



FALL NEWSLETTER  
NORTH DAKOTA STATE UNIVERSITY

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**NDSU**

COLLEGE OF  
ENGINEERING



NDSU's self-driving car project includes students from computer science, computer engineering and electrical engineering.

## ON THE COVER

Doctoral student Mike Johnson holds a chip for a breath analyzer designed to detect diabetes. Learn more about the project in this issue.

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## FROM THE DEAN

### DEAR ALUMNI AND FRIENDS OF THE COLLEGE OF ENGINEERING,

The start of the fall semester has always been one of my favorite times of year. And this year's Welcome Week was particularly exciting because it was our first one to include the Department of Computer Science, which officially joined the College of Engineering July 1.

Adding a department is no easy task, but I see several advantages to the move, including the natural fit that computer science has with our other disciplines and the fact that computer science already offers software engineering graduate degrees and is interested in expanding software engineering to the undergraduate level.

Adding departments is not the only way we are looking to grow our college. We understand the importance of strategically increasing our enrollment, both for the health of the university and to serve the workforce needs of our industry partners. We are in the final stages of launching two new programs, a robotics minor and an undergraduate degree in environmental engineering. I believe both will help the college stand out to prospective students and have a positive impact on the experiences of our current students.

NDSU's unwavering commitment to the student experience will be something you'll be hearing a lot about over the next few months. The university is set to publicly launch its largest capital campaign in history on October 10. *In Our Hands: The Campaign for North Dakota State University* is focused on four areas of student-impact: scholarships, faculty, facilities and programs.

I know that philanthropy is a key driver to the success of the college. That's why we've made increasing engagement with donors, alumni and other stakeholders one of our strategic initiatives. We've also identified several fundraising priorities for the college, including equipment for the new environmental engineering and robotics teaching labs, renewable scholarships for incoming freshmen and support for our Grand Challenges Scholars program. I believe focusing on these areas will help achieve our mission to prepare innovative problem solvers and create new knowledge to improve lives around the world.

Thank you for your support for the College of Engineering. Go Bison!

Michael R. Kessler  
Dean, NDSU College of Engineering





## NEW IP ADDRESS: DEPARTMENT OF COMPUTER SCIENCE JOINS THE COLLEGE OF ENGINEERING

This summer saw the addition of a few hundred new faces to the College of Engineering family. On July 1, the NDSU Department of Computer Science officially joined the College of Engineering. The exciting change is the result of more than a year of hard work.

"With the growth of big data in engineering and the evolution of various cyber-physical systems, the line between traditional engineering and computer science continues to become more blurred," said Michael Kessler, dean of the College of Engineering. "We believe this move will build important interdisciplinary connections, grow relationships with key industry partners and increase our involvement in key state initiatives."

The Department of Computer Science is nationally recognized for its excellence in teaching and research and has been leading

North Dakota's efforts in cybersecurity. In April, the department was named as a National Center of Academic Excellence in Cyber Defense Research by the National Security Agency and Department of Homeland Security.

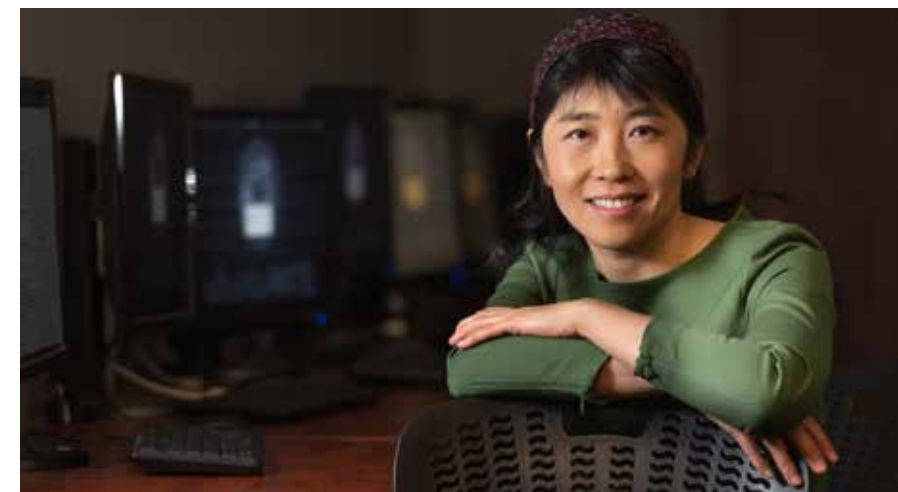
"It's exciting to be at the forefront of cybersecurity education and research. It's an area of tremendous need in terms of workforce development. There is a great need for cybersecurity programs," said department chair Kendall E. Nygard. "I am pleased that our offerings provide valuable opportunities for student success."

Faculty in the department also are working on groundbreaking research projects that have the potential to change the world. Professors Jen Li and Jun Kong received a nearly \$1 million National Science Foundation grant for artificial intelligence research designed to provide targeted health care for

American Indian patients with diabetes. The project is not only developing cutting-edge technology, it's giving students valuable real-world experience.

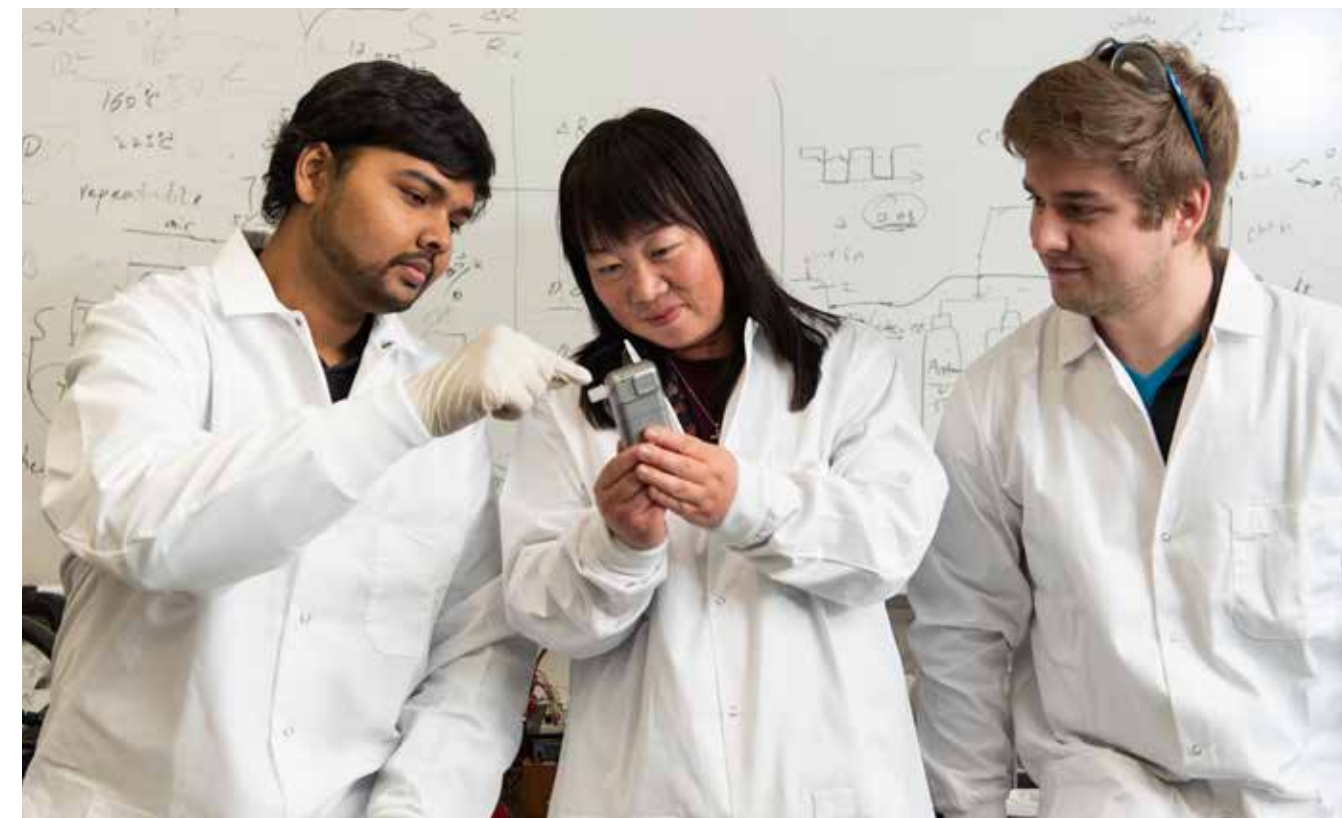
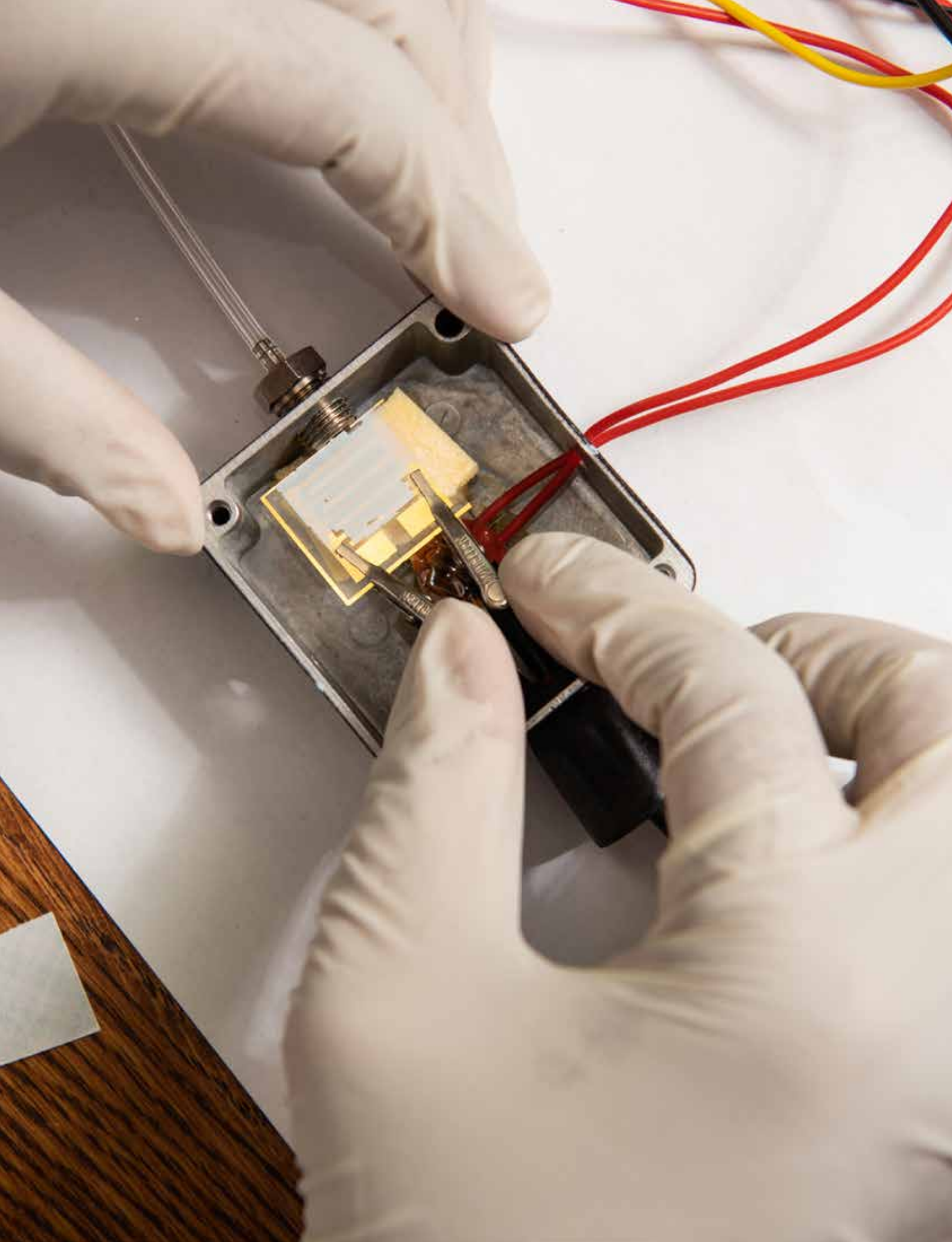
*"This sort of hands-on knowledge can't easily be taught in textbooks or classes since it requires a real setting where people are doing real work and not just preset exercises with known results. Everything they are learning will be valuable experiences for their future career as researchers or engineers," Li said.*

Besides working to grow collaborations on campus, efforts are underway to welcome computer science alumni to the college, including adding computer science graduates to the College of Engineering Advisory and Advancement Board.



**Jen Li, associate professor of computer science**





## RESEARCH TEAM INVENTS BREATH TEST TO DETECT DIABETES

College of Engineering students prepare for their careers by working with top researchers and contributing their ideas and expertise to important projects. One research team, for example, is perfecting a device that could soon become part of everyday life.

The device is a breath analyzer designed to detect diabetes. Danling Wang started working on it as a doctoral student at the University of Washington. She had gestational diabetes and hated the constant needle pokes required for testing her blood sugar. She knew there had to be a better way.

Wang brought the project to NDSU three years ago when she joined the electrical and computer engineering department as an assistant professor. She launched a nanoelectronic sensor and device lab and formed a team including graduate students Md. Razuan Hossain and Mike Johnson to push the research into a marketable device.

The device uses a sensor to detect acetone, a volatile organic compound in human breath. Acetone levels are elevated in people who are diabetic. The device doesn't

replace blood testing to diagnose diabetes, but it is a less invasive way to determine if preventive measures or further testing is needed. Wang also intends to integrate the technology into a smartphone app, giving diabetics a painless, inexpensive way to monitor blood sugar.

Wang made Hossain and Johnson each responsible for a portion of the project that fits their experience, strengths and future plans. "I adjust the training process to prepare students for their career goals," she says.

Hossain is a doctoral student in electrical and computer engineering. He has circuit design experience, so his role on the research team is to make the device more compact.

Johnson is a doctoral student in the materials and nanotechnology program. His job is to make material used in the device and to optimize it to make the sensors work better.

The team continues to perfect the device and expects it to be ready for the market in the near future.

## ALUMNI NEWS

### SCHOLARSHIP ENDOWMENT ESTABLISHED IN HONOR OF LONGTIME PROFESSOR



A new scholarship benefiting NDSU College of Engineering students has been established in honor of Don Andersen, a longtime professor of civil engineering.

The Dr. Donald Andersen Scholarship Endowment was created through a generous gift from NDSU alumnus Timothy Welch and his wife, Donna LaQua-Welch. Students pursuing a major in the Department of Civil and Environmental Engineering will be eligible for the award.

Andersen served as a teacher, researcher and mentor at NDSU for 33 years, retiring in 2012. But that's not his only connection to the university. Before earning his master's from Penn State University and doctorate from Texas A&M, Andersen graduated from NDSU in 1970 with a bachelor's degree in civil engineering.

"He had a passion for his students and for the university," Welch said.

It was that passion and love for students that inspired Welch to create the new scholarship, and Andersen is excited about the positive impact it will have on future generations of engineers.

*"I hope this endowment will help students stay on schedule to graduate and reduce their financial burden," Andersen said.*

During his tenure at NDSU Andersen served as an adviser to several student groups, conducted research with the North Dakota Department of Transportation and was awarded Teacher of the Year in the College of Engineering. He remains with the department as a professor emeritus.

**FIND OUT HOW YOU CAN GIVE BACK TO THE  
COLLEGE OF ENGINEERING: [NDSU.EDU/COE/ALUMNI](https://www.ndsu.edu/coe/alumni)**

#### ENGINEERING ALUMNAE FEATURED FOR WOMEN'S HISTORY MONTH

In March, the College of Engineering launched a special project in honor of Women's History Month. The Alumnae Spotlight webpage features interviews with more than a dozen distinguished female graduates.

College leaders say the goal of the project is to highlight female engineering role models and encourage more young girls and women to pursue an engineering degree.

"The College of Engineering actively supports efforts to increase the number of female engineering students and professionals," said Michael Kessler, dean of the College of Engineering. "One of our core values is being proactive about diversity, knowing that we are far better together."

**READ THE PROFILES: [NDSU.EDU/COE/ALUMNAE](https://www.ndsu.edu/coe/alumnae)**



#### NEW FELLOWSHIPS SUPPORT FACULTY EXCELLENCE

Two NDSU graduates and their spouses have established fellowships that will support faculty and educational excellence within the College of Engineering. Faculty fellowships are awarded to accomplished scholars to advance research, education and outreach.

The College of Engineering's newly established fellowships are the result of gifts provided by Spencer and Carol Duin of Asheville, North Carolina, and Timothy Welch and Donna LaQua-Welch of North Richland Hills, Texas.

*"My engineering degree from NDSU opened doors to many opportunities and a successful and very satisfying career," Duin said. "Carol and I have established the endowed fellowship to increase support for College of Engineering faculty and to acknowledge the value of my NDSU education."*

*"Donna and I are honored to provide financial resources that will enable faculty within the College of Engineering to take their innovative research to the next level and to build on the success of their strong educational programming," Welch said.*

NDSU benefactors who establish faculty fellowships provide a minimum of \$30,000 in annual funding for at least five years.

"These fellowships will recognize and support the innovative endeavors of outstanding faculty in the College of Engineering," NDSU President Dean Bresciani said. "We are grateful to the Duins and Welchs for making these fellowships possible through their generosity. Fellowships are critical to recruiting and retaining top faculty and to providing the best educational experiences possible."

"Investing in faculty is one of the most transformative ways that philanthropy can elevate the excellence of learning and discovery at NDSU," said John Glover, the NDSU Foundation and Alumni Association president and CEO.

Om Yadav, professor of industrial and manufacturing engineering, was named the inaugural holder of the Duin Endowed Fellowship. Yadav joined NDSU in 2004 and serves as director of the Center of Quality, Reliability and Maintainability Engineering.

"This award will help support my graduate students and further our research work," said Yadav. "It's also important in the sense it recognizes the contribution of faculty in the college and department."

Ying Huang, associate professor of civil and environmental engineering, was named the inaugural holder of the Welch Faculty Fellowship. Huang was awarded a 2018 National Science Foundation (NSF) CAREER grant, the foundation's most prestigious award in support of early career faculty.

*"This award will significantly benefit my research and teaching at NDSU. It allows me to support graduate and undergraduate researchers, upgrade lab equipment and fund K-12 outreach activities," Huang said.*





Mohammad Hadi Bazrkar and Ning Wang assemble recording equipment at one of the survey sites.

## STUDYING NORTH DAKOTA'S UNIQUE WATER RESOURCES

Water is a critical issue for North Dakota. Farmers want precipitation and snowpack information; people living along rivers want data on snowmelt and flood potential; and everyone is affected when a drought hits. That's why Xuefeng Chu, ND EPSCoR-funded researcher with the Center for Regional Climate Studies and professor in the NDSU Department of Civil and Environmental Engineering, has focused his attention on the unique cold-climate hydrology of North Dakota.

*"There are many hydrology models," Chu said, "but most models don't account for the impact of the cold climate or the hydrologic dynamics of the prairie potholes in our region."*

Chu and his team calibrate and verify their models using data from extensive field observations at sites across North Dakota.

Each site, powered by a small solar array, provides a wealth of information on precipitation, temperature and snow depth. A river surveyor system is used to measure the topography/bathymetry of a lake or pothole, as well as flow velocity profiles of rivers. In addition, soil sensors at different depths installed in crop fields provide insight into the moisture content and temperature fluctuations.

*"Our research goes beyond the theoretical," Chu said. "Our goal is to develop hydrologic models that provide better answers for our state water challenges, and that can be useful for many watershed areas, especially those in cold climates."*

As the models are refined, they can not only inform people throughout North Dakota, but researchers across the country.

## COLLEGE HAPPENINGS

### Construction management students get real-world experience

Teams of NDSU construction management and engineering students tested their ability to complete a construction project under a tight deadline at the Associated Schools of Construction competition in Nebraska City, Nebraska. It asks teams of university students to complete a real-world construction project in three days. NDSU teams finished second and third in their respective divisions.

*"The whole competition is basically a capstone project compacted into 18 hours," said Nick Jensen, a senior construction management major. "This competition can get very stressful because there is a lot that needs to get done. It's demanding but also a lot of fun."*

The event helps students apply their classroom knowledge, learn how to work under pressure, work in a team and enhance their communication skills.

### Student innovations draw industry attention at Clean Snowmobile Challenge

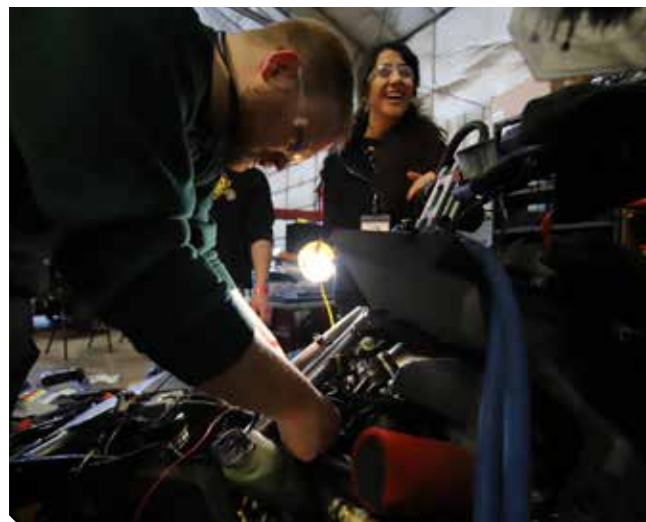
A team of NDSU engineering students earned praise for their innovative design at the 19th annual SAE International Clean Snowmobile Challenge.

The competition is an opportunity for students to apply classroom theories to real-world problems, and attracts teams and companies from across the United States.

NDSU has competed in the diesel utility category for the past several years. Team captain and NDSU SAE president Michael Restad said it's a great opportunity for students to get hands-on experience with the type of engine technology many local employers use.

*"The real reason for us doing diesel is that's what the industry does around here. The skills you learn working in this competition make you the type of engineer they want to hire," Restad said.*

Despite struggles with breakdowns during the completion, several of the team's engineering innovations, like electronic power steering and a touch-screen dashboard, attracted interest from industry officials and judges.



### STEM Kids Camp growing in popularity

More than 300 kids spent hours learning about science, technology, engineering and math, known as STEM, as part of the 2019 STEM Kids Camp sponsored by the College of Engineering.

The camp featured more than 20 hands-on learning camps covering everything from computer coding, robotics and crime-scene science to flying drones, building roller coasters and using virtual reality.

The purpose of STEM Kids is to stimulate children's interest in STEM through exploration of topics not usually covered in their regular school classes.

*"Teaching STEM Kids is such a rewarding experience," said Lauren Singelmann, College of Engineering outreach coordinator. "Our instructors are able to share knowledge and passion with curious minds that are just starting out in science and engineering. These kids are so eager to learn, and their energy and enthusiasm motivate and inspire our instructors."*

### Hands-on research for hands-off driving

A team of NDSU undergraduate students is working to build the next generation of self-driving cars, with the ultimate goal of creating a vehicle that can sense and interact with the environment around it - including other cars, pedestrians and road signs. The finished product could create a new standard of safety for autonomous vehicles.

The self-driving car project has included about 25 students from computer science, computer engineering and electrical engineering since it began in 2016. Team membership has helped several students obtain internships tied to an area of the project they worked on, increasing the chances of landing a top job after graduation.

"Doing research like this really sets you apart when you are trying to get employed. And this has been something that's helped my overall understanding of what I'm learning because it's something to which I can directly apply my knowledge," said Kevin Setterstrom, a senior in electrical engineering who will remain at NDSU to work on the project while earning a master's in computer science.

The project is open to any student—undergraduate and graduate—interested in computer technology.

## FACULTY AWARDS

### Hellevang receives Global Food Security Award



**Ken Hellevang**, professor and interim chair of NDSU's agricultural and biosystems engineering department, has received the American Society of Agricultural and Biological Engineers 2019 Sukup Global Food Security Award.

The award is one of the society's top honors. Hellevang was recognized for his exceptional engineering-based educational Extension program that has enhanced drying, storage and handling of grains, oilseeds and other food products.

### Ulven selected for 2019 Faculty Lectureship



**Chad Ulven**, professor and associate chair of mechanical engineering, was selected to present the 2019 Faculty Lectureship, one of the oldest and most prestigious of NDSU's awards.

Ulven hopes his lecture will help create a dialog about materials development and waste, potential solutions and what society needs to do next.

### Bezbaruah awarded Endowed Professorship



**Achintya Bezbaruah**, associate professor of civil and environmental engineering, was awarded the 2019 Walter F. and Verna Gehrts Presidential Professorship.

NDSU Endowed Professorships are awarded to faculty members who have attained a balanced academic record demonstrating excellence in teaching, research, and service.

### Glower receives Peltier Award for Teaching Innovation



**Jacob Glower**, associate professor of electrical and computer engineering, was honored with the 2019 Peltier Award for Teaching Innovation. The award is given annual to faculty members who enhance the educational experience of students at NDSU.

Glower joined the NDSU faculty in 1991. He was named the College of Engineering's Teacher of the Year in 1999 and 2015.

## PROMOTIONS

### PROMOTED TO FULL PROFESSOR:

- ▶ **Fardad Azarmi**, Electrical and Computer Engineering
- ▶ **Benjamin Braaten**, Electrical and Computer Engineering
- ▶ **Jacob Glower**, Electrical and Computer Engineering
- ▶ **Xinhua Jia**, Agricultural and Biosystems Engineering
- ▶ **Samee Khan**, Electrical and Computer Engineering
- ▶ **Juan (Jen) Li**, Computer Science
- ▶ **Changhui Yan**, Computer Science

### PROMOTED TO ASSOCIATE PROFESSOR:

- ▶ **Zhibin Lin**, Civil and Environmental Engineering

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NORTH DAKOTA STATE UNIVERSITY  
DEPT 2200 PO BOX 6050  
FARGO ND 58108-6050

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