

# UND ENGINEERING

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# UND ENGINEERING

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Concept building illustration on the cover provided by Clark & Enersen.

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## BRIAN TANDE

**Brian Tande, Ph.D.**, is the Dean of the College of Engineering & Mines (CEM). In his seventeen years at UND, Dr. Tande has served as a faculty member and department chair in the Department of Chemical Engineering, as well as Associate Dean and Interim Dean of CEM. Other roles he has held within the college include Director of the Jodsaas Center for Engineering Leadership & Entrepreneurship and Founding Director of UND's Grand Challenge Scholars Program, sponsored by the National Academy of Engineering.

Prior to UND, Tande spent several years in research, product development and management in the plastics and composites industry. His career has centered around the development of advanced polymeric materials for automotive, healthcare, construction, and sustainable energy applications. He is also the founder of two companies that have successfully commercialized and licensed new coatings technologies, including a novel infection control product currently used by hospitals nationwide.

Dr. Tande is originally from Stanley, North Dakota and is married to Desiree Tande, Chair of the Department of Nutrition and Dietetics at UND. They have four children and enjoy spending time traveling and attending their kids' sporting events and other activities.

# LETTER FROM THE DEAN

It has been a privilege to serve as the Dean of the College of Engineering & Mines for the past four years. I've been fortunate to be able to work with the many talented faculty, staff, students, alumni, and other supporters who make up the CEM community.

Last year we established a vision for the college that we call "20/20 by 2030." This refers to two primary goals we want to achieve by the year 2030. The first is to increase our externally funded research expenditures to \$20 million per year. The second goal is to hire more faculty and reduce our student-to-faculty ratio to 20:1.

I'm happy to report that we have made significant progress on both fronts. We ended last year with over \$13 million in new research awards and are on track to hit our target. We also successfully concluded numerous faculty searches this year and will welcome over ten new faculty members to campus this fall. These new colleagues and projects will help support our student-focused culture, create new learning opportunities for our students, and support the regional economy.

I'm also happy to share some exciting news about our facilities. Since becoming Dean, I have frequently spoken, including to many of you, about the need to modernize our facilities. While buildings like Harrington, Upson, and Leonard have served us well, they were not designed for the type of teaching and research we do today.

We are very excited that in the 2023 session, the ND Legislature appropriated \$57.4 million toward the first phase of a new state-of-the-art UND STEM Complex. This will be an integrated facility for engineering, science, and math education and research and will house disciplines across CEM and the College of Arts & Sciences.

Our share of the first phase will be at least \$25 million, which we hope to raise within the next two years. This will take

considerable effort, but it will be the most significant development in the history of the college. I'm looking forward to the day when our engineering and computer science students can learn alongside their colleagues in chemistry, physics, and math in a modern facility designed to inspire innovation and promote collaboration.

As you can see in this year's magazine, we have many success stories to share with you and even bigger plans for the future. I'm incredibly proud of the great work that our faculty, staff, and students are doing. I'm also proud of the amazing people that we are able to count among our alumni and supporters.

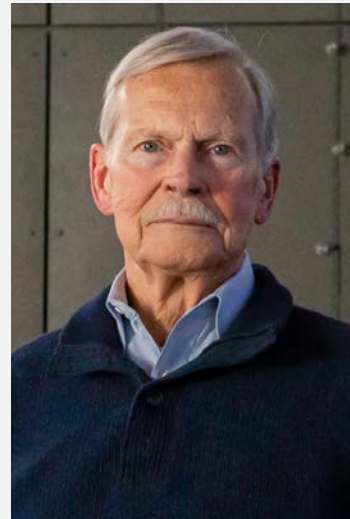
On behalf of all of us here in Grand Forks, thank you so much for all you do for CEM. I wish you all the best and hope we can see each other soon. Take care and stay safe.

**Brian Tande, Ph.D.**  
Dean, College of Engineering & Mines

## WHY I ❤️ CEM

**"The ambition and monumental potential of our students is the driving force of everything we do. Helping our students fulfill their aspirations and dreams is our highest priority."**

**Brian Tande**  
Dean, CEM



## TERRY SEVERSON

**Terry Severson** is the Board Chairman of the College of Engineering & Mines (CEM) Executive Board. Founding member of Trace Systems and the company's president for the past 12 years, Terry has extensive industry and military experience, ranging from on-the-ground field support to command and corporate-level leadership.



## STEVE BURIAN

**Steve Burian** is the Board Vice Chairman of the College of Engineering & Mines (CEM) Executive Board. He is the President & CEO of the civil engineering consulting company Burian & Associates. He brings 30+ years of industry and leadership experience to the CEM Executive Board.

# LETTER FROM THE BOARD

It's been another great year for UND's second-largest college — our College of Engineering and Mines. A new CEM building is on track to become real, the National Security Corridor in Harrington Hall is under construction, and CEM's Rare Earth Elements Pilot Project won \$10M in awards (\$8M Department of Energy grant and \$2M from the State of North Dakota).

It was only 1½ years ago that the need for a new CEM building was initially addressed in the Executive Board. Now we can expect to celebrate the CEM building groundbreaking in 2025. We on the Board are proud to have contributed to the multifaceted effort led by President Armacost, Dean Tande, and the Grand Forks Legislators, among others, to make the case and to achieve such great progress in so short a time.

UND, the community and North Dakota need a modern CEM facility to effectively support and draw students, faculty, industry, and government to UND to provide the needed technical and engineering support and workforce for the area, the state, the region, and our nation. We fully recognize the tremendous value the new CEM Complex will offer to UND, community, and state.

The National Security Corridor in Harrington that Dr. Ryan Adams and his team have designed is now under construction, with an expected grand opening early in 2024. The new satellite design and engineering, digital engineering and big data, and satellite fabrication and assembly labs will all be completed in a professional and appealing décor, showcasing these capabilities. They will provide students and faculty with modern and current-generation space technology learning and research opportunities. This has been a great initiative to support and rewarding to see come to fruition.

CEM's Rare Earth Elements (REE) Pilot Project and research, led by Dr. Dan Laudal and team, offers a huge opportunity for North Dakota as well as the nation. The

\$10M funding won is but a first step toward a \$250M commercial scale award we're competing for with West Virginia University. CEM's approach is to extract the various REE from lignite coal of which North Dakota has prodigious deposits. This CEM research, with whole-of-UND and North Dakota contribution, has the potential to open a significant new commercial business line for North Dakota.

That's exactly the value a first-tier engineering college should return to the institution, region, and state that support it. Back to the first topic, that's also why a new modern CEM facility is necessary at UND, to be able offer the value and return to its stakeholders that it should.

Those are only three of countless initiatives and programs that the team of Dean Tande, faculty, and staff are diligently pursuing to enhance CEM's value now and particularly for the future. We on the Board have been privileged to see, and contribute to, the entire concerted efforts of your CEM over the past decade. All of us—alumni, friends, and stakeholders—have every reason to be very proud of our CEM and to have great optimism for its future.

## WHY I ❤️ CEM

**"We're incredibly fortunate to have accomplished alumni who dedicate their time and talents to our students and college. Many serve on Executive Boards and department advisory councils. Our alumni's pride and commitment to CEM is incredible."**

**Deb Austreng**  
Director of Alumni, Corporate, & Public Relations, CEM



# A NATURAL FIT

## UND ANNOUNCES AEROSPACE ENGINEERING BACHELOR'S DEGREE PROGRAM

### Expected for Fall 2023, the program will leverage existing connections between engineering and aerospace

The University of North Dakota's College of Engineering & Mines has introduced a Bachelor of Science degree in Aerospace Engineering, expected to be offered for the Fall 2023 semester.

The four-year degree program, offered on-campus and online, is the only one of its kind in the Dakotas, Montana and Idaho — in other words, between Minneapolis and Seattle.

College officials are looking forward to offering an experience that's hands-on, collaborative and in-demand in the region.

Brian Tande, dean of the College of Engineering & Mines, remarked that the addition of aerospace to UND's suite of engineering programs has been long in the making.

"With our long history in aviation and strong connections to the aerospace industry, UND is a natural place for an aerospace engineering program," Tande said. "I'm very happy that this is now becoming a reality through collaborations between the College of Engineering & Mines and the John D. Odegard School of Aerospace Sciences.

"The program will serve students interested in designing systems for both air and space. It will also help support UND's National Security Initiative and help strengthen our ties to the U.S. Air Force, Space Force and industry partners."

The initiative to which Tande referred is a recent series of investments on UND's part for research, education and workforce training to expand the University's capacity to pursue, secure and execute projects with federal agencies including the Department of Defense and Department of Homeland Security.

This new degree program — housed in the Department of Mechanical Engineering — represents the latest step in pairing UND's academic offerings with an increased focus on national defense, including UND's role in the Space Force University Partnership Program.

On the aerospace side of the degree, UND Aerospace Dean Bob Kraus said engineering has been of consistent interest to prospective and current aerospace students alike.

Students pursuing Aerospace Engineering at UND can expect to complete courses based in the John D. Odegard School of Aerospace Sciences, according to the College of Engineering & Mines.

"We look forward to assisting the College of Engineering & Mines in developing and delivering this new degree, building on the success of our Aviation and Space Studies programs," Kraus said.

### Opportunities ahead

UND's aerospace and engineering forces have long been in league with each other, said William Semke, professor and associate dean for academic affairs at the College of Engineering & Mines.

Semke has worked on aerospace-related research and technological development for more than 20 years while at UND. In turn,

that type of interdisciplinary collaboration with UND Aerospace helped give rise to the University's Research Institute for Autonomous Systems.

He added that both the timing and support from all levels of the University make it the right moment to add Aerospace Engineering to the fold.

"Given the leadership we have at the University, between both President Andy Armacost's and Dean Bob Kraus' strong backgrounds in engineering as well as in the Air Force, and the historically excellent work our Colleges have done together, now is the right time," Semke said.

"UND's world-class reputation for all things aviation makes the formal connection of aerospace and engineering a real strength for us," Semke continued. "For incoming students, that link can be easily understood. Between the two Colleges, there are many things already in place that we can leverage to create an incredible degree program."

National studies show that the field is expected to grow, which means graduates with a B.S. in Aerospace Engineering will have career opportunities ahead. And with the rapid rise of UAS companies operating in the Grand Forks area, the regional outlook is even stronger, said Semke.

"At UND, our students are in a perfect place to get exposure to the entire field of aerospace, including the terminology and perspective that pilots and flight controllers rely upon," Semke remarked. "In talking to our colleagues at UND Aerospace, there are plenty of opportunities ahead for collaboration and support."

Written by Connor Murphy // UND Today



# RARE EARTH ELEMENTS: NORTH DAKOTA'S DIAMONDS IN THE ROUGH

## \$8 Million U.S. DoE grant to study possibility of refining REEs, boost national security while transforming North Dakota's economy

It's amazing that something can come from nothing. Or almost nothing — meaning a substance that scientists measure in grams can be so important to global manufacturing and the national defense of the United States.

Two UND researchers were awarded an \$8 million U.S. Department of Energy grant to study the possibility of recovering and refining rare earth elements (REEs) in North Dakota, specifically from lignite coal. It's a project, the researchers say, that has the potential to transform the state and a portion of its energy economy into a supply hub of materials critical to manufacturing, supply chain stability and national defense.

The topic of rare earth elements is frequently brought up in media outlets, as they are crucial manufacturing components. Most of these elements are mined and refined outside the United States, putting the nation at a disadvantage in securing its needed supply.

About 1 kilogram or roughly 2.2 pounds of rare earth elements are used in the making of one electric vehicle, the University of Pennsylvania reports.

The following is a Q & A about the grant and rare earth elements with Dan Laudal, Executive Director of UND's Institute for Energy Studies, and Nolan Theaker, senior research manager with the Institute. Laudal is the project manager for the grant while Theaker is the principal investigator. Together, they explain the importance of rare earth elements and UND's research into the potential of extracting those elements in North Dakota.

### Key Q & A takeaways:

- North Dakota's vast deposits of lignite coal are a significant source of rare earth elements.
- The global market for items using these elements tops \$4 trillion annually.
- Elements can be extracted from lignite while preserving the coal as a fuel source, revitalizing the industry and opening up new industry opportunities in the state.

- UND and North Dakota are vying with West Virginia University and West Virginia for federal funds topping \$120 million to build a processing facility for these rare earth elements.

### What are rare earth elements, and why are they important?

**Dan Laudal (DL):** If you remember from your high school chemistry class when you were learning the periodic table, there is a block of elements on the bottom of the table that are separate from the rest. The rare earth elements are within that separate block. They have weird properties, which make them uniquely valuable for an incredible number of applications.

**Nolan Theaker (NT):** There are 17 of these elements, including Scandium and Yttrium. While all 17 of these elements are all relatively similar in nature, each one has unique properties, many of which have no realistic substitute. What this means is that when someone makes a product from them, there isn't an easy replacement for that product with a non-REE source. REEs are used in products accounting for over \$4 trillion dollars globally, or 5% of the entire world's economic output.

### Which of these elements can potentially be found in North Dakota? What are they used for?

**NT:** REEs occur together – all 17 of them. North Dakota has all of them, but most critically we have good amounts of those that can make prized magnets, as well as important alloying elements. These magnets have no effective replacement today, and are used in everything from disk drives, electric vehicle and wind turbine motors, gyroscopes for cell phones or missile guidance systems, MRI machines and medical devices and still more. Other REEs can make stronger aluminum alloys approaching the strength of steel for tiny fractions of the weight. These alloys have aerospace applications, as well as their current largest use – sports equipment and golf clubs.

**DL:** While we have all the rare earth elements, North Dakota's rare earth resources are unique in that we have a favorable distribution of some of the most valuable ones. Rare earth magnets are the strongest magnets that can be manufactured today and are used in almost all the electronic devices we make and use.

### Where do these elements typically originate? Is it better to produce them here in the United States?

**NT:** Some of the elements come from a few sources, including a mine in California. The major source for all REEs is China. Processing of REEs happens completely in China, which presents a major supply chain and influence risk to the U.S. To have stable, domestic sources of REEs is critical to reduce the influence of other countries over us. Also, we have a chance to extract these REEs in a far more environmentally friendly way than historic mining has been conducted in China. The U.S. (and ND in our lignite) has significant resources, and we can extract them very safely and environmentally consciously, not something true in all areas of the world.

### How can you extract these elements? Will you use UND facilities to do so?

**NT:** The REEs in the ND lignite are unique, they aren't found in hard minerals we must dissolve with concentrated acids. We can extract them with a far milder solvent very rapidly, by just washing the surface of the coal. We then filter out the coal from the REE-laden solution and precipitate the REEs back into a solid somewhere else. As a sense of scale, this process will have taken hundreds of tons of coal and generated a few 5-gallon buckets of this REE material. From here, we separate the mixture of REEs further into their individual elements at a refiner before they can be made into REE products.

UND is currently commissioning a pilot facility capable of processing up to 120 tons of lignite per week into our REE solids, but this isn't a commercial scale by any means. Our goal is to, over the next year, process about 250 tons of lignite through this system, giving us all of the data we would need to design a commercial-scale facility and project our technology's economics.

### Is there the possibility to build an extraction facility in North Dakota? What would that mean for the state?

**DL:** Our new project was one of only two awards for the first phase, which is the engineering and business development phase. The other team awarded is from West Virginia University. The DOE intends to select one of these two teams to move on to the second phase where the extraction facility would be built and operated. We are



confident in our technology and the team we have, but there is lots of work to do over the next year and a half to put us in position for the next phase. If we are successful in moving on to Phase 2, this could mean the start of a completely new set of industries for North Dakota. The possibilities are truly exciting.

**NT:** Our current phase of the grant is to perform an engineering and de-risking study to identify if a commercial extraction facility makes sense here. If we're successful in building a sufficient technical and business case, we will continue to a second phase where DOE will commit about \$125 million to support the construction and commissioning of a first-of-its-kind rare earth elements production facility, pushing this into the commercial realm. I believe UND is well situated to move into this next phase and making a commercial plant a reality. Even more plants could follow.

**You will be examining the possibility of extracting these elements from coal, and coal waste. Why look there? Is there enough coal waste in the state for this to be a significant source of these elements?**

**DL:** The Department of Energy started evaluating coal and coal byproducts as a resource for rare earth elements back in about 2014 and we were fortunate enough

to be among the first teams awarded funding to explore the feasibility. The goals are twofold – one, to diversify the markets for lignite coal and two, to develop a more secure domestic supply chain of rare earth elements.

Another unique benefit of our technology and approach is that we both recover valuable metals from the lignite and upgrade the lignite into a unique carbon product that can be a better fuel or used in an array of carbon-based products such as graphene and graphite that are used in batteries. The possibilities are endless when it comes to the carbon products we can manufacture. This aspect of what we're doing further advances the goal to diversify the markets for lignite coal.

**NT:** We want to extract all possible value from every ton of earth dug up, to minimize the environmental impact of mining. This will also improve the value of the lignite supply chain and can aid an industry that has only one use for lignite— as a fuel. Adding a non-fuel reason for mining coal can only shore up that industry, while giving us access to the REEs.

We want to look at coal waste, or the margins of the coal seams currently unused in the power plants, for a few reasons: That's where REEs are most concentrated, and we don't want to disturb ongoing mining operations. And when we have finished

extracting the REEs, the leftover lignite can be used for combustion for electrical production, and we expect that it will burn better than prior to extraction.

One more thing to consider, coal is a virtually inexhaustible resource in North Dakota. At current pace, we could mine lignite for the next 800 years. There isn't huge amount of REEs in the coal, but given the amount we have to extract from, I think lignite could be a major source of these elements, and can drastically improve supply chain security for the U.S.

**Would extracting these elements in the state cause pollution?**

**NT:** Our goal is to minimize the environmental impact as much as possible. By using a mild solvent in our extraction process, doing as much as we can to minimize water usage and involve recycling of water, and responsibly disposing of whatever quantity of wastewater and solids wastes that we can, I believe we can keep environmental impacts very low. We are aiming for zero environmental impact on the surrounding communities where these plants will operate.

**DL:** One of the things we will need to do during the first phase of our new DOE project is to prepare all of the technical and environmental information needed to secure permit and regulatory approvals

for the commercial plant. We are working with a professional engineering and environmental consulting company for this effort. Our technology is designed to limit waste streams, emissions and effluents and we are confident that we can meet all environmental standards at the local, state and federal levels.

**What is the main takeaway that you would like people to understand about your research and its potential?**

**NT:** To me, it comes down to the communities surrounding these coal plants. The fact that we're knocking on the doorstep of bringing major new industries to these areas and the region, the fact that we're stabilizing these coal jobs for many years to come, and the fact that we are doing this with as much focus on minimizing the negative environmental impacts on those communities is the bright light to me. Giving these communities and North Dakota these new avenues for growth is what excites me.

**DL:** My Ph.D. research involved some of the early days of this work, so this new project and the commercial potential on the horizon are particularly exciting for me. I am incredibly proud of the research team at the College of Engineering & Mines and the many partners that have worked with us over the years. We have taken this from a wild idea, to beakers in the lab, to a pilot-scale demonstration, and now to the potential development of a commercial project.

Written by Adam Kurtz // UND Today



# SEVERSON & LODOEN INVESTITURE CEREMONY

## UND honors impactful giving from alumni

An investiture ceremony was held on Thursday, January 19, celebrating Terry Severson and Michael & Sitney Lodoen. "It was an honor to highlight the incredible impact both have had on the University, faculty, and, ultimately, our students," said Brian Tande, dean of the College of Engineering & Mines. "We look forward to seeing how their support continues to advance the educational experience offered at UND."

The event honored Terry Severson and Mike & Sitney Lodoen's establishment of the following endowed positions:

### Michael & Sitney Lodoen Endowed Professorship in Civil Engineering

Established 2021 by Michael & Sitney Lodoen // Held by Daba Gedafa

### Harold L. & Io A. Severson Faculty Fellowship in Entrepreneurship

Established in 2013 by Terry & Diane Severson // Held by Surojit Gupta

### Terry & Diane Severson Endowed Professorship of National Security

Established 2021 by Terry Severson // Held by Ryan Adams

# UND GEOLOGIST UNEARTHS WORLD'S OLDEST ICE

Jaakko Putkonen, associate professor of geology at UND's Harold Hamm School of Geology & Geological Engineering, holds a chunk of ancient ice he uncovered in Antarctica. Photo by Adam Kurtz/UND Today.



# FOR SMOOTHER ROADS AND STRONGER BRIDGES

UND President Andrew Armacost and Ronald Henke, NDDOT director, cut the ribbon dedicating the partnership for the Transportation Technology Research Institute.



## The 5-million-year-old ice samples may shed light on the Earth's ancient climate

And you thought the crusty ice in your freezer was old.

A UND geologist has ice in his freezer that's potentially up to 5 million years old — which likely makes it some of the oldest ice ever discovered on the planet.

Jaakko Putkonen, Ph.D., associate professor of geology at UND's Harold Hamm School of Geology & Geological Engineering, doesn't actually store that ancient ice in his home freezer. Rather, it's safe and sound in a commercial freezer at the Energy & Environmental Research Center on the east side of campus. It comes out only occasionally if he needs to thaw out a chunk to get at the sand and dirt particles inside, in which case, he temporarily stores it in a small, office freezer.

Putkonen and a team of researchers in 2018 drilled 10-meter core samples of the ice found under dirt in the Ong Valley of the Trans-Antarctic Mountains. They now have data indicating the ice dates back 5 million years, and their research is popping up in big-name scholarly journals such as *Nature*. Along with researchers from the Berkeley Geochronology Center and Vanderbilt University, Putkonen and Marie Bergelin, then a UND geology graduate student but who now is doing post-doctoral research at the University of California-Berkeley, published a paper about the ice in *The Cryosphere*, a journal from the European Geosciences Union. The paper details the

potential for the ice to reveal secrets about the Earth's ancient climate.

"In order to evaluate its potential as a paleoclimatic archive, we first needed to figure out how old this ice mass is and understand its history, which is what we did for this project," Bergelin said

### Paving the way for future researchers

The 10-meter-long cylindrical ice cores may open the doors for researchers worldwide by giving them a deeper understanding of the Earth's ancient climate.

To reveal those secrets, researchers are examining the amount of CO<sub>2</sub> contained in bubbles in the ice. The dwindling amount of ice is housed at UND, and is shared with collaborators to analyze CO<sub>2</sub>, DNA, biological activity and other indicators of past climate and environment.

Other researchers such as atmospheric scientists are taking on the task of CO<sub>2</sub> analysis. Putkonen and Bergelin are geomorphologists. They study the processes of landforms on the Earth's surface. In Antarctica, they are interested in the evolution of the landscape — how much it changes or doesn't change. Which makes the case of 5-million-year-old ice something of a mystery.

### Dating the samples

After a circuitous route back to UND, Putkonen began the process of dating the ice. He did that, ironically, by melting it to get at the dirt and sand particles inside. Quartz crystals were extracted from the rocks and were washed to remove

any impurities. Why quartz? At or near the Earth's surface and over a period of millions of years, the atoms in the mineral interacted with cosmic rays in ways that caused nuclear reactions within the mineral, resulting in the formation of new isotopes such as beryllium-10 and aluminum-26.

The cosmogenic isotopes have a decay rate that can be used to calculate the age of the sample. Putkonen said he sent about 30 samples to an accelerator facility run by the National Science Foundation at Purdue University. By bombarding those samples, researchers there were able to yield a concentration they could use to calculate an age range for the samples and thus the ice.

### Future drilling missions?

Bergelin said the team's discovery likely will inspire other researchers to travel to the Ong Valley in search of ancient ice. But she and Putkonen are looking at other areas to dig.

With the help of a UND Geology graduate student, Putkonen said they have identified 22 likely places to find similar buried ice bodies in Antarctica. No one will know if more ice lies under the dirt until someone puts a shovel to it and then makes the arduous journey back to a university to date the samples. It's an opportunity Putkonen says he would relish.

"This is what I do," he said. "I always tell students that I don't do geology to sit in front of a computer. I do it to be able to go out into the field."

(Excerpt)

Written by Adam Kurtz // UND Today

## Partnership with North Dakota DoT promises to help state develop, maintain modern transportation system

In a February ceremony, UND celebrated the formal dedication of a partnership with the North Dakota Department of Transportation that will provide research for the agency, while offering valuable educational opportunities for both graduate and undergraduate students.

UND and NDDOT leaders gathered for the ceremony in Upson I, which now officially houses the Transportation Technology Research Institute. It is a place that will bring researchers, educators and students together for a multi-pronged initiative to develop and maintain a modern transportation system, while training a highly skilled workforce for North Dakota's future.

UND President Andrew Armacost and senior UND leaders met with Ronald Henke, NDDOT director, and a detachment of NDDOT staff, to officially sign the partnership agreement and then christen the new research institute. Armacost thanked Henke for the opportunity to partner with the state.

"This facility and the work that will happen here at the University of North Dakota represents an important contribution by our faculty, staff members and students to the state of North Dakota as we examine the future bounds of transportation systems, here within the state and also across the

nation," Armacost said. "We are delighted that the state has made such a wonderful decision to invest in this facility."

Henke said the research institute is the culmination of about four years of talks between NDDOT and UND. He noted that his department has had a 20-year-relationship with North Dakota State University, and said he wants "that 20-year-relationship with UND." Henke also spoke of educational and workforce development opportunities.

"This is a great thing for us, it's a great thing for North Dakota," Henke said. "We're going to use the skills of these young students, and we're going to hopefully get them interested in transportation, and maybe work for the Department of Transportation."

Sattar Dorafshan, assistant professor of Civil Engineering, is the director of the TTRI. He thanked the roughly 30 state officials, UND administrators and professors, and graduate students for attending the ceremony. He noted that UND is one of only seven American universities with the ability to do 3D printing with concrete, and that he expects the institute to grow in the future, in its service to both students and the state.

"This is just a start," Dorafshan said. "We are going to grow, and we are going to have more projects."

The institute is divided into three different areas: structures, materials and unmanned aerial systems, the latter of which can be used to provide detailed bridge inspections without having to shut down lanes of traffic. UND will lead in the materials and UAS

sections in coordination with NDDOT, while the state agency takes the lead in structures area, while selecting design projects for UND students.

The institute is investigating several different possibilities to maintain and improve the state's transportation system, including the possibility of 3D printing culverts, mitigating wildlife crossing hazards through innovative structural and materials design and reducing the costs of major highway construction projects by developing reusable precast concrete to create highway crossovers.

Graduate students are already engaged in some of that research. Amalie Joergensen, a master's student in Biology, is pursuing a study on wildlife/vehicle collisions. Alireza Hasani, a master's student in Civil Engineering, is studying the feasibility of using 3D printing technology to create concrete pipes and culverts. Faezeh Jahavi, a Civil Engineering doctoral student, is working on using drones to gather needed data for NDDOT, data that otherwise is very difficult and time consuming to prepare.

"If there's one story about today, it's the role our students play," he said. "Our job is to make sure our students get the best experience that they possibly can, and to have you at the center of this photo that is now probably going to be published across the state, means a lot. You are the reason that we are here as a university."

(Excerpt)

Written by Adam Kurtz // UND Today



Ryan Adams, associate dean for national security in the UND College of Engineering & Mines, speaks about national security initiatives at UND. Photo by Adam Kurtz/UND Today.

## UND SOARS SYMPOSIUM'S FLIGHT PLAN: MAKE MOST OF STRATOSPHERE

### Inaugural symposium brings scholars, government officials and industry representatives together

On March 21 & 22, UND brought together academics, government officials and aerospace industry manufacturers all facing the same desire: developing the technology needed to harness the potential of long-term aerial operations in the stratosphere.

UND's first-of-its-kind Stratospheric Operations and Research Symposium (SOARS) provided the forum for those aerospace and government leaders to interact, learn from one another and possibly collaborate on research. The specific topics of presentation and discussion were all things related to High Altitude Long Endurance aircraft (HALE) and High Altitude Pseudo Satellite (HAPS) development. The symposium was emceed by Robert Kraus, dean of the John D. Odegard School of Aerospace Sciences.

UND President Andrew Armacost, in his opening remarks, welcomed attendees, some of whom had traveled from nations such as Japan, Germany and the U.K., to

a region that has been described as the epicenter of research and development of uncrewed aerial systems.

"Let me thank everybody in the room for being here today, for sharing in the rich discussion and for taking advantage of the chance to push the boundaries of science and uncrewed flight," Armacost said.

In his remarks, Armacost described the extent of UAS ecosystem in Grand Forks, which includes UND, Grand Forks Air Force Base (the home of the Global Hawk—the Air Force's high altitude long endurance UAS), the Northern Plains UAS Test Site and the UAS business park Grand Sky. The latter features anchor tenants Northrop Grumman and General Atomics, two premier aerospace equipment developers.

Sen. John Hoeven, R-N.D., was also on hand to help kick off the inaugural event. He spoke of the growing UAS ecosystem, in particular recent developments that will allow new companies to come to Grand Sky and fly under the existing Federal Aviation Administration waiver the Test Site has been granted for beyond visual line of site flight. This development will allow those new companies to get enough airtime to show

the FAA they can safely fly their aircraft, and thus be granted individual BVLOS waivers of their own.

But Hoeven also spoke of more weighty matters, including the recent flights of unidentified aerial phenomena (UAP) across the national air space. The federal government is calling some of those UAPs Chinese spy balloons, one of which was shot down over the Atlantic Ocean on Feb. 4, with another having been shot down on Feb. 11 over Lake Huron. Yet another was shot down over Alaska.

Hoeven spoke of what the stratosphere means to national security when it comes to UAPs, and how symposium attendees can lend their expertise in developing systems that can remain in flight in the stratosphere for extended periods of time—think months, not days. The point is to have continuous eyes-in-the-sky to identify those UAPs, as well as broaden the nation's intelligence, surveillance and reconnaissance capabilities.

And, Hoeven said, academia, government and industry researchers each bring a different piece to that puzzle. But where will they put the pieces together?



UND alumnus Noren Pan, President and CEO of Illinois-based Microlink Devices, Inc., spoke at the SOARS symposium about his company's efficient solar cells. Photo by Adam Kurtz/UND Today.

"I submit to you it's right here," he said. "It's right here because that's what we do, and we do it over and over and over again.

"We get it done; we don't just say 'someday,'" the senator continued. "We do it, and we do it expeditiously."

### Why the stratosphere?

The stratosphere lies atop the atmosphere's lowest layer: the troposphere, the layer in which clouds and weather — not to mention humanity— exist. The troposphere extends about 6 miles high where it terminates in the tropopause, a boundary layer to the stratosphere. The stratosphere extends about 30 miles high and houses the ozone layer, which is between 15-20 miles above the Earth's surface.

To avoid turbulence, commercial aircraft will fly into the low stratosphere, while spy planes fly much higher. Certain weather balloons and HAPS balloons in development can go even higher.

Speaking shortly before the symposium, UND mechanical engineering professor Hallie Chelmo told UND Today that certain atmospheric phenomena can alter the altitude of the lower boundary of the stratosphere. Recently, she said, that lower boundary extended down to the tops of mountains in Washington state, which would have given any mountain climber there the interesting honor of hiking in the stratosphere.

Communications is but one reason to operate in the stratosphere. Far above the weather, a HAPS aircraft (either lighter than air, such as a balloon, or heavier than air, like a fixed wing aircraft) can use communications equipment to provide connectivity and internet services directly to mobile devices or even first responders. This would prove useful in disaster situations, when communications have been lost;

launch a high-altitude aircraft or balloon, and suddenly a smartphone has a signal.

"That's part of what we're trying to do because in the end, we're trying to get the right information to the right people at the right time," Kraus said.

And then there are military uses.

Communications or needed data for soldiers on the ground can be provided by a HAPS aircraft when line-of-sight comms fail because of terrain or other issues. A near stationary balloon can provide those needs, and due to relatively low cost per unit, can be easily replaced should it be compromised or malfunction.

Eric Follstad, requirements and technology division chief with the Resources and Analysis Directorate at U.S. Central Command (USCENTCOM), said stratospheric operations are critical for the military for a number of reasons, including being able to surveil those regions where groups adversarial to the U.S. operate. Follstad attended the symposium to discuss the importance of developing the stratosphere, and shared ideas on how industry representatives can efficiently present to defense officials, when seeking funding for their high-altitude projects.

Ultimately, Follstad said, it is cooperation that will see the stratosphere developed.

"Within this audience, we can solve this stratospheric problem," he said.

### How can aircraft stay up there for so long?

The answer is with a little (or maybe a lot) of help from a UND alum. Noren Pan, BSME'82, (also a Grand Forks Central graduate), president and CEO of Illinois-based Microlink Devices, Inc., said it was

easy to get to the stratosphere, but tough to stay there. Not anymore.

Pan has developed a highly efficient solar cell (it resembles the negative from a film camera) that can be used to power a lightweight aircraft for, well, an almost indefinite flight time.

HAPS aircraft are by necessity light, and perhaps somewhat flimsy. They risk damage from weather when ascending to the stratosphere, but in the calm airspace there they can make use of the sun's energy to stay aloft. During the day, the solar cells keep the aircraft flying. At night the aircraft runs on batteries, which then recharge when the sun rises.

Existing HALE aircraft such as the Global Hawk operate in the stratosphere but are expensive to operate and maintain. They also use aviation fuel, which has limitations. According to the U.S. Air Force, Global Hawks can fly for about 34 hours at a time. Pan's solar panels were installed on the Airbus Zephyr, which in the summer of 2022 flew in the stratosphere for 64 days and change. Pan says stratospheric flight can go even longer.

"What we're talking about today is something that can stay there for years," Pan said.

Ryan Adams, associate dean for national security in the UND College of Engineering & Mines, told symposium attendees that he is interested in the stratosphere from the vantage point of looking down from space. He outlined the National Security and Space Initiatives at UND, which was funded by a \$14 million investment from the Legislature.

UND's focus on space overlaps with ground-based efforts to operationalize the stratosphere, Adams said. That space-based research and potential collaboration with partners both military and civilian will develop as UND's National Security Corridor, based in Harrington Hall, comes online.

Included in the corridor will be digital and satellite engineering laboratories, as well as a satellite fabrication laboratory.

"A lot of this technology, a lot of these resources can be brought to bear for the High Altitude Long Endurance mission," Adams said.

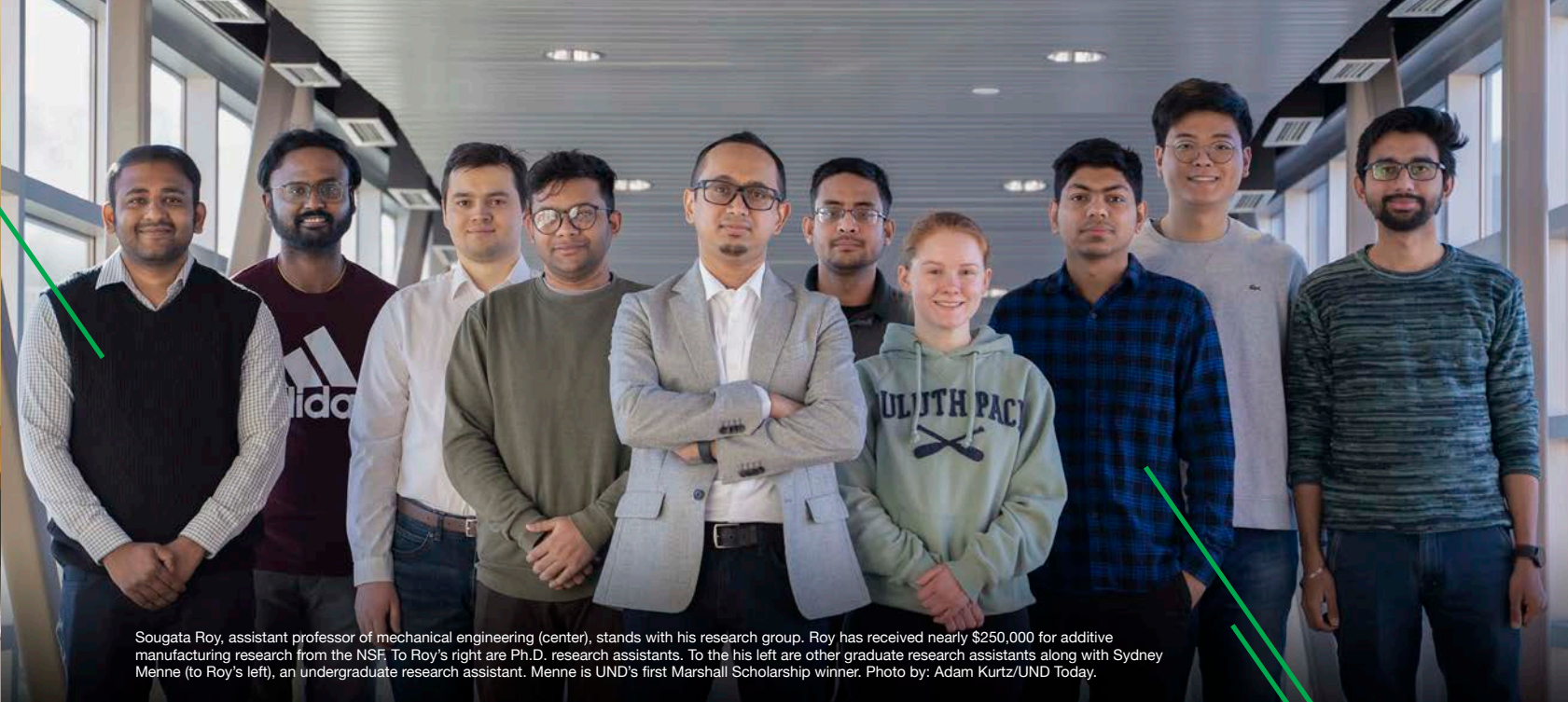
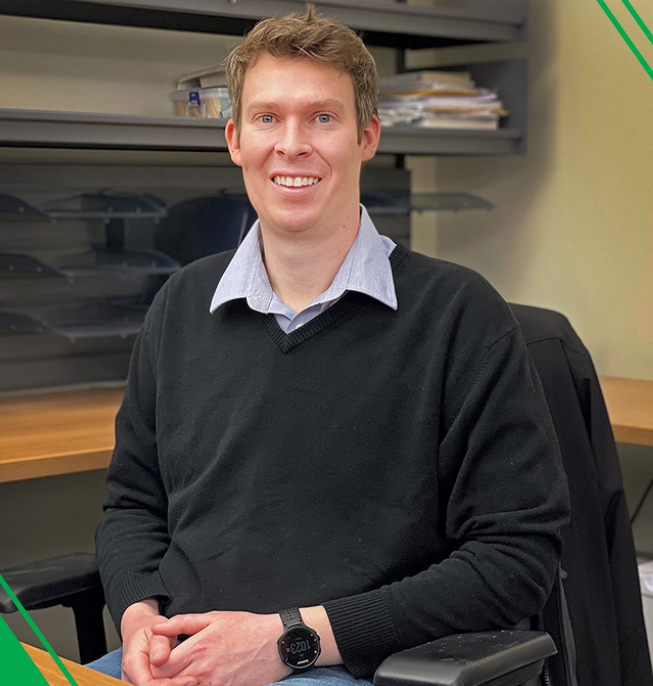
(Excerpt)

Written by Adam Kurtz // UND Today



# MODERN ALCHEMY TURNS GREENHOUSE GAS INTO USEFUL SOLID

Johannes Van der Watt, research assistant professor with the UND Institute of Energy Studies, has received more than \$1.2 million in federal funding to study how to capture carbon dioxide in a solid form. Photo by Adam Kurtz/UND Today.



Sougata Roy, assistant professor of mechanical engineering (center), stands with his research group. Roy has received nearly \$250,000 for additive manufacturing research from the NSF. To Roy's right are Ph.D. research assistants. To his left are other graduate research assistants along with Sydney Menne (to Roy's left), an undergraduate research assistant. Menne is UND's first Marshall Scholarship winner. Photo by: Adam Kurtz/UND Today.

## UND researcher receives \$1.25 million grant to transform carbon dioxide into minerals

Johannes Van der Watt, research assistant professor at UND's Institute of Energy Studies, has been awarded more than \$1.25 million in funding to study the feasibility of using industrial residues to capture carbon dioxide in a solid form—and then using that solid in a beneficial way.

The grant was awarded by the U.S. Department of Energy for a growing area of interest in carbon storage: recycling it into a useful and solid mineral. Van der Watt will investigate the carbon capture potential of numerous sources of industrial residues, such as cement kiln dust, coal ash and recycled concrete.

Van Der Watt has been named Principal Investigator for the project, and will be assisted by Envergenx LLC, a Massachusetts-based company that specializes in technology development and commercialization.

Van der Watt said it is important to take a “cradle to grave” approach when examining the implications of the overall carbon lifecycle of a material.

“Let's use what is in our backyard,” Van der Watt said. “We are looking at a wide variety of industries and asking how they can help reduce our CO2 emissions using what is available to them to either capture CO2 and store it indefinitely, or use it for something beneficial.”

One example Van der Watt is investigating is the potential of using cement kiln dust or recycled concrete to capture CO2 in mineral forms. Those minerals can then potentially be used in the manufacture of new concrete. Successfully doing so will mean permanently storing CO2 in a safe manner while reducing the amount of new concrete needed for large construction projects, yielding environmental and economic benefits.

Residue sources with degraded potential for carbon capture could also still be mineralized (capturing what CO2 it can) and then storing the inert material in a landfill, or using it in construction projects as a filler.

Dan Laudal, research professor at the Institute of Energy Studies, said mineralization as a pathway to reducing emissions to the atmosphere is of growing interest to the industrial sector.

“I am particularly excited about this new award because it will provide our team the opportunity to explore many new types of feedstocks and processes,” Laudal said. “In addition to related work we have going on, I think this project will put us in position to be a leader in this emerging research area.”

Laudal continued: “I am extremely proud of the work we are doing and congratulate Johannes on this important new award.”

According to the research proposal, identified industrial residue sources have the potential to capture and store 20 million metric tons of CO2 per year. But capturing those 20 million metric tons in an efficient way is the challenge.

Van der Watt said that not all forms of industrial residues may be equal when it comes to efficiently capturing CO2 through mineralization. Which is one of the reasons of the importance of the project: it has not been evaluated before.

“Carbon capture might be a good application for a particular residue, but until we actually assess it, we can't say if it is good,” he said.

Part of the project also includes looking at the geographic locations of a source of high-potential industrial residue. Transporting a potential source over a great distance may negate its positive impact on the environment, meaning proximity to the CO2 source and end application for the mineralized products are important.

Van der Watt said a holistic approach to carbon capture is necessary, as there may not be one source of industrial residues that can account for 20 million metric tons of the gas. A variety of different residues may be needed to account for a significant amount of safe carbon storage.

“What might work well for one industry with their residue, might not work well with the same conditions for a different industry,” he said.

Written by Adam Kurtz // UND Today

## NEXT UP: NEXT-GEN COMPONENTS FOR NUCLEAR REACTORS

### Federal grant will spur advanced manufacturing research by Sougata Roy and his team

A UND Mechanical Engineering professor has received federal funding to research new manufacturing methods for components used in nuclear reactors.

Sougata Roy, assistant professor of mechanical engineering, received nearly \$250,000 to study how additive manufacturing (AM) processes can be used to make the nuclear reactor components. Additive manufacturing is a process not dissimilar to how a 3D printer makes plastic objects.

The research project will make use of nitrogen-strengthened austenitic steel, which will function as the feedstock for the manufacturing process. Once completed, those components will undergo an in-depth investigation into their functionality versus traditionally manufactured components. Funding for the project was awarded through the National Science Foundation. Roy will serve as principal investigator on the project.

Roy said additive manufacturing allows for the capability to control material properties

near the surface of a manufactured object, as well as at its core, something not possible with traditional methods of manufacture.

“Different research groups are trying to make the components using additive manufacturing,” Roy said. “Conventionally, these components are made through casting or wrought-iron forging, but you cannot tweak the mechanical properties or the microstructure properly. In additive manufacturing, we have lot more grip on that.”

Brian Tande, dean of the UND College of Engineering and Mines, said the college has recently made investments to expand work in materials science and advanced manufacturing.

“I'm excited that this new award will add even more capabilities to the college and support the important work of Dr. Roy, one of our talented new faculty members,” Tande said. “This work will lead to advancements in metal additive manufacturing and has the potential to contribute to UND's research efforts in energy and national security.”

This is the most recent federal funding award for additive manufacturing that Roy has received. Previously, he received a grant from the U.S. Department of Defense to study the potential of additive manufacturing

for large components to be used on naval vessels. Roy is also leading two other AM projects funded by NASA.

In this most recent research project, Roy will build upon his AM experience. The part fabrication and preliminary material characterization will take place at UND, and then further analysis will be conducted using neutron diffraction at Spallation Neutron Source of Oak Ridge National Laboratory in Tennessee. Roy and a doctoral student from his research group at UND will spend the summers of 2024 and 2025 at ORNL.

Along with the manufacturing process, testing of the components will focus on the high temperature tribological properties of the components. Tribology is the science of friction, wear and lubrication, which Roy said is an inseparable field to surface engineering. This most recent research project will explore the relationships between AM, surface engineering and tribology, of which Roy has extensive research experience.

“I have been working on these three areas for the previous 13 years, and now I get the opportunity to utilize my interdisciplinary experience in a single project through this NSF award,” Roy said.

Written by Adam Kurtz // UND Today



## COLLABORATING TO FOSTER MANUFACTURING FORUM IN GRAND FORKS REGION

### Industry leaders unite to tackle shared challenges and promote regional growth

In a joint initiative, the University of North Dakota's College of Engineering & Mines and the Economic Development Corporation (EDC) of Grand Forks have forged a dynamic partnership — the Manufacturing Leadership Forum — to establish a forum of manufacturing companies within the region.

This collaborative effort aims to facilitate knowledge-sharing, address common challenges, and showcase the positive impact of the manufacturing sector on the local economy and quality of life.

Since its inception in January 2023, the manufacturing forum has brought together a diverse group of industry leaders, fostering collaboration and collective problem-solving. The forum continues to expand its membership base. Founding members consisting of eight prominent companies, including LM Wind Power, PS Industries, Retrax, Cirrus Aircraft, JR Simplot, Philadelphia Macaroni, Steffes Inc., and Red River Biorefinery.

The monthly gatherings serve as a platform for open discussion, enabling representatives from each company to participate and contribute to the forum's objectives actively. While typically attended by plant managers, the forum encourages the involvement of other relevant stakeholders from member organizations.

The forum's primary goals can be summarized into three key areas:

**Establishing Collaboration:** UND, the EDC, and the manufacturing entities aim to build strong ties, fostering collaboration and understanding. By working closely with the industry, the forum seeks to gain insights into the challenges faced by manufacturing companies in the region.

**Addressing Shared Challenges:** The forum serves as a hub for identifying, documenting, and collectively addressing common issues. Leveraging the resources available through UND's College of Engineering & Mines and the EDC, the forum members can tap into local, regional, state, and federal tools to tackle challenges.

**Promoting Positive Impact:** Through effective communication, the forum aims to highlight the significant contributions made by manufacturing partners to the region's economy and overall quality of life. By showcasing success stories and sharing best practices, the forum intends to enhance the reputation and visibility of the manufacturing sector.

With ongoing support from various stakeholders, the forum seek to foster an environment that promotes innovation, collaboration, and sustainable growth within the manufacturing sector in the Grand Forks region.

#### Interested in getting involved?

Contact **Chad Frost**, Director of Professional Development at [chad.frost@UND.edu](mailto:chad.frost@UND.edu) or call 701.777.3852.

## TWO HEARTWARMING CEREMONIES CELEBRATE LEGACIES AND PROFOUND IMPACT AT UND

In celebration of the Hoffman family's remarkable contributions to UND, a special private investiture luncheon was held in Minnetonka, MN on July 19, 2022. The heartwarming event was a testament to the enduring impact the Hoffman family has made on the UND community.

During the ceremony, Jeanne Hoffman shared the story of how her father, Norm, found his way to UND. Her words resonated deeply, illuminating the university's profound impact on her family's journey and weaving a tapestry of gratitude and lifelong connections.

Among the guests were Norm and Ann Hoffman, accompanied by their devoted caregivers, Sara and Grace. The Hoffman

family was further represented by their children: Jeanne, accompanied by her husband Brian and their daughter Sophia; Julie and Martha, along with Martha's children Sera, Hannah, and John; and Ross, together with his wife Shara and their daughter Marita.

On September 28, 2022, the Thomas C. Owens Endowed Chair of Chemical Engineering Investiture Ceremony was held at the Memorial Union. Since its establishment in 2004 by some of Tom's former students to honor him, over 150 donors have given to the fund making this endowed position one of the largest in donor participation.

The ceremony was well attended by UND leadership, family, friends and many of the

generous individuals who have supported this endowment to honor Tom — many of whom were former students of Tom's.

"He was one of the best professors I had," said retired chemical engineer Kristi Brindle, '78, who helped spearhead the endowment. "He had such an easy way of communicating. There was room for humor, and you always could tell he enjoyed being around his students and his faculty."

Both investiture ceremonies captured the uplifting commitment of our generous donors, but also served as poignant reminders of the profound impact that individuals can have on shaping our future. We wholeheartedly thank the families, friends, and game-changers that have made their lasting impact on our students, faculty, and college.

## WHY I ❤️ CEM

"CEM has transformed my curiosity into a driving force, propelling me to push myself to embrace challenges, and forge a path with opportunities I never thought possible."

**Derrick Seubert**  
Student Organization President,  
PRI3D of the North

## CONGRESSMAN ARMSTRONG VISITS CEM

From transportation technology, rare earth elements, and industrial support initiatives, Armstrong and CEM leadership discuss college's impact on the State of North Dakota



During Congressman Kelly Armstrong's visit at the University of North Dakota, he visited the College of Engineering & Mines to hear from CEM leadership about how the college's research and development projects can make a state-wide impact. Pictured above: Kevan Rusk, Sattar Dorafshan, Deb Austreng, Congressman Kelly Armstrong, Brian Tande, Chad Frost, and Dan Laudal.

**Facilities of the National Security Corridor will bolster campus and state competencies in:**

- Space and satellite development, deployment, and operations
- Space debris and aircraft identification/assessment
- Component assembly, nano-foundry and cleanroom utilization
- Advanced UAS & satellite material characterization and applications
- Systems fabrication, assembly, and testing
- Digital engineering & big data
- Classified operations



# TOGETHER, WE SECURE OUR NATION'S FUTURE

**Upgrades happening to Harrington Hall's first floor will centralize efforts in national security**

If you're visiting Upson I or Harrington Hall any time soon, we apologize in advance for the noise; we are building the future of national security education and research at UND.

In our last magazine issue, we announced our designation of the National Security Corridor, to be located on Harrington Hall's first floor, as the hub for our space and national security activities. This corridor enables us to showcase our college's capabilities, current projects, and people to potential research partners, state and federal agencies, and prospective students.

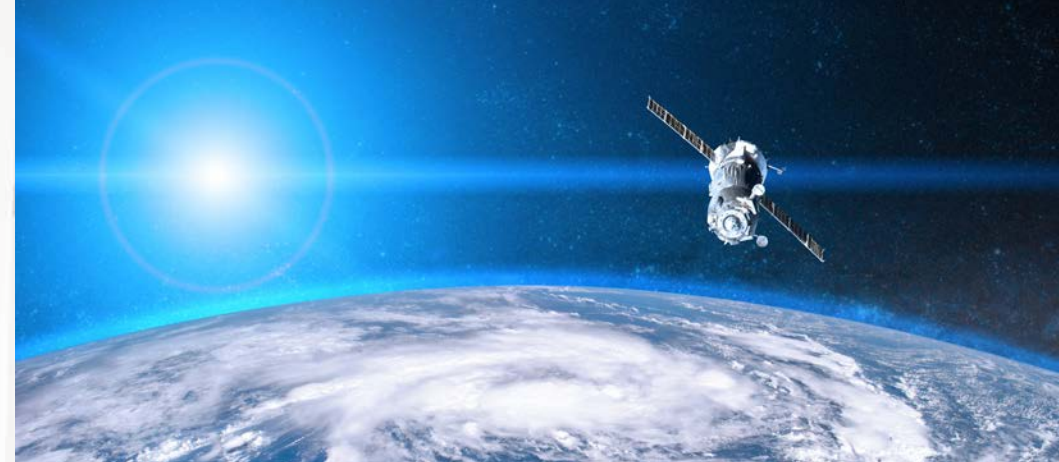
To support UND's national security initiative, including research, academic, and training programs, the corridor is undergoing major renovations - from the infrastructure up. Some walls

of outdated lab spaces have been removed completely, opening up the possibilities for better-equipped rooms and modern facilities.

Once finished, the corridor will feature hallway windows allowing visibility into the engineering labs and design spaces, highlighting the daily research and innovation happening at the college. Along the walls, displays will highlight specific industry-related projects and feature the accomplishments of students, faculty, and alumni.

The National Security Corridor will be a transformative upgrade to our previously outdated hallway and laboratories into modern facilities that demonstrate the college's commitment to national security. It will allow us to educate industry-leading professionals in experiential learning environments and be a hub for national security research on campus.

Above: Architectural concept drawn over the current progress of the National Security Corridor.



## ONE MORE GIANT LEAP

**UND will use NASA grant to develop faster space communications technologies**

UND has received a \$650,000 grant to develop high-bandwidth communications networks to be used in space.

The grant was awarded by NASA through its Space Technology Research Grants Program, and was announced by Sen. Kevin Cramer, R-N.D., in early December 2022. Funds from the award will be given out over the period of three years. Along with UND, nine universities across the nation have received funding to develop early-stage technologies with an eye toward future use. At UND, the research will take a multi-disciplinary approach involving the Engineering and Aerospace colleges.

"We're very excited about this collaborative project between the College of Engineering & Mines and the John D. Odegard School of Aerospace Sciences," said Brian Tande, dean of the College of Engineering & Mines. "This project will build upon a long history of space-related research at UND and further grow our capabilities to develop new technologies for space applications. It will also capitalize on the generous investment the North Dakota Legislature has recently provided for space research at UND and will certainly lead to even more opportunities."

The research will be overseen by Ryan Adams, Associate Dean for National Security in the College of Engineering & Mines.

Said Adams: "This is a great opportunity for UND, the College of Engineering

& Mines and the school of Aerospace to solve a very critical and timely problem for space exploration."

Adams said the research will be used to create a communications network that can be used for general space applications, but one goal is to develop a system that could be used by astronauts who are on lunar missions.

NASA began its Artemis 1 mission on Nov. 16 with the launch of the Orion spacecraft. The uncrewed mission is the space agency's first step in returning astronauts to the moon. It is there, Adams said, that a reliable, low-latency—faster—communications system will become particularly necessary.

The NASA grant is among the most recent developments in space research at UND, including the development of the National Security Corridor in Harrington Hall. When completed, the facility will feature satellite design, engineering and fabrication laboratories and a digital engineering and Big Data lab, which can be used for group or individual projects.

In total, UND received a \$14 million appropriation from the Legislature to redesign spaces on campus for space-related initiatives and add cutting-edge equipment and other resources.

Another space initiative currently happening at the college is a materials characterization lab is under construction in Upson Hall I. When completed, the lab will allow the engineering college to develop and analyze advanced materials for use in space, air and ground applications to meet national security needs.

(Excerpt)  
Written by Adam Kurtz // UND Today

## LET'S GET TOGETHER

Calling all CEM alumni & friends!

We're hosting our 3rd Annual **CEM Homecoming Social** — and you're invited! Join us during UND's Homecoming Week for hors d'oeuvres, drinks and great company. Reunite with old classmates, reconnect with professors, and network with fellow alumni. Special guests include our 2023 Alumni Academy inductees:

**Donald L (Don) Hynek**  
Civil Engineering, '71

**Robert Post (Bob) Johnson**  
Geology, '70, '73

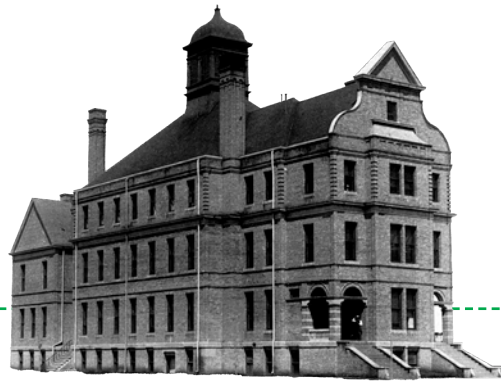
**Barbara O'Toole**  
Mechanical Engineering, '86

**RSVP BY SEPTEMBER 22!**  
**October 6, 2023 | 5-7 p.m.**

**UND College of Engineering & Mines**  
Collaborative Energy Complex  
Tom & Carolyn Hamilton Atrium  
2844 Campus Rd, Grand Forks, ND 58202

For questions, please contact **Deb Austreng** at [debra.austreng@UND.edu](mailto:debra.austreng@UND.edu) or call 701.777.4249.





**1883**

The University of North Dakota is founded.

**1889**

Constitutional Convention authorizes the UND School of Mines.



**1890**

School of Mines is established. College of Mining Engineering is approved.



## OUR ORIGIN STORY

Established in 1890, just a year after North Dakota became a state, our founders believed they could make a difference.

And they did.

Although our name has changed over the years, our fundamental mission has remained steadfast: to train industry-leading engineering and science professionals in the State of North Dakota.

Like our founders, we believe no obstacle is too big and no challenge too great. Throughout our long history, we've expanded our programs to include a wide range of engineering and science disciplines, including aerospace, biomedical, civil, chemical, electrical, environmental, geological, mechanical, and petroleum engineering. Our long and rich history of providing high-quality STEM education and research distinguishes us as a leader in innovation and technology development in the region and beyond.

Today, the College of Engineering & Mines is fueled by experiential learning, redefining the modern-day classroom through hands-on learning and one-of-a-kind experiences. Our 9,000+ graduates over the past 120 years who have gone on to make a difference in our state, region and nation are a testament to UND's top-notch engineering, computer science, and geology education.

The sky is no longer the limit. A major contributor to campus research, our efforts in national security, energy engineering, aerospace engineering, and artificial intelligence are transforming our future. Joining forces across departments, campus, and the world, we are bridging disciplines and sharing insights to move the world forward.

Together, we've earned our spot as North Dakota's premier engineering and science institution...

# ...SO WHAT'S NEXT?

**1901**

Dean Babcock announces the need for more engineering courses to encourage students seeking that education to remain in-state instead of seeking education out-of-state. The College of Mechanical & Electrical Engineering is established with Calvin Crouch as dean. Mechanical Engineering's four-year degree is born.



**1897**

UND formally opens the School of Mines with Earle Babcock as director.



**1903**

The 'Old Power House' (built 1899) and Mechanical Arts building (built 1903) are connected and named the Engineering Building (later renamed Chandler Hall). A curriculum for Electrical Engineering is added.



**1908**

The Mining Engineering (Babcock) building is complete and College of Mining Engineering moves from the science hall to its new home.



**1909**

Consolidation of the engineering schools; the College of Mining Engineering and the College of Mechanical and Electrical Engineering become the College of Engineering.



**1952**

Harrington Hall is built and the College of Engineering is thriving. "For the first time ever, the college is well-equipped, thanks to the opportunity to acquire war surplus items."

**1948**

It became apparent that Chandler Hall was highly inadequate for post-war needs, and plans for a new building began.



**1910**

The College of Engineering gets three new departments: chemical, architectural, and ceramic engineering.



**1962**

Leonard Hall breaks ground.



**1971**

Upson I is built.



**1974**

Upson II is built to connect the existing engineering buildings and provide more space for classrooms and laboratories.



**1975**

The College of Engineering and the School of Mines are fused to form the School of Engineering & Mines.



**2012**

The School of Engineering & Mines becomes the College of Engineering & Mines and the Harold Hamm School of Geology & Geological Engineering is established.



**2011**

The Department of Petroleum Engineering is established.



**2008**

Harrington Hall is expanded upon to include the Larry Jodsaas Center for Engineering Leadership and Entrepreneurship.



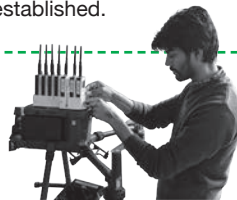
**2016**

The Collaborative Energy Complex is dedicated.



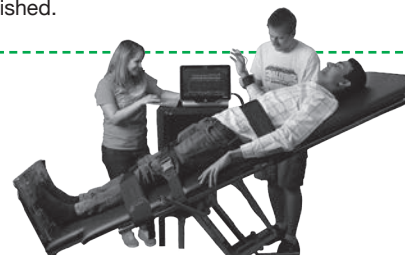
**2017**

School of Electrical Engineering & Computer Science is established.



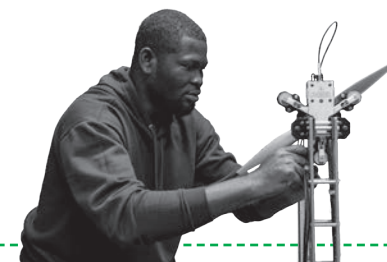
**2021**

B.S. in Biomedical Engineering is announced.



**2023**

B.S. in Aerospace Engineering is announced and National Security Corridor renovations begin.





# OUR LEGACY CONTINUES

Early concept rendering of the proposed STEM Complex. The new facility will be a game-changer for the College of Engineering & Mines. Illustration courtesy of Clark & Enersen.

## Imagine a state-of-the-art STEM hub, right here at UND, driving innovation and economic growth for the state.

As a leading institution in engineering and science education and research, we have recognized the need to construct a modern facility that will enable our students, researchers, and faculty to thrive in the dynamic and ever-changing fields of technology and engineering.

With this in mind, we are embarking on this new construction project that will provide ample space to relocate teaching and research facilities for the departments of Civil Engineering, Chemical Engineering,

Electrical Engineering and Computer Science, and Biomedical Engineering.

Phase 1 of the building will add 100,000 sq. ft. of modern spaces for CEM, featuring leading-edge learning environments to prepare students for successful futures. These advanced facilities will include collaboration-centric laboratories, modern classrooms, and teamwork-driven workspaces to foster innovation and creativity in our students and researchers.

Once completed, the STEM Complex will provide experiential learning opportunities for all UND students in science, technology, engineering, and mathematics. A beacon of cross-specialty collaboration, it will be home to the next generation of technological progress.

We are proud to be at the forefront of innovation and discovery, and our new construction project is a testament to our commitment to excellence in education and research. With these new facilities, we are confident that our students, researchers, and faculty will continue to excel and make significant contributions to their respective fields.

This new building will be the next — and most Herculean — chapter in CEM’s legacy; this part of our history weaves the thousands of collective stories uniting our students, alumni, friends, faculty and staff, university, and state. While we have a long way to go before we break ground, we’re filled with immense gratitude to every person who has lead us to this point.

“A modern first-tier CEM facility is fundamental to a vital current and future North Dakota high-tech industry base.”

**Terry Severson**  
Chairman, CEM Executive Board  
Founder & President, Trace Systems

“The new building for the UND College of Engineering & Mines is critical to meeting North Dakota’s future technology and workforce needs, particularly with UND CEM’s unique alignment with key economic priorities in the State.”

**Steve Burian**  
Vice Chairman, CEM Executive Board  
President & CEO, Burian & Associates, LLC

## 20/20 BY 2030

The STEM Complex is required to meet our ‘20/20 by 2030’ plan, created by Dean Brian Tande, which outlines areas of improvement needed to accomplished in order for the college to reach a new level of excellence.

The first ‘20’ represents \$20 Million/year in research. This supports UND’s goal of achieving R1 status and will allow us to grow our Ph.D. enrollment.

The second ‘20’ stands for a 20:1 student-to-faculty ratio. A goal for each department (while growing enrollment), this goal also requires the college hiring 40 more faculty members.

Every time I visit CEM, I am amazed at the ongoing growth, innovation and industry partnerships. **This new facility will unleash UND's potential in engineering education and research.**

**Jacquelyn Crowhurst**

General Manager of Customer Success, Microsoft  
CEM Executive Board & Alumni Academy Member  
Computer Science Class of 1994



This much-needed modern facility is imperative for our long-term success as a premier STEM education and research institution, but most importantly, it enables us to...

**FOSTER COLLABORATION**

Our greatest asset is collaboration as our STEM industries — and the world — evolve through technological advancements. From projects big and small, we have found time and time again that fostering collaboration between departments and areas of study takes our results to the next level.

The new building's infrastructure is designed not to define areas for individual areas of study but to provide opportunities for better utilization and sharing of research spaces and equipment. Incorporating modern approaches to cross-department collaboration, our facility will immerse students in a teamwork-driven environment that reflects the contemporary climate of innovation.

**CELEBRATE OUR UNIQUENESS**

Our college's small size allows for close relationships between students and faculty, facilitating cross-pollination between areas of study and genuine desires for personal growth and success. The new building will continue to nurture our unifying atmosphere and promote a sense of community. Additionally, it will celebrate our non-traditional student body, which includes many older students engaged in retraining.

The new facility will also be designed with recruitment in mind. We take pride in our uniqueness as a higher-learning institution that fosters personal growth and success, which we will communicate through our building with prospective students. Our students' footprint on real-world research and development will also be woven into the story told throughout the facility's spaces.

**EMBRACE STUDENT RESEARCH INVOLVEMENT**

We are committed to providing career-bolstering opportunities for undergraduate and graduate students to participate in research. Involvement in research improves retention, graduation, and post-graduation placement rates and provides unique hands-on learning experiences that can significantly impact students' careers.

By facilitating resource-sharing among all disciplines, faculty, and students, we strive to continue increasing our students' involvement in research initiatives.

**+100K**

Gross square footage of Phase 1

**~9,700**

Square feet of new high bay laboratory spaces

**\$57.4M**

Appropriated by ND Legislature in 2023



I'll forever be grateful for the opportunities a UND Engineering education opened for me. **The new building will further enhance UND's ability to provide talented engineers well suited to meet the challenges of a rapidly changing world.**

**A. Benjamin Dove**

Retired, Lockheed Martin  
CEM Executive Board & Alumni Academy Member  
Mechanical Engineering Class of 1983



**PLEDGE YOUR PRIDE**

**Stay tuned for ways you can contribute.** The success of this project depends on the support of alumni and friends. In the next few months, we'll reach out to all of our alumni and friends through emails and social media with new updates and exciting ways to support.

To learn more or get involved, contact:

**Robin Turner, FCEP, '89**

Director of Development, CEM  
UND Alumni Association & Foundation

✉ [robint@UNDfoundation.org](mailto:robint@UNDfoundation.org)  
☎ 701.777.1428



## WHY I ❤️ CEM

“Our students go above and beyond — inside and outside the classroom. The new STEM Complex will help us continue attracting the best and brightest.”

**Chad Frost, ME'94**  
Director of Professional Development, CEM



Hallie Chelmo, assistant professor of Mechanical Engineering, seated, and David Delene, research professor of Atmospheric Sciences, left, work in Chelmo's lab while doctoral student Imteaz Osmani assists. Photo by Adam Kurtz/UND Today.

# UND RESEARCH ON HYPERSONIC VEHICLES PICKS UP SPEED

## UND, Purdue collaborate on research to improve safety and tracking of hypersonic vehicles

What are the implications of the interaction between hypersonic vehicles traveling through the atmosphere and the ice crystals that naturally form there? A pair of UND researchers have received a federal grant to study that interaction, and their results could impact the design and improve the safety of hypersonic vehicles.

Hallie Chelmo, assistant professor of Mechanical Engineering, and David Delene, research professor of Atmospheric Sciences, have been awarded \$750,000 from the Office of Naval Research to study how ice crystals form in the atmosphere and how they impact hypersonic vehicles. The term “hypersonic” means flight at a speed faster than five times the speed of sound, and such vehicles include certain missiles, military vehicles, and spacecraft reentering earth's atmosphere.

The UND researchers are joined in the project by Joseph Jewell, an assistant professor in the School of Aeronautics and Astronautics at Purdue University. Chelmo

is the Principal Investigator on the project, and Delene and Jewell are working as Co-Principal Investigators.

Brian Tande, dean of the UND College of Engineering & Mines, praised Chelmo's leadership of the collaborative research project, which is happening alongside national security and space research at UND.

“Dr. Chelmo's unique expertise and capabilities are already making significant contributions to the research mission of our College and to UND's National Security Initiative,” Tande said. “This project is a very important part of our growing portfolio of work studying hypersonics, an area critical to our national security. Dr. Chelmo has assembled a very strong team of collaborators and I'm certain that this project will be the first of many.”

Chelmo said there is much that researchers have yet to learn about atmospheric water in all phases, especially ice. Impacts with atmospheric ice particles can potentially cause damage to a craft's thermal protective systems.

Chelmo praised the interdisciplinary nature of the research, which will also be used to

improve computer models used to track the trajectories of vehicles reentering the atmosphere from space.

“As space activity increases and we demand faster modes of human transport, we must understand how these high-speed vehicles interact with the atmosphere, for instance, to inform any restrictions on landing opportunities from outer space,” Chelmo said. “This interdisciplinary initiative bridges scientific techniques to understand atmospheric ice interactions with hypersonic flows, which are two separate specialties.”

Delene said the project is important because it will make use of novel laboratory methods to understand the implications of large, chain-like ice crystal aggregates on supersonic flight. Delene has observed such aggregates through his previous research.

“I am very excited to be involved with this project as it has the potential of producing truly revolutionary results, compared to simply making gradual advancements that are typical of most research projects,” Delene said.

The research, titled “Investigating the Formation of Ice Crystal Aggregates and Their Impacts on Hypersonic Vehicles,” has

three objectives. In the first objective, the researchers will use laboratory equipment at UND to simulate a cloud-like environment so they can better understand the formation of atmospheric ice crystals. That knowledge will inform them on how to improve flight path trajectories for hypersonic vehicles.

The second objective will see how those ice crystals interact with shockwaves, which are caused by a vehicle traveling faster than Mach 1. This objective will be undertaken at Purdue University and will make use of laboratory technology there to see how these crystals break up in aggregate. This series of tests will yield information needed to determine the extent to which ice particles can affect hypersonic trajectories and damage potential.

The third objective will see the researchers interface with experts performing related studies. Their data will be used to validate ongoing theoretical work.

Jewell said he is pleased that the Office of Naval Research saw the potential in pairing the research capabilities found at UND and Purdue.

“I'm particularly excited about this project because it's an example of my favorite

kind of collaboration: something really new that neither partner could execute on our own,” Jewell said. “Dr. Chelmo at UND has some unique capabilities in generating and characterizing ice crystals, droplets, and other forms of water that occur in the atmosphere. I'm pleased that ONR saw the same potential that we did for pairing these UND strengths with our shock tube and other hypersonic test capabilities at Purdue.”

Chelmo said there are computational researchers across the country that are looking at the physics of what is going on inside the shockwave next to a hypersonic vehicle, but they do not have the needed experimental data for their research. This is something she intends to soon remedy.

“That is exactly what we're developing,” Chelmo said. “We're developing new methods to fundamentally understand shockwave-particle interactions, and we'll give that data to the computational researchers.”

Written by Adam Kurtz // UND Today

## COLLABORATING TO DEVELOP IMPROVED WATER TREATMENT FOR FISH FARMS



**Beth Klemetsrud, Ph.D.**



**Wayne Seames, Ph.D.**

A team led by the Virginia Institute of Technology has been awarded a \$799,999 grant by the U.S. Department of Agriculture to develop and implement a new engineering system for recirculating aquaculture systems (RAS) that uses partial nitrification/denitrification and anammox (PANDA).

This project involves Beth Klemetsrud, an assistant professor of Chemical Engineering, and Wayne Seames, a Chester Fritz Distinguished Professor of Chemical Engineering.

Traditional RAS, which are closed-loop fish culture systems, rely on nitrification to treat fish water biologically. Operators use water renewal

and discharge to maintain suitable levels of accumulated solids and nitrate in the system.

The PANDA system is expected to decrease water demand, effluent loading rates of pollutants, oxygen demand, greenhouse gas emissions, and operational costs.

“This is a new collaboration for us and we are excited to support this effort to improve the sustainability of the world's fish-for-food industry,” says Klemetsrud.

The University of North Dakota will conduct techno-economic and sustainability analyses of Virginia Tech's technology.



Prakash Ranganathan, Cyber Awareness & Research Symposium chair and founder of the UND Center for Cyber Security Research, welcomed guests on Oct. 31 to the 2022 CARS event at UND.

A research-poster presentation was part of the Cyber Awareness & Research Symposium recently hosted by UND.



## PLENTY OF PHISH IN THE SEA

### Cybersecurity conference at UND attracts hundreds while boosting awareness, promoting research

Once upon a time, automotive security involved locking the door and taking the keys.

But these days, there's a reason why that statement sounds like the first line of a fairy tale.

These days, the typical new car basically is a supercomputer on wheels, using a total of some 100 million to 150 million lines of code to operate everything from the steering to the engine to the brakes. Moreover, the cars typically are connected to the Internet, meaning hackers can access the vehicle's network and listen in as the occupants speak — remember, the electronic network includes a microphone — or access the occupants' networked smartphones and get personal information, or even cause a crash.

That's on top of hackers being able to capture and mimic a key fob's transmission, and thus stealing a car within seconds. And if all of the above is sobering, it's meant to be, said Srinivasagan Ayyappan, senior expert on infotainment cybersecurity for the Aston Martin Lagonda luxury-car manufacturer in the United Kingdom.

"Think of it: Cars are becoming mobile offices, our homes away from home, and we have Internet in the vehicle," he said.

That means the payment accounts stored in your vehicle's infotainment system can be accessed by a hacker, as can the past and current GPS location info, as can safety features such as lane-departure warnings, as can ...

"In short, do we need automotive cybersecurity? Definitely," Ayyappan said.

#### Free and open to the public

Ayyappan was one of the featured speakers at the 2022 Cyber Awareness & Research Symposium, an event hosted by the Center for Cyber Security Research at UND. The event was held both online and in the UND Memorial Union, and it attracted some 240 registrants, said Prakash Ranganathan, the center's director and an associate professor of Electrical Engineering at UND.

"We have a wide variety of people participating — a combination of industries, faculty and students, including graduate, undergraduate and even high school students — and on a wide variety of aspects of cybersecurity," Ranganathan said as the conference wrapped up. "And I think everybody learned from and enjoyed it. I know I did."

The symposium's goals were twofold, Ranganathan said. It was meant first, to boost awareness for the community; and second, to showcase and spread awareness of the cybersecurity research being conducted at UND and elsewhere.

With those goals in mind, the symposium was free and open to the public, but also presented national-level research and discussion on critically important topics in cybersecurity. Some 30 researchers stood beside and presented posters describing their work, while panel discussions explored topics such as cyber resilience, cyber risk management and cybersecurity for the electric-power grid.

Among the speakers addressing the conference was Mark Hagerott, chancellor of the North Dakota University System, who spoke remotely from Bismarck.

"I can tell you as a former cyber professor and deputy director of a cybersecurity center, the work you're doing is among some of the most important being done anywhere," Hagerott said.

Why? Because the emergence of technologies such as intelligent machines and networks is presenting the world with challenges that have never before been seen, Hagerott said. Moreover, those challenges are showing up in virtually every domain of modern life, from the suburban kitchen with its smart appliances to the command-and-control of various nations' nuclear postures.

Furthermore, all of those linked technologies and networked machines have a security component.

"And that's the issue you're dealing with right now: the cybersecurity problem," he said.

Experts are hard-pressed to name a more important technological issue facing the world in the 21st century.

#### A bipartisan effort

Sen. Kevin Cramer, R-N.D., also addressed the symposium and agreed with Hagerott's assessment. But there's one piece of very good news, which is that cybersecurity is among the key issues in Congress that draw strong and sincere bipartisan support, said Cramer, who spoke remotely from Washington.

"Over the past year, I've worked with my Senate colleagues on several bipartisan cybersecurity efforts," he said.

"For example, in February, I joined a bipartisan letter that urged the Securities & Exchange Commission to increase transparency requirements for companies to include mandatory cybersecurity reporting, which is especially important for defense companies dealing with highly classified information and systems.

"In March, I joined another bipartisan letter urging Defense Secretary Lloyd Austin and Homeland Security Secretary Alejandro Mayorkas to provide resources for private and public institutions to defend against cyberattacks. It really is a bipartisan effort, as cybersecurity is among our most significant priorities, and we are doing what we can as lawmakers to bolster it."

In short, the participants in this year's symposium should be aware that they're doing essential work, Cramer said.

They're doing a task that urgently needs to be done, he added: "You have brought together a broad audience of academics, students and industry professionals to further what's really a very important mission. So, thank you."

Written by Tom Dennis // UND Today

## SHARE YOUR TIME AND TALENT

Year-round, we travel across the United States in search of the best and brightest students. From high school classroom visits, career expos, and recruitment fairs, outreach is at the forefront of our recruitment efforts.

Sharing your experiences with students will help us connect with and inspire the next generation of engineers and scientists. By volunteering to speak with prospective students about your career experiences and lessons learned as a professional, you can nurture that same spark that ignited your ambition to follow your passion.

The best engineers can go anywhere, but they start here.

You can sign up to be placed on a call list when we are in your area, or you can let us know you'll visit campus and would like to meet with our leadership and students by contacting:

**Deb Austreng**  
Director of Alumni, Corporate,  
& Public Relations

debra.austreng@UND.edu

701.777.4249





# ACHIEVEMENTS & AWARDS

Doing is in our DNA; here are a few of the amazing achievements of our faculty, staff, and students that make us [#UNDproud](#).

## Notable Grants & Sponsorships

**Dan Laudal** and **Nolan Theaker** were awarded an \$8 million U.S. Department of Energy grant to study the possibility of recovering and refining rare earth elements (REEs) in North Dakota, specifically from lignite coal. [More on page 8.](#)

**Taufique Mahmood**, associate professor of geology and geological engineering, has been awarded over \$1.3 million in grants from the USDA Natural Resource Conservation Service (North Dakota) and his NSF CAREER Award.

**Hallie Chelmo**, assistant professor of Mechanical Engineering, has been awarded \$750,000 from the Office of Naval Research to study how ice crystals form in the atmosphere and how they impact hypersonic vehicles. [More on page 28.](#)

**Johannes Van der Watt**, research assistant professor at UND's Institute of Energy Studies, has been awarded more than \$1.25 million in funding to study the feasibility of using industrial residues to capture carbon dioxide in a solid form—and then using that solid in a beneficial way. [More on page 16.](#)

**Sougata Roy**, assistant professor of mechanical engineering, received nearly \$250,000 to study how additive manufacturing (AM) processes can be used to make the nuclear reactor components. [More on page 17.](#)

## Investiture Ceremony

**Terry Severson** and **Michael & Sitney Lodoen** were honored for their generous support to UND through impactful endowed professorships and faculty fellowships. [More on page 11.](#)

## UND Founders Day 2023 Awards

VPAA Award for Excellence in Assessment: **Sven Egenhoff**, Director & Professor, Tom & Carolyn Hamilton Faculty Endowed Fellow, Harold Hamm School of Geology & Geological Engineering

VPAA Award for Outstanding Professional Academic Advising: **Sarah Pike**, Academic Advisor

UND Award for Departmental Excellence in Research and Creative Activity: **Institute of Energy Studies**

25 Years of Service: **Gwendolyn Klawon**, Outreach & Recruiting Coordinator

## CEM Dean's Outstanding Faculty & Staff 2023 Awards

Outstanding Faculty Awards: **Beth Klemetsrud & Sattar Dorafshan**

Outstanding Staff Awards: **Angie Lockwood & Elizabeth West**

## Geological engineering graduate student awarded NSF-GRFP Fellowship

**Michaela L. Neal**, a geological engineering graduate student, was awarded a 2023 National Science Foundation-Graduate Research Fellowship. Her selection is a significant national accomplishment and places her among an elite group of fellows, many of whom have gone on to distinguished careers in STEM or STEM education. [More on page 42.](#)

## Doctoral Student Wins ACCE Student Paper Competition

**Kordell Tan**, a biomedical engineering graduate student, has won the American College of Clinical Engineering (ACCE) Student Paper Competition, in the US/Canada Doctorate Division. [More on page 43.](#)

## UND Steel Bridge Team takes home honors at regional competition

CEM's **Student Steel Bridge Competition Team** placed second in Construction Economy, first place in Lightness, and first place in Construction Speed at the Western Great Lake Student Steel Bridge Competition. [More on page 45.](#)

## Doctoral student wins Best Paper Award at ICRTEC '23

**Meera Gopinath**, a doctoral student in the School of Electrical Engineering & Computer Science, has won the Best Paper Award at the International IEEE Conference on Recent Trends in Electronics and Communication (ICRTEC 23).

## UND ASCE student chapter turns 100

The **American Society of Civil Engineers Student Chapter's** milestone, a testament to the longevity and significance of their community and demonstrates the rich history of teamwork and belonging in UND's Department of Civil Engineering. [More on page 43.](#)

## Doctoral graduate's paper showcased as Editor's Choice in ASCE Journal

After **Dr. David Khani's** Ph.D. dissertation was published, he achieved Editor's Choice status in the American Society of Civil Engineers (ASCE) publication, *Journal of Hydraulic Engineering*.

## Doctoral student awarded 'Outstanding Presentation Award' at AGU '22 Meeting

**Alexis Archambault**, a geological engineering doctoral student, received the Outstanding Student Presentation Award during the American Geophysical Union (AGU) 2022 Fall meeting. Alexis's work demonstrates how the recent

wetting changed wetland storage and area and its implications for streamflow generation in a headwater basin draining to Devils Lake.

## 'Batter Shaker' senior design project wins Minnkota Power Cooperative's annual innovation contest

In the spirit of making life a little sweeter, **David Barber, Michael Ramseth, Robbie Robinson, and Riley Sondrol** created a contraption called the "Batter Shaker," which shakes cake batter on a platform to remove bubbles that cause voids in a cake. [More on page 42.](#)

## Mechanical engineering graduate students take home poster honors at STLE's Annual Meeting

**Kommineni Uday Venkat Kiran** wins first place at the student poster competition while **Hyunsuk Choi** and **Sudip Saha**, secure third place prizes. [More on page 44.](#)

## SEEGS graduate student awarded 'best paper presentation' at IEEE conference

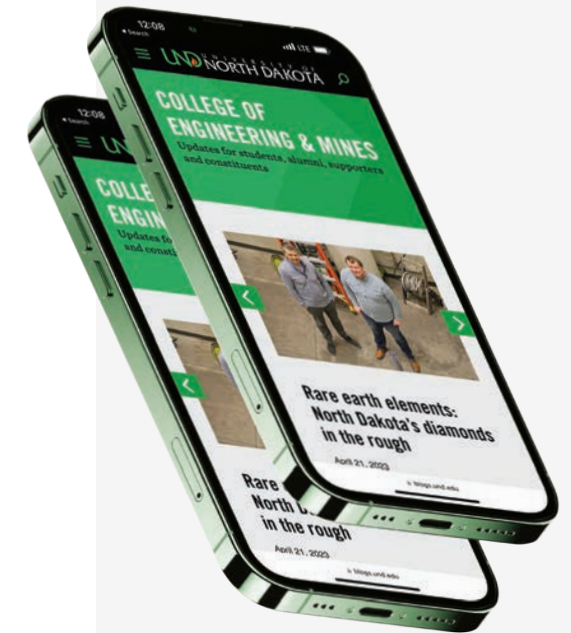
**Barathwaja Subash Chandar** received the best paper presentation award at the IEEE 13th Computing and Communication Workshop and Conference for the paper titled "Short-Term AQI Forecasts using Machine/Deep Learning Models for San Francisco, CA." The paper's co-authors include **Prashanth Rajagopalan** and **Prakash Ranganathan** (advisor).

## CEM team places in NASA's annual Lunabotics Challenge

The **UND Lunabotics Team** wins second runner-up overall and places third in the 'proof of life' video competition. [More on page 46.](#)

## Doctoral student selected as winner at IEEE International Symposium on Women in Services Computing

**Shereen Ismail** has been selected as one of the winners of the IEEE International Symposium on Women in Services Computing scholarship awards. Last May, she received third place at EIT2023 in the paper competition.



## CEM NEWS DELIVERED DIRECTLY TO YOUR INBOX

Want to keep updated on the latest news and stories from the UND College of Engineering & Mines?

The next time you visit our blog, be sure to enter your email address into our newsletter subscription box!

At the beginning of every month, we'll send you the biggest stories from the previous month, along with important updates and upcoming events for our alumni and friends.



SUBSCRIBE TO OUR NEWSLETTER TODAY AT [blogs.UND.edu/cem](https://blogs.UND.edu/cem)



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16

# AROUND CAMPUS... AND BEYOND

[1] A team of engineering students competes in the BatSuBot Robotics Tournament. [2] The American Rock Mechanics Association (ARMA) UND Student Chapter poses for a photo together with Sven Egenhoff and Olusegun Tomomewo in the Collaborative Energy Complex (CEC). [3] Petroleum engineering graduate students work together hands-on at the Drilling & Completions Lab (DRACOLA). [4] Two civil engineering seniors collaborate in the Upson II study lounge on their senior capstone involving the Memorial Stadium project on campus. [5] Dan Inman (Vice President & CISO, BSEE'02, Minnkota Power Cooperative, CEM Executive Board member) congratulates and inspires graduating students at the Spring 2023 Order of the Engineer & Pledge of the Computing Professional Ceremony. [6] Sponsored by the ECouncil, faculty, students, and staff gather for the Engineers Week Wrap-Up Social, where students and faculty were recognized for their achievements. [7] Geology students at the lowest point in the United States: Badwater Basin in Death Valley, CA. [8] Over a hundred high school students (and future engineers) from North Dakota visit campus and compete at the North Dakota State Science and Engineering Fair. [9] North Dakota-based paleontologists Dr. Denver Fowler and Dr. Liz Freedman Fowler are welcomed as guest speakers at Paleontology Talks, lead by Joseph Hartman and presented by the Leading Edge of Earth & Planetary Science (LEEPS). [10] Students in the Rocketry Club make rockets together. [11] Students take part in a field camp in Turkey with Dexter Perkins, Ph.D., gaining critical hands-on experience while exploring the country's rich environment and culture. [12] In the high-bay area, students work together on a formula race car. [13] During the 2022 Cyber Awareness & Research Symposium, students present their research in a poster competition. [14] At the Spring 2023 Order of the Engineer & Pledge of the Computing Professional, students show off their engineering ring and computer science pin, bestowed upon inductees after taking their lifelong pledge of service to their profession. [15] A student works in the Integrated Systems Engineering Laboratory. [16] Chemical engineering students test their capstone project: UV-sensitive toothpaste designed to help consumers identify plaque-problem areas.



**“UND has prepared me to be a successful leader in many ways. The coursework I’ve had, I believe, has really prepared me to excel in the professional world.”**

**JULIA DEWHURST**

## TRANSFERRING HOME

**Julia Dewhurst loves math, puzzles and people. Depending on when you see her, at least one of those passions will be notably present.**

The Niagara University transfer, corresponding with a family move, was looking for a Midwest university with a strong cyber security program. UND was the only one offering a bachelor’s degree in cyber security.

“I really like solving problems, solving puzzles,” Dewhurst said. “As I excelled through my high school programs, I realized that I really like math and problem solving. What drew me to cyber security is protecting people’s data.”

Cyber security can be a relatively broad term, encompassing the digital protection of anything from a credit card number to the systems hospitals rely on to safely and effectively treat people. As a field, it offers a variety of challenges and demands complex problem solving. While data and analytics are not everyone’s cup of tea, Julia has found a group of like-minded peers.

“When I got to UND, a lot of the people in my immediate circle weren’t in engineering,” Dewhurst said.

“So, when I heard of the Society of Women Engineers, it was a really great way for me to meet other women in STEM. It was a really good source of encouragement and support. It’s good to have other people to lean on.”

Finding students to share her experience with has highlighted Julia’s time at UND.

“I became more of a well-rounded, outgoing social person,” she said. “When I first came to

UND, I was more on the shy side. I realized I wanted to be part of more things on campus and get involved and meet new people. So as I branched out, I became more outgoing, more social. And I have to say that I’m really thankful to UND for that.

Part of that branching out included the swim club. A competitive swimmer since the age of ten, Julia couldn’t pass up the opportunity to join. Of course, her favorite part has been the relationships.

“It’s a team environment,” Dewhurst said. “Everybody builds each other up.”

She picked up running as cross-training for swimming, but one thing led to another, landing her in the Triathlon Club as well.

She also joined the Tau Sigma transfer student honor society. This was another way to form quick connections with other transfer students who similarly found UND to be the best place to advance their education.

After graduation, Julia hopes to work in ethical hacking, a job requiring her to attack companies’ databases in order to find vulnerabilities before they are exploited.

“Ethical hacking combines the element of problem solving with hands-on activities. It’s an interesting and fun way to apply what I’m learning in school.”

Julia Dewhurst became a leader by simply being herself. A female engineer, swimming enthusiast and transfer student, she, along with her many passions, has found a home at UND.

Written by Nathan Bayne  
Photo by Mike Hess



Chioma Onwumelu, a Ph.D. candidate in geology at UND, spoke to the community at the Nov. 5 event. Photo courtesy of the National Renewable Energy Laboratory.

Dr. Monica Mayer, a Mandan, Hidatsa, and Arikara Nation tribal councilwoman and North Segment representative, spoke on a panel at a geothermal community event. Other panelists included (from left to right) Caitly Smith, NREL geothermal project manager; Brian Tande, CEM dean; and Olusegun Tomomewo, director of the energy engineering program. Photo courtesy of the National Renewable Energy Laboratory.

## EXPLORING GEOTHERMAL ENERGY POSSIBILITIES WITH THE MANDAN, HIDATSA, AND ARIKARA NATION

### Second-Place DOE 2022 Geothermal Collegiate Competition Team Hosts Impactful Event in North Dakota

“Let’s look to the past and learn so we can figure out what we need to do for the future,” said Dr. Monica Mayer, a tribal councilwoman for the Mandan, Hidatsa, and Arikara (MHA) Nation, at a Nov. 5, 2022, panel discussion focused on geothermal energy possibilities for the tribal nation.

That statement weighs heavy in an area where past injustices are too numerous to list. These injustices include the loss of nearly all tribal lands, partially for the sake of what was then called “energy progress” when the area was flooded in the 1950s from the creation of the Garrison Dam.

“The major transition in energy we are facing is a chance to correct the mistakes of the past,” said panelist Brian Tande, dean of the College of Engineering & Mines. “We make better decisions when we involve more people with diverse perspectives.”

Students from the University of North Dakota and Reykjavik University—team “UND Geothermal Vision”—are attempting to do just that. The second-place winners of the U.S. Department of Energy (DOE) 2022 Geothermal Collegiate Competition (GCC) hosted the November 2022 event to bring their geothermal ideas to the community, seeking input and dialogue.

“What we go to in the future is exactly what you are doing today,” Dr. Mayer said to the students. “You come out to the community, you talk to the people, you tell them what your ideas are, you let them know how you are going to be respectful of culture, tradition, way of life, and help us keep our land, air, and water clean and not take advantage of us. That is called meaningful tribal consultation.”

The team came in second place for their design of a combined heat and power geothermal system for the city of New Town, North Dakota, which is located on the Fort Berthold Indian Reservation. The team used extensive preexisting geological information from oil and gas exploration in the area to design a system that could heat and power an entire district, including the possibility for greenhouses and aquaculture efforts.

Propane, which can rise in cost exponentially during the cold winters, is the current heating source for the town of nearly 3,000 people. There are no natural gas utilities in the service area, despite the recent increase in extraction of shale gas across the local Williston Basin. These economic pressures have led to a greater desire in the community to switch fuel sources.

“We want to thank the MHA Nation,” said Jessica Eagle-Bluestone, a recent graduate of UND with a master’s in energy systems engineering and one of the 17,107 enrolled members of the MHA Nation. “We went through the tribal council to request the proper resolutions for different aspects

of the project; getting the tribe’s consent and support was pivotal.”

### An “Energy Nation”

In North Dakota, approximately 25% of the oil and gas produced now comes from the Fort Berthold Indian Reservation, yet the self-proclaimed “Energy Nation” is always seeking ways to further protect their land, water, air, and people—especially through renewables.

“We are very open-minded at the MHA Nation. We have always been like that, for more than 200 years since Lewis and Clark came here,” Dr. Mayer said. “Everybody likes to follow our lead. If we pour ourselves into energy and renewables, everyone else will too.”

The tribe started with solar, installing a large array at the MHA Interpretive Center. The solar array, located in New Town where the winter temperatures are frequently in the single digits or below, helped the museum move from owing hundreds of dollars a month to receiving credits for generating excess energy.

Now the tribe is interested in expanding their renewable energy generation to include geothermal.

“My favorite part of the GCC was the community engagement component,” Eagle-Bluestone said. “This is my community, and I was able to introduce a lot of the local leaders and the general population to a resource that they didn’t realize was something we could utilize.

Geothermal would be a good transitional energy resource to ensure the tribe can remain an energy tribe well after oil and gas, and it would provide additional industry to the area.”

### Community Event

The student team partnered with the MHA Nation to hold the community event at the Northern Lights Wellness Center, centering the various talks and panels around geothermal energy and tribal energy independence.

Team members gave presentations on geothermal basics and their competition entry for high school students and the New Town community. The DOE Geothermal Technologies Office sponsored the event, with the intent of furthering discussion of geothermal energy as a clean, renewable resource in areas that can benefit most.

The UND Geothermal Vision team also built a model showcasing various geothermal uses and technologies, gifting it to the MHA Nation and presenting them with a certificate of appreciation for their support during the project. More than 100 community members and UND students attended the event.

### The Geothermal Collegiate Competition and Team UND Geothermal Vision

The DOE Geothermal Collegiate Competition, administered by the National Renewable Energy Laboratory, is designed to inspire students to consider new career opportunities, learn geothermal industry-relevant skills, and connect students to their communities.

As part of the 2022 competition, students assumed the role of project developers, working with communities across the United States to identify local energy challenges and explore geothermal energy solutions.

“This project takes you outside your comfort zone, outside your classroom work, and applies it,” said

The UND Geothermal Vision team has participated in the GCC since 2019, achieving two first-place wins in addition to their second-place prize this year. They attribute their success to teamwork, sometimes coordinated across continents, as well as their willingness to study areas outside their traditional academic focuses.

“Working with a diverse team like our team, from different backgrounds, brings up

creativity and always pushes the project forward,” said Chioma Onwumelu, a Ph.D. candidate in geology at UND.

“We are ready to win the next competition,” said Jerjes Porlles, a Ph.D. candidate in energy engineering at UND. “Everything I learned about geothermal I learned through three years of the Geothermal Collegiate Competition.”

Just as the team is looking ahead to the next GCC cycle, the leaders of the MHA Nation are already planning how to put more renewables into practice, including geothermal.

“My electricity bill for this community center is \$6,000–\$8,000 a month; it is just a nightmare,” Dr. Mayer said. “I believe the future for all of us in the MHA Nation, as we utilize our oil and gas revenues, is to build net-zero everything. We need to utilize all our renewables—geothermal, solar, wind—to advance the future so that our children won’t have to pay \$8,000 a month in electrical bills. They will be getting credits.”

Written by Kelly MacGregor, NREL

## ANNUAL UND ROBOTICS COMPETITION POWERS ON



The Leonard Hall Lecture Bowl buzzed with energy during Finals Week of the fall semester. The second annual BatSuBot Robotics Competition, a fusion of BattleBot and SumoBot, has become a beloved event at the College of Engineering & Mines.

Students who applied to compete were challenged to design and construct their own DIY robot capable of pushing opponents out of a ring. The students’ passion and dedication were evident in the quality of their robot designs, and the competition was more intense than ever before.

The BatSuBot Robotics Competition is a testament to the School of Electrical Engineering & Computer Science (SEECs) commitment to providing an engaging and enjoyable learning experience. The event was

well-attended, with UND students and faculty marveling at the impressive engineering skills of the competitors.

“The concept of this event is to make robotics not only educational but also enjoyable and fun,” said Tarek Elderini, SEECs instructor and coordinator of the BatSuBot competition.

As the competition gains momentum in the UND community, it provides a unique platform for students to excitingly apply their skills and creativity. The BatSuBot Robotics Competition is sure to become a regular event at UND, inspiring and educating future generations of engineers and innovators.

The next competition is set for December 8, 2023. Everyone is invited to attend! Stay up-to-date on our social media pages.

# FUTURE PROBLEM SOLVERS AT WORK

## Seniors showcase their capstone projects at UND's annual College of Engineering & Mines Expo

Visitors to the Memorial Union Ballroom on Tuesday, May 2 might have encountered an electric bicycle zooming across their path, before noticing a large rocket standing in a corner, robotic devices, a small bridge and a race car simulator, among myriad other displays.

It's a good thing, then, that plenty of visitors got to see those sights. On Tuesday was held the UND College of Engineering & Mines Expo, an event where seniors showcase their capstone projects. More than 270 high schools across North Dakota and Minnesota were able to view online presentations of those projects, then vote for a winner. More than 80 students from Central High School in Grand Forks attended the CEM event in person, which has come to be known as a premier showcase of technology and innovation for disciplines spanning Engineering, Computer Science and Geology.

Brian Tande, dean of the College of Engineering & Mines, likened the gathering of soon-to-be graduates to a group of professional problem solvers. In fact, many of the capstone research projects were supported by local businesses that need engineering solutions.

"It's all about what engineers are supposed to be doing, solving problems," Tande said, moments before taking the stage to kick off the event.

Once at the podium, Tande joked that if the seniors didn't know who he was, it was likely due to them being diligent students during the course of their studies. He thanked them for their efforts and congratulated them on working to solve real-world problems.

"This is this is one of the most fun events that we have every year, where we get to see what everybody else is doing," he said.

"We get to brag about the all the hard work that we put in and show everybody what engineering really is all about, which is working on real projects, solving problems for people and making life better for other people."

Mikayla Schirado was one of those problem solvers. She was explaining to attendees her group's work to devise a new mechanism that can rotate a horizontal pressure vessel for Steffes Group—the vessels are used in powder coating operations, among other uses, and the industry, she said, has moved beyond the use of vertical vessels.

"We reused an old part and added attachments in the red and the yellow there," Schirado said, gesturing to a poster outlining the work. "That rotates their vessels so they can do blasting and coating on their pressure vessels at the facility here in Grand Forks."

Along with Tim Fah and Kaycee Lambrecht, Matt Malusky and Broc Waldhausen were on hand to discuss their work on the feasibility of using a thermoplastic to manufacture components used in ethanol fuel systems. The project, which received funding from the North Dakota Corn Council, proved to be popular among attendees, as the group was voted to receive the "Best Process/Research Project" award.

Receiving the "Best Prototype Project" award were David Barber, Michael Ramseth, Robert Robison and Riley Sondrol for their Batter Shaker food device. Winners of the awards will split scholarship funds.

In between learning about projects like a robot mining device (designed to be used by NASA for lunar mining operations), an electric bicycle that recharges when pedaled or the latest activities of the UND Rocketry Club (yes, they actually design rockets on campus then launch them just north of Fargo), attendees were invited to take a spin on a race car simulator. There was just one catch though, would-be racers had to get stamps on an Expo passport. More rides meant getting more stamps.

Dominik Steinbauer, senior lecturer in mechanical engineering, has been involved with organizing the Expo for about five years. The event, he said, gives seniors the opportunity to hone their presentation skills. But it also has another purpose, to spark an interest in engineering among younger students, and introduce them to educational pathways at UND that can lead to lifelong careers.

"It's a way for all the senior students and other design projects to show off to the public in a way to get the public interested in engineering," he said.

In fact, many of the presenters said they were looking forward to beginning their careers. Mikayla Schirado, of the Steffes engineering project, said she has taken a job doing design work for HVAC systems. Other students said they won't be away from UND for long and will be back for graduate school in the fall. Others are still sifting through potential career options.

Said Broc Waldhausen, with the award-winning thermoplastic project on behalf of the North Dakota Corn Council: "I'm going through interviews right now. Several project sponsors visited the campus to participate in the event, including Marvin, Retrax, Textron Aviation, Steffes Group and American Crystal Sugar Company.

Written by Adam Kurtz // UND Today



### Tour the Virtual Expo

To view a selection of student projects, scan the QR code above or visit [bit.ly/3pru5he](https://bit.ly/3pru5he).





## GRADUATE STUDENT AWARDED NSF-GRFP FELLOWSHIP

Michaela L. Neal, a graduate student in the UND Geological Engineering program, was awarded a 2023 National Science Foundation-Graduate Research Fellowship (NSF-GRFP). She applied under Geosciences-Hydrology as her GRFP field of study. Previously, Michaela earned her B.S. in Environmental Studies, with a minor in math, from UND.

Selection as an NSF Graduate Research Fellow is a significant national accomplishment and places Michaela among an elite group of fellows, many of whom have gone on to distinguished careers in STEM or STEM education.

Michaela would like to offer a special thank you to her mentor/graduate advisor, Dr. Taufique Mahmood, and each of her professors, advisors, and supervisors who have guided her — past and present.

“Thank you also to the University of North Dakota for all the opportunities that have led to this moment and for enriching me with such an immersive, top-notch education.”



## ANDREW FREEMAN COMPETITION TEAM TAKES THE CAKE

The most beloved inventions are often those that solve an irritating problem faced by everyday people.

For Andrew L. Freeman, former general manager of Minnkota Power Cooperative, the irritating problem was his vehicle not starting during North Dakota’s coldest winter days, and the solution was his invention of the headbolt heater — now called an engine block heater.

In the spirit of making life a little sweeter, the winners of the 2023 Andrew Freeman Design Innovation Competition created a contraption called the “Batter Shaker,” which shakes cake batter on a platform to remove bubbles that cause voids in a cake. The four-person team of engineering students responded to a request from a national company to develop the appliance.

“There were three values that he held dear: teamwork, innovation and communication,” said Brendan Kennelly, Minnkota Vice President of Power Delivery, to the room of competition finalists on May 5. “That’s how we rated the presentations and projects, based on his principles.”

The Andrew Freeman Design Innovation Competition began with a 1996 endowment honoring Freeman’s history with UND’s College of Engineering & Mines. The first awards were given in 2000, and the contest has become an annual source of pride for UND’s brightest aspiring engineers.

“It’s a great feeling,” said Batter Shaker team member Riley Sondrol, a mechanical

engineering student set to graduate in spring 2023. “We knew we would enter our project in the career expo, but I didn’t know we could go on to the Andrew L. Freeman Competition — and stand a chance of winning it.”

Two student teams tied for second place in the competition, earning them both a \$1,000 prize. One group determined the feasibility of using a steam-iron process to produce hydrogen from syngas. They found that the steam-iron process would be more environmentally and economically beneficial than the standard method that is widely used today. The other group developed a proof-of-concept prototype to show the benefits of a laser-based wireless power transmission system.

“We’re very impressed with your ability. The projects, and the technical content of the projects, and being able to communicate them,” Kennelly told the participants, noting the fact that several teams — including the winner — were mixed teams of on-campus and online students. “Remote work is just a part of the equation now, in the workforce as well, and you guys flew right through that. You did a really nice job.”

UND College of Engineering & Mines Dean Brian Tande congratulated the top teams, and he offered his gratitude to Minnkota for shining a light on the generation’s next problem solvers.

“This longstanding partnership is indescribable,” he said. “We’re happy to have your support, so thanks for coming back and doing this every year.”

Written by Kaylee Cusack // Minnkota Current



## DOCTORAL STUDENT WINS ACCE STUDENT PAPER COMPETITION

Biomedical engineering student’s paper proves excellence in clinical engineering

Kordell Tan, a graduate student in Biomedical Engineering at the UND College of Engineering & Mines, has won the American College of Clinical Engineering (ACCE) Student Paper Competition, in the US/Canada Doctorate Division. The competition showcases the talents of undergraduate and graduate clinical engineering students through their development of a paper involving any area of clinical engineering practice.

Tan’s winning paper, titled “Development of a Vein Detecting Imaging System,” will be published on the ACCE website. The paper explores the development of an imaging system that can detect veins.

“The overall motivation for this project is to achieve a better understanding of using light and imaging sensors to visualize the arterial system under the skin throughout various parts of the body, using simple light-emitting diodes (LED) as a light source,” writes Tan in his paper.

The award is given to an enrolled student in a clinical engineering or related doctorate program whose work “contributes significantly to the body of knowledge in the field.” Tan’s paper demonstrated relevance to current and future concerns, his understanding of the subject, familiarity with other relevant work in the field, application of the topic in the profession, appropriate analysis, strong presentation format, and solid results and discussion to support the conclusion.

Tan submitted his paper for Dr. Bo Liang’s EECS 590 course, Advanced Topics in Electrical Engineering. Dr. Liang provided feedback on his paper and reviewed his vein detection-imaging project before submission.

Tan’s win in the ACCE Student Paper Competition is a significant achievement for both himself and the Biomedical Engineering program at the university. Congratulations to Kordell Tan on his well-deserved win!

Written by Paige Prekker // blogs.UND.edu/cem



## UND ASCE STUDENT CHAPTER TURNS 100

A centennial milestone later, civil engineering students still find community, success among peers

The American Society of Civil Engineers (ASCE) student chapter at the University of North Dakota is proudly celebrating its 100th anniversary this year.

This milestone, a testament to the longevity and significance of the community, demonstrates the rich history of teamwork and belonging in UND’s Department of Civil Engineering.

“The ASCE UND Chapter has played a significant role in advancing the leadership, teamwork, real-world, and hands-on skills of generations of civil engineers,” says Daba Gedafa, Michael & Sitney Lodoen Endowed Professor of Civil Engineering and chair of the Civil Engineering Department.

“Its future impact on graduating life-long learners who make a difference in the quality of life in the ever-changing world will be even more significant.”

The ASCE student chapter at UND was established in 1923 to provide students with opportunities to learn about the field of civil engineering, network with professionals, and develop their leadership and teamwork skills.

Over the past century, the chapter has continued to thrive, providing students with a supportive community and hands-on experiences outside the classroom.

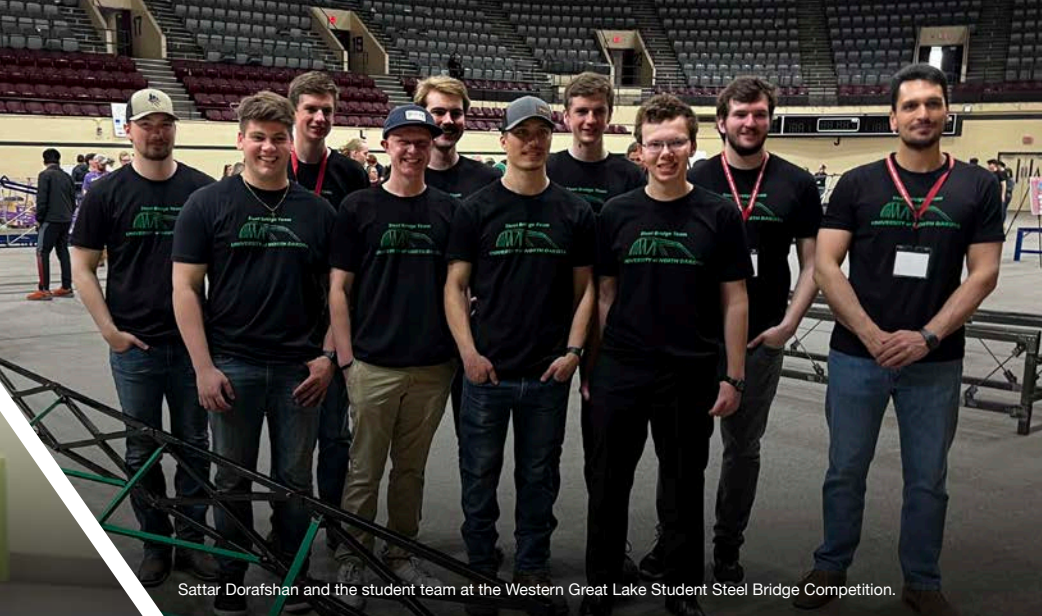
As a whole organization, the ASCE represents more than 150,000 members of the civil engineering profession in 177 countries. Founded in 1852, it holds the title of America’s oldest engineering society.

(Excerpt)

Written by Paige Prekker // blogs.UND.edu/cem



Associated General Contractors of North Dakota representatives Russell Hanson, Paul Dietrich, Dan Swingen, and Dave Zavoral with scholarship awardees and UND College of Engineering & Mines representatives.



Sattar Dorafshan and the student team at the Western Great Lake Student Steel Bridge Competition.

## A LEGACY OF BUILDING FUTURES

Associated General Contractors of North Dakota visits campus to deliver congratulations — and awards — to three UND civil engineering students

For over half a century, the Associated General Contractors of North Dakota have awarded scholarships to civil engineering students at the UND College of Engineering

& Mines. These scholarships have supported students' educational journeys and have nurtured the legacy of civil engineering professionals in North Dakota.

Back in September, North Dakota AGC representatives Russell Hanson, Paul Dietrich, Dan Swingen, and Dave Zavoral visited the University of North Dakota campus and met with the awarded students for the 2022 year. During their visit, they connected with the students and

shared valuable insight into the profession post-graduation.

The 2022 scholarship awardees include **Patrick Casserly** (Walt Swingen Scholarship), **Coby Stauss** (John Jardine Scholarship), and **Scott Rousseau** (Don Lindberg Scholarship). The John Jardine Scholarship is the longest-standing scholarship in North Dakota, established in 1964. Along with the Walt Swingen Scholarship, it is a full-tuition scholarship.

## UND STEEL BRIDGE TEAM TAKES HOME HONORS AT REGIONAL COMPETITION

Students rank regionally in construction speed, lightness, and construction economy

The University of North Dakota College of Engineering & Mines' Student Steel Bridge Competition Team has placed second in Construction Economy, first place in Lightness, and first place in Construction Speed at the Western Great Lake Student Steel Bridge Competition.

This regional competition is part of the National Student Steel Bridge Competition — an event partnered by the American Society of Civil Engineers and the American Institute of Steel Construction — which challenges students to apply their classroom knowledge to a practical and hands-on steel-design project that fosters innovation and builds professional relationships between students and industry professionals.

Led by advisor Sattar Dorafshan, Assistant Professor of Civil Engineering, the UND team's design and construction process faced the challenge of building a scaled steel bridge that would serve as a hypothetical crossing in the San Diego National Wildlife Refuge. The bridge had to support the weight of pedestrians, cyclists, and equestrians, as well as

maintenance and park vehicles — all while respecting the existing habitat.

The team's success at the competition demonstrates their hard work and dedication, as well as Dr. Dorafshan's ability to lead them to victory in his first year as their advisor.

"It was great seeing our students getting so excited and proud of their accomplishment," said Sattar. "We have a great team of younger students in the chapter who I suspect are going to keep improving UND's design to get better."

Sattar praises everyone on the team for their hard work and effort. "All credit should go to Erik Wilken, the current president of the ASCE chapter, Domenic Marchetti, the Steel Bridge Team captain, and the rest of the team, of course."

The student group's achievement also highlights the strength of UND's engineering program and its commitment to fostering innovation and practical skills among its students. The Steel Bridge Team's success at the competition solidifies UND as a leader in civil engineering. It is a testament to the team's hard work and dedication and the strength of UND's engineering program.

Written by Paige Prekker // blogs.UND.edu/cem

## MECHANICAL ENGINEERING STUDENTS SHINE AT STLE ANNUAL MEETING

UND graduate students work hard — and take home top honors

Five mechanical engineering graduate students from the UND College of Engineering & Mines made a remarkable impression at this year's Society of Tribologists and Lubrication Engineers (STLE) Annual Meeting, held in Long Beach, CA. The students showcased their research through engaging poster presentations and captivating oral sessions, leaving a lasting impact on the international gathering of academics and industry professionals.

The STLE Annual Meeting featured a fiercely competitive student poster competition, with 45 entries hailing from renowned universities

across the globe. The judging panel selected nine posters among the impressive submissions for recognition in the first, second, and third categories.

In an outstanding display of talent and dedication, two of CEM's graduate students, Hyunsuk Choi and Sudip Saha, secured the third prize for their exceptional posters.

However, the triumph did not stop there. Kommineni Uday Venkat Kiran, another graduate student from the College of Engineering & Mines, won the prestigious first prize in the student poster competition. Uday's groundbreaking work not only captivated the judges' attention but also solidified UND's reputation as a leading institution in the field of mechanical engineering.

Expressing his delight at his students' achievements, mechanical engineering assistant professor Sougata Roy shared, "It seems the hard work by the students paid off." Roy's guidance and mentorship have undoubtedly played a crucial role in nurturing the talents of these exceptional students.

The STLE Annual Meeting serves as a platform for scholars, researchers, and industry professionals to exchange ideas, present cutting-edge research, and foster collaborations. CEM's successful participation not only highlights the institution's commitment to academic excellence but also positions its students as frontrunners in the field.

Written by Paige Prekker // blogs.UND.edu/cem

## WHY I ❤️ CEM

"Being able to bring and support students at conferences is one of my favorite things about my job. Watching them land interviews and internships, present their work, and gain confidence in themselves as future engineers is my favorite part of attending these conferences with my students."

**Beth Klemetsrud**  
Assistant Professor of Chemical Engineering, Advisor of the American Indians in Science & Engineering Society and the Society for Women Engineers



Watch the video

To view the team's winning video, scan the QR code above or visit [bit.ly/3rsZyRq](https://bit.ly/3rsZyRq).

The Lunabotics team works on their lunar excavation robot in a simulation environment. Photos courtesy of John Nordlie.



## A LETTER TO OUR ALUMNI & FRIENDS

Words can hardly express how thrilled we are to share the news and preliminary renderings of the soon-to-be latest addition to our college.

This brand-new complex which includes 100K square feet of collaborative spaces for our departments in Phase I promises to be a game-changer for future generations of students. We are continuously awestruck by how transformative this college can be for young minds. This new STEM complex will be a multiplier for that experience in ways we cannot yet fathom.

The North Dakota Legislature has generously set aside \$57.4M to support Phase 1 of the STEM Complex. However, we need to raise a minimum of \$25M to ensure this first portion of the project is fully funded. We hope we can count on your support to help us achieve this goal.

Imagine the impact that this space will have on students. A place where they can learn, grow, and cultivate their passions, it will serve as a beacon of intellectual wealth and economic prosperity built to navigate and dominate our world's accelerating technological landscape. It will symbolize the power of education to transform lives, our state, our country, and the world.

If you would like more information, please contact Robin.

If you plan to return to campus and would like to lend your support to our students by visiting with them or any of our leadership and faculty, please let Deb know. We enjoy sharing with you all that is happening on campus, and as you see in this issue, we are full of excitement!

You can keep up-to-date on the latest news and developments by visiting [blogs.UND.edu/cem](https://blogs.UND.edu/cem) or by following us on [LinkedIn](#).

### PLEDGE YOUR PRIDE

Stay tuned for ways to give, or contact **Robin Turner** to explore how you can ignite the future through your gift.

## DIG THIS: UND TEAM PLACES WITH TOP HONORS AT NASA CHALLENGE

### Mechanical and electrical engineering students excel in lunar excavation competition

The University of North Dakota's Lunabotics Team has once again demonstrated their exceptional problem-solving skills and dedication as they secured remarkable achievements at this year's annual Lunabotics Challenge, organized by NASA. The student-led team clinched the second runner-up position, earning recognition for their ingenuity and technical expertise.

Comprised of students exclusively from the College of Engineering & Mines, the UND Lunabotics Team showcased the collaborative prowess of 13 members: AJ Ash, Matt Boston (President), Shawn Cvetezar, Ian Graves, Cheyenne Harrison, Kevin Jordan, Caden Knutsvig (Vice President), John Merila, Peter Nikrin, Ian Picklo, Gabriel Schettler, Naman Shah, Nicholas Snyder, Samuel Sondreal, and Estephania Yost.

Under the guidance of their advisors, John Nordlie, an instructor in the School of Electrical Engineering and Computer Science (SEECs), and Dr. Jeremiah Neubert,

a professor in the Department of Mechanical Engineering, the UND Lunabotics Team has consistently displayed their mettle in the competition since its inception in 2010.

The judges were captivated by the team's compelling narrative and creative approach through their captivating 'proof of life' video, which secured them third place in the video contest. Narrated by Caden Knutsvig, the team's Vice President, the video showcased their meticulous attention to detail and highlighted the importance of their project.

Caden's leadership within the team has not gone unnoticed; he has been elected President of the Lunabotics Team for the upcoming year, a role that will undoubtedly benefit from his commitment.

Matthew Boston, the current President of the Lunabotics Team, expressed his heartfelt gratitude to the entire team, advisors, the university, and their generous sponsors. He acknowledged the collaborative effort and unwavering support that enabled the team to complete their robot successfully.

"I would like to thank the team, advisors, college, and sponsors for helping the team complete the robot."

Team members look at their lunar excavation robot functioning inside a simulated environment

The Lunabotics Challenge, a part of NASA's Artemis Student Challenges, is an invaluable platform for students to engage with NASA's Systems Engineering process and gain hands-on experience designing and constructing robotic Lunar excavators. For over a decade, this prestigious competition has allowed students to contribute to NASA's mission of returning to the Moon through the Artemis program by gathering vital data on excavation hardware and surface locomotion processes.

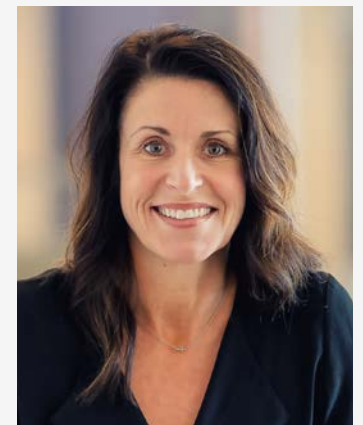
The University of North Dakota's Lunabotics Team's achievement showcases their technical prowess and exemplifies the power of collaboration, innovation, and perseverance. Their success is a testament to the university's unwavering commitment to STEM education and the remarkable potential of its students.

Written by Paige Prekker // [blogs.UND.edu/cem](https://blogs.UND.edu/cem)



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# OUR PRIDE LEADS THE WAY

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