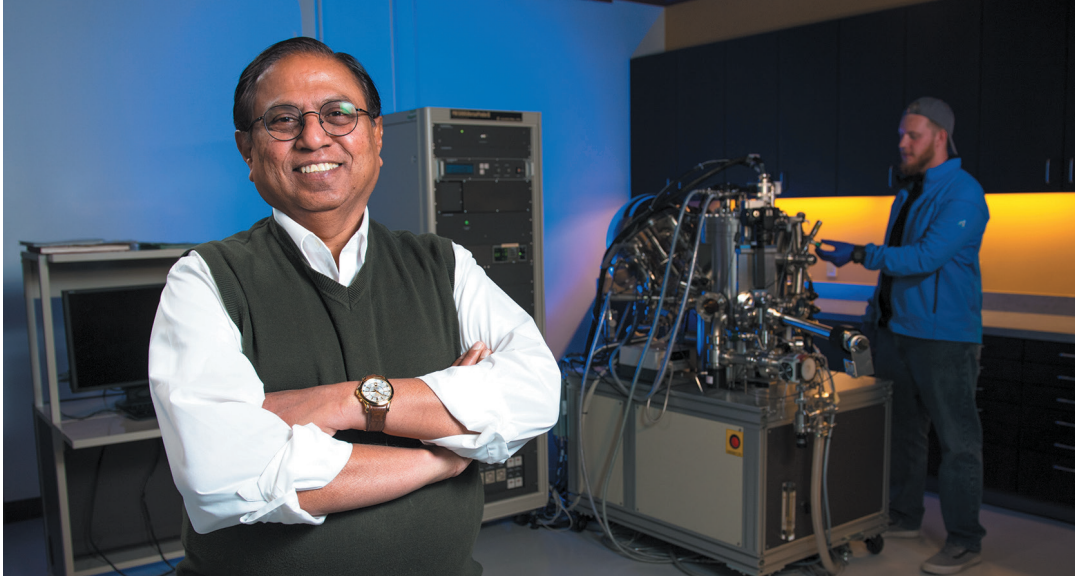
The College of Engineering received a $2 million grant from the National Institutes of Health to develop a biodegradable medical stent.

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.





LIFETIME ACHIEVEMENT AWARD

Narendra Dahotre, interim vice president of research and innovation and a Distinguished Research Professor in the College of Engineering, 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.

Dahotre, who has worked with laser processing for more than 25 years, has received 16 U.S. patents and has published more than 270 articles in professional journals.

PRESTIGIOUS POWE AWARD

College of Engineering assistant professor Tao Yang, right, 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.

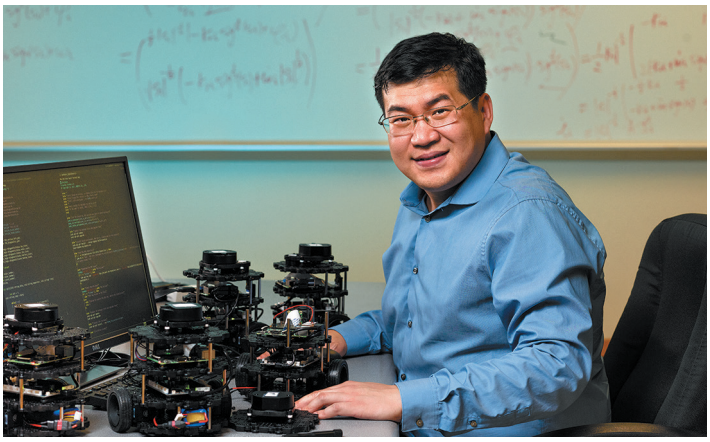
DESIGNING SMALLER, FASTER MICROCHIPS

Chemistry professor Oliver Chyan developed a way for microchip manufacturers to view flaws in their chips that were previously unobservable.

"Currently, if one part of a chip doesn't work, chip makers will try various fixes without really understanding the underlying chemistry problem," Chyan says. "The scale of the microchip is so small that researchers literally don't have the ability to see the fault in the chip."

But through highly sensitive infrared spectroscopy, it is possible to see which chemical bonds succeed and which fail in the nanometer-size domain. This gives chip makers the ability to focus their designs using reliable hard data.

Chyan adds that the new technology will revolutionize how chips are manufactured and lead to smaller chips and faster computing times.



#METOO MOVEMENT DIGITAL ART

Liss LaFleur, assistant professor of new media art in the College of Visual Arts and Design, was selected for an Immersive Scholar Residency to produce new, digital-based artwork using data from the #MeToo movement. #MeToo is a hashtag used in social media to demonstrate the widespread prevalence of sexual assault and harassment.

"I want to create a piece that will make a viewer think both inward and outward," LaFleur says. "My goal is for this work to enhance the visibility of the movement, provide emotional relevance to the viewer and maybe lead to policy changes that make a difference."

LaFleur spent the six-week residency creating immersive, open source content for the large-scale digital walls in the James B. Hunt Jr. Library at North Carolina State University. The commission was part of "Visualizing Digital Scholarship in Libraries and Learning Spaces," a grant awarded from the Andrew W. Mellon Foundation to support the advancement of tools and techniques for developing and sharing large-scale visual content for research.

LaFleur says the project was completed mostly by women and members of the queer community, an underrepresented population in technology and new media art.

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."

FLOWER'S SEED OIL FOR RENEWABLE LUBRICANT

Diana Berman, a professor in the Department of Materials Science and Engineering and researcher in UNT's Advanced Materials and Manufacturing Process 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 and the University of Nebraska-Lincoln, Chapman and Berman are examining the oil from different perspectives.

"As soon as we saw the molecular structure of the oil, we knew it could make an excellent lubricant," Berman says. "The more we learn about the oil, the more we believe the applications for industry can be enormous."

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.

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's changed in today's technology-driven environment.

The grant will allow Kim to travel to Korea University Business School, the top private university in South Korea, in February. Once there, he'll begin a six-month stint teaching and researching along with other world-class scholars.

Darrell Hull, professor of educational psychology, will use his Fulbright grant to travel to Jamaica to study "unattached" youth — young people who are unemployed and are not in school or any training programs.

Hull will examine the long-term impacts of a training program designed to reach Jamaican youth who aren't working or in school, as well as assess the psychometric validity of measures used to evaluate youth in developing countries. While in Jamaica next year, he'll also lecture on observational studies and field trial design and analysis at the University of the West Indies – Mona Campus.

RENOWNED MODERN ARAB ART HISTORIAN

Nada Shabout, professor of art history and the coordinator of UNT's Contemporary Arab and Muslim Cultural Studies Initiative, received a Creative Capital Andy Warhol Foundation Arts Writers Grant for *Demarcating Modernism in Iraqi Art: The Dialectics of the Decorative, 1951-1979,* a book she will write about modern artists and critics in Iraq who were instrumental in constructing the language of art.

She's also the co-editor of the book *Modern Art in the Arab World: Primary Documents* for the Museum of Modern Art in New York City. And *Artsy.net* named her as one of "Eight Influential Female Art Historians You Should Know," citing her for "increasing the visibility of art from communities that often go overlooked in the contemporary art world."

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 is 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.

DISCOVERING NEW 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.

"This process not only refines but also homogenizes the microstructure leading to enhanced tensile and yield strength," Nene says.

COMPUTER ENGINEER EARNS TECH TITAN AWARD

Renee Bryce, professor in the Department of Computer Science and Engineering, received the 2018 Tech Titans of the Future–University Level Award.

The award honors Dallas-Fort Worth area higher education institutions that encourage and support students in pursuing engineering- and technology-related disciplines.

Bryce, below 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.

FUELING THE CREATIVE ECONOMY IN FRISCO

PARTNER WITH UNT®

Frisco city leaders teamed up with the University of North Texas to attract businesses and titans of industry. Other university partners such as the Dallas Cowboys are taking advantage of UNT's resources and collaborating to grow in this rapidly changing marketplace — where creative minds are key to prosperity.

Find out how you can partner with UNT at *unt.edu/friscopartners.*

ENGINEERING NEW MATERIALS

UNT researchers are leading the way in the Fourth Industrial Revolution — the fusion of manufacturing design, process and production — to transform how industries engineer new materials and devices.

BY: JIM ROGERS

It is a time of marvels and miracles, a time when 3D objects can literally be printed from a computer. Look around. It's the Fourth Industrial Revolution, where manufacturing design, process and production are combining into one comprehensive whole. New technology is leading industry into the age of additive manufacturing where it will be possible to design and print a final product using only the materials needed without ever leaving your chair.

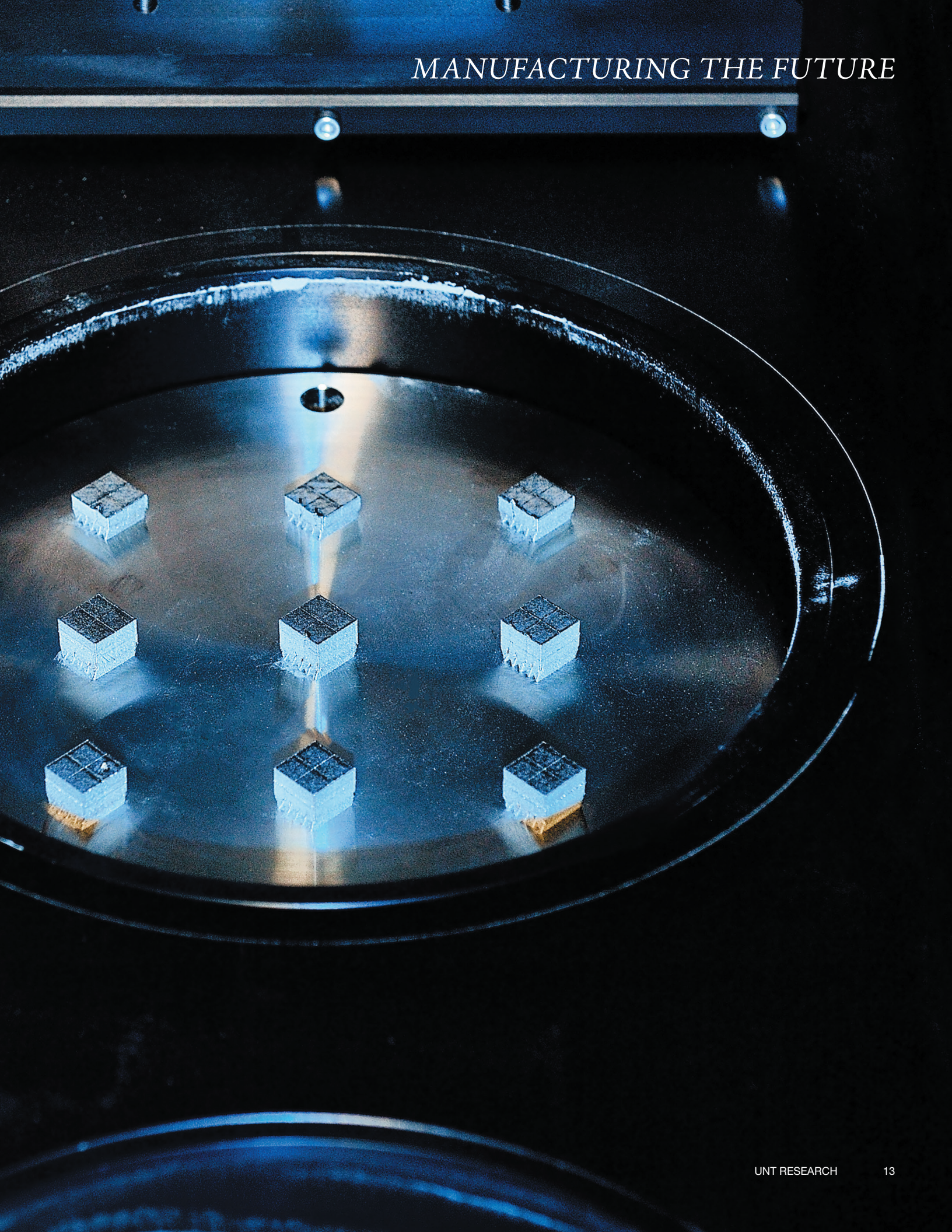
"The uses for additive manufacturing have the potential to transform a wide variety of industries — from the oil fields to the operating rooms," says Narendra Dahotre, interim vice president for research and innovation at UNT. "Imagine knowing exactly what you want to create, exactly how much it will cost, exactly how much materials will be needed and exactly how long it will take to complete. Additive manufacturing is the industry's dream come true."

At UNT, researchers are probing the possibilities of additive manufacturing through its highly advanced Additive Manufacturing Laboratory. The lab is located within UNT's College of Engineering right next to the Materials Research Facility in Discovery Park, the North Texas region's largest research park. UNT is the only university in the nation with this configuration across fields to better advance the science and application of additive manufacturing. The lab is one of the key assets being leveraged in UNT's new Center for Agile and Adaptive Additive Manufacturing (CAAAM) to move Texas further along in advancing additive manufacturing technologies and meeting the growing demands for additive manufacturing of high-performance and functionally efficient advanced materials.

PERFECTING THE PROCESS

Additive manufacturing may sound complicated, but the theory isn't. Instead of building a sandcastle by subtracting sand away from a pile until the structure appears, imagine adding sand beginning at the bottom and moving up layer by layer until a castle is built. In the actual application of additive manufacturing, the grains of sand would be placed one at a time in a specific

MANUFACTURING THE FUTURE



"For UNT, it's not just about the research. The lab will provide a platform for education where students and faculty will be exposed to the latest technology and in turn provide a trained workforce for the future of manufacturing."

— Rajarshi Banerjee

Regents Professor and director of UNT's Materials Research Facility

order pre-determined by an enhanced computer design.

"Additive manufacturing is a new area of engineering," says Rajarshi Banerjee, Regents Professor and director of UNT's Materials Research Facility. "As such, there are many unexplored areas and unanswered questions. For example, we are finding that the structure of certain metallic materials has fundamentally changed after going through this process. The aluminum alloy powder used to create a component using additive manufacturing technology may look the same and be chemically similar to those produced using traditional manufacturing, but it has a different microscopic structure and properties. The question we are trying to answer is 'Why?'"

At this time, most additive manufacturing involves plastics and polymers. UNT has taken the materials involved several steps further to include metals, ceramics and metal-ceramic composites. Due to the change that occurs to materials during processing, Banerjee's research also involves the creation of additive manufacturing-specific alloys. These alloys are better adapted to additive manufacturing processes and provide for a consistent end product.

Additive manufacturing is capable of producing higher-strength and more energy-efficient materials while reducing the actual amount of materials needed, wear and tear on parts and use of natural resources. The shapes created are anything but simple. These shapes can be hollow and contain other hollow, internal shapes like Russian nesting dolls. This allows for the printing of objects from struts to gears to be printed inside the primary shape as it is being created.

"For UNT, it's not just about the research," Banerjee says. "The lab will provide a platform for education where students and faculty will be exposed to the latest technology and in turn provide a trained workforce for the future of manufacturing."

TRANSFORMING INDUSTRY

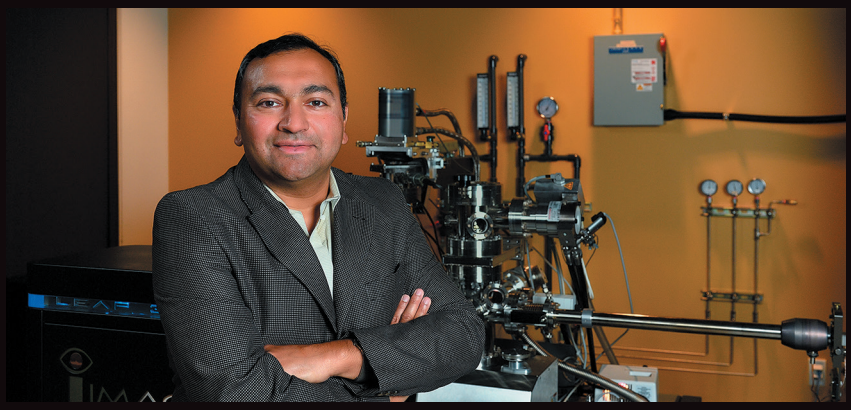
There was a time when designers, architects and engineers would sit for hours at a drafting table creating blueprints for everything from small toys to automobiles. Then, with the advent of computers, computer-aided design and drafting (CADD) became an everyday tool. Users could produce 2D drawings, correct and modify them, print them out on paper as a final draft and then build a 3D model.

Now, UNT students and faculty have moved beyond the drafting table, beyond 2D CADD and beyond hand-made models. Utilizing the latest in CADD programming

and 3D printing, additive manufacturing users at UNT will develop the skills needed to design and manufacture products in an ever-changing industry. But this doesn't just apply to students and researchers using the Additive Manufacturing Lab. UNT libraries operates The Factory, an innovation lab/makerspace with two locations on campus. These spaces are used to provide students from all disciplines with access to equipment, software and training — including 3D printers and CADD systems — to promote innovative, cross-disciplinary learning.

In a 2016 *Nature Materials* article, "Policy Needed for Additive Manufacturing," the authors point toward a future where additive manufacturing must go hand-in-hand with materials science — which is exactly what happens at UNT. The article also goes on to state that the best way for industry and future workers to learn is to "learn by doing."

"By providing students and researchers with all of the current tools needed in not just additive manufacturing but materials science and general engineering, UNT is creating the next generation of investigators and technicians who will not only work in the additive manufacturing world but also help bring about the next stage in advanced production," Banerjee says.



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) 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 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.

MULTI-DIMENSIONAL CHARACTERIZATION LAB

The instruments in this lab are complementary to each other such as the trio comprising the dual-beam focused ion beam microscope (FIB-SEM), the high-resolution analytical transmission electron microscope and the 3D atom probe microscope. The FIB-SEM allows one to carry out high-resolution scanning electron microscopy on various materials and components from industry and site-specific or location-specific sample preparation, and these samples can immediately be analyzed using the TEM and 3D atom probe.

Additionally, the lab has a range of other microscopy, spectroscopy and X-ray diffraction instruments, all located in close proximity in a central location. The facilities in the lab are used by researchers from industries such as aerospace, defense, and oil and natural gas, as well as academic investigators from around the world.

NANOFABRICATION CLEANROOM

The cleanroom features about 3,000 square feet of clean space and includes a class 100 lithography area and a class 10,000 metallization wet and dry processing and characterization area. Its capabilities emphasize nano and micro-device development, biomedical, advanced materials, photomask fabrication, OLED device fabrication and thin film techniques. This open-access facility is used in a wide variety of engineering disciplines, including materials, mechanical, electrical and biomedical, along with chemistry and physics.

RESEARCH AT THE BOTTOM OF THE WORLD

BY: PAOLA VEZZANI

The Sub-Antarctic Biocultural Conservation Program received a major financial boost in 2018 when the Chilean government awarded the Cape Horn Biosphere Reserve $20 million for the construction of a new Sub-Antarctic Cape Horn Center, which is being constructed in Puerto Williams, Chile, at the southern tip of South America. The center, scheduled to open in 2020, aims to become a national and international model for the long-term study of social sciences and ecology in the context of global climate change.

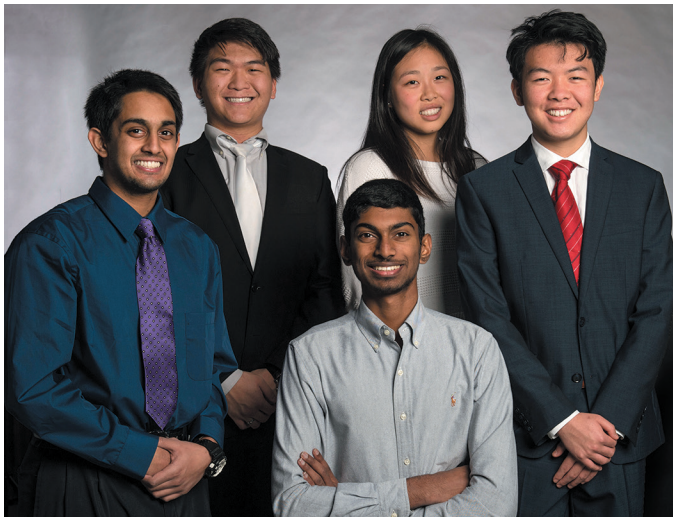
"This means an opportunity to strengthen the social mission and research excellence in a privileged place for the monitoring of climate change and testing of a sustainable development," says Ricardo Rozzi, the director of the Sub-Antarctic Biocultural Conservation Program and a UNT professor of philosophy and religion.

The Sub-Antarctic Cape Horn Center will be a world-class 2,750 square-meter facility focused on promoting sustainable development for the Chilean Antarctic Province. In addition to featuring space dedicated to scientific research that aims to attract specialists from around the world, the center also will include an interpretive visitor center where tourists can learn about the biodiversity of Cape Horn.

The Sub-Antarctic Biocultural Conservation Program is a consortium led by UNT in the U.S., and other Chilean universities and institutions. Since 2006, students from UNT and various other U.S. and South American universities have participated in Tracing Darwin's Path, a study abroad program in the UNESCO Cape Horn Biosphere Reserve that blends environmental philosophy and biology with the study of art and culture. The Sub-Antarctic Biocultural Conservation Program at UNT, the Universidad de Magallanes and the Institute of Ecology and Biodiversity in Chile coordinate this interdisciplinary program. In June 2018, UNT joined the University of Magallanes in Chile, the Catholic University of Chile and the Chilean Institute of Ecology and Biodiversity in consolidating a partnership strategy for the management of the Cape Horn center.

"The new center will provide UNT students along with students around the world with an extraordinary opportunity to experience the transdisciplinary approach to biocultural conservation in one of the last pristine regions of the world," says Rozzi.

INNOVATORS TO WATCH



CREATING A CULTURE OF DISCOVERY

UNT STUDENTS ARE LEARNING FIRSTHAND HOW THEIR INNOVATION CAN IMPACT ART, SCIENCE AND CULTURE.

REGENERON SCIENCE TALENT

Ashwin Kumar, Ted Zhao, Sarah Zou, Abhishek Mohan and Tan Yan (above from left), students in UNT's Texas Academy of Mathematics and Science, 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.

GENETICS AND STEM EDUCATION

Chipo Gray, a master's student in biological sciences, discovered her passion for research as a biochemistry undergraduate at UNT. After graduating in 2014, she worked in the health care system as a certified nurse assistant and returned to UNT in 2016 for graduate studies. Gray's keen interest in genetics led her to the lab of Pamela Padilla, professor of biological sciences and interim associate vice president for research and innovation, where she conducts research. Her experiences as a genetics teaching assistant and with the UNT Elm Fork Education Center helped Gray realize she also has a passion for STEM education, which she shared at the 2017 national conference for the Society for Advancement of Chicanos/Hispanics and Native Americans in Science. Gray plans to pursue a career in biology education with a concentration in genetics with hopes to teach at the community college level.

PRESERVING LANGUAGES

Sumshot Khular, an international student pursuing a master's in linguistics, is trying to save her disappearing Lamkang language. An Indian native from the northeastern state of Manipur, Khular has worked with UNT linguistics professor Shobhana Chelliah and several other UNT students to create a writing system — Lamkang Online Lexical Database — for the language that will provide the community, students and researchers access to the ways the language puts sounds and words together for communication. She's used techniques such as acoustic analysis, linguistic annotation, rapid word collection, sound identification, and how verbs and relative clauses function to translate the language. Lamkang is labeled as "critically endangered" since fewer than 10,000 speakers remain, according to UNESCO.

IBM MAINFRAME WINNER

College of Business senior Anna McKee became the first woman to win 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. In addition to coming in first in North America, McKee also was ranked in the top three of competitors globally. She had to come up with creative solutions to real-life computing problems and coding errors. For the final task, 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.

INTERACTION DESIGN

Through Max Parola's work as an undergraduate studying psychology in the xREZ Art + Science Lab, he became interested in human computer interaction research and saw how it translated into the growing industry of interaction design. The lab, directed by Ruth West, an associate professor of design and new media, is a creative studio and research space with a focus on new discoveries at the intersection of arts, sciences and humanities. Parola developed research skills working on projects focused on virtual reality, human computer interaction and 3D segmentation. He says his lab time inspired him to enroll in UNT's new master's in design program, with a concentration in interaction design, which involves designing interactive digital products, environments, systems and services. Parola is on track to become the first graduate of the program in December.

IDENTITIES ON THE JOB

Researcher Kathryn Ostermeier, who recently earned her doctorate in management from UNT, used her dissertation to study how different identities at work or at home impact people on the job. For example, an individual who has to balance a role as a health care provider, where the focus is on patient care, with a role as a hospital employee, which has an additional focus on profitability, may feel conflicted regarding the two roles. In her research, *A Foot in Two Worlds: Exploring Organizational and Professional Dual Identification*, Ostermeier found that multiple identities can hurt work performance if the individual hasn't reconciled the identities. Ostermeier graduated in May and is now an assistant professor of management at Bryant University in Rhode Island.

MARIACHI RESEARCH

José R. Torres-Ramos, a College of Music doctoral candidate in ethnomusicology, has spent the past year completing dissertation fieldwork on mariachi music culture in Mexico as part of a Fulbright-Hays Doctoral Dissertation Research Abroad Fellowship. He is researching the connection between male-dominated mariachi music, body language and music text. For example, a trumpet player in a mariachi band may play harsh and out of tune, compared to the smoothness of a trumpet in an orchestra, as a way to assert himself in the ensemble and the embedded masculine sociology of mariachi music. He is the first UNT Ph.D. candidate to earn this honor, and he hopes to become an ethnomusicology professor.

VISUALIZATIONS OF BIG DATA

Accounting doctoral candidate Megan Seymore, CPA, has been awarded the $10,000 Michael J. Barrett Doctoral Dissertation Grant to study how visualizations of big data and differing data sources influence decision-making in internal audits. The grant comes from the Institute of Internal Auditors' Internal Audit Foundation. The award will help fund Seymore's doctoral research, examining the way data analytics and different sources for information can alter business judgments. Internal audit reports have traditionally been text-heavy documents. However, auditors are increasingly incorporating visuals to help explain results from large data sets.

PROTECTING NANOELECTRONICS

Benjamin Sirota, a doctoral materials science and engineering student, worked with a team of collaborators from the U.S. Air Force Research Laboratory and the National Institutes of Standards and Technology to develop a metal film for nanoelectronics that can be sandwiched with an ultra-thin protective layer. His research, which explains a new method for protecting nanoelectronics that will result in longer-lasting components with better electronic stability, was published in *Nature's Scientific Reports* last summer. Sirota was mentored by Andrey Voevodin, professor and interim associate dean of UNT's Department of Materials Science and Engineering.

SIEMENS FINALISTS

Four of UNT's Texas Academy of Mathematics and Science students were named regional finalists in the 2017 Siemens Competition in Math, Science and Technology. David Yue was part of a team with a student from St. Mark's School of Texas, Abhishek Mohan worked in the laboratory of UNT physics professor Mohammed Omary, and Sahil Patel and Steven Sun both worked in the laboratory of UNT physics professor Carlos Ordonez. Fifteen TAMS students were named regional semi-finalists in this year's competition, the second largest number of semifinalists.

INNOVATIVE SPACES

UNT is committed to continually improving facilities that enable faculty, students and external research partners to conduct high-level, solutions-based research in key areas. This infrastructure — from physical space to high-end research equipment to innovative technology — fosters collaboration and new ideas and is key to research that leads to discovery or enrichment in a field. Recent building and renovation projects — including a new Biomedical Engineering Building at Discovery Park, a new Genomics Center and an addition to the Art Building — reinforce the university's academic and research efforts. In October 2018, UNT acquired the 50,000-square-foot former North Texas Enterprise Center building, now known as Inspire Park (see page 11). The facility is located close to the 100 acres where UNT will build its Frisco campus.

GROWING BIOMEDICAL ENGINEERING PROGRAM

The UNT College of Engineering is adding a new 26,250-square-foot building to its Discovery Park campus.

The state-of-the-art building will 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 are scheduled to open in Fall 2019 and will contain two large research labs, three teaching labs and three classrooms, one of which will be tiered and seat nearly 200 students. Laboratory space will include a biomedical instrumentation lab; a biomedical modeling, biomechanics, and biomaterials (B3) lab; two optics labs; two cell culture labs; a senior design lab; and an 18-station open research lab. 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.

By adding the new building, the college will be better able to meet the demands of the rapidly growing department. The program has grown to more than 250 students since opening in 2014. The first undergraduate class graduated in May 2018, and the first group of graduate students were admitted in fall 2017.

GENOMICS CENTER SEQUENCES

UNT's state-of-the-art genomics laboratory is advancing next-generation research in genomics, one of the fastest-growing fields in modern science. The in-house laboratory is located in the Life Sciences Complex.

Part of the university's BioDiscovery Institute, the Genomics Center provides high-quality, low-cost DNA and RNA sequencing, as well as computational and statistical analysis of genetic data. Genomics, the field of DNA sequencing, has broad applications for the health of humans, plants, animals and the environment.

Slight modifications in the genome can result in developmental disorders and diseases or be found to create new, desirable traits. The data from the Genomics Center is assisting UNT researchers to develop ways to improve blood clotting, determine how probiotic supplements alleviate gluten intolerance and bolster the amount of useful oils a plant can generate. The researchers come from a variety of departments including biological sciences, mathematics, kinesiology, chemistry and engineering.

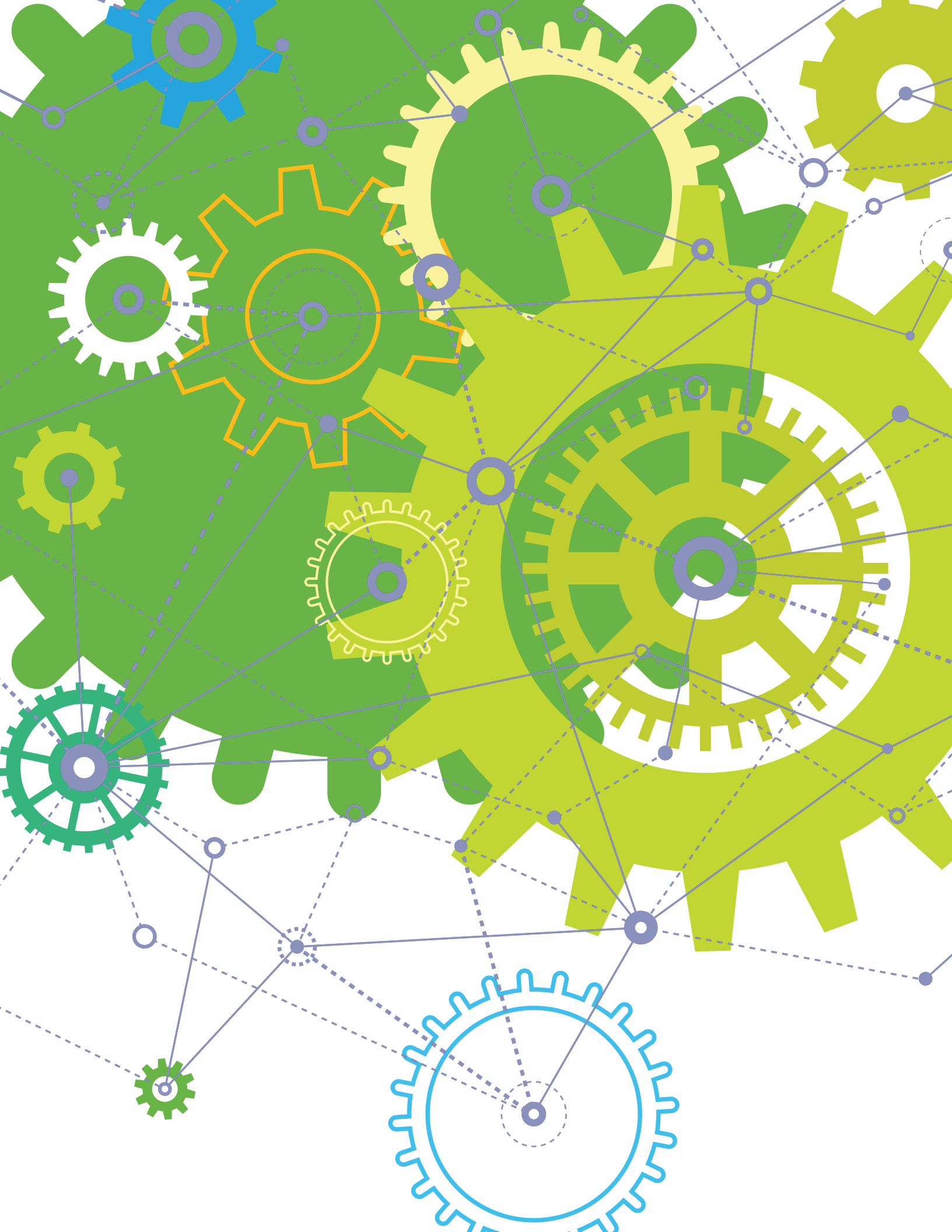
Recently, the center introduced robotics to assist with sample preparation and increase sequencing throughput and consistency.

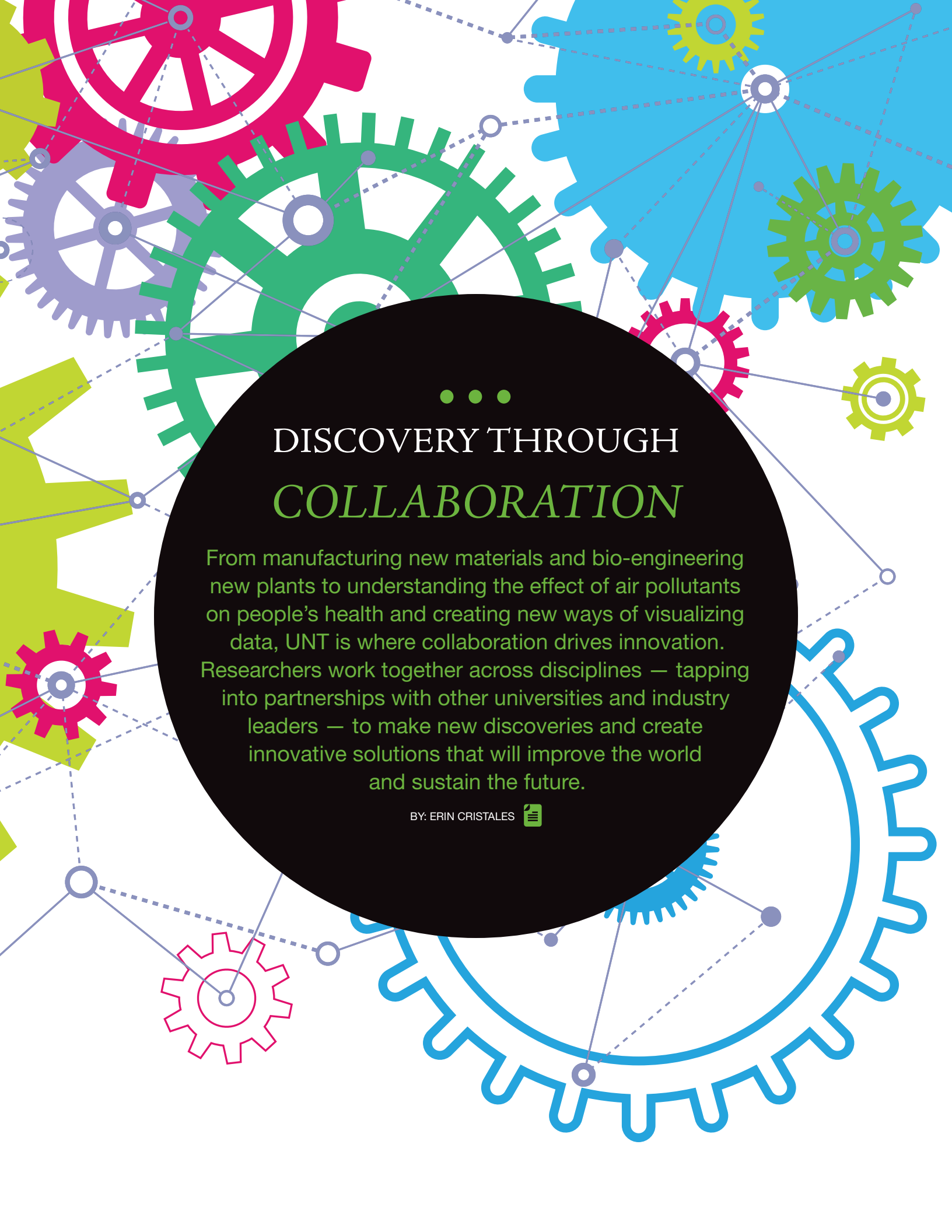
The laboratory enables UNT to work closely with business and industry leaders, while also giving students the opportunity to work in one of the newest frontiers of science. Since opening in 2016, the Genomics Center has sequenced more than 3 trillion bases of DNA and provided initial funding and experimental design consultation support to more than 30 research labs at UNT.

NEW ART BUILDING OPENS

The new Art Building housing the College of Visual Arts and Design opened for the Fall 2018 semester. 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 stunning series of world-class facilities, including a 19,000-square-foot, multi-purpose courtyard with landscaping and seating, at the heart of the building; 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.





DISCOVERY THROUGH *COLLABORATION*

From manufacturing new materials and bio-engineering new plants to understanding the effect of air pollutants on people's health and creating new ways of visualizing data, UNT is where collaboration drives innovation. 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.

BY: ERIN CRISTALES

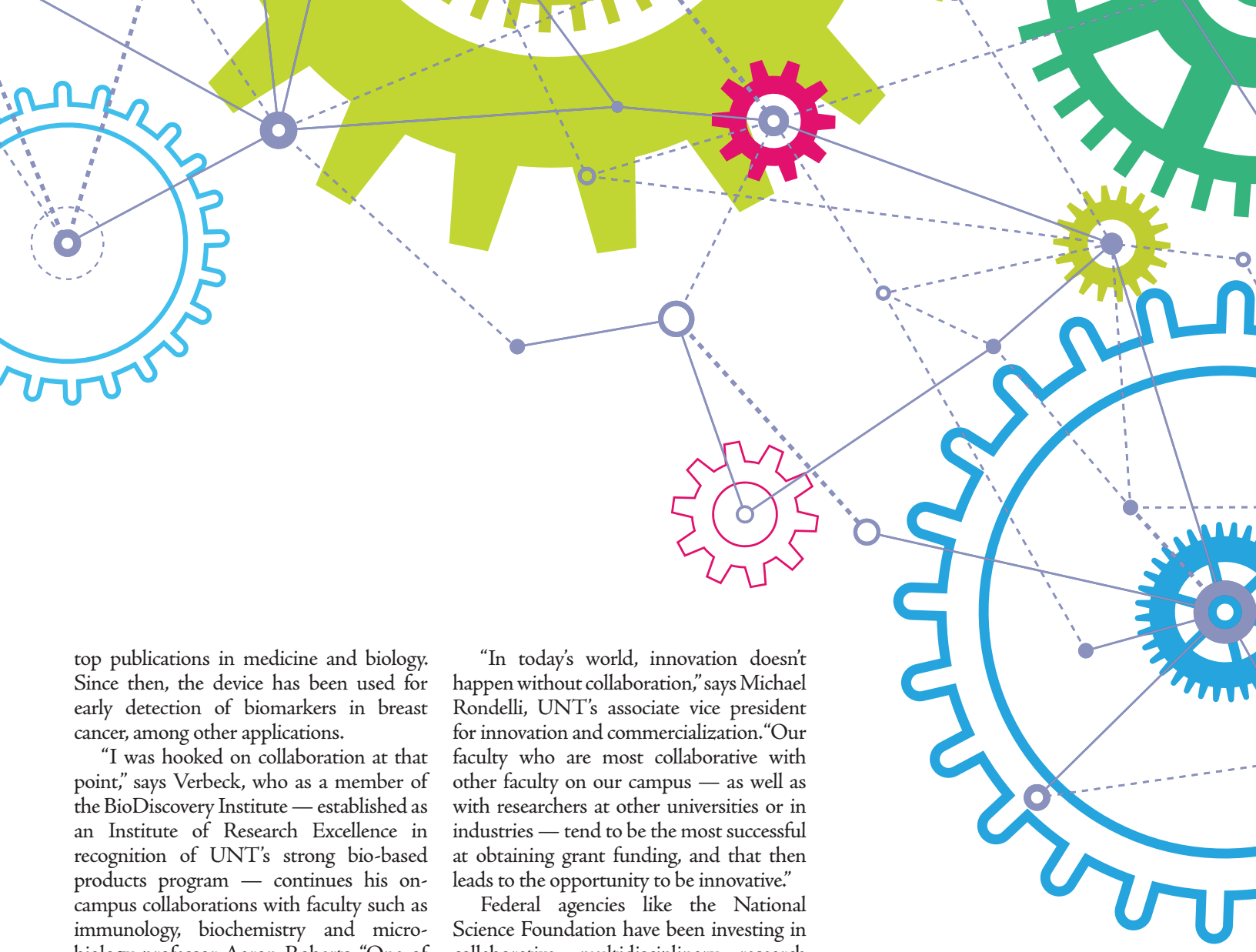
Adjacent to his office in UNT's Laboratory of Imaging Mass Spectrometry sits what Guido Verbeck refers to as an Erector Set. It's how all of his research starts out, he says — as brutally ugly, Frankensteinian piles of parts. But the inherent homeliness can't hide the truth of what this instrument, and all the others sprinkled throughout his lab, represent: aspirational deep dives into cross-disciplinary and corporate collaborations that yield tangible solutions to real-world problems.

"You start with Legos and end up with a Maserati," says Verbeck, a professor of chemistry and biochemistry who holds seven patents for his devices.

To his point, there's the instrument by his office. The creative combination of pieces culminated in the first iteration of a breathalyzer device to detect drugs, a collaboration with Frisco-based research and development company InspectIR Systems LLC, which focuses on portable opioid and cannabis detection tools. Funded by a National Institute of Justice grant, the device — now reconfigured into a sleeker model — addresses the need, born of the opioid crisis, to detect drugs on the spot, as well as the importance of preventing unjust jail time for presumptive drug use.

That device, in turn, is a natural extension of the instrument that sits in the back of Verbeck's lab. Developed in 2016, it's the world's first mechanical drug-sniffing "dog," which can be installed in patrol cars to locate certain chemical molecules in the air, particularly those used to create meth-amphetamines. He collaborated on an instrument grant with Inficon, a New York-based technology company dedicated to gas analysis, to build the device, and with UNT's Office of Innovation and Commercialization and Thermo Fisher Scientific, a leader in biotechnology product development, to develop software that allows the data gathered by the instrument to be processed in real time.

And then there's the instrument that started it all, perched right in the middle of the lab — the nanomanipulator, initially meant for forensic analysis, that Verbeck brought with him to UNT in 2006 after a stint in the corporate world. But after Regents Professor of biology Kent Chapman, now director of UNT's BioDiscovery Institute, asked if the instrument could drill down into a single cell, the two began collaborating on a research project to determine the fats in a plant organelle. The resulting paper, published in 2011 and titled "Visualization of Lipid Droplet Composition by Direct Organelle Mass Spectrometry," made a list of the year's



top publications in medicine and biology. Since then, the device has been used for early detection of biomarkers in breast cancer, among other applications.

"I was hooked on collaboration at that point," says Verbeck, who as a member of the BioDiscovery Institute — established as an Institute of Research Excellence in recognition of UNT's strong bio-based products program — continues his on-campus collaborations with faculty such as immunology, biochemistry and microbiology professor Aaron Roberts. "One of the things I love to do, and try to inspire other faculty to do, is to have discussions with other groups. Step outside your comfort zone."

OUTSIDE DISCIPLINE

You could almost view Verbeck's wildly successful instruments as a metaphor for cross-disciplinary research itself — a melding of distinct parts that create a functional, often world-changing whole.

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.

"In today's world, innovation doesn't happen without collaboration," says Michael Rondelli, UNT's associate vice president for innovation and commercialization. "Our faculty who are most collaborative with other faculty on our campus — as well as with researchers at other universities or in industries — tend to be the most successful at obtaining grant funding, and that then leads to the opportunity to be innovative."

Federal agencies like the National Science Foundation have been investing in collaborative, multidisciplinary research above all else for years, and universities that have integrated that approach into the way they do business have been the most successful. A 2012 NSF report, for example, indicated "research collaboration among multiple institutions is a growing trend," citing a 47-percent increase in academic research and development (R&D) funding from 2000 to 2009.

Over the past decade, UNT has been devoted to establishing labs that promote collaboration among faculty, other institutions and corporations. UNT's BioDiscovery Institute, where faculty like University Distinguished Research Professor of biological sciences Richard Dixon — recently elected as a fellow of the Royal Society in London for his

"One of the things I love to do, and try to inspire other faculty to do, is to have discussions with other groups. Step outside your comfort zone."

— Guido Verbeck
professor of
chemistry and biochemistry

JON MCCARRY

Senior director of the Murphy Center for Entrepreneurship and Innovation

MURPHY CENTER FOR ENTREPRENEURSHIP AND INNOVATION

UNT is leading an initiative to grow a sustainable, business accelerator platform throughout the North Texas region, thanks to new leadership from Jon McCarry for UNT's Murphy Center for Entrepreneurship and Innovation. McCarry plans to make the center a go-to resource for businesses, as well as UNT students, faculty, staff and alumni.

MISSION AND GOALS

The Murphy Center is working to build a collaborative environment that facilitates the development of new business ventures strengthens the prospects of early-stage companies in the North Texas region, and supports efforts to commercialize university assets. By building a strong ecosystem, our UNT students have access to a range of services and opportunities to realize their potential.

Over this first year, the Murphy Center is building frameworks to assist our students, faculty and staff looking to develop an idea. As well, we have begun working with early stage companies seeking resources and to take the next step. Our platform provides a range of support functions to foster success. Generating and supporting success means building a base of partners within the business community, institutional investors and venture capital firms.

STUDENT CONNECTIONS

Working with UNT's Office of Innovation and Commercialization, we recently began discussions with venture capital firms eager to provide opportunities to our students and access leading technologies developed by the university.

Additionally, we are developing and launching 30 venture clinics that provide targeted, concise content relevant to building successful startups. Our clinics include academic and practical perspectives. The practicals are typically led by industry practitioners and mentors, who have decades of experience in their fields of expertise. Clinical topics range from LLC formations to marketing analytics to patent strategies. We believe firmly that venture success is predicated on the success of influencers around the entrepreneur.

COMMERCIALIZATION

Lastly, the Murphy Center has begun holding 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 our research.

As we move forward, we will continue to build out our platform by adding services and onboarding new ventures. We hope to extend the reach of the Murphy Center throughout the region, becoming a leading resource for students and a partner for the venture community. With Texas being ranked the 10th largest economy in the world, the Murphy Center believes UNT has a leading role to play in the development of future entrepreneurial activities that contribute to the overall economy and impact the region in meaningful ways.

LINK WITH INVESTORS

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. 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 Texas region and inspire others.

groundbreaking work in plant science — consistently push the limits of what's possible. Chapman leads the institute, where he and assistant professor of materials science and engineering Diana Berman — as part of a joint effort between BioDiscovery and UNT's Advanced Materials and Manufacturing Processes Institute, along with researchers from the University of Nebraska-Lincoln, Indiana University-Purdue University at Indianapolis and Huazhong Agricultural University in China — are investigating the Chinese violet cress, whose seeds contain an oil that could be a competitor in the lubrication industry. Read more, page 8.

"As with any new knowledge, it takes a broad, in this case international, interdisciplinary team to fully take advantage of a discovery such as this," Chapman says.

UNT's Materials Research Facility — a state-of-the-art lab space that promotes innovative materials work — generated more than $7 million in research grants last year. It's where Regents Professor of materials science and engineering Rajarshi Banerjee develops multi-phase high-entropy alloys to revolutionize aircraft construction as part of a $900,000 grant from the Air Force Office of Scientific Research and where Regents Professor of mechanical and energy engineering Nandika D'Souza introduces her students to high-powered equipment that helps the team conduct boundary-crossing research to address unique consumer needs such as fiber sensors and bio-based foams for building applications.

"My research is trying to bring government, academia and industry together," D'Souza says.

And that's just scratching the surface of the collaborative hubs on campus. There's also UNT's Advanced Environmental Research Institute, which conducts science-based interdisciplinary environmental research that provides an understanding of how human actions impact the environment and suggests scientific, engineering, policy and educational solutions to environmental problems. Additionally, UNT's Jim McNatt Institute for Logistics Research — which specializes in business logistics, economics, information technology, transportation and operations research — provides the capability to develop effective solutions to complex problems confronting public and private organizations.

And the UNT-Chile Sub-Antarctic Biocultural Conservation Program, an international interdisciplinary cooperative, approaches conservation by coupling the social and biological dynamics within policymaking. The program, led by its director and professor of philosophy and religion Ricardo Rozzi, recently was awarded $20 million from the Chilean government for the construction of a new Sub-Antarctic Cape Horn Center. In June, the Catholic University of Chile and the University of Magallanes, along with UNT and the conservation program, consolidated a partnership strategy for the management of the future center, expected to open in 2020. Read more, page 17.

"We, as a university, are breaking down the barriers of linear thinking and fostering interdisciplinary collaborations to push innovation across all disciplines," UNT President Neal Smatresk says.

TACKLING AIR POLLUTION

Those collaborative opportunities aren't lost on UNT researchers, either. In fact, they've become so adept at working together, their connections are akin to six degrees of separation — chat with one faculty member, or visit their colleagues in the same building or even right next door, and you'll find work that leads you to a researcher in a different discipline. Verbeck, for example, connects to departments ranging from visual arts — in 2013, his students collaborated with associate professor of printmaking Andrew DeCaen's students on a Metabolic Science in Art exhibit — to biology. He points out

"My research is trying to bring government, academia and industry together."

— Nandika D'Souza
Regents Professor of mechanical and energy engineering

the students in his lab who he shares with Chapman, biochemistry and molecular biology professor Rebecca Dickstein, and toxicologist Amie Lund.

Lund, an assistant professor of biology, often utilizes the instruments in UNT's Laboratory of Imaging Mass Spectrometry in her research, which investigates the effects of air pollutants on the progression of cardiovascular disease, neurovascular blood brain barrier disruption and obesity. The nanomanipulator allows her to look at the particle components of complex mixtures to determine if they are driving negative outcomes in the body.

Verbeck introduced Lund to Yong Yang, associate professor of biomedical engineering, who she now collaborates with on her research. Yang and his team use nanomaterials to build matrices for cell culture models that more closely resemble what one would see in a human or animal body, which can be used for research and pharmaceutical development.

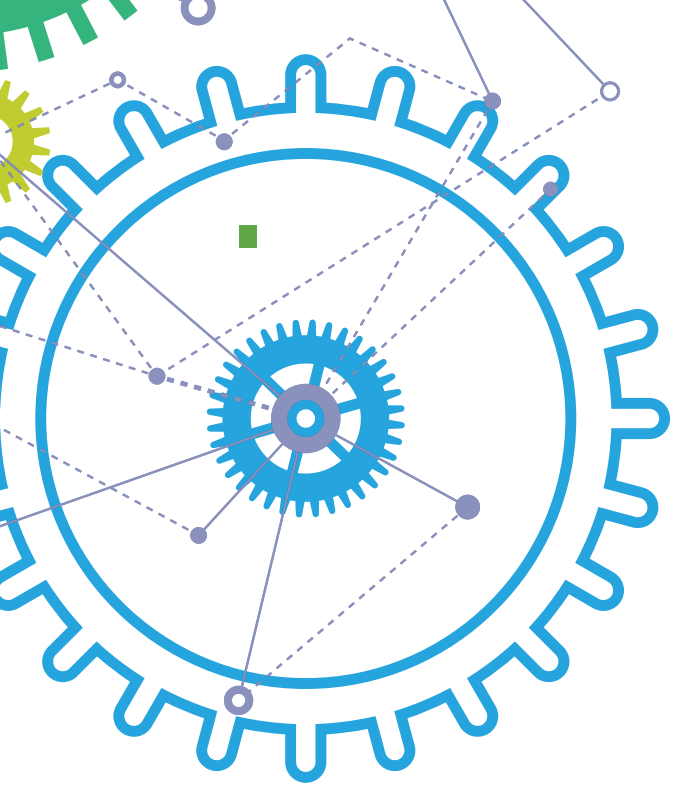
"When you bring together people from across different fields, you're bringing in new ways of finding solutions to a problem," says Lund, a member of AERI. "I could never produce the novel cell cultural matrices that Dr. Yang does, because I'm not of that engineering mindset. It allows a different approach that increases the validity of the science."

In addition, she collaborates with neuro-endocrinologist Rebecca Cunningham, of the UNT Health Science Center in Fort Worth, in research that investigates the effects of air pollutants on the vasculature of the brain, including possible links to Alzheimer's disease and dementia and the appearance of Alzheimer's-related pathways in the brains of children.

"There may be significant alterations on brain function and behavioral effects when air pollutants cross from the blood into the brain," Lund says. "Dr. Cunningham has the expertise to train us on how to assess the resulting neurobehavioral effects from our exposure studies."

And then there's the $437,964 National Institutes of Health/National Institute of Environmental Health Sciences grant Lund was recently awarded to study the effects of air pollution on obesity. Her co-investigator on the project is Brian McFarlin, professor of kinesiology, health promotion and recreation in the College of Education and director of UNT's Applied Physiology Laboratory. Lund is gearing up to conduct a probiotic study, based on results from McFarlin's research in probiotic benefits in humans coupled with pollutant exposures, and will use the equipment in the Applied Physiology Laboratory to analyze different biomarkers they have identified as being associated with obesity and increased propensity for heart attacks and strokes.

"What's exciting to me about our current research is that we've taken a step back. Instead of focusing on one disease state, we're saying, 'Wait a minute — if we can figure out the main pathways that contribute in some way to each of these interrelated diseases, then we can target those, whether



"When you bring together people from across different fields, you're bringing in new ways of finding solutions to a problem."

— Amie Lund
assistant professor of biology

by decreased exposure, pharmaceutical therapy, probiotics, whatever it happens to be,'" Lund says. "With this interdisciplinary approach, we can investigate these questions related to human health from different angles and possibly hit multiple birds with one stone."

DIGGING INTO DROUGHT

Just one floor down from Lund's office in the Environmental Science Building, archaeologist Lisa Nagaoka also mulls the human-environment connection. And like Lund, she's not doing the mulling alone.

"We're pretty much looking at anything and everything that can be studied today, but in the past," says Nagaoka, an associate professor in UNT's Department of Geography and the Environment.

In her current research, funded by a $116,206 National Science Foundation grant, Nagaoka teamed up with UNT geography professor Steve Wolverton, Regents Professor of environmental science and director of UNT's Advanced Environmental Research Institute Sam Atkinson, UNT hydrology professor Feifei Pan, and a researcher from Washington State University to study the impact of climate change, particularly drought, on societies reliant on dryland agriculture. The research is focused on the Mesa Verde region of southwestern Colorado, where the team is looking at prehistoric culture change — in terms of both community collapse and resilience — to determine what factors lead to failure or sustainability of dryland farming over the long term.

Pan takes the landscape data the team collects and creates hydrological models that convey an area's ability to retain moisture and for how long, while Atkinson conducts drone work to ground truth the data the team receives from the federal government. Both, Nagaoka says, are key to understanding the potential effects of climate change on soil.

"We're able to see what moisture the soil can hold, to see the implications of years of drought in a modern context," she says. "We're trying to figure out the magnitude of the drought that could lead to the collapse of the agricultural system."

URBAN LANDSCAPE

Right next door to Nagaoka, biophysical geographer Alexandra Ponette-González also is focused on rain and soil, but from an atmospheric perspective. An associate professor in the Department of Geography and the Environment whose work spans diverse ecosystems from tropical forests to urban areas, she has long been fascinated by what is deposited to ecosystems through rain and fog, whether nutrients from fire, pollutants from fossil fuel combustion or dust particles from dryland soils.

Currently, Ponette-González is working on several projects, including research on intra-urban variability in carbon deposition funded by a $534,263 NSF Geography and Spatial Sciences and Ecosystems CAREER grant. She and her colleagues — from the University of Oregon's School of Architecture and the Environment,

"Part of the creative process that art shares with science is making connections between ideas to create something new."

— Dornith Doherty
University Distinguished Research Professor of photography

the Cary Institute of Ecosystem Studies and Baylor University's department of environmental science — are investigating to what extent city trees can function as "urban air filters": capturing soot particles from the atmosphere and then depositing them into soil, where they can be stored long-term. The research has implications for urban planning, specifically in determining where city trees should be planted.

"Soot has multiple adverse effects on human health and is the second most important contributor to global climate change after carbon dioxide," says Ponette-González, who heads UNT's Ecosystem Geography Laboratory and also utilizes the technology available in UNT's Materials Research Facility for her urban air filters research. "If we can use trees to clean the air, then we have to think creatively about how we manage our landscape to promote that process."

She's also exploring dust impacts, both positive and negative, on terrestrial ecosystems. She and her colleagues are studying the effects of the 2011-2014 drought on dust emissions and dust deposition across Texas. As the PI on the study funded by NSF Geomorphology and Land Use Dynamics, Ponette-González is collaborating with researchers Gary Glass, Todd Byers and graduate student Jack Manuel from UNT's Department of Physics, as well as researchers from the University of Texas at El Paso, Texas A&M-San Antonio, the Cary Institute of Ecosystem Studies and Middle Tennessee State University.

And along with three other UNT faculty — associate professor of biology Jeff Johnson, associate professor of geography Matthew Fry and University Distinguished Research Professor of photography Dornith Doherty — Ponette-González is part of a working group that received funding from a 2017-18 microgrant through UNT's Office of Faculty Success. As part of the group, Ponette-González will study if bird feathers can serve as biomonitors of air pollution.

"Collaborating allows you to answer bigger questions," she says. "You can go places you just can't go alone."

POWER OF VISUALIZATION

Across campus, in the College of Visual Arts and Design's Department of Studio Art, Doherty explains her essential role in the working group. As the only member with a humanities background, she is uniquely equipped to offer what would otherwise be an unexplored perspective.

"Part of the creative process that art shares with science is making connections between ideas to create something new," says Doherty, who will use a scanning electron microscope to make images of bird feathers and air pollution as a way to encourage new modes of thinking in regards to birds as biomonitors. She and Ponette-González also are sponsoring undergraduate research fellowships as part of the project, in which geography and art students will conduct collaborative research. "For me, the access to scientific instrumentation like the SEM literally allows a different point of view into these topics."

Over the past decade, another of Doherty's projects, *Archiving Eden*, has taken her to 20 national seed banks over four continents, where she often uses x-ray technology available in research laboratories to "peer into these little sparks of life." The banks serve as botanical backup systems meant to preserve genetic diversity in case of catastrophic climate change or political unrest.

"Part of my work is documentation, but the other important aspect is creating visual metaphors that make connections in a more open-ended way," she says. "A lot of the time, those metaphors center on the ideas of time and the fragility of life that are harder to show in a direct, concrete way."

Doherty's *Archiving Eden* project will be on display at the National Academy of Sciences in Washington, D.C., and the Ontario Science Center beginning in January as part of a prestigious solo exhibition. She continues to add to *Archiving Eden* even as she tackles three other projects, including a collaborative endeavor with the Cary Institute of Ecosystem Studies, in which she worked with the institute's research labs to look at the role of ecosystems in spreading mosquito- and tick-carried diseases.

"These are ways to explore the edges of our experience that people might not think about otherwise," Doherty says. "It's about bringing the invisible to light."

COLLABORATIONS

Of course, the connections just keep going on a campus where collaboration is king. UNT's College of Music, for example, began offering a Ph.D. in Performing Arts Health this fall in conjunction with the UNT Health Science Center. Last year, UNT partnered with the Indian Institute of Technology in bioimplant longevity research, led by associate professor of materials science and engineering Sundeep Mukherjee. And in May, the ribbon was cut on the NetDragon Digital Research Centre — a collaboration between UNT and Digital Train Limited, a leader in internet and mobile educational content and delivery — which will give faculty and students additional opportunities for research and technology development.

"By working together, UNT is challenging what is known — and what is possible," Rondelli says. "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."

UNT'S NETDRAGON DIGITAL RESEARCH CENTRE

UNT's new 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, 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.

"As a growing research university, we are constantly looking for ways to grow and improve our research. Through the NetDragon Digital Research Centre, our faculty and students will develop next generation technologies to improve our students' success," President Neal Smatresk says.

"They also will receive support to conduct research related to other emerging and evolving technologies, industries and innovations. The centre will support digital-first researchers from all disciplines who may make discoveries with the capability of revolutionizing industry."

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

"I am excited by the possibilities that the NetDragon Digital Research Centre avails and look forward to working with faculty and student researchers at UNT, as well as with industry partners who have ideas for groundbreaking technologies," Parson says.

ALUMNI INNOVATORS @ WO

CUTTING-EDGE RESEARCH, TRAILBLAZING CAREERS

INNOVATION HAS BEEN PART OF UNT'S CULTURE SINCE 1890, AND GRADUATES HAVE CARRIED THAT SPIRIT THROUGHOUT THE WORLD AS RESEARCHERS, INNOVATORS AND LEADERS.

ADDRESSING HEALTH DISPARITIES

Evelinn Borrayo, a professor of psychology at Colorado State University in Fort Collins, works to address cancer health disparities that affect Latinas and other underserved individuals. She oversees a $1.8 million public health program to encourage Latinas to take the HPV vaccine to prevent cervical cancer. Borrayo, who earned a master's degree in psychology and doctoral degree in clinical psychology, worked in the lab of Chuck Guarnaccia, associate professor of psychology, as a student. She also is conducting a clinical trial on an intervention to address the mental challenges that head, neck and lung cancer patients and their caregivers encounter. The project received $1.9 million from the Patient Center Outcomes Research Institute.

UTILIZING ARTIFICIAL INTELLIGENCE

A trailblazer in artificial intelligence, Dave Copps, founder of DFW-based startup Brainspace, formerly PureDiscovery, produced technology that can read and learn from hundreds of millions documents simultaneously, enabling Fortune Global 1000 companies and intelligence agencies to use it for internal investigations and counterterrorism efforts. Brainspace was acquired by Cyxtera in 2017 as part of a $2.8 billion deal. He previously established Engenium Corp., which produced a semantic search engine that could pore through, and make intelligent connections among, millions of documents simultaneously. Copps, an anthropology major who underwent major brain surgery during college, studied how to create inspiring work environments through corporate culture classes taught by now Professor Emerita Ann Jordan.

BATTLING BREAST CANCER

Alan Kumar, assistant professor of pharmacology at the National University of Singapore, is researching how to help women with metastatic cancer respond better to chemotherapy. He identified a biomarker called DEAD-box protein DP013, which drives particular pathways that trigger cancer dissemination and resist chemotherapy. His finding may help doctors determine early if the breast cancer will spread. If researchers are able to reduce levels of this biomarker, it could make chemo-resistant women respond to chemotherapy. Kumar also is a principal associate in the Cancer Science Institute of Singapore at the National University of Singapore. As a biology undergraduate, he worked as a research assistant in the lab of James Kennedy, Regents Professor of biological sciences, going on to earn master's and doctoral degrees in molecular biology at UNT under the supervision of the late professor Gerard A. O'Donovan, then chair of the Department of Biological Sciences.

DELIVERING SPEECH-LANGUAGE THERAPIES

A speech-language pathologist specializing in neurological disorders in adults, Madison and her husband Sky McClure created Cortex Therapy Solutions, alongside co-founder and CEO Keaton George. Cortex is a mobile application that stores therapy activities for speech-language pathologists and their patients to use between therapy sessions and after discharge. Their pitch for the app won the top prize at CodeLaunch, a Dallas-Fort Worth-based competition for software technology startup ideas, in 2017. Cortex Therapy Solutions will be submitting joint research grants with UNT's Gloria Olness, associate professor of speech-language pathology. Clinical trial design is underway and will take place at UNT in collaboration with the Department of Audiology and Speech-Language Pathology. Madison earned bachelor's and master's degrees in speech-language pathology and Sky earned a bachelor's degree in theatre and a master's degree in higher education and is currently seeking a doctoral degree in education administration.

PROMOTING WOMEN IN STEM

Alexis Scott was named one of the "Hidden Figures of Dallas: Top Women of Color in STEM" by the National Society of Black Engineers' Dallas-Fort Worth chapter. She is manager and engineer at Raytheon in Dallas and works in the field of system security engineering, with expertise in cybersecurity. She earned her master's degree in mathematics from UNT and in 2011, founded AMS Academic Solutions, a company providing math and science tutoring with hopes that more women of color will enter those fields. The award, inspired by the movie *Hidden Figures*, goes to women of color who have excelled in the science, technology, engineering and math fields.

SOLUTIONS FOR AUTISM

UNDERSTANDING AUTISM

UNT researchers use diagnostic testing, intervention services, behavioral therapy and counseling as a piece of the puzzle in understanding those with autism spectrum disorder and training professionals in the field.

BY: AMY ARMSTRONG

The latest statistics from the Texas Education Agency's Texas Academic Performance Report show that there are more than 58,000 students with identified autism spectrum disorder (ASD) in the state's public schools. This number is expected to nearly double by 2020.

At the University of North Texas, faculty and staff in 12 departments spread across four of the university's colleges are diligently working to understand the complexities of one of the biggest health and education challenges of our time and creating real-world solutions to help those living with ASD achieve their greatest potential.

For Demetria Ennis-Cole, the fight is personal. She says she was driven to autism research to know if the challenges her son, who was diagnosed with ASD at the age of 4, faces were universal and to learn more about ASD.

"It is rewarding and interesting work," says Ennis-Cole, professor of Learning Technologies in UNT's College of Information who has been at UNT for 25 years and has been conducting autism-specific research for the past eight years. She is focusing on technology utilization in learning. "Being able to point parents in the direction of resources that will help their children is important to me."

SUPPORT SERVICES

Nationally, 1 in 59 children is diagnosed with autism spectrum disorder, but only about a third of those students attend postsecondary education.

While those numbers can be sobering, there is hope that universities like UNT can provide an environment for students to be successful in school and life, says Kevin Callahan, executive director of the Kristin Farmer Autism Center (KFAC).

"We are definitely poised to be leaders in providing an exceptional educational opportunity to those with autism spectrum disorder," he says.

A key component to the work being done at UNT is the KFAC, which provides invaluable services to the Denton community and beyond by offering individualized intervention services for school-aged children, adolescents and adults with ASD

"We are definitely poised to be leaders in providing an exceptional educational opportunity to those with autism spectrum disorder."

— Kevin Callahan
executive director of the Kristin Farmer Autism Center

through applied behavior analysis and other evidence-based interventions.

The center currently serves about 50 families. In addition to those families, through a grant from the Texas Higher Education Coordinating Board's Autism Grant Program, the center provides support to more than 80 families around the state who have a child with autism.

In July, the center hosted its 10th Adventures in Autism Intervention and Research Conference, which provided free registration to more than 100 families. Three hundred and fifty attendees learned about the latest in autism research, intervention and therapies from renowned experts and networked with hundreds of parents and professionals from the autism community during breakout sessions.

Another component is the recently founded UNT ENGAGE (Embracing Neurodiverse Groups in Academics and Gainful Employment) supports postsecondary students' academic, social and mental wellbeing through collaborative and individualized services. The program was developed and implemented by UNT clinicians and researchers as a transition program to support students with ASD and other disabilities.

"We are so proud of the services that we provide and the hands-on training we give our students," Callahan says.

USING TECHNOLOGY

Karen Toussaint, assistant professor of behavior analysis in the College of Health and Public Service, has been conducting autism research for the past eight years.

"I have always been interested in understanding human behavior," she says. "The science of it fascinates me but also the clinical interventions and working with families to provide solutions."

Toussaint, who conducts research and also teaches at KFAC, recently completed and submitted research about observation learning and how it is often a skill deficit for children with ASD.

"Kids with ASD often do not learn really well by watching others," she says. "However, our research shows that we can teach specific skills that allow children with ASD to readily learn while interacting with others."

Ennis-Cole agrees. Her research has shown that children on the spectrum enjoy the user control, visual presentation and immediacy of feedback that technology such as tablets gives them.

"Getting the content directly through technology means they don't have to ask a lot of questions, which can be daunting for kids on the spectrum," she says. "If they enjoy the experience, they are going to be more receptive to learning."

Ennis-Cole is currently awaiting the publication of her book, *Seeing Autism Through Parents' Feedback, Sketchnotes, Technology, and Evidence-Based Practices*. The book was a collaboration between Ennis-Cole and Lin Lin, also a professor of Learning Technologies in the College of Information, with sketchnotes drawn by visiting research scholar Michelle Yang.

"I wanted to describe autism to people who have no knowledge of it," Ennis-Cole

says. "The book combines research with practical information people can refer to."

PASSING ON KNOWLEDGE

Faculty researchers from the College of Information, College of Health and Public Service and College of Engineering, recently completed a week-long STEM Camp to help increase awareness for students with disabilities. The pilot program, hosted at UNT's Discovery Park, was funded by a Texas Workforce Commission grant and served about 22 individuals ages 14–20. Ennis-Cole helped with the camp, and says it gave faculty the opportunity to expose the kids to a variety of STEM activities, including virtual and augmented reality, chemistry, math, physics, robotics and engineering.

"These children don't often get to experience these types of activities, yet it's crucial to reach them," Ennis-Cole says. "This was an amazing opportunity for us to do that."

For Toussaint, she says she found a way to teach through video modeling that has proven to be effective. She also is conducting research into the most efficient way to train novice behavioral therapists. Toussaint has created an instructional module and is turning it into a virtual reality training to reach as many behavioral therapists as possible.

"Everything we are doing is with the recognition that kids with autism have a lot to learn," she says. "We want to close the gap for each child."

KRISTIN FARMER AUTISM CENTER

In 2012, UNT founded the Kristin Farmer Autism Center, with the help of College of Education alumna Kristin Farmer ('95 M. Ed.), founder and CEO of ACES (Autism Comprehensive Educational Services Inc.).

The Kristin Farmer Autism Center, housed in UNT's College of Education, conducts evidence-based direct services, research and training to positively impact individuals with Autism Spectrum Disorder, their families and the community.

"We are proud to bring together UNT's long history of interdisciplinary autism services and research all under one roof," says Kevin Callahan, executive director of the Kristin Farmer Autism Center. "This allows us to ensure families in the North Texas region and beyond have access to services designed by our team."

That team is a collaborative group of highly qualified researchers, professors and professionals in the fields of special education, applied behavior analysis, vocational rehabilitation, early childhood intervention, speech and language pathology, counseling and other fields in autism intervention.

The center also provides comprehensive assessments and conducts training for UNT students, parents, families and professionals, including the annual Adventures in Autism Intervention and Research conference on the UNT campus. The center serves as a site for ongoing basic and applied research. Its staff and collaborators disseminate important research results in leading autism journals and at top conferences around the world.

IMPROVING COMMUNITY RESILIENCE

RESPONDING TO DISASTER

Through big data analytics, logistics and emergency management, UNT researchers are working to address challenges in disaster lifecycles through increasing community engagement and resilience to minimize human suffering and economic loss.

BY: ERIN CRISTALES

When Hurricane Harvey slammed Texas' Gulf Coast a little more than a year ago, the numbers revealed its staggering toll. At least 89 dead. More than $125 billion in business and property loss.

And one important question: Where do we go from here?

It's a query often posed following catastrophic events, particularly in Texas, which ranks first in the nation for the variety and frequency of natural disasters and is home to at least one major natural or manmade disaster each year. Regardless of the event — hurricane, tornado, wildfire, drought, flood — the answer is summed up in one word: resilience.

The word holds endless possibilities for UNT researchers, who are increasingly dedicated to addressing community preparedness — in turn mitigating human suffering and economic loss — through areas such as emergency management and disaster science, computer science and logistics.

"When we talk about resilience, we're not talking about returning the community back to where it was — we're talking about bringing it back even stronger, economically and socially," says Gary Webb, professor and chair of UNT's Department of Emergency Management and Disaster Science. "Disasters are tragic, but they also can present these windows of opportunity to come back stronger and better."

LESSONS LEARNED

UNT has long been a pioneer in emergency management and disaster science. In 1983, the university was the first in the nation to offer a bachelor's degree in emergency management, and this year began offering a master's degree in the discipline.

"Catastrophic disasters are on the rise, and the demand for knowledgeable emergency managers has never been greater," Webb says.

Currently, faculty in the department are backed by National Science Foundation grants and state-supported activities to research business and community recovery after Hurricane Harvey, household recovery after Hurricane Sandy, and disaster preparedness in Native American communities, among other topics. Students have traveled to South Texas to conduct field work in the wake of Harvey, and to Joplin, Missouri, to study the devastating effects of the 2011 tornado.

It's all in an effort to gather perishable data quickly so that researchers can learn from each event and better prepare

communities for potential disasters.

"There are always so many lessons to be learned," Webb says. "We are recognizing that there are a broad array of hazards that we need to equip ourselves to manage — certainly natural disasters, but also technological disasters like the explosion in West and human-induced tragedies. To be truly resilient, we have to embrace the all-hazards perspective."

TECHNOLOGY AS A TOOL

At UNT's Center for Computational Epidemiology and Response Analysis, director Armin Mikler echoes Webb's all-hazards approach. Although Mikler's RE-PLAN software — developed as part of a nearly $800,000 grant from the National Institutes of Health — is specifically designed to address bioemergencies, the methodology can be applied to a variety of catastrophic events.

"What really is essential to resilience is preparedness," says Mikler, a professor in the Department of Computer Science and Engineering. "You have to make planning a continuous task, where new information can be easily taken into consideration."

RE-PLAN, an evidence-based response planning tool, uses population data at the individual and household levels that allows emergency planners to determine the number of Point of Distributions needed for a region, choose POD locations from a list of available facilities, and examine POD facilities in-office by automatically linking to Google Earth's 3D imagery, among other capabilities. The result? A process that used to take as long as nine months now takes as little as 10 minutes, and has led to 30-percent cost savings.

"From anywhere in the nation, emergency planners can develop a response plan for medical countermeasures that involves the placement of ad hoc clinics or access points to pick up resources," Mikler says.

RE-PLAN was first deployed in Texas' Region 23, which includes 49 counties in North Texas, as well as in Los Angeles County, home to 13 million people. Most recently, the tool was deployed in Texas' Region 65 South, which includes Houston and surrounding counties.

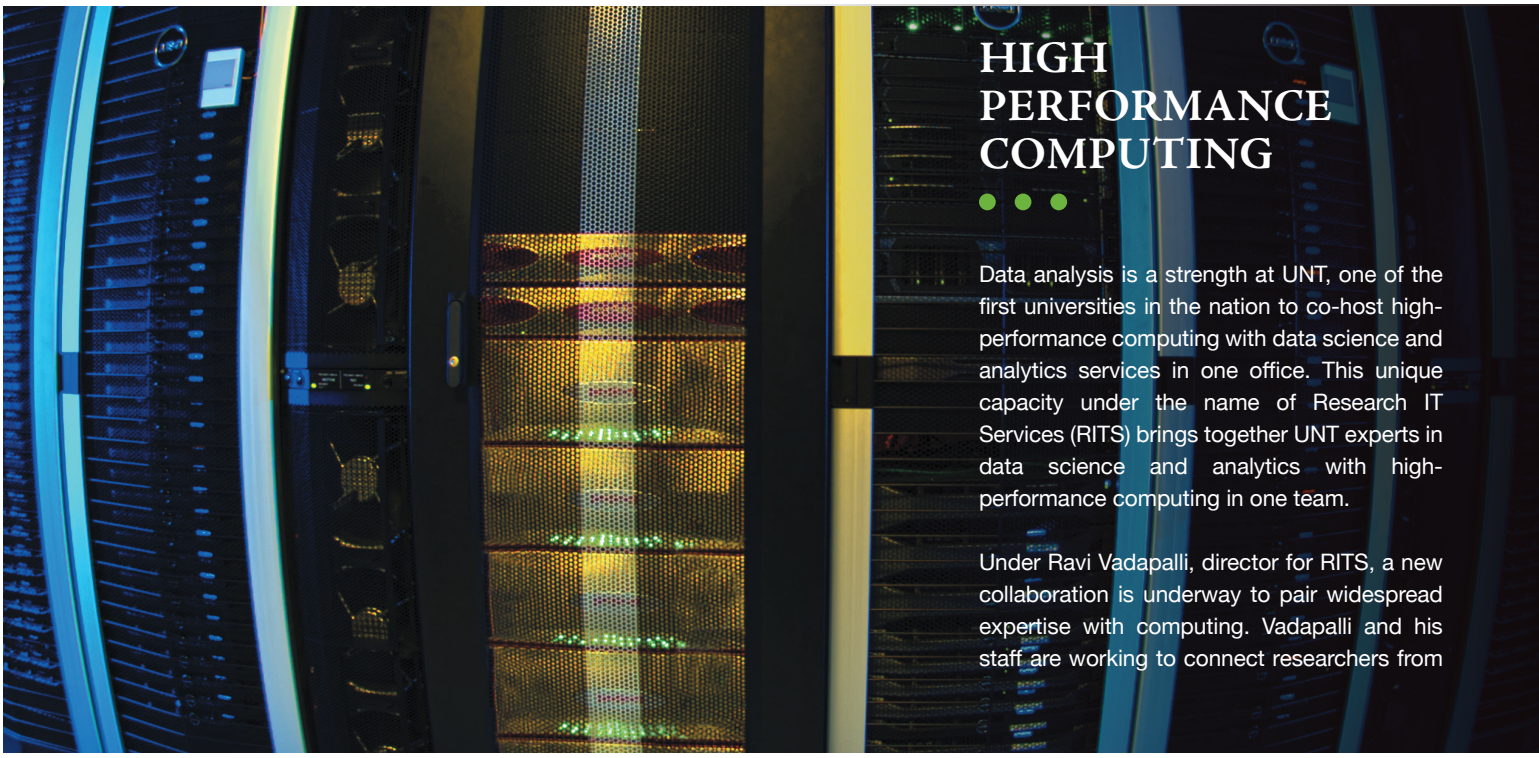
As Mikler's research into resilience continues, so do his interdisciplinary collaborations. He's worked with researchers in the Department of Geography and the Environment, the Advanced Environmental Research Institute, and the Jim McNatt Institute for Logistics Research.

"Resilience also means maintaining or rebuilding supply chains so that businesses can survive. It means recognizing the impact chemical spills may have on the environment," Mikler says. "In many ways, your plan is a living thing — it evolves and never becomes stale and static."

IMPACTING COMMUNITIES

Evolution — particularly in terms of the global economy — is a key factor when it comes to resilience research conducted by Brian Sauser, director of UNT's Jim McNatt Institute for Logistics Research.

"It used to be if you were a small



HIGH PERFORMANCE COMPUTING

Data analysis is a strength at UNT, one of the first universities in the nation to co-host high-performance computing with data science and analytics services in one office. This unique capacity under the name of Research IT Services (RITS) brings together UNT experts in data science and analytics with high-performance computing in one team.

Under Ravi Vadapalli, director for RITS, a new collaboration is underway to pair widespread expertise with computing. Vadapalli and his staff are working to connect researchers from

"When we talk about resilience, we're not talking about returning the community back to where it was — we're talking about bringing it back even stronger, economically and socially."

— Gary Webb
professor and chair of UNT's Department of Emergency Management and Disaster Science

business in a small town, you sold a product to the people who lived in that town. But the economy has changed now, and you can have a small business that is selling a product completely outside of that town," says Sauser, who also is a professor of logistics in the College of Business. "What we find is that the balance of those newer kinds of businesses and traditional small businesses can impact a community's resilience."

In addition, Sauser is looking at businesses that fail to reopen after a disaster — known as "lost" or "misplaced" businesses — in an effort to glean what is causing their disappearance.

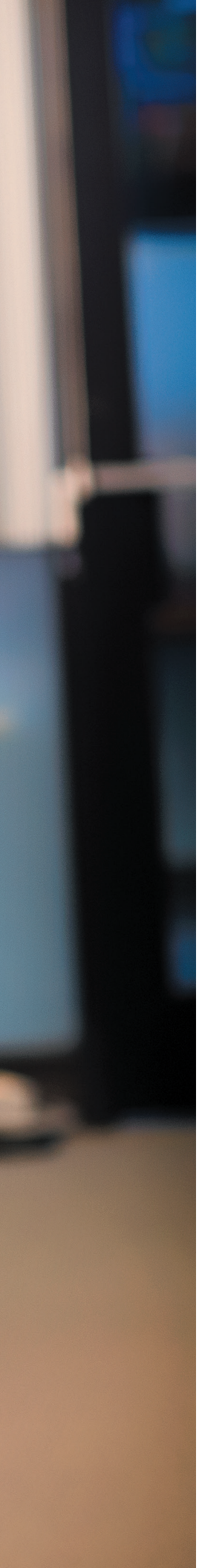
"We know about the businesses that come back, but we know very little about the ones that don't and why they didn't come back," he says. "Maybe they didn't know about resources that are available to help them — I think there is a lot to be learned, and of what is learned, it needs to be effectively transferred to communities."

across campus with industry and government for common research areas such as disaster resilience. The industry-academe-government model is essential to address complex problems that can't be solved by isolated researchers in any one discipline or group.

Using a large amount of data from previous disasters, professionals from across all domains can use UNT computing power and analysis in natural disaster prediction, preparedness, response and recovery. The challenge is in digesting the data into meaningful, useful knowledge that can be applied. RITS is leveraging expertise in data analysis and UNT's high-performance computing center to help researchers find solutions leading to greater disaster resilience in the future.

"Resilience is a community engagement problem. By integrating STEM and non-STEM researchers from all colleges, more expertise is then applied to solve problems, which interests the government as well as industry ," says Vadapalli. "The common backbone is computing. We are proposing a data-driven model."

Vadapalli was a site director of the National Science Foundation Cloud and Autonomic Computing Center Site at Texas Tech University before joining UNT in May. He says UNT's facilities, unique capabilities and proximity to Dallas-Fort Worth's high-tech community resulted in the CAC's recent unanimous approval making UNT an affiliate site of the center. UNT seeks to join as a fully-approved NSF site through an application process that will take place in spring 2019.



PROFILE

MEET *THE DEAN*

KINSHUK

DEAN OF UNT'S COLLEGE OF INFORMATION SINCE 2016

FAVORITE QUOTE:

"Be the first to change, be the first to take the challenge, be the first one to overcome the difficulties," by Jack Ma, philanthropist and internet and technology entrepreneur.

WHAT I LOVE MOST ABOUT MY JOB:

Supporting my students continuously and to be able to prepare them for individual successes. Over the years, my research has focused on maximizing the effectiveness of learning and personalizing the learning experience in and out of the classroom. I love that I have the possibility to ensure those aspects in my job.

THE COLLEGE'S LATEST ACCOMPLISHMENT:

The ongoing successes in providing a very high-quality education. That is what each and every student expects from us, and I am very proud of my colleagues, both faculty and staff, who have the passion and dedication to improve the learning experiences of our students. My interactions with our students and alums in our online programs have been equally humbling. Kudos to my colleagues for taking such good care of our students.

FUN FACT:

For the past 23 years, I have recharged myself daily by practicing Sahaj meditation.

TRENDS IN EDUCATION TECHNOLOGY:

While new technologies are emerging at a rate faster than ever, there also is the increasing realization that it is education that governs technology, and not vice-versa. Technology provides affordances that were perhaps not possible before. We are in the midst of many amazing technological advancements, such as virtual and augmented reality technologies, that allow students to experience learning in very realistic, authentic scenarios. Combine this with the advances in the data science and data analytics fields, and we have the possibility to support student learning in real time and to personalize it to suit their individual strengths, needs and requirements.

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