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VOL. 28 | 2020 KNOWLEDGE. DISCOVERY. INNOVATION.

INNOVATIVE FORWARD THINKING page 24

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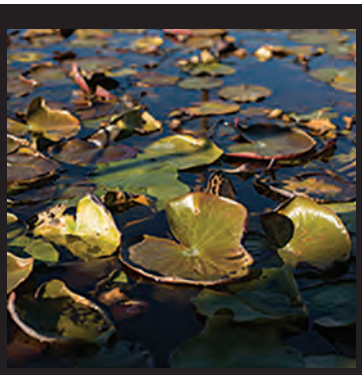

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24 INNOVATIVE FORWARD THINKING

UNT's commitment to bringing multiple perspectives together to solve society's most pressing problems has led to extraordinary results. Researchers from linguistics, journalism, psychology and chemistry are investigating ways to combat the insidious side effects of COVID-19, while faculty from artificial intelligence, fashion design and electrical engineering are collaborating to find new approaches to conditions such as decreased mobility, breast cancer and opioid abuse.

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MOVING FORWARD TOGETHER

With an emphasis on interdisciplinary collaboration and support for faculty research and enterprise, UNT is creating a culture of innovation that will prepare students to thrive in a changing world.

After a record-setting year in funding and license revenue, I'm proud to say that more faculty than ever are engaged in funded research, and collaborations with national laboratories and industry are on the rise. In 2019, our faculty filed 44 disclosures of inventions and intellectual property with commercial potential, compared to seven in 2015.

Forward-thinking interdisciplinary research is fueling our innovation, as evidenced by the 14% increase in grant submissions we've seen over the past year. This comes as no surprise to our industrious faculty, who have taken advantage of our new grantsmanship workshops, Washington D.C. Faculty Research Fellows program and streamlined proposal processes to bring their solutions-based research to industry and the marketplace. And this spring, UNT was designated a Minority-Serving Institution as well as one of just 16 Carnegie-ranked Tier One research universities designated a Hispanic-Serving Institution, and we are committed to cultivating a research community that reflects our values.

In spite of the challenges presented by the COVID-19 crisis, we've made great strides toward our goals. We are building the Center for Agile and Adaptive Additive Manufacturing, thanks to $10 million in funding from the last Texas Legislative session (page 22). Meanwhile, our new initiatives such the Center for Integrated Intelligent Mobility Systems (page 12) and the Center for Racial and Ethnic Equity in Health and Society (page 40) are seeing unprecedented cross-disciplinary participation from our innovative faculty and student researchers. I look forward to the coming year as they continue to set their sights beyond the labs, changing the world and reinforcing UNT's reputation as a world-class Tier One research university.

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Vice President of Research and Innovation

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UBSC 11/20 (21-025)

TRENDING @ UNT

UNRAVELING SECRETS OF PLANT LIPIDS

PLANT SCIENTIST HONORED FOR CAREER ACHIEVEMENTS

Kent Chapman, a Regents Professor at UNT and director of UNT's BioDiscovery Institute, in conjunction with scientists at the Huazhong Agricultural University in China, recently developed a complete map for the genome of the jojoba tree. This is the first complete DNA sequence of *Simmondsia chinensis*, which will help scientists find the desired genes in jojoba and express them through other plants.

Jojoba is a sustainable but difficult to grow plant source of wax esters, a major ingredient in cosmetics and skin care products, shampoos and soaps. It also makes an excellent industrial lubricant due to its stability under high temperatures and pressures and its antirust properties. It is made up of high-energy molecules, which also has caught the interest of the biofuels industry.

"If we could take the specific wax-producing genes we want from the jojoba tree, and put them into a more easily grown seed oil crop like canola, suddenly we have a row crop that is easy to grow, doesn't need a specialized environment and can be harvested using general farming practices. This would be a boon to a number of industries," Chapman says.

Chapman has spent 27 years in UNT's Department of Biological Sciences as an educator and researcher, where he teaches and explores the intricacies of plant biochemistry, specifically lipids. He was recently honored with the Terry Galliard medal by the International Symposium on Plant Lipids for his career achievements as a distinguished plant lipid scientist.

SHEDDING LIGHT ON THE PAST

In professors Andrew Torget and Todd Moye's 2018 public history research seminar, their students uncovered important information about St. John's, a disappeared freedmen's community near Pilot Point, Texas, that disbanded in the early 1930s.

Four of the students continued the research, discovering links between incidents of racial violence in Denton County and the dissolution of St. John's. Then grad students Micah Crittenden and Hannah Stewart and undergraduates Emily Bowles and Jessica Floyd presented their findings of what life was like for the residents of St. John's to the Denton County Commissioners Court, and Crittenden drew upon those findings when applying for a funding application for an Untold Story marker from the Texas Historical Commission.

After the others graduated and went on to other pursuits, Crittenden, now a doctoral student in UNT's Department of History, continued the research, using her skills to help save a Pilot Point residence that was previously a one-room schoolhouse for African American students. Known as the Lincoln Academy, the school — built in 1905 — originally was located in the freedmen's community of Oakdale before it was moved to Pilot Point in the 1940s.

The dilapidated structure was scheduled for condemnation before Crittenden spent 200 hours over a two-month period piecing together a portrait of the academy and its attendees to present to the Pilot Point City Council who granted a reprieve for funds to be found to save the structure. More than 100 years after it first opened its doors to educate Oakdale's African American community, Lincoln Academy has itself become a lesson in Denton County history thanks to the hard work started by students in the public history seminar in 2018.

INSPIRING SACNAS

This fall, Pamela Padilla, associate vice president for research and innovation, was named as one of 100 Inspiring Hispanic/Latinx Scientists in America by Cell Press for her scholarly achievements, mentoring excellence and commitment to diversity, equity and inclusion.

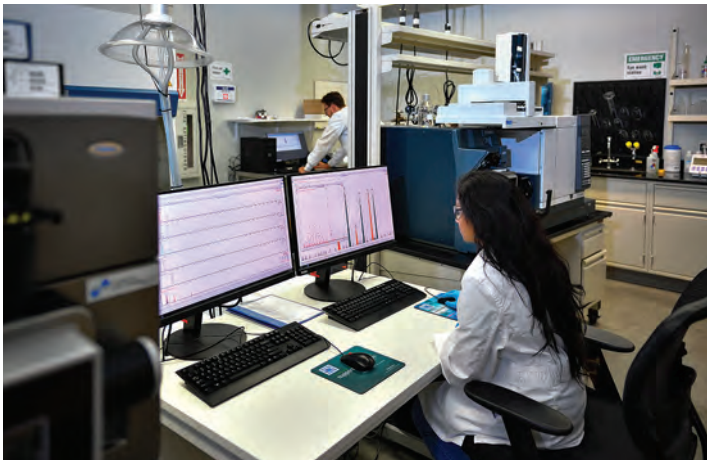
Earlier this year, Padilla was selected president of the Society for Advancing Chicanos/Hispanics and Native Americans in Science — the fifth woman to hold the office in the organization's 46-year history. She will serve a four-year term.

Padilla, professor of biological sciences and former associate dean of research and graduate studies for the College of Science, was featured as part of the SACNAS Biography Project in 2019. She was involved with SACNAS as an undergraduate student, transitioned to faculty volunteer and was elected to the SACNAS Board of Directors and served as treasurer (2016, 2018). Padilla and chemistry professor Andrés Cisneros serve as faculty advisors for the UNT SACNAS Student Chapter.

GIFT ESTABLISHES INNOVATION CENTER

A collaboration between LaCore Labs and UNT will include a $1 million gift eligible for matching funds from the Texas Research Incentive Program, a new laboratory, sponsored research, a license to UNT technology and real-world opportunities for students.

In a first-of-its-kind collaboration, LaCore Labs — the developer of custom-formula health products based in Melissa, Texas — will establish an innovation center at UNT, a Tier One research university. The five-year agreement is to develop the first ISO quality assurance lab specifically within the nutraceutical space. LaCore signed a five-year lease and converted space at UNT's Inspire Park to wet labs, an investment exceeding $600,000.



Additionally, LaCore Labs has licensed patented technology from UNT for an improved patch delivery system for prescription medications or nutraceuticals, developed by Guido Verbeck, chemistry professor in UNT's College of Science and director of the Laboratory of Imaging Mass Spectrometry at UNT.

College of Science faculty and students are actively involved in the lab. Internships at the newly opened facility will provide students with real-world experience. LaCore also hopes to hire UNT graduates from the lab to join their team.

The $1 million gift is eligible for $750,000 in matching funds from the Texas Research Incentive Program, which assists designated emerging research universities in leveraging private gifts for the enhancement of research productivity. An additional $500,000 sponsored research grant will support Verbeck's research at UNT.

FORENSIC SCIENCES HONORS

Harrell Gill-King, founding director of UNT's Laboratory of Forensic Anthropology and co-founder of the UNT Center for Human Identification, has been awarded the T. Dale Stewart Award by the American Academy of Forensic Sciences for work that has included responding to the World Trade Center after 9/11, the Oklahoma City bombing and many other natural and man-made mass casualty events.

The award is presented for outstanding contributions in the forensic anthropology field, and winners are nominated by their peers and chosen by a committee of former award winners.

Patrick Willey, the chair of the selection committee that chose Gill-King as this year's award recipient, says letters nominating Gill-King were "outstanding," citing his continuous work with law enforcement agencies since the late 1970s, the unique capabilities of the Center for Human Identification, Gill-King's teaching and mentorship for aspiring forensic anthropologists in the College of Science, and his efforts in mass disasters.

NSF CAREER GRANTS AWARDED FOR INNOVATIVE RESEARCH

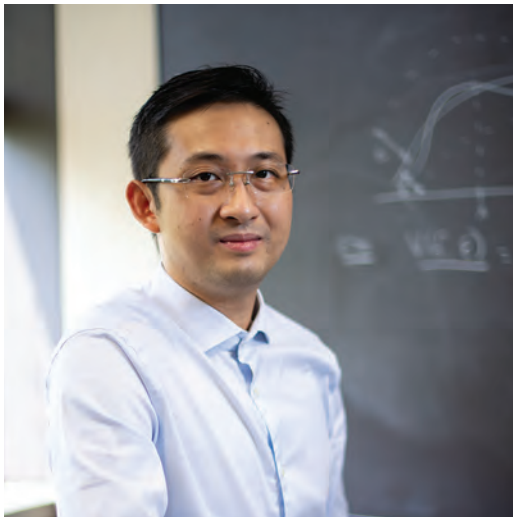
THIS YEAR, FIVE UNT RESEARCHERS IN LINGUISTICS, PHYSICS, MATHEMATICS AND ENGINEERING RECEIVED PRESTIGIOUS EARLY CAREER AWARDS FROM THE NATIONAL SCIENCE FOUNDATION FOR RESEARCH ACHIEVEMENTS AND THEIR POTENTIAL TO SERVE AS ACADEMIC ROLE MODELS IN RESEARCH AND EDUCATION.

SOLID-LIQUID INTERFACE CHEMISTRY

Oliviero Andreussi, a computational scientist and assistant professor of physics, received the grant to develop and apply new tools that help characterize chemical processes at solid-liquid interfaces. Many common devices, ranging from chemical sensors to lithium-ion batteries, involve a liquid solution interacting with a solid electrode. Improving the performances of these devices requires a better understanding of these interactions. Andreussi is developing computer models that will capture the complexity of these systems and help screen existing or innovative compounds, such as two-dimensional materials. The inexpensive nature of computer simulations will simplify the design process and guide future experiments.

INTRICACIES OF NEGATION

Eduardo Blanco, associate professor of computer science and engineering, is working to teach computers the intricacies of negation. Computers are currently unable to understand the many positive interpretations hidden in sentences with negation. For example, "Joe never leaves the house in the morning without a coffee in his hand," is understood by humans to mean that Joe does leave the house and that when he leaves the house in the morning, he does so with a coffee in his hand. These interpretations are intuitive to humans whereas intelligent systems have trouble understanding them. Blanco's team will develop computational algorithms to automatically recognize negation and generate positive interpretations, taking into account context. This work could help smart devices and computers carry on more natural conversations with humans and provide better language translations.



NATURAL LANGUAGE PROCESSING

Alexis Palmer, a computational linguist, received her grant for her work in the development of natural language processing tools designed specifically for little-known or endangered languages. These tools will provide support to linguists and language communities for documenting and translating languages more quickly. Natural language processing tools use artificial intelligence to learn how to analyze a language through large amounts of training data. The larger and more common the language, the larger the dataset for the AI to utilize. Palmer, an assistant professor, is developing tools that can learn from much smaller datasets to analyze smaller, less common languages and new AI training methods that focus on using information from one language to predict how another language is constructed.

CHRONIC PAIN & STROKE RECOVERY

Ifana Mahbub, assistant professor of electrical engineering, is developing a wireless recording, stimulation and power system that will allow medical researchers to study and possibly treat brain diseases such as chronic neuropathic pain and post-stroke paralysis. She's working to develop a microscopic, wirelessly powered system that will record neural signals from electrodes inside the brain and provide stimulation in the form of visible light from tiny LEDs. This will allow researchers to study genetically modified neurons in the brain. Today, scientists are limited to external electrodes or wires running directly from the brain for data recording, stimulation and power. By eliminating the need for wires, test subjects will not have to wear bulky recorders and batteries. Power will be delivered through inductive coupling, the same technique used to wirelessly charge mobile devices.

MATHEMATICAL LOGIC CONTRIBUTIONS

Nam Trang, assistant professor of mathematics, will use his grant to further his project *Current and Future Developments of the Core Model Induction* in theoretical mathematics. This research has the potential to help better understand the foundation of mathematics as it relates to science. He says the study of infinity and the laws and bounds of logic are not only fascinating, but pursuing mathematical logic as a science keeps it alive as a prototype of exactness and honesty for future research. As part of Trang's award, he will develop educational programs such as research seminars and individual and group research projects so that UNT students can be involved in his research. The grant will be used to support students with stipends, travel expenses to conferences and purchasing relevant books and equipment for their research.

BONDING IN METALLIC ALLOYS

Materials science and engineering researchers are working to better understand how metal alloys function at the atomic level with a $1 million grant from the U.S. Air Force Office of Scientific Research.

Professor Srinivasan Srivilliputhur, Raj Banerjee, a Presidential and Regents Professor, and University Distinguished Research Professor Michael Baskes, hope to give scientists better insight on how certain metal alloys used by the military and aerospace industries deform under stress. While engineers take stress factors into account when determining the tolerances of a material, their methods of finding the breaking point often take place at the macro level. This research will look at the underlying principles in metallurgy and into the atomic level.

"Scientists have observed that when one metal is added to another, there can be a change in the properties of the resulting alloy. We are trying to understand why this occurs by looking at the atoms involved and how they interact rather than looking at the alloy overall," Srivilliputhur says.

The team will create a model using physical experimentation and advanced computer simulations to understand what properties and tolerances will result from mixing different kinds of atoms.

POSTPARTUM DEPRESSION

With support from the National Science Foundation, Rachel Louise Moran, assistant professor of history, is delving into how society has defined and diagnosed postpartum depression, which affects one in nine women in the U.S. according to the Centers for Disease Control.

For her project, *A History of the Definition and Diagnosis of Postpartum Depression as a Disease,* she's looking primarily at the time period between 1950-2000 tracing how postpartum depression has been talked about by a variety of groups, from the medical and religious spheres to politics and popular rhetoric. Her research will be the basis of a book for historians, physicians, psychiatrists and others interested in maternal wellness. Transcripts of oral histories will be available to future researchers through the UNT Oral History Program, and she will design a course on the history of mental health.

"This research reminds us that while mental illness is biological, it also is political." Moran says. "Understanding when and why we started to take postpartum depression seriously tells us a lot about changing attitudes toward women and motherhood."

FULBRIGHT AWARDS

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

Saraju Mohanty, professor of computer science and engineering, recently earned a Fulbright U.S. Specialist grant to collaborate with universities in India for three years on research related to security, communication and interoperability in areas where long-range communications are needed for the Internet of Things (IoT).

Daniel Alemneh, a digital curation unit supervisor at UNT Libraries, worked in Ethiopia in 2019 and early 2020 through his Fulbright grant to develop digital library structures and a framework to support local universities and organizations in creating and maintaining sustainable libraries. These digital repositories will hold the many varied histories of the citizens of the country.

Jincheng Du, professor of materials science and engineering, used his Fulbright grant to conduct research on functional glass materials at the Federal University of São Carlos, home to the Center for Research, Technology and Education in Vitreous Materials — one of the top international research centers on glass materials in São Paulo, Brazil, from January to March of this year.

FLEXIBLE SOLAR CELLS

Professor Anupama Kaul, director of UNT's Nanoscale Materials and Devices Lab and the PACCAR Technology Institute, is working to develop new solar cell technology for the Office of Naval Research under the Department of Defense, utilizing perovskite materials that are extremely efficient at absorbing incoming light.

One of the major goals of this project is to formulate a special photovoltaic ink made from perovskites and additively manufacture solar cells with ink-jet printing on flexible, transparent and light-weight substrates.

Kaul says flexible solar panels from perovskites could be used not only in the military, but wherever power generation is needed. Unlike silicon, which is rigid, a flexible solar cell can be molded to conform to any surface, such as buildings, windows, textiles for wearables or the roof of a vehicle to provide power.

"We hope to use this new science uncovered from this project to further technological innovations, given that one of the grand challenges we face as a society is the need for low-cost, clean energy sources that don't have a detrimental impact on our environment," Kaul says. "And for the Navy, this technology could lead to flexible, low-cost solar cells molded to wings, hulls and fuselages, for airborne and ocean-going drones."

PRESTIGIOUS POWE AWARDS

April Becker, assistant professor of behavior analysis, and Jiang Yijie, assistant professor of mechanical engineering, have earned prestigious Ralph E. Powe Junior Faculty Enhancement Awards from Oak Ridge Associated Universities for their research.

Becker's award recognized improvements in behavioral assessment testing for stroke research. Her research team developed a new test for stroke recovery assessment in rodents that she hopes will lead to a better understanding of stroke-related effects and treatments in humans.

Jiang's award will further his research into passive controls of internal structures during 3D printing of composites. The optimized designs are expected to enhance printing capabilities in light-weight aerospace composites, energy-absorbing materials, tough protective materials and other applications.

SOCIAL MEDIA ADVERTISING

College of Merchandising, Hospitality and Tourism researchers are working to help minority-owned small restaurant owners make more informed decisions when it comes to social media advertising.

Backed by a Facebook Research grant, the year-long study will compare the cost effectiveness of data-driven ads on Facebook and contextual ads on YouTube for small, minority-owned restaurants. The interdisciplinary effort combines the expertise from Xi Yu Leung, assistant professor of hospitality and tourism management, and Jiyoung Kim, associate professor of merchandising and digital retailing.

Their project was one of five chosen by Facebook from nearly 200 proposals around the world in its Economic Impact of Digital Technologies research awards.

STUDENT EDUCATIONAL TECHNOLOGY

Lauren Eutsler, assistant professor in teacher education and administration, is dedicated to improving student literacy by examining how to better use continually changing technology in the classroom and at home. She recently examined instances where pre-kindergarten through fifth-grade teachers used mobile technology to improve students' literacy achievement. She identified gains in several areas, including increased comprehension for English learners when they combined reading digital books with apps that provide recording and listening features.

The study found teaching strategies that can make the most out of using technology remotely and at home to create student-centered learning. The study examined apps, devices and settings and identified those that contributed to students' academic growth in literacy and those that were less effective.

FROM THE LAB TO THE MARKETPLACE

COLLABORATE WITH US

UNT researchers from across disciplines are combining their expertise to fuel discoveries that are changing the shape of industries and our world. Innovative technology created here is catching the eye of companies and potential investors who are taking advantage of UNT resources and collaborating to impact our communities in positive ways.

Learn how you can partner with UNT at *research.unt.edu/rca.*

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ADVANCING INTELLIGENT MOBILITY

UNT researchers from across disciplines work together to deploy intelligent mobility systems, including autonomous vehicle and aerial drone technology, in rural and urban settings.

TEXT BY: AMY BRUNDEEN

Personal drones to pick up groceries and cleaning supplies, apps that help the elderly navigate public transportation, and robots that deliver food and social interaction to underserved populations. What would have seemed like luxuries prior to 2020 now look like valuable solutions during a global health crisis.

That's just part of the objective of a group of UNT researchers who are using their combined expertise to advance a broad integration of intelligent mobility systems spanning freight, people, airways and roadways, above ground and below ground — and use them to solve challenging and pressing problems facing our transport world today. UNT has strong research and development programs in air and ground autonomous vehicles, supply chain logistics and artificial intelligence, and ongoing partnerships with industry and public organizations. A new Center for Integrated Intelligent Mobility Systems (CIIMS) launched this year to capitalize on the interdisciplinary research of UNT faculty in areas including business, engineering, science, information and health and public service.

"The whole concept of mobility we're tackling is very broad and encompassing," says Terry Pohlen, associate dean of the G. Brint Ryan College of Business, director of UNT's Jim McNatt Institute of Logistics and co-director of CIIMS. "It ranges from personal mobility to supply chains and the movement of freight."

INTEGRATING SOLUTIONS

Technology to automate the movement of goods, services and people is progressing rapidly, but an integrated approach is a must for successful deployment in safe, affordable, accessible and resilient ways.

"It's not just about the smart transportation, it's about the integrated structure of this mobility," Simon Andrew, professor of public administration, says.

Andrew, together with others in the College of Health and Public Service and the College of Engineering have been exploring intelligent mobility systems for some time, with grants from NASA, the Office of Naval Research, the Army Research Lab and the National Science Foundation. UNT's unique approach to air-to-ground vehicle integration uses modern tools like meshed networks, data sharing, machine learning and artificial intelligence integrated into 3D intelligent mobility systems. Kamesh Namuduri, professor of electrical engineering, collaborated with Andrew using networked drones to enable emergency communications during disaster recovery.

SOLUTIONS FOR THE FUTURE

"When we develop the tools, business models and technologies into a cohesive focus, and when we help our industry partners, all of this is for one purpose: to improve the quality of life for citizens and communities in Texas and beyond."

— Andrey Voevodin,
associate dean of the College of Engineering and co-director of
UNT's Center for Integrated and Intelligent Mobility Systems (CIIMS)

"It's critical for local governments to be aware of different technologies and how they can be implemented in terms of policy development and adoption," Andrew says.

Namuduri also is part of NASA's Advanced Air Mobility National Campaign, which works to address the drastic increase of low-flying traffic over U.S. cities expected during the next decade by sharing airspace hazards data from multiple sources.

And with a focus on improving unmanned aircraft in the military, materials science and engineering researchers Diana Berman, Samir Aouadi and Andrey Voevodin, co-director of CIIMS, have been working on solutions to improve drone engines. They are using tribology — the study of friction — to develop more efficient and durable unmanned aerial vehicles.

QUALITY OF LIFE

A Texas-based partnership center, CIIMS will bridge these research breakthroughs in intelligent technologies and workforce preparation.

Computer science and engineering researchers Qing Yang and Song Fu have partnered for connected and autonomous vehicle research to link all autonomous cars via wireless communication techniques, creating a network through which the vehicles can get a better sense of their surroundings. They also are working to address a shortage of engineers trained in autonomous vehicle technology. Graduate, undergraduate and TAMS students consistently assist them in the research and many have landed internships with companies like Fujitsu America and Nokia Bell Labs. The duo also hosted a 10-week summer camp in 2019 for underrepresented populations in the computer science industry to learn about autonomous vehicles.

Additionally, a demonstration laboratory for autonomous vehicles has been established at UNT's Discovery Park — a joint project between the College of Engineering and the G. Brint Ryan College of Business. Initial projects include ground-to-air drone tracking and interactions between robots and IoT infrastructure in smart building environments. And new collaborations continue to percolate such as researchers in the G. Brint Ryan College of Business addressing supply chains for COVID-19 reagents and vaccines, and an interdisciplinary group led by Lauren Ames Fischer in the College of Health and Public Service, who are working to help the elderly, disabled and those with limited English use public transportation.

Autonomous vehicles have the potential to improve the lives of many, but many still question their safety. Researchers at the Jim McNatt Institute for Logistics Research believe that their field-tested technologies in freight logistics will provide a necessary confidence level to transport through intelligent mobility systems.

"I envision an autonomous truck backing

up to a warehouse and unloaded by robots," Pohlen says. "Another set of robots will pick up the goods, with humans doing value-added activities, and then another loads them into an autonomous truck or drones will pick up the goods and deliver them to your home. It's possible. It's just how do we put it all together?"

COHESIVE FOCUS

Part of the answer, Voevodin says, is collaborations with public and community organizations. And UNT's expertise and DFW-area industry connections position it at the forefront of the development of intelligent mobility systems that can solve those problems and more. These are big, bold goals — but their success is critical, particularly as the global pandemic has placed an unprecedented emphasis on quick solutions, such as the large-scale distribution of vaccines and medical supplies. There is an increased demand for contact-free delivery, along with demonstrated weaknesses in supply chains, taking the potential advantages of automated delivery systems like autonomous vehicles and drones way beyond novelty and simple convenience.

"When we develop the tools, business models and technologies into a cohesive focus, and when we help our industry partners, all of this is for one purpose," Voevodin says. "To improve the quality of life for citizens and communities in Texas and beyond."

INTEGRATED SMART TRANSPORTATION

Computer science and engineering team lead the U.S. in developing an autonomous vehicle cyber infrastructure.

Qing Yang and Song Fu, researchers in UNT's College of Engineering, are working to advance the safety and awareness of autonomous vehicles by developing a method for them to work together. They have earned $1 million in grant funding from the National Science Foundation for various projects in connected autonomous vehicles.

"Consensus is growing among engineers and researchers that self-driving cars aren't yet perceptive enough to make them safe to drive on public roads," Yang, assistant professor of computer science, says.

CREATING A NETWORK

Yang and Fu, together with student researchers, are developing a way for vehicles to exchange fully processed data to others around them to better detect objects near them while on the road. The goal of their work is to link all autonomous cars via wireless communication techniques, creating a network through which the vehicles can get a better sense of their surroundings, communicating information about everything from traffic flow to malfunctioning stoplights.

"Machine learning programs will utilize the collected data to build an informational map to make a decision about what actions to take regarding the object on the road," Yang says.

WORKFORCE TRAINING

The two also are creating workforce development trainings for researchers in connected autonomous vehicles. They plan to offer annual trainings along with summer research opportunities for undergraduates and at international conferences. Additionally, they are creating an industry advisory board that includes researchers from companies such as Fujitsu Network Communications, Texas Instruments and Microsoft Research, as well as government agencies like the National Science Foundation, Texas Department of Transportation and researchers from other universities to ensure the training stays up-to-date with current trends and developments within the field.

"It's combining all the new technologies, like self-driving cars, Internet of Things and also edge computing — all new technologies the industry is very interested in," Fu, associate professor of computer science and engineering, says.


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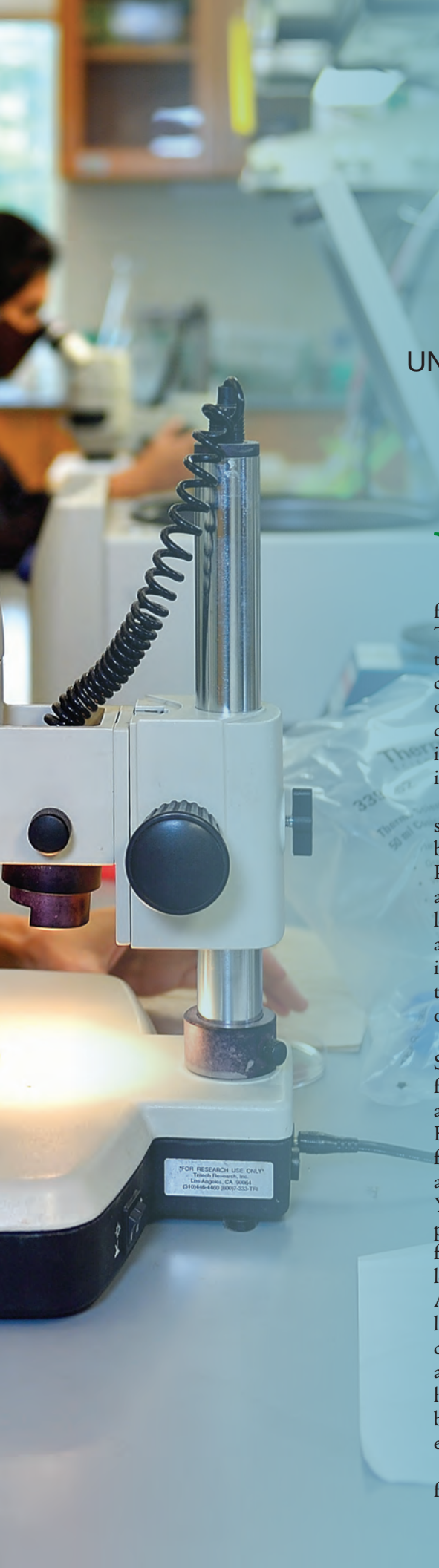


EXPERIENTIAL LEARNING

UNT offers learning, research and mentorship opportunities to engage undergraduate students in creative inquiry.

TEXT BY: AMANDA FULLER
PHOTOGRAPHY BY: MICHAEL CLEMENTS

Undergraduate students aren't just welcome in UNT's research community — they're a part of its foundation. UNT's journey to becoming a Tier One research university was guided by the kinds of innovative and diverse ideas that can only come from an equally diverse group of researchers. From the first day of class, dedicated faculty mentors engage students in rigorous and creative modes of inquiry, inspiring them to solve real-world problems.

"Hands-on experiential learning has been shown to cement the learning process far beyond the basic classroom lecture," Pamela Padilla, associate vice president for research and innovation, says. "And experiential learning ignites a passion for the discipline and career path that is unparalleled in impact. If you want to grow the scholars of the future then we must give them a hands-on experience today."

UNT leads the state in Goldwater Scholars, one of the most prestigious honors for students pursuing careers in math, science and engineering — a total of 66 since 1996. Kevin Yao and Christopher Zhou, students from UNT's Texas Academy of Mathematics and Science, were named 2020 scholars. Yao, who conducted research with physics professor Jose Perez, has a patent pending for his independent research on machine learning for cancer-prediction applications. And Zhou, who conducted research in the lab of Thomas Cundari, Regents Professor chemistry, used computational chemistry and artificial intelligence algorithms to help design novel transition metal catalysts, building blocks for the future of alternative energy sources.

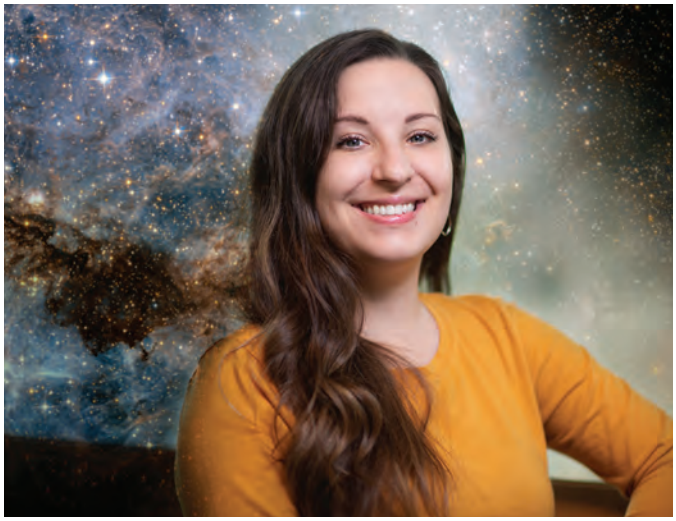
UNT also boasts a number of research fellowships and grant-supported programs dedicated solely to undergraduate students, including the Undergraduate Research Fellowship Program and the McNair Scholars Program, which provides research opportunities for first-generation college students from low-income families or members of underrepresented groups who plan to pursue a Ph.D. Students from across disciplines participate in research with faculty mentors. Their interests are as diverse as our student body, with projects ranging from kinesiology senior Stephanie Gonzalez's research on virtual reality exercise for physical and mental health promotion in colleges students during the COVID-19 pandemic, to psychology senior Madison Card's research into how formal dance training influences a person's cognitive ability and thus, informs methods of treatment.

The UNT PHAGES program, under the direction of associate professor of microbiology Lee Hughes, offers freshmen a chance to start building their research skills and portfolios early in their academic careers, making them better candidates for internships, graduate programs and other professional opportunities.

During the summer, senior researchers across disciplines host highly competitive National Science Foundation Research Experiences for Undergraduates. Participants gain experience in research and academic writing and they build lasting relationships with their faculty and graduate student mentors.

"Undergraduate research teaches you to respect the efforts made by others to improve our understanding of complex matters and resolving issues we face as a society," Card says. "The best part is the confidence and sense of direction I've gained."

INNOVATORS TO WATCH



CREATING A CULTURE OF DISCOVERY

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

SPACE STATION ERGONOMICS

Since she was a kid, Morgan Kainu ('19), a UNT anthropology alum, has loved outer space, attending NASA summer camps and visiting observatories and planetariums. Though no one else at UNT — and practically no one in the U.S. — was studying it, Kainu thought: Why not combine anthropology and the universe? With mentorship from UNT anthropology professor Christina Wasson, Kainu researched the human factors and ergonomics of space station, analog station and off-planet habitat design. Additionally, Kainu started a UNT chapter of Students for the Exploration and Development of Space in 2017. In her senior year, she launched a student organization called SWISE — the Society for Women in Space Exploration — and was lead flight director for Mars Academy USA, which uses exponential technologies and simulation-based learning to train the next generation of analog astronauts.

PROTECTING THE ENVIRONMENT

Shrika Eddula, a second-year student in UNT's Texas Academy of Mathematics and Science, jumped in with both feet as part of the early summer research scholarship program before she began her first year in 2019. She has published eight research articles across publications including the *European Chemical Bulletin* and the *Journal of Molecular Liquids*, based on her work in environmental and physical chemistry in the laboratory of her mentor William Acree, professor of chemistry. Eddula, who is president of the TAMS Research Organization, was a semifinalist in the United States National Chemistry Olympiad and is the recipient of the TAMS dean's scholarship for research. She hopes to pursue a Ph.D. in physical chemistry and lead a cheminformatics research team at a national laboratory specializing in developing safer, cost-effective solutions for greenhouse gases, environmental degradation and carcinogenic solvents.

TACKLING COMPLEX DISEASES

Giorgio Di Salvo ('20), a biomedical engineering student, was selected as the first fellow in the Westheimer Science Research Fellow program, specifically designed to support undergraduate research in UNT Mathematics' new Statistics Lab. The program is funded by Distinguished Alumnus Jerome "Bruzzy" Westheimer ('65). The fellowship will enlist four students overall, each working on high-impact research projects that focus on public health. Di Salvo, who graduated this spring, and UNT biostatics professor Xuexia Wang worked together to develop a novel and powerful statistical method to identify susceptible genes for complex diseases. They focused on schizophrenia, a severe and disabling mental illness with onset typically during early adult life, which remains in many ways a mystery in regards to the heritability of the disorder.

FOOD STUDIES BRIDGES GAPS

As the first recipient of the Julia Child Foundation for Gastronomy and Culinary Arts Fellowship in Food History, UNT history doctoral student Joshua Lopez wants to bridge queer and food studies — and he's started that process by compiling oral histories from the Latinx and queer community. He also has read up on other stories, such as those of LGBTQIA writers who came out as they were making food and a Chicana who, after she was diagnosed with cancer, changed her diet to reflect her indigenous ancestors. He says that food studies is very interdisciplinary and can be a great meeting ground for different types of people.

MORE EFFICIENT DRONES

Kelly Jacques ('20), a Ph.D. student in UNT's College of Engineering, is the 2020 recipient of the U.S. Department of Defense's SMART (Science, Mathematics and Research for Transformation) scholarship, which will cover the cost of her tuition, books and living expenses. She also will participate in summer internships at DOD facilities across the U.S. and, upon graduation, she will be employed by the DOD. Jacques specializes in the field of tribology, the study of friction. During her undergraduate career at UNT, she conducted research into developing protective coatings that can be incorporated into the internal mechanics of a drone's fuel injection system to reduce friction in the system, especially when using a lower quality fuel. Through this research, Jacques aims to make drones more efficient.

CREATING A FINANCIAL PLAN

Jackie Battles ('20), a financial planning major, was recently awarded second place in the International Association of Registered Financial Consultants' National Financial Plan Competition out of 98 other teams and individuals from 15 universities across the United States. The competition is for undergraduate students in a financial services curriculum and requires them to create a reality-based financial plan using data from a fictional family. This is the second consecutive year a UNT student has placed in the competition, with Rebecca Boyle ('19) taking first place last year. Dave Ragan ('03), adjunct professor in UNT's G. Brint Ryan College of Business, served as faculty advisor to Battles and Boyle.

NEW FRONTIER FOR SPACESHIPS

Alexander Sarvadi ('20) and his mentor Huseyin Bostanci, associate professor of engineering technology, believe they have found a better way to revitalize the air aboard spaceships — and NASA agrees. The two received a NASA Space Technology Graduate Research Opportunities grant that will provide up to $160,000 over two years for their research into the design and development of a "microgravity vortex phase separator for liquid amine CO_2 removal system." Sarvadi — who began graduate studies at UNT this fall and will work at NASA during the next two summers as part of the grant — and Bostanci propose to design and build a system using a microgravity vortex phase separator that could potentially offer a reliable, high-throughput flow and energy-efficient CO_2 removal technology for future crewed space exploration missions.

HISTORY OF RESILIENCE

Brian Elliott ('20 Ph.D.), who earned his doctorate this spring, never allows his visual impairment to slow him down. Elliott didn't expect to finish his time at UNT defending his doctoral dissertation in a Zoom meeting, but he says it ended up not being a big deal. It's not surprising he took it in stride. After all, he earned three UNT degrees in history while living with Stargardt's disease, a visual impairment he was diagnosed with as a teen. Elliott, selected as a special projects research assistant for UNT's Portal to Texas History, has published book reviews and has manuscripts under consideration by several journals. He was named the history department's 2019 Outstanding Teaching Fellow and teaches history in the diploma program at Westlake Academy in Westlake.

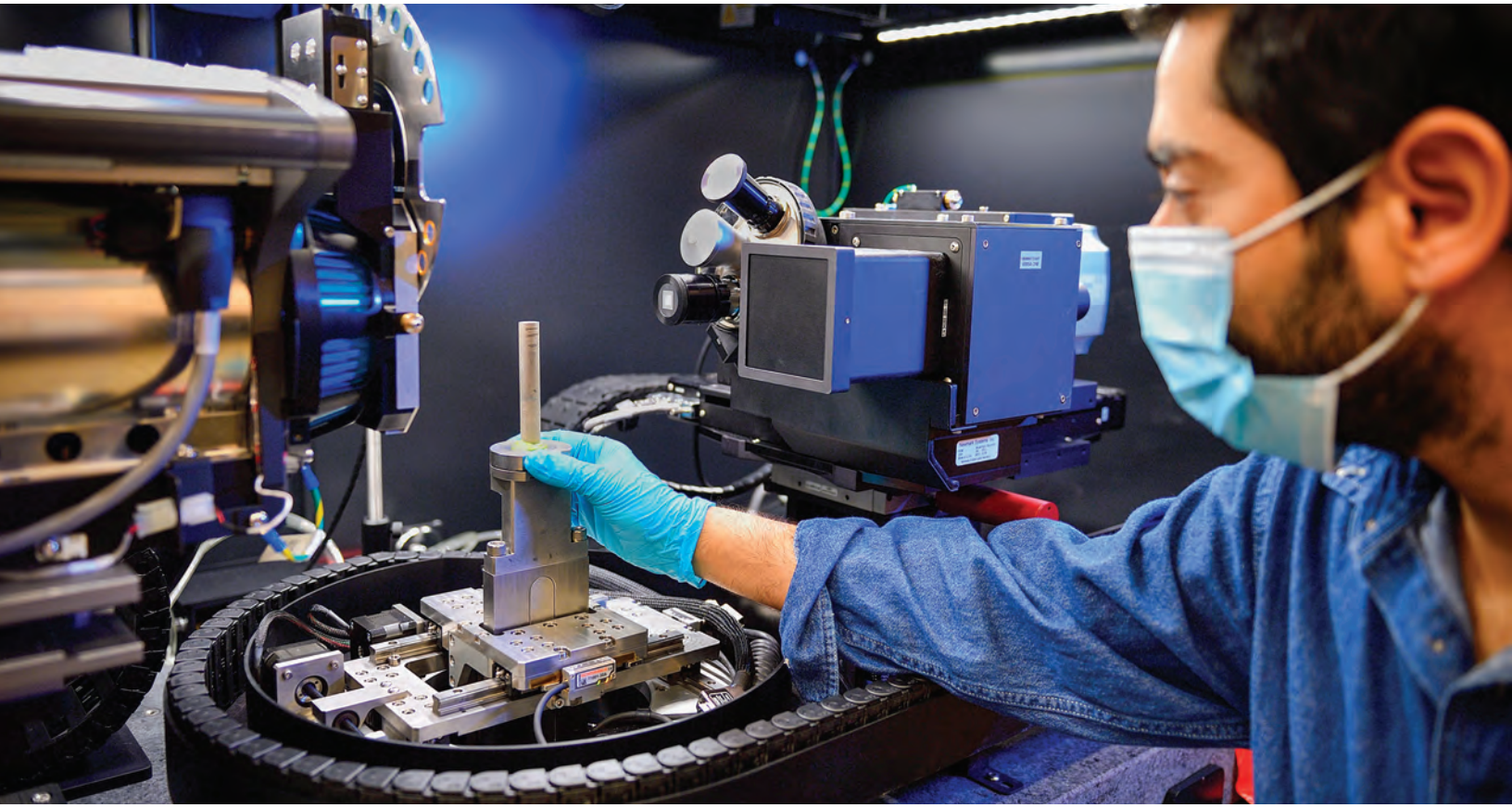
CURING HER OWN DISEASE

Diagnosed at 18 with Charcot-Marie-Tooth disease, commonly known as CMT, Allison Taylor ('20), who earned her biology degree this spring, has dedicated her life to researching a cure. The most frequently inherited peripheral neuropathy disease, CMT leads to muscular and sensory degeneration. In her quest to better understand CMT, Taylor took part in the UNT PHAGES program as a freshman and then participated in a National Science Foundation Research Experience for Undergraduates the next summer. At Mississippi State University that summer, she studied the evolution of gap junction beta proteins. During her junior year, she joined neuroscience professor Jannon Fuchs' research group and began the work for her honors thesis, which centered around the Schwann Cells and their role in CMT. After graduation, Taylor joined the Neuroscience Postbaccalaureate Initiative at Oregon Health and Science University.

NEW REALITY FOR ASTRONAUTS

During their time as undergraduates at UNT, David Woodward ('20), Juan Ruiz ('20), Tim Stern ('20) and Nickolas Bratsch ('20), who earned degrees this spring, proved that one small step toward the unknown could result in a giant leap for the future of spacesuit user interface technologies. The computer science and engineering alums formed a team that developed an augmented reality program for space helmets as part of the NASA Spacesuit User Interface Technologies for Students (SUITS) Design Challenge. Their program provides real-time visual communication — anything from suit status, biometrics, checklists, detailed instructions and even pictures — via an astronaut's helmet visor. This spring, they created a glove that sent a live camera feed directly to the headset as part of their senior design project. They also added a second live camera feed from the back of the helmet, which they called the "rearview cam."

INNOVATIVE SPACES



As UNT's creative and scholarly footprint grows, so does the campus, which has seen the addition of new facilities that encourage collaboration and enable faculty, students and external research partners to conduct solutions-based research. Recent building projects — including the Center for Agile and Adaptive Additive Manufacturing (CAAAM) and a new Biomedical Engineering Building at Discovery Park, and the expansion of UNT's presence in Frisco — not only create a pipeline for technology transfer and industry partnerships, but meet the demands of a changing workforce.

Learn more about CAAAM and see a video at *research.unt.edu/magazine/CAAAM.*

STANDOUT ADVANCED MATERIALS FACILITY

In 2019, UNT secured $10 million from the 86th Texas Legislature for the Center for Agile and Adaptive Additive Manufacturing (CAAAM). UNT launched the center at Discovery Park in 2018 under the umbrella of the university's existing Additive Manufacturing Laboratory, and the expertise of its world-renowned faculty helped place the university at the forefront of this rapidly emerging field. UNT has developed one of the most advanced university research facilities in the nation for materials processing, manufacturing and analysis, allowing faculty and industry to collaborate to advance the science and application of materials processing and additive manufacturing across industries — from energy to aeronautics, automobile, biomedical and beyond.

Co-sponsored by UNT's Division of Research and Innovation and the College of Engineering for the dual purpose of research and providing students with additional hands-on educational opportunities in this growing area, CAAAM is helping Texas develop a highly skilled workforce of engineers.

STATE-OF-THE-ART BIOMEDICAL ENGINEERING BUILDING

In Fall 2019, UNT opened its new $12.6 million Biomedical Engineering Building — a place where glass-walled open-concept labs and classrooms create a transparent and collaborative environment for cutting-edge research and learning. Biomedical engineering is one of the fastest-growing programs at UNT, increasing more than six-fold since its first class in 2014.

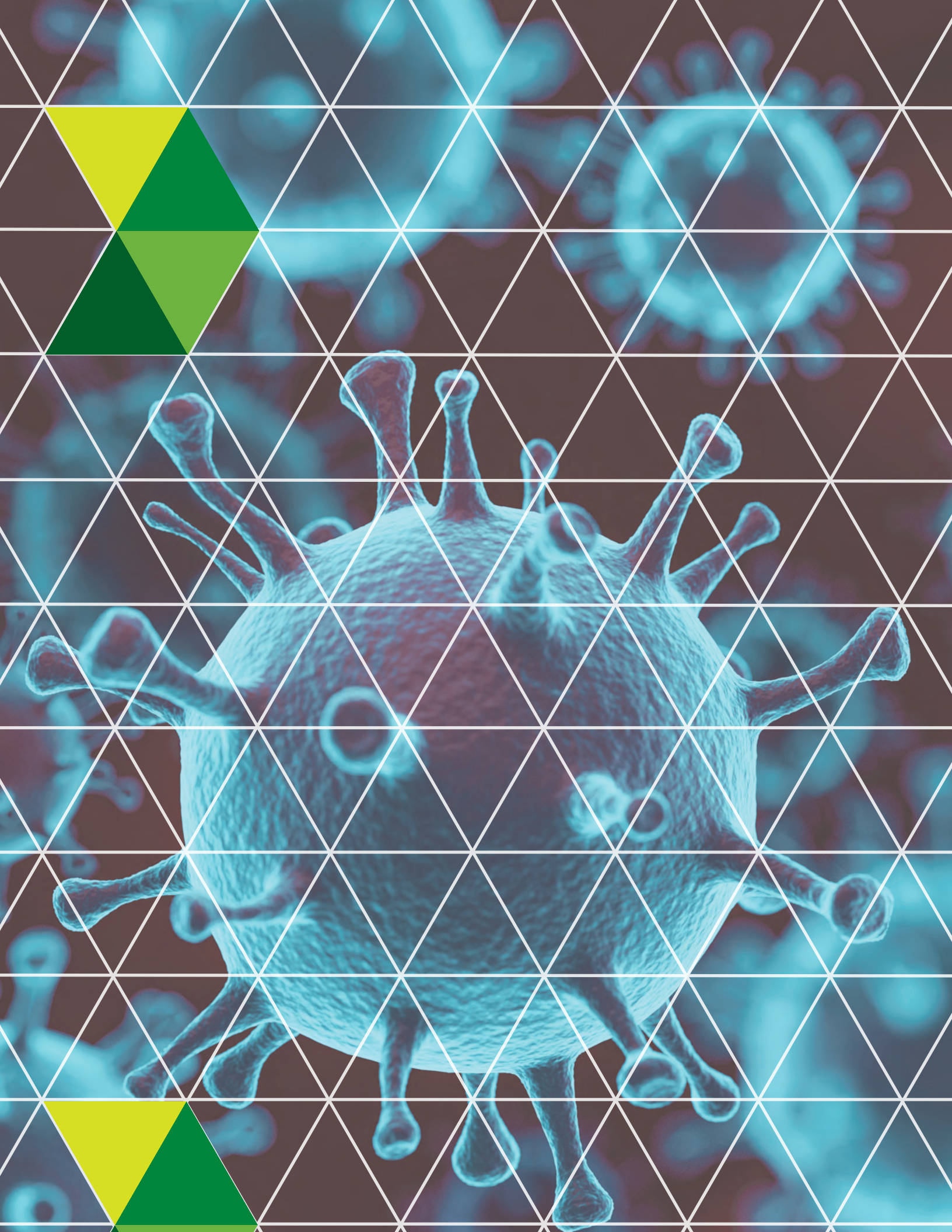
The 26,250-square-foot building located on UNT's Discovery Park campus provides faculty and students with modern classrooms, research labs, facilities for microscopy, cell culture and optics, as well as teaching labs and a senior design lab. Inside research labs, faculty investigate exoskeleton technology that may someday help people with limited mobility. They develop nanotechnology and optics to diagnose cancer and biopolymers and flexible bioelectronics that may help doctors deliver medications and manage illnesses.

And the new facilities have allowed UNT to recruit new faculty and students to the biomedical engineering program — the department has added five new faculty in the last three years with research expertise in diverse areas such as biotechnology, medical imaging, flexible bioelectronics, and genetic and tissue engineering.

GROWTH IN FRISCO

The Texas Higher Education Coordinating Board voted in January 2020 to approve UNT's creation of a Frisco-based branch campus — situated on 100 acres donated by the City of Frisco — that will provide core curriculum, upper-level and graduate courses. UNT's collaboration on this branch campus with the City of Frisco, Collin County and Collin Community College will allow the university to continue to support innovative programs and partnerships in a location that is becoming synonymous with innovative growth.

Currently, UNT serves 2,900 students at its locations in Frisco — Hall Park and Inspire Park — as well as at the Collin Higher Education Center in McKinney. Inspire Park is a 50,000-square-foot building on 4.8 acres located in close proximity to the future campus. It operates as a business incubator for startup companies, including a new analytical chemistry lab, and offers space for classes, such as labs for students studying to become science educators.



INNOVATIVE *FORWARD THINKING*

From using artificial intelligence and engineering new devices to promote better health care to developing out-of-the-box approaches that improve educational outcomes and collaborating in an effort to combat COVID-19, UNT researchers lead the way in confronting today's toughest challenges.

TEXT BY: ERIN CRISTALES

The Biomedical Artificial Intelligence Lab in UNT's Discovery Park is a place where "the only chemical is coffee," but the energetic number crunching is applied to conditions including cancer, Parkinson's disease, spasticity, leg amputations, aphasia and cerebral palsy.

The lab is led by Mark Albert, assistant professor of biomedical engineering and computer science and engineering, and his primary goal is to provide the kind of career-shaping, discipline-disrupting experiences that can boost academic potential and better society in the process. Albert's grad students collaborate on artificial intelligence projects ranging from real-time tumor tracking with radiation oncologists to improving assessments of microprocessor-controlled prosthetic legs with physical therapists.

In March, COVID-19 forced the lab, along with nearly every other part of campus, to temporarily shut its doors. The desire to use research as a tool for changemaking, however, stayed very much open for business.

For example, just a month after the pandemic made its way to Texas, 30 teams of students taking AI classes with Albert and Ting Xiao, computer science and engineering assistant professor, used real-world data to predict the number of infections and fatalities for each region of the world as part of the Kaggle COVID-19 Global Forecasting challenge. Many students used state-of-the-art recurrent neural network models tuned for the task — and found they predicted the path of the virus with a fair amount of accuracy. The exercise, Albert says, emphasized the potential for data to help improve people's lives and plan for future events.

"There are problems that need to be solved, and more data out there to solve them than any number of people can manage," Albert says, "so we're using machine learning to sift through that sea of data and make an impact."

"Making an impact" could easily be UNT's research motto — it's an institution where education never stops and world-bettering interdisciplinary innovations know no bounds. For instance, UNT's approach to AI — for which it added a master's program this fall — means faculty from business, engineering, information, health and public safety, and music collaborate on machine learning, deep learning and data science in areas as varied as natural language processing, computer vision and autonomous control. And this fall, the university launched several new cutting-edge degree programs including a B.S. and M.S. in cybersecurity, an M.S. in engineering management and an M.B.A. in music business.

UNT also is a place where researchers possess the flexibility to change focus when tough times require it — in the months since COVID-19 ravaged the globe, faculty from nearly every field have pivoted to address the insidious effects of the pandemic, looking for solutions to problems ranging from linguistic barriers to health care to the efficacy of proposed treatments.

All of that and more is what makes UNT's research footprint so indelible. Last year, UNT's Tier One status was reaffirmed, making the university one of only 131 institutions in the nation to be included in those ranks — its diversity of doctoral programs and strengths in non-STEM research areas were major factors in UNT earning, and retaining, that designation. In fall 2019, Mark McLellan joined UNT as vice president of research and innovation, bringing 35 years of experience in leading major university research programs, including stints at Portland State, Utah State, the University of Florida, Texas A&M and Cornell. And like all great researchers, McLellan understands the power of iteration. That's why he's drawing on his past successes — along with a healthy dose of support from UNT President Neal Smatresk and UNT Provost Jennifer Cowley — to illuminate the path forward.

"Not every institution has that all-hands-on-deck approach to its future in terms of building out the role of discovery and innovation," McLellan says. "We're relatively young in this game, but our opportunity and potential are sky high."

INTEGRATED INGENUITY

And faculty are harnessing that potential — quite literally, in the case of Barbara Trippeer, assistant professor of fashion design. She's collaborating with researchers from Columbia University's College of Engineering and the Fashion Institute of Technology to create a brassiere lined with optical sensors that can track changes in breast cancer tumors.

Trippeer brings a unique perspective to the table — yes, the sensors are potentially gamechangers, but will patients actually wear them? She's applying her knowledge to ensure the garment will feature the kind of comfortable, fashionable design that promotes patient satisfaction, which in turn could ultimately prevent more invasive forms of therapy.

"Not every institution has that all-hands-on-deck approach to its future in terms of building out the role of discovery and innovation."

— Mark McLellan, vice president of research and innovation

UNT Washington D.C. Research Faculty Fellows with U.S. Rep. Michael Burgess ('72, '76 M.S.) during February's trip.

WASHINGTON D.C. RESEARCH FACULTY FELLOWS PROGRAM

As part of a focused strategy to advance UNT's research standing and help faculty members' dreams come alive as they address some of society's biggest problems, last year a new Washington D.C. Research Faculty Fellows program was launched to take select researchers to visit Washington D.C. and meet federal research agency program directors.

In early February, 19 junior faculty from across all disciplines traveled to Washington, D.C., to interact with granting agencies about their research. Their projects run the gamut — they focus on everything from optical-sensor lined bras that can help detect breast cancer to the human factors of cybersecurity to behavioral neuroscience and exercise psychology. The researchers' goal, however, is the same — to better understand the grant-review process as a way to claim their piece of the $6 billion in federal funding released each year.

"All of our faculty need to become comfortable in explaining very clearly why their research deserves investment," says Mark McLellan, vice president of research and Innovation. "The better they get at this, the more likely they are to receive federal support for their work."

That's why upon his arrival to UNT last fall, McLellan established the Washington D.C. Research Faculty Fellows program as a way to provide young faculty an inside look at granting agencies and their review processes, to increase their awareness of the funding opportunities available and to help them discern what is — and isn't — effective when it comes to grant applications.

OPENING DOORS

The 2020 cohort hailed from 11 of UNT's 14 colleges and were nominated by the deans and associate deans of research.

"I had a very positive experience speaking with agencies and program officers, many of whom provided feedback and guidance on other potential funding that may be more aligned with my work," says Ryan Olson, assistant professor in of kinesiology, health promotion and recreation, whose research focuses on behavioral interventions to improve cognitive, cardiovascular and mental health outcomes. During the trip, he spoke with representatives from the National Institutes of Health. "This opened the door to new opportunities that I originally missed in my search."

April Becker, assistant professor of behavior science who recently won a prestigious Ralph E. Powe Junior Faculty Enhancement Award for her work in improving behavioral assessment testing for stroke research, visited four granting agencies during the February excursion. She's seeking funding in the area of neuromodulation of cortical and behavioral plasticity — specifically as applied to recovery from brain injury or skilled training — as a means to discover basic principles of brain changes that contribute to learning and to find brain stimulation approaches that can augment the process. Following discussions with granting agencies, her goals included completing minor revisions to a grant for resubmission and applying for up to three junior-level grants before spring 2021.

"The added value of this kind of in-person experience compared to phone contact can't be overstated," Becker says. "Direct contact with federal funding officers and parallel support and advice through the research office and colleagues improves the quality of opportunities for networking, self-education, communication, clarity of information, and many other grant-relevant skills and content."

INCREASED FUNDING

The fellows contributed significantly to the 14% increase in grant applications that UNT's Grants and Contract Administration saw in the past fiscal year. Several of the fellows have already received awards from major funding agencies including Qing Yang, assistant professor of computer science and engineering, who has been awarded multiple grants from the National Science Foundation for his autonomous vehicle research, and Sara Champlin, assistant professor of journalism, who was part of an NSF RAPID grant for a collaborative project providing usable COVID-19 health information to refugee populations.

"Everyone needs aspirational leaders that you see as being successful, and you want to ride their coattails and be like them," McLellan says. "We're creating that here in our young new faculty hires so that they're just rocket ships taking off."

"Fashion is like people's armor — it's what you put on every day to feel confident," says Trippeer, who in February took part in UNT's Washington D.C. Research Faculty Fellows program, in which 19 junior faculty from across all disciplines traveled to Washington, D.C., to meet with funding organizations. "The challenge is that often scientists only care if the technology works. But with medical regime adherence, if the patient doesn't like the product, they may not wear it. So, how can we include patients in the process so they are engaged and invested?"

Trippeer's user experience expertise means she's able to see the project from a divergent, yet no less critical, angle. It's those kinds of multidisciplinary meetings of the minds — both in-house and across industry and institutions — that have long been an essential component of UNT's scholarly culture.

In just the past year, there have been numerous research endeavors that have proven UNT's collaborative power. A few highlights include the work of Kent Chapman, Regents Professor of biology and director of UNT's BioDiscovery institute, who — in conjunction with researchers from Huazhong Agricultural University in China — created the first complete DNA sequence of jojoba, a drought-tolerant, wax-bearing desert shrub that is a major ingredient in cosmetics and skin care products because it supports moisture retention in human skin. Misty Sailors, professor of teacher education and administration, and Jim Hoffman, professor of language and literacy, are part of the BETTER project — implemented by CODE (Canada) and Associação Progresso (Mozambique) with funds from the Government of Canada and in close collaboration with the Ministry of Education and Human Development of Mozambique — which reimagines primary literacy teacher preparation through an initiative that promotes personal, literacy-focused relationships between preservice teachers and primary-aged students. And Ifana Mahbub, assistant professor of electrical engineering, received a $500,000 National Science Foundation CAREER grant to develop a wireless recording, stimulation and power system that will allow medical researchers to study and possibly treat brain diseases such as chronic neuropathic pain and post-stroke paralysis. The project is a collaboration with other chronic pain mitigation researchers, including one from Texas A&M.

"Opioids are a problem, and people are trying to find alternative ways to solve chronic pain," Mahbub says. "We have to work together to solve the problems that exist."

COLLABORATIVE CURES

Over the past few months, the number of problems has substantially increased, as has the urgency to solve them. The COVID-19 pandemic has united UNT scholars across every discipline — early on, for instance, researchers in the College of Engineering and CVAD combined their talents to produce transparent face shields in response to an in-house equipment shortage caused by the pandemic, a move that enabled lab-based researchers to continue their hands-on quest for answers.

Of course, not all COVID research requires test tubes and centrifuges. Back in March, Sara Champlin, assistant professor of advertising and a participant in the fellows program, was looking for ways to contribute her expertise to the COVID-19 pandemic. At one meeting, there were ideas pitched from biology, chemistry, physics, mathematics — all crucial areas, but none that directly applied to her work in the social sciences. And then Shobhana Chelliah, associate dean and professor of linguistics, said the magic word: *communication*.

"I sent her a message," says Champlin, whose expertise is in health communications. "And I was like, 'We don't know each other, but we have overlapping interests.'"

"We have to work together to solve the problems that exist."

— Ifana Mahbub, assistant professor of electrical engineering

"Whether you are applying the scientific methods of documentary linguistics or conducting tests in a lab, science matters. You need science to make a significant impact on things like public health."

— Shobhana Chelliah, associate dean and professor of linguistics

That led to the two collaborating on a project — along with Kelly Harper Berkson, assistant professor of linguistics at Indiana University, and Ken Van Bik, assistant professor of linguistics at the University of California, Fullerton — that aims to discover how to effectively communicate information about COVID-19 to refugees of Myanmar, who are members of the Chin language community. The group, which recently received a National Science Foundation Rapid Response Research grant for the project, is preparing to gather feedback from the minority language community through interviews and narratives, which Chelliah will linguistically analyze. Ultimately, those translations will be given to Champlin's students, who will create visual materials for Chin speakers.

Chelliah hopes that by learning how to best communicate COVID-19 information to the Chin community, the team will deduce how to better support speakers of any underserved language, particularly when it comes to their health.

"Whether you are applying the scientific methods of documentary linguistics or conducting tests in a lab, science matters," she says. "You need science to make a significant impact on things like public health."

And other researchers have certainly heeded that call, applying their knowledge in areas including mental, physical, educational and financial health. Wendy Middlemiss, associate professor of educational psychology, received a grant from OneStar National Service Commission to examine what the Texas Home Institution for Parents of Preschool Youngsters State Office can do to support AmeriCorps members during times of disaster. Buddy Scarborough, assistant professor of sociology, co-authored a study with researchers from Washington University in St. Louis, the Maryland Population Research Center and the University of Melbourne that found mothers reduced their work hours four to five times more than fathers during the pandemic, further widening employment-based gender gaps. And Norman Dulch, an adjunct professor in the College of Health and Public Service, released the book *Nonprofit Crisis Management: Response to COVID-19* that tells stories of nonprofits and their responses to those they serve.

Then there's Christopher Long, assistant professor of teacher education and administration. In the months before the pandemic wound its way across the globe and gained a foothold in the U.S., he had teamed up with fellow assistant professor Lauren Eutsler to study virtual reality headsets as part of K-12 science-based learning environments.

But when public schools closed their doors following spring break, he was forced to address another question: How could he gauge students' attitudes about learning environments if they were no longer physically in the classroom?

"Our entire study that we'd spent the year setting up vaporized in front of us," Long says. "But then it occurred to me that

with our undergrads, we could actually look at learning environments before and after students had to start learning from home."

Long sent surveys to roughly 4,000 undergraduates from his department and the Department of Kinesiology, Health Promotion and Recreation, gauging feelings about their learning environments prior to the spring break closure, and after. Of the 230 students who fully participated, most students reported that at-home learning left much to be desired — they cited internet issues and feelings of social disconnectedness as primary areas of concern. Those findings, Long says, can likely be extrapolated to K-12 students — and in discovering students' misgivings regarding online instruction, educators can look for ways to make the experience better.

For example, Long says, a university in Holland employed a Discord server — typically used for video games — to set up virtual lab groups for students to work on projects remotely, improving both collaboration and connectivity.

"Getting it right is going to take a lot of trial and error," Long says. "One way forward is for teachers to create cooperative learning environments where students are interacting with each other rather than just teacher-student interactions. We have to make sure we're giving instructors room to try things."

Trent Petrie, professor of psychology, is addressing COVID's effects on the mind from a different perspective. Like Long, he tweaked the project he was tackling prior to the pandemic, an investigation into student-athletes' experiences following graduation.

"Then, all of a sudden, collegiate sports shut down," Petrie says. "So we did 'pivot,' to use that term, to address the reality of this unique situation for college athletes."

Petrie began to look at how COVID-19 affects student-athletes' mental health — everything from body image issues and depression stemming from changes in training to their concerns about returning to in-person practice. That holistic approach is important, Petrie says, because there hasn't been much nationally-based research regarding college athlete's mental health and well-being beyond some NCAA studies based on single-item questions.

"One of the things that we wanted to do in this study was to use measures that have been linked to actual clinical diagnosis so we could determine the percentage of athletes who are at risk for more severe psychological distress," Petrie says. "And so that became our driving force — to collect data on which psychologists who were working with athletes could base their interventions."

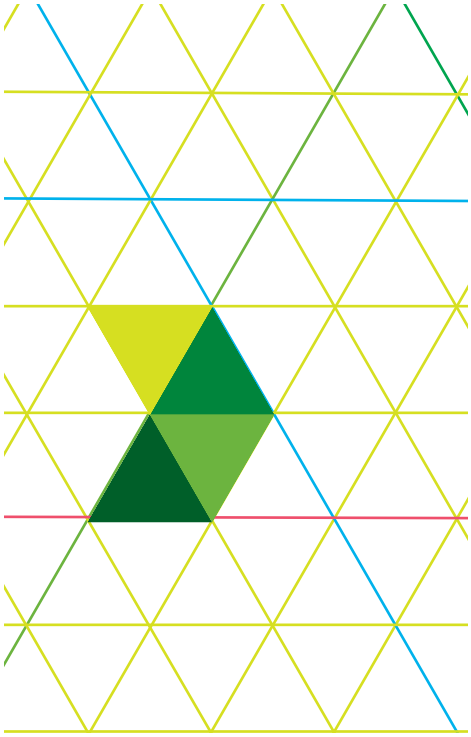
DELVING DEEPER

In the hard sciences, researchers' goals have largely centered on the physical effects of the virus — and how to prevent them from taking hold.

A team from UNT's College of Engineering, for example, used 3D-printing technology to manufacture ventilator splitters that will allow doctors to use

"It's very hard for one person or one team to have expertise in everything. If everything is homogenous, you're not going to have the difference of ideas you need. That's why collaborations are crucial not only within, but also outside of, institutions."

— Andrés Cisneros, professor of chemistry



a single ventilator to treat two patients. Using biocompatible materials that can be sterilized for medical applications, the team printed 20 splitters along with flow limiter inserts to enable medical providers to adjust air flow for each patient.

And a student research team led by Yijie Jiang, assistant professor of mechanical and energy engineering, has developed open source codes for a mask and nose plugs that have high virus trapping efficiency and allow for smooth inhalation. The best part? Anyone with a 3D printer at home can make their own.

"Our next phase," Jiang says, "will include researching efficient ways to sanitize the masks and nose plugs with medical disinfectant as a person breathes."

That impulse to use research expertise and collaboration to explore the possibilities of curbing — and potentially treating — COVID-19 is no stranger to Andrés Cisneros, professor of chemistry, whose focuses include theoretical and computational chemistry, biochemistry and inorganic chemistry. For years, he's performed computational simulations to better understand the structure of DNA polymerase, the enzymes essential for replicating the entire genome of any living organism before cell division. After reading a study in mid-March that discussed the structure of RNA polymerase in SARS-CoV-2 — the virus that causes COVID-19 — the proverbial light bulb switched on.

"We already know how polymerases work for DNA, so for RNA, it's not going to be much different," Cisneros says. "I talked with my team and said, 'I don't know about you, but I'm sick and tired of doing nothing for this particular pandemic.'"

The team already was conducting plenty of potentially life-changing research, including looking at cancer-related mutations on DNA polymerases. But they jumped at the opportunity to examine at the atomic level interactions between inhibitors and RNA dependent RNA polymerase (RDRP) and the main protease (MPro) in SARS-CoV-2. The idea, essentially, is this: If a drug can inhibit these enzymes, the virus could stop replicating in cells and would no longer be able to spread in the body.

Cisneros and his team, which also includes collaborators from France and two other U.S. institutions, applied for a grant from the COVID-19 High Performance Computing Consortium. Just three days later, they were awarded 500,000 hours of supercomputer time at national labs, including the Texas Advanced Computing Center and Oak Ridge National Laboratory, which houses Summit, the world's fastest supercomputer for academic use. Additionally, the team was given $250,000 in credit to run simulations on Microsoft's cloud computing service Azure. So far, Cisneros says, the results have been "very interesting." Right off the bat, they were able to deem two of the six inhibitors under review as ineffective, and have developed a model for the RNA polymerase.

Still, much like the various vaccines that are currently being tested, Cisneros knows it's a numbers game — granting institutions are providing scientists with access to as many resources as possible to see who comes up with the best ideas. That time crunch makes collaboration even more critical.

"It's very hard for one person or one team to have expertise in everything," he says. "If everything is homogenous, you're not going to have the difference of ideas you need. That's why collaborations are crucial not only within, but also outside of, institutions."

THE MISSION CONTINUES

While in many ways it's been a banner year for UNT and its researchers —

2019-20 saw its highest-ever number of CAREER awardees, a record $78.4 million in research expenditures, and an all-time high income in technology licensed for commercialization — it's not yet mission accomplished. But for an institution that, in the 130 years since its founding, has continually strived to provide bigger and better outcomes for its students, and society in general, it probably never will be.

And it's exactly that kind of tenacious commitment to creating a brighter future that leads institutions to the top of the Tier One pack.

"The move to Carnegie's top tier is a validation of our impact and an important milestone as we increase our national prominence," Smatresk says. "It doesn't change UNT's trajectory, but it does change the speed at which we can move forward, because it gives us momentum to further our impact. We're making great strides."

Read more about Ifana Mahbub's research into the biomedical applications of semiconductor devices and about the research experiences of students in the Biomedical Artificial Intelligence Lab. *research.unt.edu/magazine/forward-thinking*

BIOMEDICAL ARTIFICIAL INTELLIGENCE LAB

Graduate students gain real-world experience in using artificial intelligence to improve health care outcomes in UNT's Biomedical Artificial Intelligence Lab.

In the Biomedical Artificial Intelligence Lab at Discovery Park, students are on a path to changing their future — and the future of patients dealing with issues ranging from cerebral palsy to cancer to cardiac arrest.

"Students pursuing hot areas like natural language processing and deep learning — if they have the research papers to back up their knowledge — are asking for starting salaries of $150,000," says Mark Albert, assistant professor of biomedical engineering and computer science and engineering, who is dedicated to providing his graduate students with the kind of career-shaping experiences that can boost their potential — and better society in the process.

DETECT FALLS

Havish Nallapareddy, a second-year graduate student in computer science and engineering, is using machine learning to improve fall detection for better wearable airbag deployment as part of a collaboration with the Shirley Ryan Ability Lab. The project is tricky — Nallapareddy must use data to teach the airbag the difference between an actual fall and a downward movement such as sitting.

"A fall is not just a fall. According to the CDC, one in four Americans over the age of 65 fall each year," Nallapareddy says. "The motivation of the Biomedical AI Lab is to address all the physical challenges humans face."

PREDICT CARDIAC ARREST

Akansha Goel, a first-year graduate student in UNT's new M.S. in AI program, recently joined a collaborative project with Albert's lab and faculty from electrical engineering to develop the analytics for a wearable EKG vest to measure abnormal heart rhythms and potentially predict sudden cardiac arrest.

'The AI program has project-centric curriculum with experienced professors engaged in active research projects and grant efforts," says Goel, who after graduation wants to further explore machine learning, particularly as it relates to biomedical applications.

ALUMNI INNOVATORS @ WO

CUTTING-EDGE RESEARCH, TRAILBLAZING CAREERS

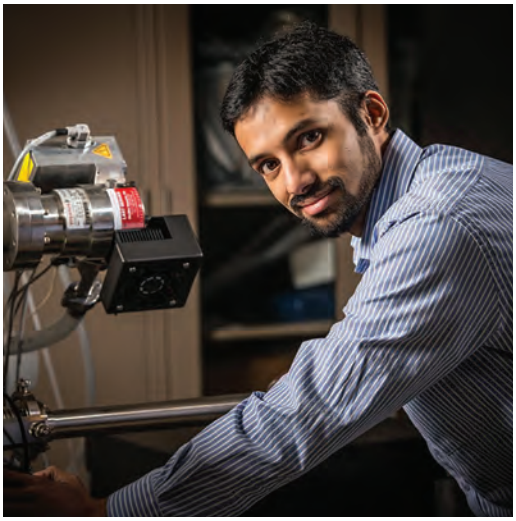
INNOVATION HAS BEEN PART OF UNT'S CULTURE SINCE 1890, AND GRADUATES HAVE CARRIED THAT SPIRIT THROUGHOUT THE WORLD AS RESEARCHERS, INNOVATORS AND LEADERS.

PRODUCING MORE EFFICIENT BIOENERGY

Jantana Keereetaweep ('15), an assistant biochemist in the biology department at the U.S. Department of Energy's Brookhaven National Laboratory in New York, won the Paul K. Stumpf Award, given to early career scientists, from the International Symposium on Plant Lipids. Keereetaweep was honored for her work in lipids and plant biochemistry at Brookhaven, where she has worked since 2015. She is studying plant lipid biosynthesis to see how it can create more efficient bioenergy production. The oil or lipid-based bioproducts could be used for fuels and raw materials — and, consequently, help combat climate change. She was inspired to study plant biochemistry because of Regents Professor of biological sciences Kent Chapman, who received the lifetime achievement award at the conference. Chapman and Keereetaweep have co-authored 15 papers on the subjects of lipids and plant biochemistry.

DELIVERING AWARD-WINNING NEWS

Kalani Gordon ('12), a graduate of UNT's Mayborn School of Journalism, was part of the team from the *Baltimore Sun* that won the Pulitzer Prize winner for local reporting. As director of audience and analytics for the *Sun*, she assisted with the research and investigation that found former mayor Catherine Pugh used no-bid contracts with the University of Maryland's medical system to boost profits for her self-published children's book. The team's reporting resulted in Pugh's resignation and a three-year sentence in federal prison. In 2016, Gordon was a Pulitzer finalist as part of the *Sun's* breaking news team for their coverage of riots following the death of Freddie Gray, who died while being transported in a police van. She is part of a group of 15 living UNT alumni who have been recognized as Pulitzer winners or finalists. Gordon previously worked as digital assistant managing editor at *The Evening Sun* in Hanover, Pennsylvania, and as a breaking news intern for *The Dallas Morning News*.



DEVELOPING STRONGER METAL ALLOYS

Arun Devaraj ('11 Ph.D.), a materials science and engineering graduate, received the 2020 Early Career Research Program award from the U.S. Department of Energy. Now a materials scientist at the Pacific Northwest National Laboratory, he will use the five-year, $2.5 million award to explore how the combination of hydrogen, stress and oxidation can result in the failures of high-strength steels that are used in nuclear and automotive industries. He hopes to develop strategies so metal alloys are designed to withstand extreme corrosion, stress and high temperatures. While at UNT, Devaraj studied experimental and computational materials science with his mentor Regents Professor Raj Banerjee and associate professor Srinivasan Srivilliputhur, both from the Department of Materials Science and Engineering. For his thesis, he studied the phase transformation of titanium alloys, which are used to decrease the weight in automobiles, and correlated the experimental results with theoretical computation.

RESEARCHING SAUDI ARABIAN CONTEMPORAY ART

As an assistant professor at King Saud University in Riyadh, Saudi Arabia, Noura Shuqair ('20 Ph.D.) is developing research about the relationship between the historical area Al-Balad and contemporary Saudi art practice — a topic she will study as part of a creative residency sponsored by the Ministry of Art and Culture. Al-Balad, located in the west of Saudi Arabia in historic Jeddah, is listed as a World Heritage Center by UNESCO to support the documentation and research of Al-Balad, especially in Arabic language. She wanted to pursue the topic because of her interest in the architecture and art of her homeland, and she hopes to gain more understanding of the history of the area and enrich the literature about the site. She was inspired to research and write about contemporary art in Saudi Arabia while studying at UNT with her mentors, art history professor Nada Shabout and art education professor Tyson Lewis.

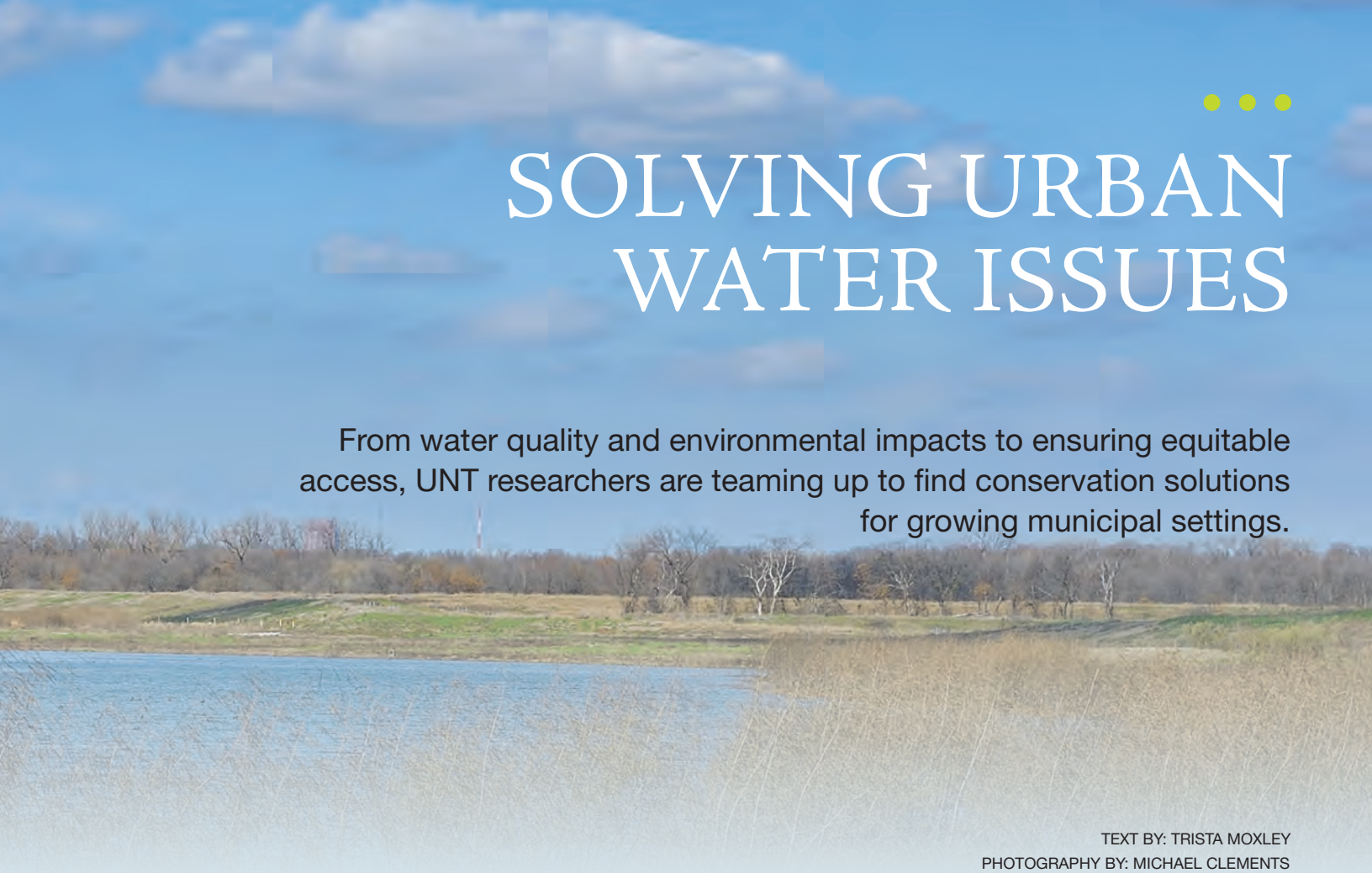
ACHIEVING MORE WITH MACHINE LEARNING

As an applied data scientist at Microsoft in Redmond, Washington, Zikra Toure ('16, '17 M.S.) works hand-in-hand with Microsoft's high-impact customers to help them tackle some of their toughest technical problems, such as improving forecasting, classification and recommender systems, using the Azure Cloud Systems. Toure earned bachelor's and master's degrees in electrical and electronics engineering from UNT where she also was involved in the Society of Women Engineers and served as president of the Institute of Electrical and Electronics Engineers Computer Society. Before working at Microsoft, she was a machine learning engineer at Dallas-based Call Box where she developed advanced facial recognition technology. She hopes to use machine learning and artificial intelligence to help others, including those in her home country of Mali in Africa.

SAFEKEEPING WATER

SOLVING URBAN WATER ISSUES

From water quality and environmental impacts to ensuring equitable access, UNT researchers are teaming up to find conservation solutions for growing municipal settings.



TEXT BY: TRISTA MOXLEY
PHOTOGRAPHY BY: MICHAEL CLEMENTS

Water is arguably the most important resource on the planet. We need it to drink, to wash our clothes and for recreation and fishing in our reservoirs. And it's imperative for industry and commerce, agriculture and thermoelectricity. But our water supplies are at risk.

The Texas Water Development Board estimates that Texas' existing water supplies will decrease by more than 10% over the next 50 years, while demand will increase by 17%. The greatest increase in demand is in the municipal sector as a result of a growing urban population, which is expected to overtake the agricultural sector by 2070.

Several researchers from across UNT — including biology, philosophy, urban planning and geography — are building upon their efforts in water issues, developing and identifying solutions for policymakers, municipalities and stakeholders throughout the state. UNT has deep roots in urban water studies — nearly 85 years ago, its first funded water quality research was undertaken by biologist J.K.G. Silvey, who studied the microorganisms causing changes in the taste and odor of city water supplies.

Today, researchers collaborating within UNT's Advanced Environmental Research Institute (AERI) are tackling water topics from toxicity to environmental impacts to access, as well as social justice issues that are connected to urban water centers.

"We collaboratively look at different aspects of water and urban water — starting with availability and quality," Aaron Roberts, professor of environmental toxicology and director of AERI, says. "And how to ensure a sustainable and resilient water future for an increasingly urban and drought-prone state."

COMMUNITY ENGAGEMENT

The State Water Plan estimates the costs of water management strategy projects to reach $63 billion by 2070. If Texas does not implement the plan, estimated annual economic losses resulting from water shortages could range from $73 billion in 2020 to $151 billion in 2070.

Ruthanne "Rudi" Thompson, associate professor of biological sciences and co-director of Teach North Texas, hopes that some of the cost can be mitigated by teaching Texas' youngest citizens about conservation and responsible water use. She has secured more than $7 million in funding from the City of Dallas over the past 13 years, most recently receiving a $2,252,475 grant renewal through 2024, to study raw water bill data and use the information to teach students in pre-K through fifth grade in corresponding zip codes about conservation. Thompson's Environmental Education Initiative uses hands-on activities such as building mini aquifers in cups.

The results are clear — Dallas has seen annual savings of over $3 million and more than 22 billion gallons of water. Through the program, Thompson's team provides instruction to students and leads professional development classes year-round for teachers and students in the Dallas, Richardson and Duncanville school districts, as well as local private schools.

"North Texas is one of the fastest-developing regions in the world. That also brings problems such as gentrification around water."

— Irene Klaver,
professor of philosophy and religion

"There are two areas in which kids are prone to teach their parents — technology and the other is the environment," she says. "And we think that's happening here."

Irene Klaver, professor of philosophy and religion, founded the Philosophy of Water Project in 2003, with a grant from the Dixon Water Foundation, to study water from socio-political, cultural and environmental perspectives, including social justice issues related to urban water. In the early 20th century, many rivers were heavily polluted and became places for poor communities. The Texas Department of Health called the Trinity River in 1925 the "Mythological River of Death." After improvements in water quality due to the Clean Water Act (1972), urban river fronts became valuable real estate, places for wealthier citizens, forcing poor residents out.

"For fair infrastructure around urban waterfront development, around drinking water and wastewater, you need public policy interventions," says Klaver, who was part of a social and environmental justice water panel at the 2020 Denton Black Film Festival. She also participated in a think tank event at the Houston SWA Architecture group to re-center their urban planning around water.

"North Texas is one of the fastest-developing regions in the world," Klaver says. "That also brings problems such as gentrification around water."

PROTECTING ECOSYSTEMS

UNT faculty, funded by the Texas Water Development Board, Texas Parks and Wildlife Department, and other regional environmental agencies, conduct research to inform environmental policy.

Ed Mager, assistant professor of biological sciences, is currently studying the swimming performance of fish species of conservation concern to inform policy regarding the design and modification of new and existing infrastructure such as road crossings and culverts. Such infrastructure can greatly increase water flow velocity, threatening the survival of resident fish populations.

"If the flow of water exceeds the maximum speed of a fish, it can't swim upstream," Mager says. "This can impact migrations critical to their life cycle and fracture habitats."

He and his team are examining the swim velocities of the Guadalupe Bass (the state fish of Texas), Guadalupe Roundnose Minnow, Guadalupe Darter and Plateau Shiner. The research will be used in the planning of future waterway crossings.

Additionally, David Hoeinghaus, associate professor of biological sciences, is working to better understand how the quantity and timing of water flows in streams and rivers affect ecosystem functioning and spawning success of conservation concern such as Alligator Gar.

"Reservoirs provide many benefits, such as flood control, water supplies and recreation, but they also affect the distribution and timing of river flows with important consequences for ecosystem functioning," Hoeinghaus says. "Our research informs policy for managing freshwater resources for both human use and resilient aquatic ecosystems."

PROTECTING COMMUNITIES

While a lack of water can be deadly, so can a surplus. Elyse Zavar, assistant professor of emergency management and disaster science, studies home buyouts — programs that seek to relocate residents out of high-risk areas like floodplains or hurricane-impacted coastlines — and the challenges and successes of open space management by local governments, most recently in areas of Harris County hit by Hurricane Harvey. Federal funds are used to purchase properties, and local government takes ownership with the condition that the land cannot house any structure in the future. And Zavar says those buyouts create opportunities for conservation.

"The deed restrictions on the properties give local communities an opportunity to reimagine how that land is used," she says. "Some may put in wetlands, parks or soccer fields mitigating not just high water, but potentially impacts from climate change."

Roberts emphasizes that leveraging UNT's research expertise and collaborations will not only provide viable solutions for climate change and other urban water issues, but lead to a workforce uniquely trained to address future water issues for the state of Texas.

"Water is an increasingly limited resource," he says. "It's fundamental to all Texans to ensure economic growth as well as human and environmental health."

WATER RESEARCH FIELD STATION

One of the most significant research laboratories within UNT's Advanced Environmental Research Institute (AERI) is the Water Research Field Station. Located eight miles from UNT, the 18-acre facility contains 24 experimental streams and 46 ponds used in aquatics research. A recent anonymous gift is enabling the institute to add a 2,000-square-foot modular building with room for a classroom, lab spaces with benchtops and work areas, and office spaces for students, visiting researchers and AERI faculty.

"The Water Research Field Station is crucial in our studies of aquatic resources," Aaron Roberts, professor of environmental toxicology and director of AERI, says. "The expansion will allow us to perform more long-term research projects, expand our educational resources, and explore collaborative studies with other disciplines."

Water is an increasingly limited resource for human consumption, economic growth and maintenance of aquatic ecosystems. The facilities at the Water Research Field Station will be able to incorporate expertise from various disciplines to research water management, water quality and other important ecological issues.

AERI expects exponential growth in the number of students and researchers who can utilize the field station, and educational access for learners of all ages will be enhanced through virtual lab experiments and ongoing monitoring via the station's technological improvements.

Because AERI is focused on creating avenues of education and collaboration in the community, an increase in public engagement is also expected. This will include tours for retirement groups, Master Naturalists, schools, local community members, local government, citizen scientists and others. Additionally, the Water Research Field Station will be a forum for scientific communication by creating online-accessible materials for teachers, incorporating a classroom into the building's design, and hosting facility tours and events.

"The laboratory and additional workspaces will not only enhance our water research at UNT," Roberts says, "but create a collaborative community space to further our mission of engagement and outreach."

REDUCING DISPARITIES

CREATING HEALTH EQUITY

UNT researchers from across disciplines are providing guidance on improving the health and quality of lives of marginalized populations.

TEXT BY: JESSICA DELEÓN

This year, protesters filled the streets of America, marching against racial inequalities. But others are fighting racism by gathering data and shaping policy.

Through their research, more than 40 UNT faculty members are addressing inequities in how people in Texas live, work, learn and interact socially — factors that the Centers for Disease Control cite as contributions to overall health considerations and outcomes.

UNT's Center for Racial and Ethnic Equity in Health and Society (CREEHS) was initiated by Chandra Carey, associate academic dean for UNT's College of Health and Public Service and associate professor of rehabilitation and health services, and Tony Carey, associate professor of political science.

Through federal- and state-funded grants, faculty are researching the educational, economic, environmental and social determinants of health to enhance the quality of life for underserved populations across Texas. UNT will seek additional funding from the Texas Legislature to help support the center that will provide a platform, such as policy reports, in creating legislation.

"CREEHS is committed to seeking solutions to stimulate movement toward health equity," Chandra Carey says. "Our mission is to explore racial and ethnic equity, examining the causes of these health care gaps, evaluating social determinants of health, uncovering their broader economic and social consequences across the state of Texas, and providing research to uncover best practices and policy prescriptions for remedying these issues."

It couldn't be timelier. The coronavirus pandemic has affected people of color more than whites. In the U.S., Blacks are dying at 3.7 times the rate of whites. Indigenous people are dying at 3.5 times the rate and Latinos at 2.5 times the rate, according to the APM Research Lab. Other health disparities exist. Black women are more likely to die while giving birth at three times the rate of white women. Black women also will die from breast cancer at a 40% higher rate than that of their white counterparts.

"We like to think that economics will solve these problems," Tony Carey says. "When in reality, you still have these racial and ethnic disparities that play a role. While in some cases accounting for class may reduce the impact of race on health outcomes, it very rarely eliminates it. Race or ethnicity tends to influence class position in the U.S., but not the other way around. Consequently, the emerging consensus is that it is best to consider the interactive relationship between race and class disparities when examining health care outcomes."

FROM ALL ANGLES

Faculty members in the center are from a wide range of fields — anthropology and art history to business and journalism. And they're tackling subjects from unique perspectives. Take mental health — Angie Cartwright, associate professor of counseling and higher education, is studying how it effects underserved communities, while Martinque "Marti" Jones, assistant professor of psychology, examines wellness and counseling interventions relevant to Black women.

"We're approaching it from a variety of different angles," Tony Carey says, "including how to convince policymakers to do the things that need to be done."

The center also brings opportunities for collaboration. Sarah Evans, assistant professor of information science, talked with Joanna Davis-McElligatt, assistant professor of English, about graphic medicine, which explains health concepts through graphic novels and comics and can be used as a health literacy tool.

"It's exciting to work across disciplines," Evans says. "Instead of being in my own bubble of thinking about what libraries can do for our own community."

Evans' specialty is libraries, which also can play a crucial role in distributing health information to patrons, especially to those in rural areas who may not have strong internet connectivity or lack devices or infrastructure to support technology. During the pandemic, some libraries have circulated devices and others have kept their Wi-Fi signal on so people can access it from the parking lot. Some use bookmobiles to broadcast Wi-Fi.

Libraries can be used to help patrons fill out unemployment forms. There's even a health literacy movement in which libraries offer programs about growing food.

"Libraries are friendly, neutral open spaces where a lot of people can come to," Evans says. "And can be an access point for education and communication like they always have been."

Tony Carey adds that rural areas, even with their mostly white populations, face disparities because state funding tends to go toward urban spaces and larger populations.

"Rural spaces have to contend with less economic resources to address health concerns and often more chronic health issues due to lack of access," he says. "Those factors alone make rural spaces equally important in the center's focus."

PROVIDING EVIDENCE

Cities face unique issues regarding inequities. For example, Black residents have been leaving the city of Chicago in high numbers since 1990.

William Scarborough, assistant professor of sociology, was part of a team at the University of Illinois at Chicago that tried to figure out why. He found Black and Latinx neighborhoods received fewer resources than majority white neighborhoods — a legacy of residential redlining in which government and businesses segregated non-white residents for certain services. But discrimination continues in other forms, such as housing and barriers to credit. Black residents in Chicago were paid over 20% less in hourly wages than white residents in 2016, after accounting for factors such as education, age, family attributes, gender and part-time/

DISPARITIES IN SPECIAL EDUCATION

Brenda Barrio, associate professor of special education and lead faculty for the Innovative Educational Equity and Career Pathways branch of UNT's Center for Racial and Ethnic Equity in Health and Society (CREEHS), is focused on helping to solve for racial and ethnic disparities that exist in special education. In collaboration with Susan Nichols, interim executive director of UNT's Kristin Farmer Autism Center, she is researching disparities in diagnoses and treatment of young children with Autism Spectrum Disorder (ASD) from culturally and linguistically diverse backgrounds, who are less likely than their peers to be diagnosed early.

"Our mission is to explore racial and ethnic equity, examining the causes of these health care gaps, evaluating social determinants of health, uncovering their broader economic and social consequences ... and providing research to uncover best practices and policy prescriptions for remedying these issues."

— Chandra Carey,
associate academic dean for UNT's College of Health and Public Service and
associate professor of rehabilitation and health services

full-time status. The unemployment rate for Black residents in Chicago was over five times as large as for white residents.

The team's report, "The State of Racial Justice in Chicago Project," was made publicly accessible and sent to activist groups. Rep. Bobby Rush, who represents part of Chicago, cited it on the floor of the U.S. House of Representatives.

Scarborough's most recent study on the effects of women's personal and professional roles during the pandemic was featured in *The New York Times*. COVID-19 and the Black Lives Matter movement have further thrust health disparities into the spotlight.

"That's why we, in academia, play such an important role," he says. "We provide the evidence to help make change."

And CREEHS could become a leader in creating solutions — as well as provide opportunities to the next generation of researchers.

"It signals to the students on campus that these are our values, and it provides a place where people can seek mentorship and guidance," Tony Carey says, "Not only around these issues, but also in other areas of their life and career."

While UNT has always been on the cutting edge of innovation, CREEHS is working to bolster its reputation even more both in the state and across the nation.

"UNT is perfectly poised to help achieve equity in Texas," Chandra Carey says, "And to be a model for institutions across the nation."

"A big issue in special education is disproportionality, mainly affecting students of color, not only in diagnoses or disability categories, but also in equity to access to services," Barrio says.

The team of researchers, including four of Barrio's students, will survey caregivers and parents of young children with ASD to learn some of the underlying factors behind the disparities. Early intervention is very important, and there is a critical shortage of practitioners, especially those who speak Spanish, who can provide a diagnosis.

"We need to not only understand the rationale of this disproportionality, but we also need to look at how we address it and provide access," Barrio says, adding they will conduct surveys in English and Spanish. "We don't have enough information from families. We want to learn more from them."

Nichols says that this project will help identify existing barriers to accessing autism evaluations and evidence-based treatment.

"Once we gain this understanding, culturally responsive practices can be adopted to make these time sensitive interventions more readily available," Nichols says.

The community-based research will not only help children with ASD and their families, but it also will help prepare students in teacher education programs.

"CREEHS is providing a space for students to have dialogue directly with faculty and join in the collaboration to enhance their communities," Barrio says.

Learn more about Brenda Barrio's research and see a video about CREEHS at *research.unt.edu/magazine/CREEHS.*

PROFILE

MEET *THE DEAN*

TAMARA BROWN

DEAN OF UNT'S COLLEGE OF LIBERAL ARTS AND SOCIAL SCIENCES SINCE 2019

WHAT I LOVE MOST ABOUT MY JOB

The opportunity to serve and help others — faculty, staff and students — achieve their goals.

FAVORITE QUOTE

I have two. One is "Lifting as we climb" and the other is "I am because we are."

TRENDS IN LIBERAL ARTS AND SOCIAL SCIENCES RESEARCH

Interdisciplinarity. Historically, disciplines have been very siloed, but we now realize that when we collaborate across disciplines we are able to better understand the world and prepare students to make positive contributions.

IMPACT OF YEAR'S EVENTS

The events of the past year, which include the pandemics of racism and COVID-19, highlight the importance of the liberal arts and social sciences because they emphasize our common humanity and how interconnected we are. More than ever, we need our humanities disciplines to help us understand what it means to be human, and our social science disciplines to help us understand how to live together.

HOW LIBERAL ARTS AND SOCIAL SCIENCES CAN LEAD

Despite the decades-long emphasis on STEM and approaching education vocationally, research now shows that if we want to prepare students to solve large-scale human problems and improve the human condition, we have to teach them how to think, lead and work in teams. Google, Chevron, IBM and many other large and small companies have found that the most important qualities of top employees are all soft skills such as communicating and listening well, possessing insight into others with different values and points of view, having empathy, being a critical thinker and problem solver, and being able to make connections across complex ideas. STEM skills are important, but they are not enough. Employers, and the world, need those who also are educated to the cultural and social aspects of people.

READING NOW

I am reading seven books right now including *How to Be an Antiracist* by Ibram X. Kendi, *Blindspot: Hidden Biases of Good People* by Mahzarin Banaji and Anthony Greenwald, and *Three to Get Deadly* by Janet Evanovich.

FUN FACTS

I dabble in the art of playing saxophone, and I ride a motorcycle.

PROUDEST MOMENT FOR THE COLLEGE

December commencement was a proud moment for me. Celebrating the accomplishments of our students was priceless. Another proud moment was how we pulled together as a college during the pandemic to support our students and one another. Our resilience and innovation were nothing short of amazing.

PHOTOGRAPHY BY: RANJANI GROTH

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