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UND College of Engineering & Mines

Dean
Dr. Ryan Adams

UND ENGINEERING Magazine

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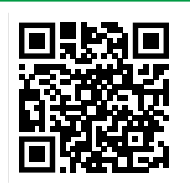
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COVER: Inside of the Student Competitive Team Lab in the Upton I Building a member of the UND Robotics Team works on assembling UND's lunar mining robot scheduled to compete in the 2026 NASA Lunabotics Challenge. The Lunabotics Challenge invites students from higher education institutions to apply NASA's Systems Engineering principles to design and build a prototype off-world robot capable of performing construction operations that support future space exploration objectives. Photo by Russell Hons Photography.

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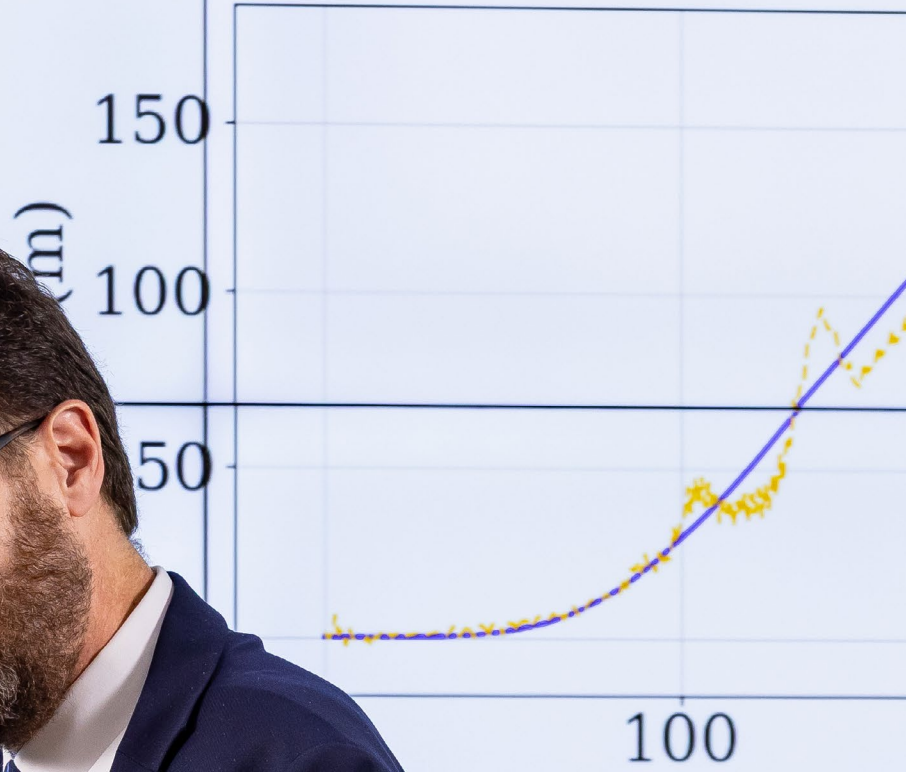


From Newton to iPhones: How Collaboration Works

Scan the QR code to listen to Dean Ryan Adams as he shares the essence of collaboration and innovation at UND's 18:83 talk.



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LETTER FROM THE DEAN

Dear Alumni and Friends,

North Dakota's future will be shaped by those who are willing to build it.

That work is happening every day at the College of Engineering & Mines. It is happening in our classrooms, where students prepare for careers that matter. It is happening in our labs and research spaces, where new ideas take shape in response to real challenges. And it is happening through the partnerships, generosity and shared vision that connect this college to communities and industries across our state.

That is why the theme of this year's magazine — the College's impact on North Dakota — is so meaningful.

At CEM, we believe our responsibility extends far beyond the campus. We are here to educate the next generation of engineers, scientists and leaders, but also to contribute to the strength and success of the state we serve. Our graduates enter the workforce ready to solve problems, drive innovation and lead with confidence. Our faculty pursue work that addresses pressing needs and opens new possibilities. Together, these efforts create a ripple effect that can be felt in North Dakota's industries, infrastructure, economy and communities.

This impact is both immediate and lasting. It can be seen in the students who gain the skills and experience to contribute from day one. It can be seen in the research and collaboration that help advance key sectors across the state. And it can be seen in the growing momentum behind a college that clearly understands its mission: to prepare people, create knowledge and help build a stronger North Dakota.

None of this happens alone.

The progress of this college has always depended on the commitment of people who believe in the value of education and in the promise of this institution.

Our alumni carry UND's influence into their professions and communities every day. Our donors and partners help expand what is possible for our students and faculty. Your support is not simply appreciated — it is essential. It helps ensure we can continue to meet today's needs while preparing for tomorrow's opportunities.

Looking ahead, that preparation matters more than ever. North Dakota will continue to need talented graduates, ambitious research and strong partnerships to meet emerging challenges and seize new opportunities. The College of Engineering & Mines is prepared to answer that call. We are proud of the impact we are making today, and we are equally confident in what lies ahead.

The STEM Complex is one important part of that future. It represents an opportunity to expand our capacity, strengthen hands-on learning and create even greater opportunities for collaboration and growth. But more than anything, it reflects a belief we all share: that investing in this college is an investment in North Dakota.

I hope the stories in these pages leave you with a strong sense of pride in what this college is accomplishing and where it is headed. The impact of CEM is real, and it continues to grow. With your continued partnership, that impact will reach even further in the years ahead.

Thank you for your belief in this college, in our students and in the future we are building together.

With gratitude and best wishes,

Ryan Adams, Ph.D.
Dean, College of Engineering & Mines
University of North Dakota



MEET THE BOARD MEMBERS

The CEM Executive Board consists of industry leaders who are professionally invested in the growth and success of the college.

UND ENGINEERING

MESSAGE FROM THE BOARD

By Terry Severson, Board Chair, & Steve Burian, Board Vice Chair

Momentum has continued to grow in our College of Engineering & Mines (CEM) and shows no signs of abating. Construction has just begun on Phase I of the UND STEM Complex. CEM is still UND's largest college by enrollment, and research activity continues to grow, befitting UND's R1 Carnegie ranking.

Congratulations to CEM's new Dean, Ryan Adams! The Dean initiated a series of topical discussions at our last board meeting and, from those outcomes, has focused the board on three vital topics: "Research & Industry Collaboration," "Academic Innovation & Curriculum" and "Student Experience." The objective is to help steer CEM toward the best path forward to become even more valuable and impactful within UND and North Dakota, and to extend nationally and internationally.

UND STEM Complex Phase I, which had a Homecoming 2025 groundbreaking, should open in the fall of 2028. Then, construction should begin immediately on STEM Phase II, with completion in 2030. We're well on the way to reaching the required Phase II match to the

state's allocation. The result will be an impressive \$163 million state-of-the-art engineering and technology home designed to serve UND and North Dakota for the next 50 years and beyond. This is on the site of the former Hyslop Sports Center/UND Fieldhouse. This modern facility will fuel even more growth.

CEM's fall 2025 enrollment grew to 2,753 grad and undergrad students, both on-campus and online (3.1% over fall 2024), and continues to be UND's largest college by enrollment. Fall 2026 projections will exceed those for 2025; applications are ~20% higher. The nationally — and internationally — popular new Aerospace Engineering program (a collaborative program with Aerospace) enrolled 227 students for fall 2025, up from 154 in 2024, and applications are running 25% higher for fall 2026.

The breadth of our students is inspiring. Aerospace Engineering student Louis-Lys Fanucchi is a UND track team member who runs a sub-4-minute mile, and Biomedical Engineering online student Paige Jones was a 2025 U.S. Olympic Ski Jumping Team member. Students' range of projects, from building satellites to electric race cars, is tremendous. They graduate with highly valuable and sought-after skill sets.

CEM research has grown to \$19.7 million in 2025. Six different research centers have been established to better organize for growth. Biomedical Engineering is leading, with several North Dakota companies, a major national effort to improve chronic disease management for older adults in an Advanced Research Projects Agency for Health (ARPA-H) project. Hypersonics has \$2.6 million in Air Force and Naval research awards. There's a promising bid, in conjunction with North Dakota industry, to DOE for rare earth element (REE) extraction from lignite coal worth ~\$100 million. That same technology led to an MOU with a Bulgarian entity to establish a collaborative research initiative to explore and develop rare earth elements in Bulgaria. The new Mark & Claudia Thompson National Security Corridor in Harrington is in operation and receiving great responses from industry and government partners; the new radar lab has just been completed; and bistatic radars will be installed this spring.

If you haven't visited UND and CEM recently, we believe you'll be amazed and impressed with the growth and positive change when you do. STEM Complex construction progress will be really interesting to watch.



The future of NORTH DAKOTA

PUSHING THE PEACE GARDEN STATE INTO THE FUTURE THROUGH ENGINEERING & SCIENTIFIC DISCOVERY

North Dakota is central to the work of the College of Engineering & Mines. Our students, faculty and partners are doing work that matters here — advancing research, expanding access to education and preparing the workforce that keeps this state moving.

That impact starts with research. Across the college, faculty and students are tackling problems tied to energy, infrastructure, cybersecurity, geology, unmanned systems and other areas that matter to North Dakota's future. Their work supports industry, informs new ideas and helps bring practical solutions to the state.

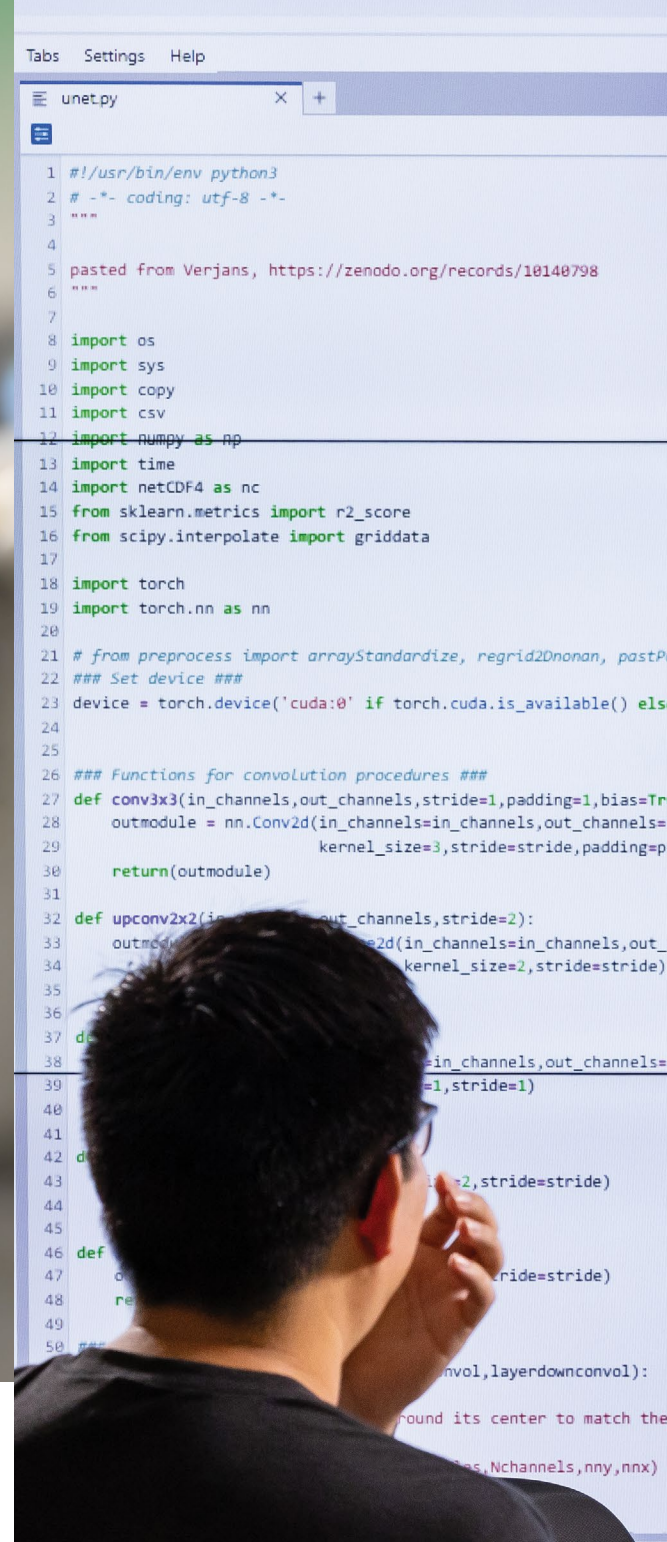
It also depends on expanding education. CEM is creating more ways for students to see themselves in engineering, science and technology — from outreach and hands-on learning to opportunities that connect students across North Dakota to UND. That work strengthens the pipeline to the college and helps more students prepare for high-demand careers.

Just as important is workforce development. CEM is helping North Dakota keep talent, grow talent and meet workforce needs across the state. Our graduates enter essential fields with the knowledge, experience and problem-solving skills to contribute right away. Together, these efforts show what CEM's impact looks like in practice: research with purpose, education with reach and graduates ready to do the work North Dakota needs.

Learn how CEM is making an impact on North Dakota through page 37.

RESEARCH IMPACTING NORTH DAKOTA

From the expansive skies above the prairies down to the culverts beneath our extensive roadways, the research we do goes right back into our beautiful state.



RESEARCH IMPACTING NORTH DAKOTA

ARTIFICIAL INTELLIGENCE

Artificial intelligence meets North Dakota ingenuity. Our AI research can transform our state — and beyond.

Process engineering scale-up research

The Alfred P. Sloan Foundation has awarded a \$125,000 grant to the UND Center for Process Engineering Research (CPER) to support the prototyping of a domain-specific AI copilot for process engineering scale-up research. The project represents a new direction for the center, combining process engineering expertise with artificial intelligence to create a practical decision-support tool for early-career researchers and engineers.

“The goal is to help move promising laboratory discoveries toward pilot-scale application more efficiently and with less trial and error,” says Dr. Nagababu Andraju, PI and Research Engineer II in CPER. “In the long term, this capability could support innovation in energy, manufacturing and industrial decarbonization across the United States.”

Making everyday tech safer

Jielun Zhang, assistant professor of the UND School of Electrical Engineering & Computer Science, is leading an NSF-supported project to build smarter, longer-lasting intrusion detection for edge devices using approaches like federated learning and privacy-preserving data methods. This work supports North Dakota’s expanding HPC/AI ecosystem and helps develop the cybersecurity talent needed to keep that infrastructure secure over the long term.

RESEARCH CENTERS & INITIATIVES

- Advanced Transportation Infrastructure Center
- Artificial Intelligence Research Center
- BioInnovation Zone
- Center for Cybersecurity Research
- Center for Engineering Education Research
- Center for Process Engineering Research
- Center for Water Research
- Critical Minerals & Rare Earth Elements
- Hypersonics Initiative
- Materials Manufacturing Research Center
- UND National Security Initiative

BY THE NUMBERS

\$19.7M
in sponsored research expenditures in FY25

72
unique sponsors

190
active sponsored awards

+400%
in external research expenditures over the past five years

51
new awards in FY26 (as of March 2026)

21
major grants surpassing \$500,000



OPPORTUNITY IS IN THE AIR

The Artificial Intelligence Research Center brings disciplines together to shape safer, smarter AI

Artificial intelligence is changing the world faster than most people can keep up with it.

While it's transforming how doctors detect disease, how communities prepare for severe weather and how autonomous systems make decisions, it's also changing how nations — and us as individuals — think about security, privacy and trust.

The Artificial Intelligence Research (AIR) Center was built for exactly this moment.

The AIR Center serves as UND's hub for AI education, research and community engagement. Its mission reaches beyond advancing powerful new software and hardware systems to solve real-world problems; the center is also focused on preparing students and researchers to develop AI that is economically viable, technologically resilient and ethically grounded.

That mission is especially important because AI is no longer confined to one field. Its opportunities (and risks) span nearly every research field and sector of modern life.

Aerospace, agriculture, autonomous systems, cybersecurity, infrastructure, medicine and even weather forecasting — the center's cross-disciplinary model is helping AIR Center address a wide range of urgent challenges. In North Dakota, several of those areas have particularly strong local relevance, with direct implications for the state's economy, safety and future workforce.

"The center is partnering with several universities and companies on federal projects," says Naima Kaabouch, Chester Fritz Distinguished Professor and Director of the Artificial Intelligence Research Center. "It strengthens the state's economy by attracting funding and creating high-skill jobs. It also helps modernize key industries such as agriculture, energy, drones and healthcare by developing AI tools tailored to regional needs."

What sets the AIR Center apart is that it is not only focused on what AI can do, but on how it should be done. Work done with fundamental AI models aims to create systems that are explainable, safe, secure, fair, transparent and accountable, while also protecting privacy, civil rights and civil liberties.

So, even in a field often defined by speed, responsibility remains AIR's highest priority.

Beyond being a research center, the AIR Center is a resource for students and junior faculty to access mentoring, collaboration and hands-on learning in one of the fastest-moving areas of science and engineering. For UND, that

makes the center both a research and talent engine — a place where students can prepare for careers in fields being reshaped in real time by artificial intelligence.

Meet the students behind the research happening in the AIR Center:

Emmanuela Andam, an electrical engineering student, is involved in multiple AIR projects spanning malware detection, UAV cybersecurity and AI weather forecasting for Alaska. Andam's work uses machine learning and AI to detect, classify and analyze cyber threats across different systems.

Toro Dama Caleb, also studying electrical engineering, works at the intersection of artificial intelligence and cybersecurity. Caleb's research focuses on protecting critical infrastructure, including unmanned aircraft systems, traffic management systems and smart grids, while also exploring how physics-informed AI can strengthen resilience against emerging threats.

Kyle Foerster, an electrical engineering student, develops, tests and deploys AI models using distributed high-performance computing. Foerster's work supports Arctic research through LiDAR damage detection and weather and permafrost prediction in extreme cold climates.

Soumaya Ghali, a non-degree student, supports AIR's broader artificial intelligence research efforts and contributes to its interdisciplinary research environment.

Mahrukh Khan, an artificial intelligence student, is working on soil moisture estimation through the NISAR project, which uses L-band radar imagery provided through a collaboration between NASA and ISRO. Khan's work adds an environmental and remote sensing dimension to AIR's research portfolio.

Meisam Shayegh Moradi, an electrical engineering student, is helping build the Arctic Knowledge Base System, a project that uses high-performance computing and distributed AI workflows to analyze extreme cold environments. Moradi's work includes predictive geospatial intelligence, LiDAR-based point cloud processing, road damage detection, weather modeling and large-scale environmental system modeling.

Nafiul Nawjis, a computer science student, is researching LiDAR-based road damage localization. Nawjis developed an uncertainty-aware geometric voting framework that helps turn noisy point-cloud predictions into clearer damage regions and surface-aligned bounding boxes, improving accuracy under difficult sensing conditions.

Muhammad Umair, an electrical engineering student, contributes to the Arctic Knowledge Base System through LiDAR road damage dataset preparation, 3D deep learning applications and distributed processing of soil temperature data.



SPACE & HYPERSONICS

With the skies and celestial bodies above as center stage for some of our next greatest challenges and adventures, UND and North Dakota are playing a major role.

Experimental hypersonics

The “Novel Measurement Diagnostics for Experimental Hypersonics” project — led by Carson Running (PI, Assistant Professor, Mechanical Engineering) with Binglin Sui (Co-PI, Assistant Professor, Chemistry) and mentor Clement Tang (Chair & Associate Professor, Mechanical Engineering) — is developing optical diagnostic coatings that enable high-speed imaging of complex hypersonic flow physics. It also positions UND to win follow-on federal funding while training students in advanced aerospace test-and-measurement methods tied to high-demand defense and aviation careers.

Adding “MoonLight” to space agriculture

UND is partnering with Grand Forks company SafetySpect Inc. on NASA’s SBIR Phase I “MoonLight” project to build an autonomous, AI-enabled plant sensing platform — led by Hossein Kashani Zadeh (PI, Assistant Professor, Mechanical

Engineering) supported by CEM graduate researchers Abdolrahim Zandi (Biomedical Engineering) and Gilbert Cauthorn (Space Studies). NASA-funded R&D stays rooted in the state through UND, growing advanced sensing/AI talent and expanding North Dakota’s emerging space-ag and vertical-farming capacity via facilities like the Space Agriculture Laboratory in the BiInnovation Zone (BiZ).

Strategic partnerships and unique statewide advantages

By pairing North Dakota’s Vantis statewide BVLOS capability — enabled by a first-in-the-nation FAA radar data feed through the Northern Plains UAS Test Site — with UND’s multi-decade partnership with Voyager Technologies and a new MOA with Auriga Space, CEM helps cement North Dakota as a premier hub for advanced UAS and space/defense innovation that attracts industry, accelerates R&D and grows a high-skill workforce in-state.



NORTH DAKOTA BACKS FIRST ACADEMIC SPACE RADAR OF ITS KIND AT UND

New bistatic radar project on campus will advance space domain awareness, power student research and help prepare the next generation of engineers for a growing national need

The skies above Earth are getting crowded.

With the number of satellites and debris objects in orbit rising fast, the need to track what is moving through space has become more urgent than ever. Even a small object can cause major damage in orbit, and as traffic increases, so does the risk of a cascade of collisions known as Kessler Syndrome.

At CEM, a new project supported by the State of North Dakota is taking aim at that challenge.

Faculty and researchers in the college’s School of Electrical Engineering & Computer Science are leading the development of a bistatic space radar on UND’s campus for space domain awareness. The effort will create the first North Dakota-based academic radar for space applications, giving UND students and researchers a powerful new tool to monitor objects in space while building expertise in one of the nation’s most important emerging fields.

The project is led by the Dean of the College of Engineering & Mines, Dr. Ryan Adams, and graduate students Sajib Kapali and Vigneshwar (Vig) Parameshwar. The research is being conducted in the Mark & Claudia Thompson National Security Corridor.

“This project puts UND in a strong position to contribute to a rapidly growing need,” Adams said. “Space is more essential to everyday life, national security and the global economy than ever before.

Building this radar on our campus gives students direct experience with the kind of advanced systems they will see in industry, while helping expand North Dakota’s role in space and defense research.”

Unlike a monostatic radar, which uses a single antenna to both transmit and receive signals, a bistatic radar separates those roles between two antennas. That added complexity creates engineering challenges — especially in geometry and synchronization — but it also comes with major advantages.

For example, its novel configuration is ideal for radar surveillance, as there is no need to switch between transmit and receive modes. The antennas will capture everything within their scope, missing no object passing over the horizon.

A mile apart, the transmit antenna on the roof of the Collaborative Energy Complex will communicate with the receive antenna on the roof of Odegard Hall.

“At UND, we’re tackling an important challenge in hypersonic flight: how weather and atmospheric particles interact with vehicles traveling faster than Mach 5. By combining ground testing with new experimental instruments we’re building ourselves, we’re uncovering fundamental physics that will help make future hypersonic systems safer and more reliable.”

Hallie Chelmo

Director, Hypersonics Initiative
Assistant Professor, Mechanical Engineering



PHOTO: Student researchers and Hallie Chelmo perform research in hypersonics in the Aerosol Engineering Laboratory in the Upson I Building.



For UND, that makes the bistatic radar an ideal platform for research, experimentation and workforce development.

“Being part of a project like this is exciting because it gives us the chance to work on a real-world problem with growing importance,” said Kapali, a doctoral student studying electrical engineering. “Space is becoming more crowded every year, and building this radar at UND means students like us can contribute to research that has practical value while gaining experience with advanced RF systems we may work on in our careers.”

While the system will not match the range of major operational defense installations, it is well-suited for academic research and student training. It also arrives at a time when global investment in space surveillance is growing. The Deep Space Advanced Radar Capability, or DARC, is under development at three sites in the United States, the United Kingdom and Australia, with operations expected by 2030. UND’s project gives students a chance to engage with similar concepts and technologies at a university scale.

The radar system planned for campus will operate in Ku-band, a frequency that balances improved resolution with moderate atmospheric absorption, especially in cold and dry conditions. That makes it especially promising for North Dakota, where year-round reliability matters.

The project is designed around two radar approaches.

One uses a parabolic reflector system, which offers a simpler design, easier maintenance and strong sensitivity for long-range detection of known objects

such as satellites or specific debris. Its narrow beam concentrates energy for high gain, making it effective for focused tracking. The trade-off is flexibility; parabolic systems are slower to reorient and less effective at tracking multiple fast-moving objects at once.

The other approach uses a phased-array system, which provides researchers with a wider field of view, instant beam steering and the ability to track multiple objects simultaneously. That makes it especially useful for fast-moving targets and broad-area surveillance. Phased arrays also adapt better to atmospheric interference and can be easier to deploy in tighter spaces. Their drawback is complexity, requiring more advanced electronics, software and maintenance.

Antennas on both the Collaborative Energy Complex and Odegard Hall will be installed in May. Over the summer, the parabolic reflector system will be brought online and calibrated.

“What makes this project especially meaningful is that we are not just learning concepts in the classroom — we are applying them to something tangible and technically challenging,” said Parameshwar, who is pursuing a doctoral degree in computer science. “From radar design to signal processing to AI and machine learning, this work brings together multiple areas of engineering in a way that prepares us for industry and research opportunities.”

Artificial intelligence and machine learning also play a major role in the project. Those tools increase the radar’s sensitivity, helping researchers identify smaller objects in space that are harder to detect with conventional approaches.

That blend of radar engineering, signal processing and AI gives UND students a direct connection to the future of the field.

“This is exactly the kind of hands-on, high-value project that prepares students for careers that matter,” Adams said. “They are not just studying theory. They are helping build a system tied to a real and growing global challenge.”

The impact reaches beyond campus.

As concerns grow over derelict resident space objects, orbital congestion and the vulnerability of space-based assets, projects like this one help strengthen the broader knowledge base needed for safer operations in orbit

For North Dakota, it also represents another step in the state’s expanding footprint in aerospace, national security and advanced technology.

Backed by state support, the UND bistatic space radar project reflects both a practical need and a larger opportunity: to grow research capacity, train talent and help North Dakota lead in a field that is only becoming more important.

On UND’s campus, that future is already taking shape. This research project will continue for another ten years, providing opportunities for the next generation of students to play a hands-on role in shaping the future of national security research.

Acknowledgment: This work is supported by the State of North Dakota.



GOVERNMENT & INDUSTRY TOURS

MARK & CLAUDIA THOMPSON NATIONAL SECURITY CORRIDOR WELCOMES SPECIAL GUESTS AND MEANINGFUL DISCUSSIONS



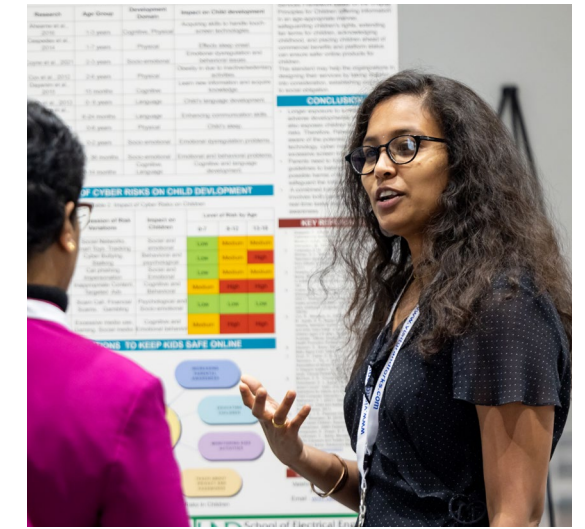
Benjamin Davies, corporate vice president and president of Northrop Grumman Defense Systems sector, tours CEM’s facilities after the UND LEADS: Broad Perspectives on National Security speaker series in November.



In tandem with U.S. Sen. Kevin Cramer, Space Force Gen. Michael Guetlein and Space Development Agency Director Derek Tournear praise UND’s capabilities during a campus tour. The tour included the Mark & Claudia Thompson National Security Corridor, where Dean Ryan Adams showcased labs surrounding satellite design and control, and much more. Discussions touched on upcoming developments and ongoing research projects, such as that of Hallie Chelmo, assistant professor of Mechanical Engineering, who is researching the impact of ice crystals on hypersonic vehicles.



Lt. Gen. Adrian L. Spain (Deputy Chief of Staff for Operations, Headquarters U.S. Air Force, the Pentagon, Arlington, Virginia) and other U.S. Air Force representatives tour the college’s newest facilities.



GRADUATE RESEARCH EXCELLENCE

On Graduate Research Achievement Day (GRAD), CEM’s graduate students showcase their work to the UND community.

Graduate Research Achievement Day (or GRAD, for short) is a celebration of UND graduate students’ work over the past academic year. Students present their work in a poster format to be judged by faculty. Cash prizes are awarded to students whose work and presentation are deemed best. All graduate students, full-time or part-time, from all disciplines and all colleges are encouraged to participate. All sessions are open to the public.

Graduate Research Achievement Day (In-Person)

Engineering

2nd Place: Temitayo Ikuero, Energy Engineering

3rd Place: Raja Abubakar Khalid, Civil Engineering

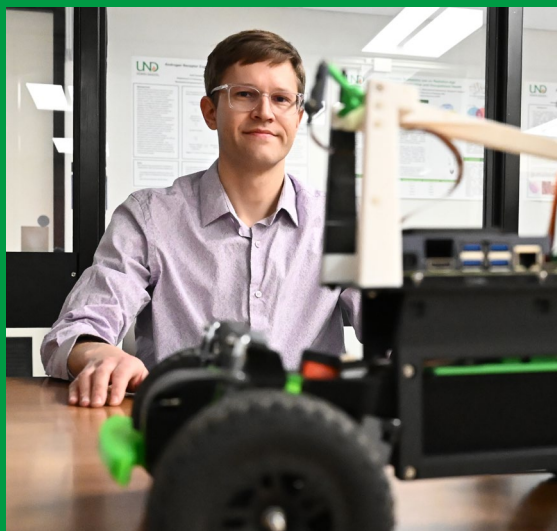
Graduate Research Achievement Day (Virtual)

3rd Place: Megan Stubbs, Biomedical Engineering

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BEST OF THE BEST

Five CEM faculty recognized among the world's most influential researchers in Stanford-Elsevier Top 2% Scientists List

Fifteen faculty members from the University of North Dakota have been recognized among the world's most influential researchers in the 2025 Stanford-Elsevier Top 2% Scientists List, a widely respected global ranking that highlights scholars whose work has had a significant impact on their fields.

Compiled by a research team led by Stanford University scholar John P. A. Ioannidis in partnership with the scientific publishing company Elsevier, the annual list identifies the world's most cited scientists using a comprehensive set of bibliometric indicators drawn from Scopus, the largest abstract and citation database of peer-reviewed literature.

The ranking places researchers in the top two percent of their respective disciplines based on the influence of their published research.

For UND, the recognition of 15 faculty members reflects the University's growing international footprint in research and scholarship across multiple disciplines.

"This distinguished group of scholars provides a clear demonstration of the impact of UND's research worldwide," said Scott Snyder, vice president for Research & Economic Development at UND.

"Their emphasis on discovery sets new boundaries of knowledge and provides new solutions to society. We are incredibly proud to call them colleagues."

Measuring global research impact

The Stanford-Elsevier list is built from a large dataset that analyzes millions of scholarly publications and citation records. Scientists are evaluated through a composite citation indicator — often

called a "c-score" — that incorporates several widely used metrics, including total citations, the h-index and measures that account for co-authorship and authorship positions.

Researchers are classified across 22 broad scientific fields and more than 170 subfields, allowing scholars to be assessed within the context of their specific discipline.

To be included, scientists must either rank among the top 100,000 researchers worldwide by composite citation score or fall within the top 2 percent of researchers in their subfield.

The database includes both career-long rankings, which measure cumulative research influence over many years, and single-year rankings, which capture impact based on citations received in the most recent year.

A prestigious recognition in academia

Because the rankings are derived from citation data — an indicator of how often other scholars rely on a researcher's work — the list is widely regarded as a marker of scientific influence and sustained scholarly impact.

Being named to the Stanford-Elsevier Top 2% Scientists List can significantly enhance a researcher's visibility within the global academic community. Studies and commentary on the rankings note that such recognition can help strengthen a scientist's professional reputation, expand opportunities for collaboration and support efforts to secure research funding.

For universities, the presence of faculty on the list also highlights the strength of institutional research programs and the global reach of their scholarly contributions.

Advancing UND's research mission

The recognition of 15 UND faculty members underscores the University's commitment to research excellence and the pursuit of knowledge that benefits communities locally and globally. Their work spans a wide range of scientific and scholarly areas, contributing new discoveries, advancing technology and helping address complex societal challenges.

As the Stanford-Elsevier rankings continue to track research influence across disciplines, UND's representation on the list reflects the University's growing role in the international research landscape — and the dedication of its faculty to producing impactful scholarship.

The five CEM faculty members are:

- **Ali S. Alshami**, Associate Professor, Department of Chemical Engineering
- **Naima Kaabouch**, Chester Fritz Distinguished Professor & Director of the Artificial Intelligence Research (AIR) Center
- **Kouhyar Tavakolian**, Professor, Department of Biomedical Engineering & Director of the BioInnovation Zone
- **Dongmei Wang**, Associate Professor, Harold Hamm School of Geology & Geological Engineering
- **Yachao Wang**, Assistant Professor, Department of Mechanical Engineering

Excerpt
Written by Tom Dennis // UND Today



PHOTOS: Left: Johannes van der Watt, research assistant professor, speaks about his work on reducing carbon dioxide emissions. Right: Vida Atashi, Mark Kaemingk, Sattar Dorafshan and graduate student Boshra Besharatian present on using culverts to maintain fish populations in the state. Photos by Joe Banish/UND Today.

FACULTY SET COLLABORATIVE RESEARCH MILESTONE

CEM faculty help set new milestones in UND Early Career Scholars program.

UND's Early Career Scholars Program hit a new milestone on Feb. 19 with a record 10 projects funded, celebrating what early support and cross-disciplinary collaboration can produce in just one year. The number of research projects increased this year, as did external funding, published papers and conference appearances.

Awarded projects featuring CEM faculty

GIS Mapping Culverts and Fish Species in the Red River Basin of the North

- Vida Atashi (PI), Civil Engineering
- Mark Kaemingk (Co-PI), Biology
- Sattar Dorafshan (Co-PI), Civil Engineering
- Taufique Mahmood (Mentor), HHSNGE

Perovskite Nanocrystal Photocatalysts for Reducing Carbon Dioxide Emissions

- Jesse Caviasca (PI), CPER
- Maria Morrell (Co-PI), Chemical Engineering
- Johannes van der Watt (Co-PI), CPER
- Daniel Laudal (Mentor), CPER

Proactive Traffic Safety Assessment at High-Risk Intersections using Machine Vision Applications

- Sherif Gaweesh (PI), Civil Engineering
- Ahmed Abdelhadi (Co-PI), SEECS
- Daba Gedafa (Mentor), Civil Engineering

Novel Measurement Diagnostics for Experimental Hypersonics

- Carson Running (PI), Mechanical Engineering
- Binglin Sui (Co-PI), Chemistry
- Clement Tang (Mentor), Mechanical Engineering

Towards HPC-Powered Autonomous and Adaptive Host Anomaly Behavior Analysis System

- Sicong Shao (PI), SEECS
- Tingjun Lei (Co-PI), SEECS
- Chonglin Zhang (Co-PI), Mechanical Engineering
- Prakash Ranganathan (Mentor), SEECS

Carbon Lowering Efforts in Agriculture using New Effective Methods (CLEAN-EM)

- Johannes van der Watt (PI), CEMRI
- Tarek Elderini (Co-PI), SEECS
- Clement Tang (Mentor), Mechanical Engineering
- Derek Sporbert (Mentor), TRIO Programs

Intensifying Polarization and Hostility? Analyzing Media Coverage of Politicians' Discourse Using Artificial Intelligence

- Xudong Yu (PI), Communication
- Jielun Zhang (Co-PI), SEECS
- Naima Kaabouch (Mentor), SEECS

CEM faculty in UND Early Career Scholars Program 2027 Cohort

Incoming scholars from CEM include: Mahmut Ersan (Civil/Environmental Engineering), Hossein Kashani Zadeh (Mechanical Engineering), Jueming Hu (Mechanical Engineering), Jielun Zhang (SEECS), Tingjun Lei (SEECS), Sicong Shao (SEECS), Ahmed Abdelhadi (SEECS), Naima Kaabouch (SEECS), Jeremiah Neubert (Mechanical Engineering) and Yun Ji (Chemical Engineering).

The incoming scholars represent a diverse array of disciplines spanning engineering, science, technology and more. Their proposed projects reflect UND's commitment to discovery — from innovative approaches in sustainability to groundbreaking technologies and data-driven solutions that have the potential to make meaningful impact both regionally and globally.

RESEARCH IMPACTING NORTH DAKOTA

NORTH DAKOTA RESOURCES

From protecting our precious wealth to harnessing its limitless potential, our research gives back to our state.

Mapping culverts and fish in the Red River Basin of the North

"GIS Mapping Culverts and Fish Species in the Red River Basin of the North" — a project led by Dr. Vida Atashi (PI, Civil Engineering) with Dr. Mark Kaemingk (Co-PI, Biology) and Dr. Sattar Dorafshan (Co-PI, Civil Engineering), mentored by Dr. Taufique Mahmood (Geology & Geological Engineering) — uses scalable detection and mapping to pinpoint culvert issues that disrupt fish passage. The result is smarter, more cost-effective culvert decisions that protect waterways and fish populations without requiring full replacements — improving environmental outcomes while reducing infrastructure costs statewide.

A U.S. "mine-to-battery" pathway for next-gen drone power

CEM researchers Dr. Xiaodong Hou and Nolan Theaker in the UND Center for Process Engineering Research are leading a \$1 million project funded by the North Dakota Industrial Commission's Renewable Energy Program to develop next-gen drone battery cathode materials with Packet Digital, leveraging ND-sourced inputs like Talon Metals nickel/cobalt, Wellspring Hydro lithium and UND-produced rare earth elements. By pairing materials R&D with a Battery Materials Qualification & Testing Lab, the effort accelerates readiness for Packet Digital's Fargo battery factory and strengthens in-state manufacturing, jobs and supply-chain security.

Studying the impact and implications of Devils Lake flooding

Researchers at the Center for Water Research (CWR) — one of CEM's research centers — study the Devils Lake flooding, the impacts of various tillage practices on agricultural hydrology and the forecasting of snow-water supply in North Dakota. CWR uses field-based observations and process-based modeling to observe soil health, snow accumulation, water quality and runoff. The findings will help North Dakota farmers make more informed tillage decisions that protect soil health and reduce nutrient runoff into local waterways.

COLLABORATIVE EXPERIENCES

Through CEM's Collaborative Experiences (CoEx), industry partners support capstone projects and engage directly with our students.

The Collaborative Experiences Capstone Course simulates an engineering consulting firm within an academic environment. Following industry models, students participate in single and interdisciplinary projects provided by industry partners. Project teams consist of both on- and off-campus students, mirroring today's realistic job market where video conferencing and distance collaboration are part of day-to-day life.

CoEx projects are showcased at the annual CEM Senior Design Expo. See **page 46** for more info.

2025-26 PROJECT SPONSORS

Belen Aerospace

Buzzcare

Fruitful

John Deere

Marvin Windows

MuskOx

NoSquito, LLC

Pavewise

Retrax

Strategic Mission Elements

Strikewerx

Urban Reblok'd



LEARN MORE

Scan the QR code to learn about supporting capstone projects.

EXPANDING EDUCATION IN NORTH DAKOTA

As the flagship university of North Dakota, we are committed to educating and supporting our students — and attracting promising prospective learners into our great state.



EXPANDING EDUCATION IN NORTH DAKOTA

Fulbright Scholar: Ali Alshami

For his Fulbright research project, Dr. Alshami's goal was to innovate the process of making salt water and brackish water both drinkable and usable. He collaborated with Qatar University's Center for Advanced Materials (CAM) to develop innovative reverse osmosis (RO) membranes that filter out salt. With the water chemistry of both Qatar and the United States in mind, their goal has been to make potable water using equipment that is durable, efficient and economically viable in both countries.

Alshami says they are working to enable "sustainable, accessible, and environmentally responsible water desalination... thereby reducing dependence on petroleum-based products and toxic chemicals." The ultimate goal of his Fulbright research is to contribute to technological advancements within "the broader water-energy nexus," which he deems "an issue of national security and economic importance."

The Fulbright-backed research project fostered joint research opportunities for scientists, engineers and students in Qatar and the United States. Through workshops, shared lab work, joint thesis supervision and cross-cultural educational programs the collaboration promoted mutual understanding and advanced scientific innovation.

Alshami says this opportunity has elevated UND's "institutional reputation through Fulbright-backed research." He has been able to help both his own research, and his university's research, in critical areas such as natural resource management, energy production and sustainability. Alshami is proud to advance North Dakota's knowledge-based economic goals to foster innovation, training future engineers and scientists and cultivating global partnerships. He says that "Fulbright positions American universities at the forefront of sustainable water technology, an area vital to tackling global challenges in water scarcity and rising energy demand."

"The benefits of Fulbright facilitating this high-profile collaboration are shared by my home university, my home state of North Dakota and America as a whole."

Dr. Ali Alshami

Associate Professor, Chemical Engineering



EDUCATIONAL PARTNERSHIPS

We work closely with schools regionally and nationally to offer flexible and affordable pathways to a North Dakota education.

2+2 Programs

Our **2+2 programs** provide students the flexibility of taking lower-level courses at one of the partnered institutions and to transfer to UND to complete the remaining requirements in their junior and senior years.

PARTICIPATING INSTITUTIONS

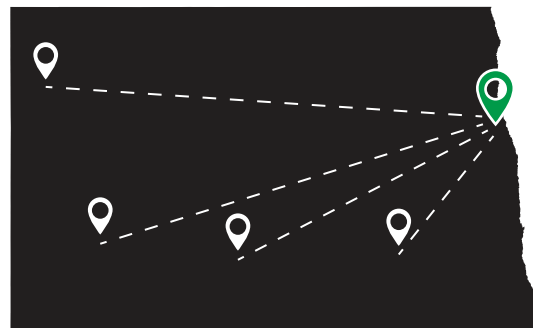
Bismarck State College
Dickinson State University
Williston State College

LCMC Programs

The **Lower Cost Models for Independent Colleges Consortium (LCMC)** is a consortium of partnered small colleges and universities providing students with an opportunity to earn dual degrees.

PARTICIPATING INSTITUTIONS

Adrian College	McMurry University
Augustana University	Piedmont University
Baker University	Principia College
Briar Cliff	St. Thomas University
Concordia Texas	Siena Heights University
Defiance College	York University
Huntington University	

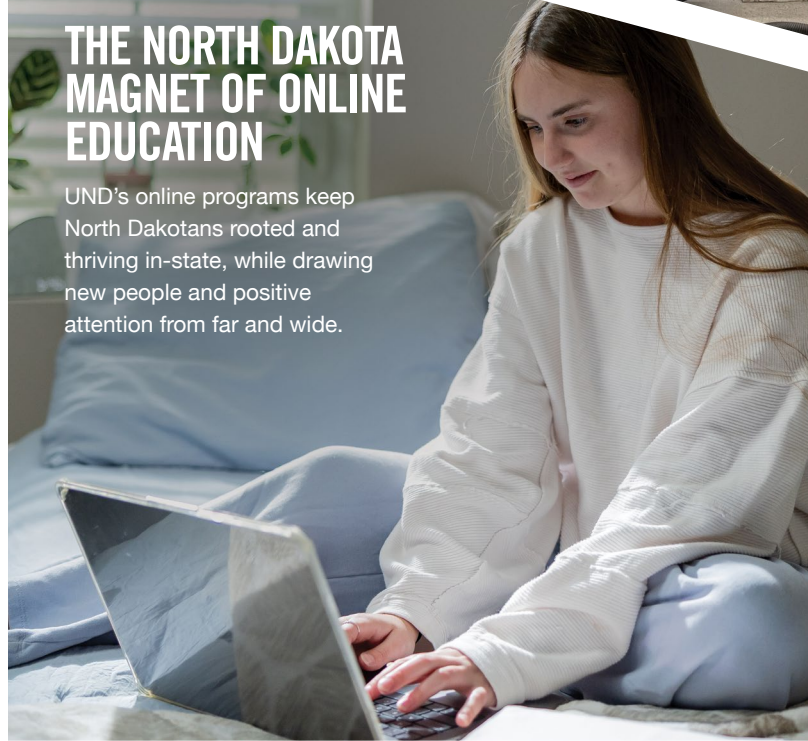


New Pathways for North Dakota Students

Dickinson State University, Valley City State University, and Williston State College have signed new Memorandum of Agreements with UND to create expanded and flexible pathways for engineering degrees in North Dakota.



UND, PAPUA NEW GUINEA SIGN STEM EDUCATION PARTNERSHIP



THE NORTH DAKOTA MAGNET OF ONLINE EDUCATION

UND's online programs keep North Dakotans rooted and thriving in-state, while drawing new people and positive attention from far and wide.



BORDER STATES TEAMS UP WITH UND AND ECN AUTOMATION TO INCREASE WORKPLACE READINESS FOR STUDENTS IN AUTOMATION



STAY IN THE KNOW.

Read all these stories and more at blogs.UNDedu/cem. Scan the QR code to sign-up for an e-newsletter at the beginning of every month.



THE 2026 LEGO CHAMPS OF NORTH DAKOTA

On February 7, the UND College of Engineering & Mines was proud to host the North Dakota FIRST® LEGO® League Robotics State Championship.



“My wife and I are quiet people. We like nature, tranquility and peace.”

North Dakota kind of fits us.”

PHOTO: McKoy and his wife next to the English Coulee on campus. Photo by Walter Criswell.

EXPANDING EDUCATION IN NORTH DAKOTA

Fulbright Scholar: O'Dane McKoy

When O'Dane McKoy first saw a U.S. Embassy advertisement for the Fulbright Program, he didn't think much of it. He passed it along to a few friends and went about his day. What changed everything was a conversation with his then-fiancee, Keilah.

“She asked me, ‘Why not you?’” McKoy recalled. “We were about to get married, but she said, ‘Wherever you go, I'll go.’ That meant everything to me.”

That simple question set McKoy on a path over 2,000 miles north, to North Dakota — and to a transformative academic and cultural experience that he hadn't anticipated.

Studying in North Dakota wasn't part of McKoy's original plan. That changed only when a Fulbright interview connected him with Taufique Mahmood, associate professor of Geology and Geological Engineering at UND, whom McKoy clicked with immediately.

McKoy arrived in Grand Forks last year and, shortly after, experienced his first North Dakota winter.

“I'd never seen snow before. The lack of sun was an adjustment and at times, it was rough — but I got through it,” he said. “It's

sort of a different experience, but now I can come back and say ‘I survived the North Dakota winter. I can do anything.’”

Now in his second year of doctoral study, McKoy spends most of his days in Leonard Hall, conducting research on the effects of wildfires on a small basin in California. His work involves advanced hydrological modeling and environmental data, but what he values just as much is the sense of community he's found through the Fulbright experience.

While science remains his central focus, the cultural experiences and personal connections have been highlights of his first year living in the United States.

McKoy credited faculty and staff such as Sven Egenhoff, Art Malloy, Emanuel Grant, Manuela Gabriel, Amy Vein, Darin Buri and Nick Macleod for making his transition to UND a pleasant one. And throughout his time in North Dakota, he's encountered cultures he never expected to learn about.

For example, after seeing Native American art in the Memorial Union Gallery, McKoy became interested in learning about Indigenous history.

“What really got me interested was the Native American population,” he said. “I'd never known much about Native Americans. Now, I've met students here and they're telling me about their culture, and that history is something I think is unique about this state. This gave me the chance to meet people I never would have known otherwise.”

Excerpt from “The Fulbright Pangaea”
Written by Tom Dennis // UND Today

SCHOLARSHIP OPPORTUNITIES

Scholarships provide not only incentive to attract great students, but security in retaining the best in North Dakota.



Karen Nyberg, ME'94, launches Astronaut Scholarship Foundation partnership

UND welcomed back Karen Nyberg, a Mechanical Engineering alumna and retired NASA astronaut who spent a total of 180 days in space conducting missions servicing the International Space Station (ISS). She chronicled her 20-year career with NASA, while also celebrating the launch of UND's partnership with the Astronaut Scholarship Foundation (ASF).

Read more on [page 26](#).

“UND was definitely my foundation — technically, and in a lot of the softer skills.”

Karen Nyberg

Engineer, Astronaut & Artist

During an exclusive Q&A session with CEM students

PINS OF PHILANTHROPY

At this year's annual Scholarship Award Ceremony, we introduced a new college tradition: Pins of Philanthropy.

Given to students who have been awarded CEM scholarships, this set of distinctive pins is designed to remind students that a scholarship is more than financial support — it's belief, opportunity and momentum that carries forward.

Each pin represents a stage in the ripple effect made possible through scholarships.



The Heart Behind the Gift

Every act of generosity begins with one person's belief that they can make a difference.



The Passing of the Torch

The moment when gratitude becomes action, and the act of giving becomes a student's beginning.



The Commitment to Profession

Graduates step forward to serve, innovate and lead, strengthening their professions and industries.



The Service to Humanity

STEM is bigger than just us; what began as one person's intention now impacts countless lives.



PHOTO: AGC representatives, scholarship recipients, and department faculty come together to recognize the excellence of UND's civil engineering students and the faith that North Dakota's industry leaders have in them.

AGC OF NORTH DAKOTA CONTINUES TO SUPPORT UND CIVIL ENGINEERING STUDENTS

Civil engineering professionals across North Dakota come together at UND to support the next generation of leaders

On Sept. 3, the Associated General contractors (AGC) of North Dakota visited the UND College of Engineering & Mines to extend congratulations and awards to five exceptionally talented students from the Department of Civil Engineering.

Their tradition of awarding scholarships to UND students spans over half a century. Among these prestigious scholarships, the John Jardine Scholarship, established in 1964, holds the distinction of being the oldest scholarship in North Dakota and is still awarded annually.

These generous scholarships not only ease the financial burden for students but also play a pivotal role in nursing the legacy of civil engineering professionals in North Dakota.

2025 Associated General Contractors of North Dakota Scholarship Recipients

This year's scholarship awardees are Autumn Bergum (Walt Swingen Scholarship), Kyle Schill (John Jardine Scholarship), Samuel Gapp (Don Lindberg Scholarship), Landen Snelling (AGC Scholarship) and Joshua Crowder (AGC Scholarship).



IAN GRAVES

Major:
Mechanical Engineering

Hometown:
Dickinson, N.D.

Leadership:

- President of UND Robotics Club
- President of UND ASME Chapter
- President of E-Council

Scholarships:

- Alexis J. Diakoff Mechanical Engineering Scholarship
- Continental Resources Leadership Scholarship
- Olson Family Communications Scholarship
- Roy Wehe Scholarship
- Sydney E. Westman Memorial Mechanical Engineering Scholarship

“Thanks to my scholarships, I have been able to focus my energy on building a sense of community on campus and sharing the genuine inspiration that comes from engineering in action.”

KAREN NYBERG LANDS ON CAMPUS TO LAUNCH ASTRONAUT SCHOLARSHIP FOUNDATION PARTNERSHIP

While on UND campus, Karen Nyberg speaks with CEM students during an exclusive fireside chat.



UND graduate and retired NASA astronaut chronicles 20-year career in campus address

On Jan. 26, UND welcomed back an alumna whom administrators called among the University's most distinguished.

Karen Nyberg, a retired NASA astronaut who spent a total of 180 days in space conducting missions servicing the International Space Station (ISS), addressed students, faculty and staff at the Odegard Hall Atmospherium on that day. She chronicled her 20-year career with NASA, while also celebrating the launch of UND's partnership with the Astronaut Scholarship Foundation (ASF).

The scholarship was established in 1984 by NASA's Mercury Seven astronaut group – the first Americans to travel to space. It is awarded to approximately 70 rising juniors and

seniors studying STEM subjects annually, representing 55 partner institutions nationwide. Additionally, the scholarship's mentorship program provides awardees with invaluable networking opportunities to help launch their academic and professional careers.

Robin Turner, senior director of development for the College of Engineering & Mines at UND's Alumni Association and Foundation, expressed excitement at the opportunities such a partnership affords UND students.

"This partnership marks an important milestone for UND," she said. "This collaboration recognizes the excellence of our students and faculty and opens new doors for our talented undergraduates pursuing STEM degrees. It will directly empower the next generation of innovators, researchers and explorers right here at UND."

"Essentially every student in the College of Engineering & Mines could benefit from this program," added the college's

Dean Ryan Adams. "There are so many opportunities here. One thing I've learned over the past 25 years or so of my life, is that people in the space community love to share their knowledge."

Provost Eric Link introduced Nyberg – who herself played a major role in establishing UND's membership in the ASF.

"We are incredibly grateful for Dr. Nyberg's leadership and service within the Astronaut Scholarship Foundation," he said. "Her commitment to supporting the next generation of leaders reflects both her remarkable career, and her enduring connection to our university."

Nyberg reminisced about the first time seeing Earth from space shortly after leaving orbit.

"When we opened the payload doors and I got my first look at the Earth – the broad limb of the Earth – I have never

seen anything so vibrant in my entire life," she said. "It was so overwhelming and beautiful."

"It changes a person," she added. "I gained so much more respect for the Earth. When you compare that to the vastness of space where there is nothing for millions of miles, everyone on Earth is your neighbor. It certainly increased my empathy for the people I don't know on all corners of the Earth."

Nyberg, who also met her husband – former astronaut Doug Hurley – during her time at NASA, said her career exposed her to a truly international team.

"The International Space Station really is the example of working together," she said. "No matter what the politics were on Earth, we collaborated and cooperated."

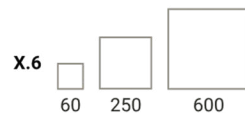
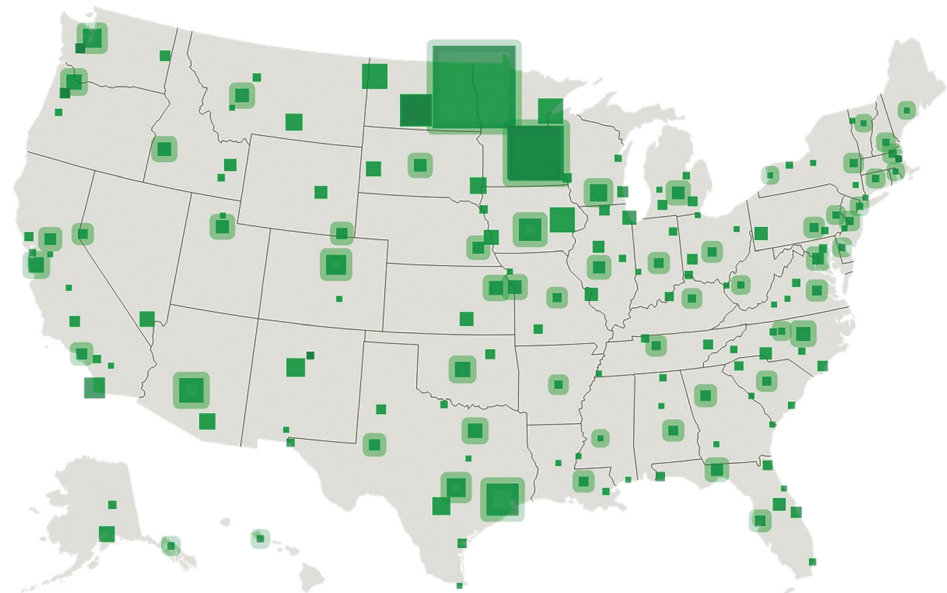
[Excerpt] Written by Joe Banish // UND Today

THE WORKFORCE OF NORTH DAKOTA

We are committed to retaining the skilled leaders we produce in North Dakota — and creating other solutions to address the skilled labor shortage.



RETAINING REGIONAL TALENT



Map illustrates locations of CEM alumni across the United States as of 2025.

THE WORKFORCE OF NORTH DAKOTA

COMMUNITY OUTREACH

Inspiring the next generation of engineers and scientists through outreach — and getting them to UND through recruitment.



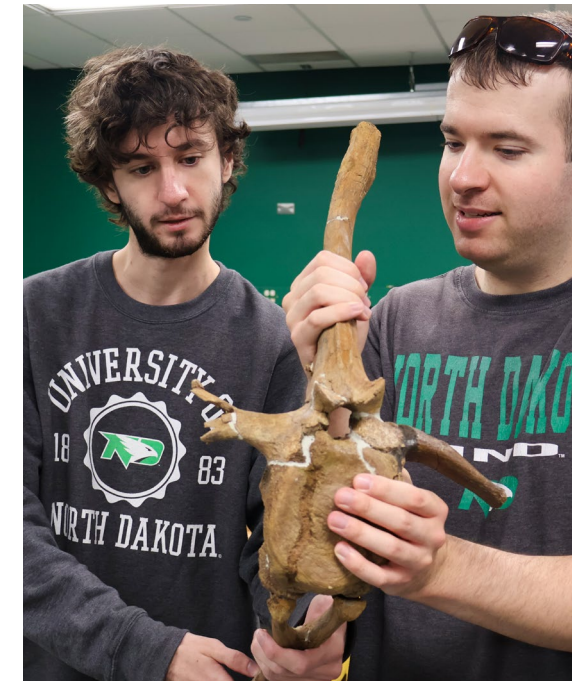
UND paleontology expert brings dinosaur talk to Downtown Grand Forks

As part of Half Brothers Brewing Co.'s popular "Hopped Up on Science" series, Dr. Kristyn Voegele captivated the community with her talk, "3D Modeling of Unique Dinosaur Anatomy," right in the heart of downtown Grand Forks. These lively monthly events make complex STEM topics accessible to everyone, drawing curious crowds to Half Brothers. At a packed house, attendees were fascinated to learn how paleontology not only reveals secrets of the past, but also shapes the future of fields like robotics and medicine.

"Talking about my research on dinosaurs and why I find them fascinating with people from my hometown was really special and another reason why I am excited to work at UND," says Voegele.

Supporting in-state energy education

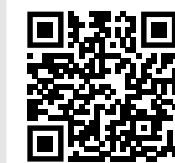
UND CONNECT is funding an Energy Education Workshop co-led by UND Department of Energy & Petroleum Engineering's Dr. Moones Alamooti and Dr. Andreas Michael, in partnership with Williston High School and the Williston Basin CTE Center, to give 50 Williston-area juniors and seniors hands-on exposure to energy careers (planned for April 20–21, 2026). The workshop builds a stronger workforce pipeline by connecting local students to in-state pathways across traditional petroleum engineering and emerging renewable energy technologies — helping address shortages and reduce talent flight.



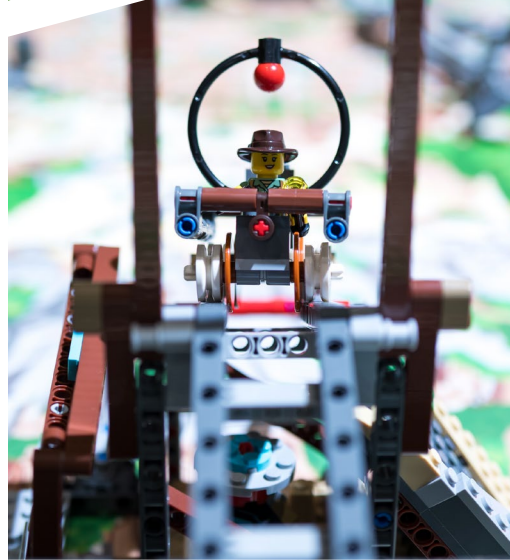
A COMMUNITY EFFORT TO BRING A DINOSAUR BACK TO LIFE

Through the Harold Hamm School of Geology & Geological Engineering, public Fossil Prep Sessions invite people from campus, Grand Forks and beyond to help clean and rebuild real dinosaur bones, including an *Edmontosaurus annectens* specimen named "Marvin." No experience is required, making the project an accessible way for the public to step into active scientific work happening right here in North Dakota.

This hands-on access strengthens UND's role as both a research leader and a community resource. The project brings people together around discovery, gives residents a memorable connection to science and adds to Grand Forks' cultural life by turning paleontology into something the public can actively help shape. As of Spring 2025, nearly 300 unique volunteers have taken part in the effort.



Want to join us for a session?
Scan the QR code above to learn more and sign up.



THE WORKFORCE OF NORTH DAKOTA

K-12 ROBOTICS PROGRAMMING

Inspiring the next generation of engineers and scientists through outreach — and getting them to UND through recruitment.

VEX Robotics University of North Dakota Signature at the Mall of America

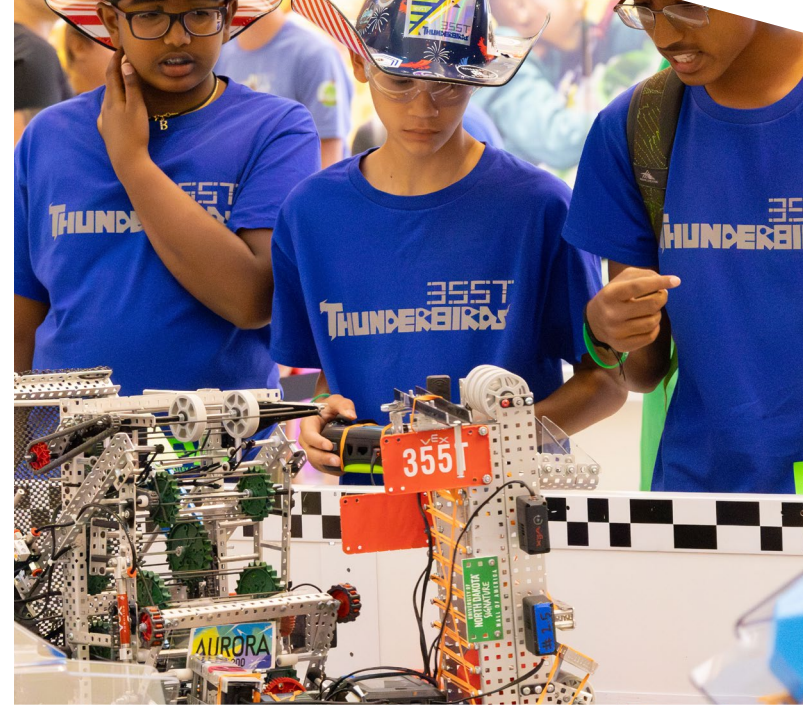
Last August, CEM took the helm of the highly anticipated annual VEX Robotics Signature at the Mall of America, now proudly titled the University of North Dakota Signature Event. Located at the mall's bustling north atrium, 200,000 curious daily mall-goers could stop their mid-shopping spree to watch robots whir, spin and score — and maybe even meet the engineers and scientists of tomorrow. Competing at the annual Mall of America tournament is a big deal for students; it's a premier opportunity to compete against some of the world's best teams. With registration filling up in less than ten minutes, teams from around the country and world vied for a chance to compete — and for a shot at the most coveted prize: qualifications to advance to the VEX Robotics World Championship. Read about the upcoming University of North Dakota Signature at the Mall of America on [page 46](#).

VEX Robotics North Dakota Signature

In January, hundreds of high schoolers from across North America descended on the Alerus Center in Grand Forks for UND's second annual VEX Robotics Competition. The two-day competition was hosted by CEM, featured 80 teams and more than 400 competitors and is a signature VEX event — meaning it served as a qualifier for national and international competition. VEX's stature is growing rapidly, with more than 20,000 teams representing 50 countries competing in some 1,700 competitions around the world. Dean Ryan Adam opened the event. Addressing students, he stressed robotics' applications to the disciplines of engineering offered at UND. "We are working in air, space, on the ground and below the ground," he said. "Robotics is an incredibly important part of that. Everything you're doing now, keep doing it, and come talk to us if you're interested in taking it to the next level."

FIRST® LEGO® League Robotics

On February 7, CEM was proud to host the North Dakota FIRST® LEGO® League Robotics State Championship. Bringing together talented 9-14-year-olds from across North Dakota, the championship was held at the UND Memorial Union and was open to the public. FIRST® LEGO® League educational program provides preschool and school-aged children with an ideal introduction to research, engineering and programming. It sparks early interest in STEM while fostering teamwork and communication skills.



UND & VEX

Scan the QR code to learn about UND and VEX Robotics' partnership — and what it means for North Dakota students.





PHOTO: Standing with Rosen Zhelyazkov (fifth from left), the prime minister of Bulgaria, are Dan Laudal (far left), executive director of the UND College of Engineering & Mines Research Institute; Ryan Adams (second from left), dean of the UND College of Engineering & Mines; Scott Snyder (fourth from left), vice president for Research & Economic Development at UND; and various executives of Bulgarian ministries and Bulgarian Energy Holding. The photo was taken at the Permanent Mission of the Republic of Bulgaria to the United Nations in New York City, on the occasion of the signing of a Memorandum of Understanding between UND and Bulgarian Energy Holding. Bulgarian Council of Ministers photo.

UND, BULGARIAN ENERGY HOLDING FORGE NEW PARTNERSHIP ON RARE-EARTH ELEMENTS RESEARCH

Agreement builds on UND's world leadership in extracting rare earth elements from lignite coal

UND is proud to announce the signing of a Memorandum of Understanding (MOU) with Bulgarian Energy Holding to establish a collaborative research initiative focused on the exploration and sustainable development of rare earth elements in Bulgaria. Bulgarian Energy Holding is a state-owned energy holding company in Bulgaria.

UND Vice President for Research & Economic Development Scott Snyder, Dean of the College of Engineering & Mines Ryan Adams and BEH representatives officially executed the agreement in New York City, marking the beginning of a strategic trans-Atlantic partnership aimed at advancing both scientific understanding and practical applications of critical minerals.

"We are excited to build on this partnership with Bulgaria as part of UND's wider efforts to meet the rapidly growing need for critical minerals of the United States and our allies," Snyder

said. "As we work to commercialize this innovative technology in North Dakota, our MOU with Bulgaria represents another step in using the results of UND research in supporting economic development here at home and around the world."

Adams agreed. "This agreement with Bulgaria Energy Holding gives us an opportunity to expand on our work in critical minerals and help one of our NATO allies," he said. "We are very excited to enter into this agreement and look forward to strengthening our relationship with the people of Bulgaria."

Leveraging UND's expertise

Rare earth elements play an essential role in modern technologies, renewable energy systems, electronics and national security. The technology to extract these elements from lignite coal was developed at UND's College of Engineering & Mines and the University's Energy & Environmental Research Center, with state and federal support.

UND has built a prototype plant to demonstrate the feasibility at scale of this technology, and the technology

is widely considered to be the gold standard of REE extraction from lignite. In addition, UND is actively working toward building a large commercially viable REE extraction facility based on this technology in western North Dakota to use North Dakota coal to support the industrial and national security needs of the United States.

Initial analyses suggest that the composition of lignite in Bulgaria's Maritsa Basin is analogous in key respects to coal mined in North Dakota, offering a strong technical foundation for collaboration.

The new agreement will enable BEH and UND to pool resources, expertise and technologies to:

- Conduct mineralogical characterization, advanced laboratory testing and technological validation
- Perform techno-economic studies, environmental impact assessments and sustainable resource management planning
- Establish a Center for Critical Raw Materials Research and Knowledge

in Bulgaria to support European supply chains

- Explore the potential of processing lignite from the Maritsa Basin in Bulgaria for extraction of rare earth elements with high added value

Through this initiative, UND and Bulgarian Energy Holding aim to foster innovation, reduce strategic dependencies and advance low-impact mining and processing practices.

Next steps and implementation

Following the signing, expert teams from UND and BEH convened to develop an initial action plan. Key near-term steps include:

- Expanded geological surveys and new coal sampling across the Maritsa Basin
- Pilot laboratory testing of extraction methods tailored to Bulgarian lignite
- Preparation of a pre-feasibility study to evaluate technological viability and economic returns
- Engagement with Bulgarian universities, national scientific agencies and regional stakeholders in support of the national program on critical and strategic materials

Looking ahead

UND and Bulgarian Energy Holding envision this agreement as the beginning of a long-term, mutually beneficial partnership, the officials agreed. By uniting scientific capacity and institutional commitment, both parties hope to contribute to resilient, sustainable supply chains for strategic minerals — and to the broader transition to clean energy technologies.

"This is, I hope, the first of many such partnerships with allied nations around the world," said Dr. Dan Laudal, executive director of the UND College of Engineering & Mines Research Institute, who also took part in the negotiations. "I give all of the credit for this important milestone to the fantastic research team at the College of Engineering & Mines' Center for Process Engineering Research. I can speak for the team when I say we're eager to get started in this collaboration with Bulgarian Energy Holding."

ADVANCING THE GEOTHERMAL CONVERSATION IN NORTH DAKOTA

UND is helping shape North Dakota's energy future through the work of Energy & Petroleum Engineering faculty and researcher Moonas Alamooti. As part of a legislative study tied to Senate Bill 2360, Alamooti was invited to present to the Energy Development and Transportation Committee on North Dakota's geothermal potential. Her presentation made the technical, economic and agricultural case for geothermal development in the state, covering topics ranging from favorable subsurface conditions and the opportunity to repurpose thousands of nonproductive oil and gas wells, to reliable baseload electricity generation, agricultural applications like year-round greenhouse production and crop drying, workforce and economic development, and available federal funding through programs like the Inflation Reduction Act.

Since that presentation, the committee has recommended meaningful next steps, including a more detailed feasibility study and pilot project planning. These recommendations signal that geothermal energy is gaining real traction at the state level and position UND as a key contributor to the conversation around North Dakota's evolving energy landscape.



PHOTOS: Above: Professional Engineer Alexa Ducioame, Project Manager at Moore Engineering, Inc., greets students at the second BrainSTEM event held at UND. Right: A day full of hands-on activities makes this field trip to UND productive and memorable. Photos by Paige Prekker/UND College of Engineering & Mines.

THE WORKFORCE OF NORTH DAKOTA

BRAINSTEM RETURNS TO UND WITH A BIGGER, BOLDER DAY OF HANDS-ON DISCOVERY

Second-annual event at UND welcomes seventh-graders to campus for robots, spaghetti bridges, CSI science and more

On Oct. 9, the Memorial Union social staircase felt like a pep rally for curiosity.

Seventh-graders spilled onto campus, ready for BrainSTEM — a full day of hands-on workshops across the University of North Dakota. By day's end, they'd have extracted DNA from strawberries, programmed light sequences on microcontrollers, built and load-tested spaghetti bridges, explored how robots "see" and learned why an airplane wing works.

"If something today sparks interest within you, don't be afraid to lean into it," encouraged College of Engineering & Mines Dean Ryan Adams as students were welcomed into the Memorial Union for the eventful day's kick-off. "You're going to meet real engineers, scientists and researchers today — people who were just like you at one point. Have fun, ask questions, and stay curious. That's what today is all about."

Hosted in partnership with the North Dakota Section of the American Society of Civil Engineers (ASCE), BrainSTEM is designed to spark early interest in science, technology,

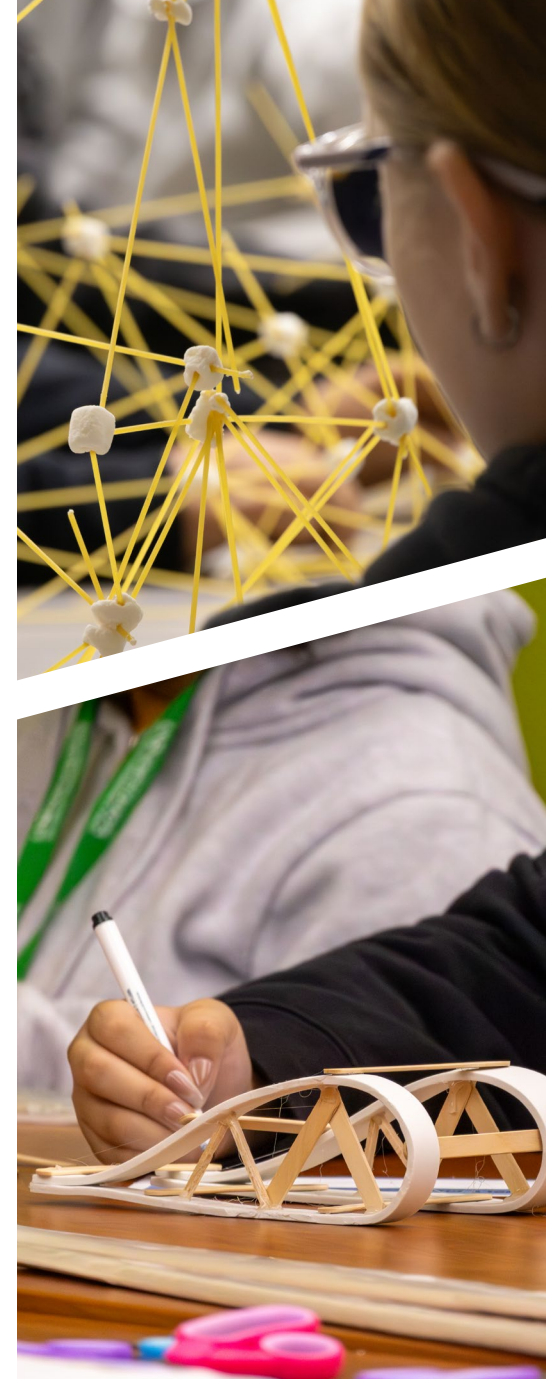
engineering and math — especially among students who don't always see themselves represented in those fields.

"Our brains take in about 11 million pieces of information a second, but we only consciously process 40 per second," explained Professional Engineer Alexa Ducioame of Moore Engineering and founder of BrainSTEM. Ducioame explains that the brain takes shortcuts to process everything else, creating what we refer to as bias. Sometimes bias can be beneficial, but it can also lead to implicit biases about people around us — and even ourselves.

Workshop leaders included UND professors and college students from underrepresented groups in STEM, offering role models as well as real-world context. Ducioame emphasized the importance of seeing STEM leaders from diverse backgrounds in a simple yet powerful statement:

"Because everyone belongs in STEM."

Reaching students earlier, with real hands-on experiences and real role models, helps them imagine futures in labs, on design teams, in hospitals and on job sites. It also reflects UND's commitment to learning, discovery and service — meeting students where they are and inviting them into careers that solve problems and improve lives.



THE WORKFORCE OF NORTH DAKOTA

RETAINING TALENT IN NORTH DAKOTA

Our mission goes beyond producing leaders. More than ever, we're focused on keeping those leaders in North Dakota.



Bakken boots on the ground

CEM petroleum engineering students Farhad Bina (pictured) and Vasanth Gokapai gained field-ready experience through internships and hands-on work on Bakken workover rigs with North Dakota operators and crews. The pair held an internship with Foremost Well Services, LLC, joining the crews who keep the Bakken running safely and efficiently. Graduates like them enter the workforce more prepared for high-demand roles — supporting safer, more efficient operations that keep North Dakota's energy engine strong.



Mentoring in our own backyard

UND School of Electrical Engineering & Computer Science faculty member Jielun Zhang partnered with Grand Forks Red River High School to coach the team that won the North Dakota Cyber Madness state championship in Bismarck. That kind of K-12 collaboration helps grow a homegrown cybersecurity pipeline by building confidence and job-ready skills in a fast-growing, high-demand field.



UND FOUNDERS DAY RECOGNIZES EXCELLENCE IN CEM MENTORSHIP & ADVISING

Building North Dakota's workforce pipeline starts with students who feel supported — in the classroom, in their major and in the bigger decisions that shape their futures. Across the College of Engineering & Mines, faculty and staff go the extra mile to provide the guidance, reassurance and real-world perspective students need to move forward with confidence.

During Founders Day 2026, three CEM faculty and staff members were recognized for their exceptional commitment to student success — and for the steady mentorship that helps turn goals into plans and plans into careers.

Outstanding Graduate Faculty Mentor Award

Iraj H.P. Mamaghani
Professor, Civil Engineering

UND Foundation/Karleen Home Rosaaen Faculty Award for Excellence in Academic Advising

Yun Ji
Professor & Graduate Program Director, Chemical Engineering

VCAA Award for Outstanding Professional Academic Advising

Natalie Chitnis
Academic Advisor

THE WORKFORCE OF NORTH DAKOTA

NORTH DAKOTA'S CYBER SUMMIT



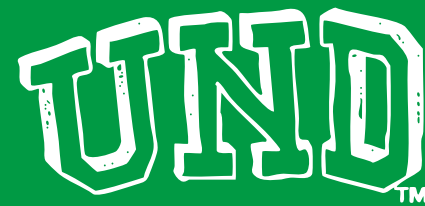
One of North Dakota's premier IEEE symposiums, the event bridges industry, government and education to discuss the next challenges and innovations in our multifaceted cyber future.

UND's annual IEEE Cyber Awareness & Research Symposium (IEEE-CARS) is hosted by the UND Center for Cybersecurity Research — one of CEM's 10 research centers and initiatives. Held at the Memorial Union as well as virtually for attendees and presenters worldwide, the symposium is a multi-day event with a line up of events and opportunities zeroed in on the leading edge of cybersecurity activity.

See **page 46** for information about IEEE-CARS 2026.

“Through NSA CAE-R designation, nationwide CTF programs and critical infrastructure grants, IEEE-CARS strengthens North Dakota's cybersecurity workforce and protects essential systems.”

Dr. Prakash Ranganathan
SEECs Faculty & Founder of IEEE-CARS



SAVE THE DATE: CEM HOMECOMING SOCIAL

October 2, 2026 // 5-7 p.m.
Collaborative Energy Complex

Calling all CEM alumni and friends! We're thrilled to invite you back to our annual Homecoming Social on campus during UND's Homecoming Week. During the social, we invite you to join us on a tour of the new and changing spaces around the college.



Let us know you're coming!

Questions? Contact Deb Austreng
at debra.austreng@UND.edu
or call 701.777.4249

THE WORKFORCE OF NORTH DAKOTA

WORLD-CLASS STUDENTS & ALUMNI

Our students and alumni are the source of our pride. They are the proof that what we do every day is work worth doing.



Championing the Three Minute Thesis

Environmental Engineering graduate student Johan Dominguez Lopez won first place at UND's Three Minute Thesis Competition with his presentation on a hot button issue: “forever chemicals.” Lopez's win follows last year's winner also from CEM — doctoral energy engineering student Rachael Josephs — who advanced all the way to the national showcase.



Branelle Rodriguez, ME'05, gets Moon-bound Orion spacecraft ready for 'Go'

A childhood dream leads a UND grad to work for NASA, a place where each win “brings us closer to the extraordinary.” Her job is to ensure the spacecraft is ready for its historic mission — carrying humans to the Moon for the first time in over 50 years.

COMING SOON: STEM COMPLEX

For UND, state lawmakers — who very generously provided \$113 million of the building's cost — and industry partners, the new facility represents a step toward solving one of North Dakota's most pressing challenges: building and keeping a skilled, homegrown workforce in science and engineering.



NORTH DAKOTA'S FRONT DOOR OF STEM

Break silos, build solutions. The upcoming STEM Complex is designed to connect disciplines and transform student learning into statewide outcomes.

On the east edge of campus near the Columbia Road overpass, UND's STEM Complex is taking shape as one of the University's most visible — and most consequential — investments in the future of North Dakota.

More than a new building, the \$163 million, two-phase project is designed to help the state solve a persistent challenge: growing (and keeping) a skilled, homegrown STEM workforce.

At its heart, the STEM Complex is a story about UND building capacity for what North Dakota needs next—more engineers, more problem-solvers and more opportunities for students to learn in modern spaces that mirror how industry actually works.

A front-door facility for CEM — and for the state

Rising on the former Hyslop Sports Center site STEM Complex will be a three-story, 179,000-square-foot facility serving more than 6,000 students each year, designed with modern classrooms, advanced laboratories, makerspaces, student success centers and flexible event space.

And location matters. Dean Ryan Adams put it plainly: “One of the things this will do for Engineering is that it’ll give

us a central and prominent location on campus that is easy to get to.”

That visibility isn't just a campus upgrade — it's a recruitment advantage for a state competing for STEM talent.

Built to break down silos and speed up innovation

The STEM Complex is intentionally designed to bring disciplines together — because real-world problems don't arrive neatly sorted by department. President Andy Armacost emphasized the broader stakes: “This project is much bigger than just educating engineers and scientists... It's about how those graduates will support our communities, drive innovation and shape the future.”

Adams described the facility as a major step forward for how students will learn and build: “This facility represents a bold leap forward... It will house cutting-edge labs, collaborative spaces and student innovation hubs that reflect the evolving needs of engineering and science education.”

That collaborative focus shows up everywhere — from hands-on lab and maker space design to student-centered features supporting competitive student organizations.

Why it matters for North Dakota

State leaders have been central to making the STEM Complex possible, with legislative funding supporting the project across multiple sessions. But the “why” is workforce: North Dakota needs more STEM graduates who are prepared to contribute quickly in industry, infrastructure, energy, defense, computing, and emerging technology sectors.

As Arts & Sciences Dean Brad Rundquist stated: “The whole philosophy behind the building is student success in science and engineering... [it] is meant to recruit and retain students in those fields, because the state needs them.”

And it's not only about students. Alumni and industry partners see the STEM Complex as a force multiplier. Terry Severson, CEM Executive Board Chair, noted: “The STEM Complex responds to North Dakota, regional and national needs for world-class STEM education and research; it reflects student, faculty, industry, and government recognition of UND as a prime solution to those needs.”

A new hub for the “teams of tomorrow”

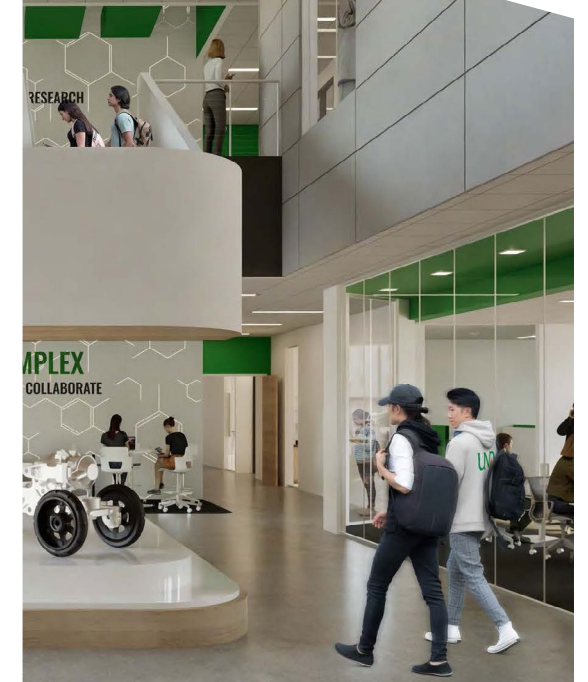
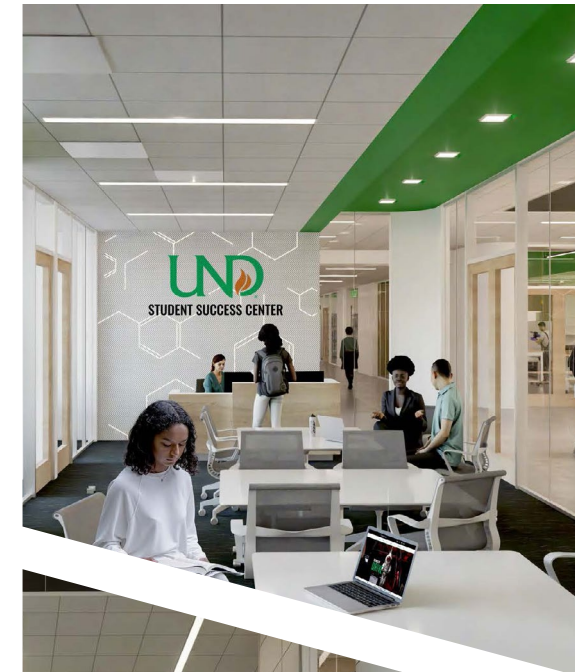
From a CEM perspective, the STEM Complex is a capacity-builder: modern labs that match today's engineering demands, spaces that encourage collaboration across fields and a highly visible home base that strengthens recruitment and retention — two of the biggest levers for workforce growth.

Or as Armacost framed it at the groundbreaking during Homecoming Week, the real measure of success will be what North Dakotans see on the other side of the ribbon cutting: graduates who “support our communities, drive innovation and shape the future.”

“The STEM Complex expands the capabilities of the college, connects us more closely to the sciences and provides a modern space to develop the relationships and technologies for the future of the State of North Dakota.”

Dr. Ryan Adams

Dean, UND College of Engineering & Mines



FUTURE IN ACTION.

Fundraising for Phase II is still underway.

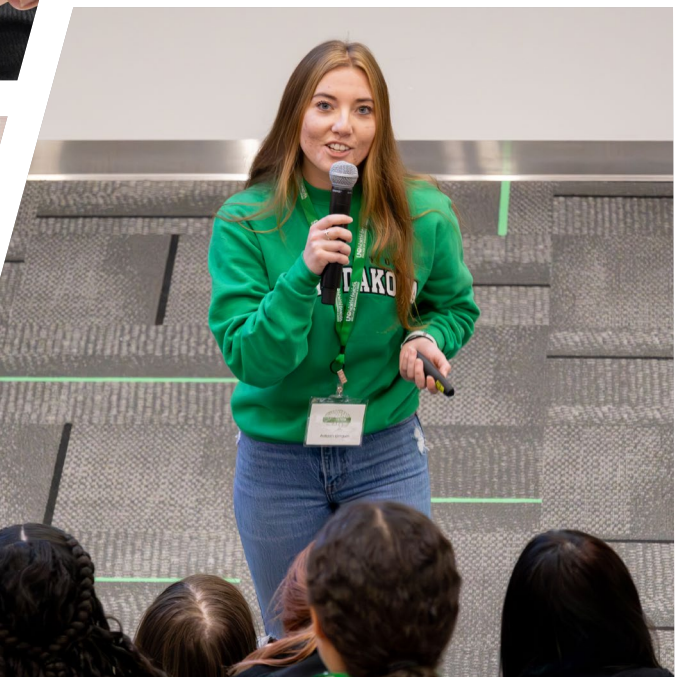
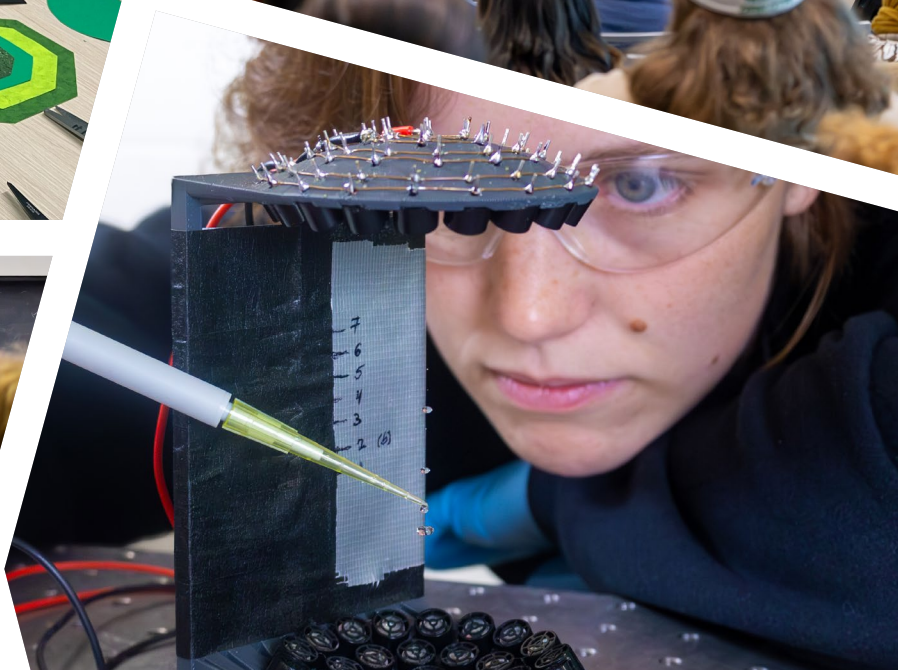
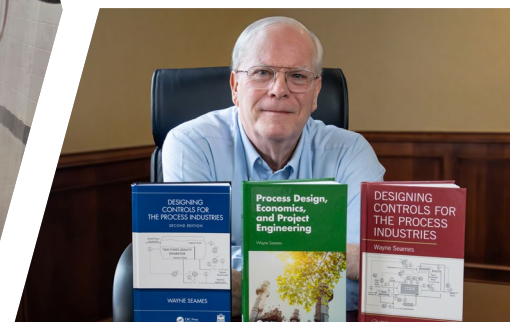
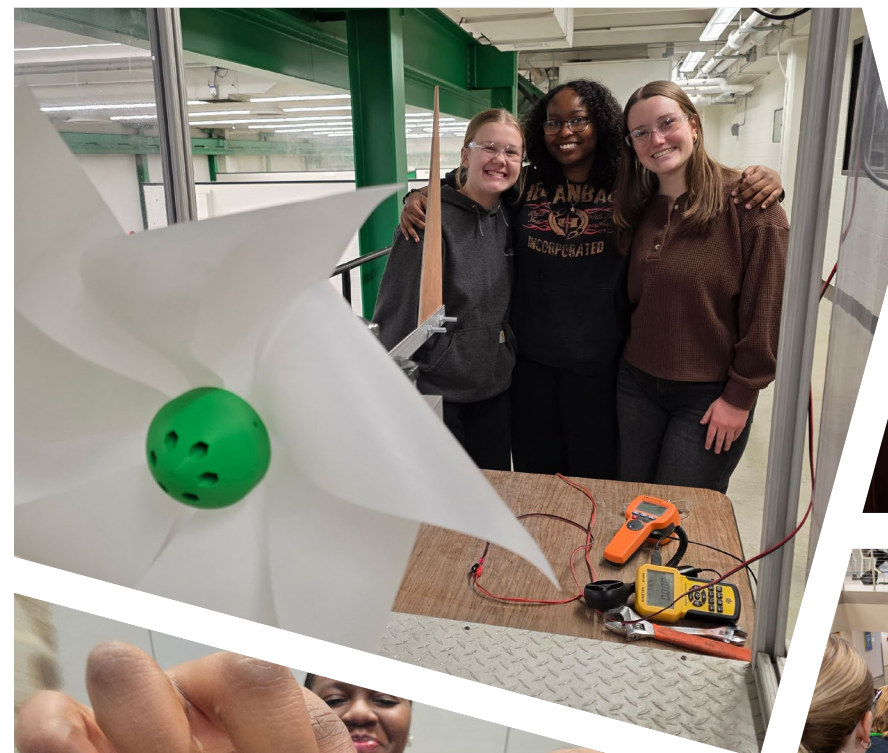
Reach out to **Robin Turner** or **Brett Austin** (page 27) to learn how you can contribute to this project or visit

UND.edu/stem-complex



A DAY IN THE LIFE AT CEM

Scan the QR code to learn more about what's happening in each photo.





2025 INDUCTION CEREMONY

ALUMNI ACADEMY

CEM's highest honor bestowed upon three alumni at the 21st annual Alumni Academy Induction ceremony.

On September 19, 2025, the University of North Dakota College of Engineering & Mines celebrated the achievements of three distinguished alumni during the annual Alumni Academy Induction Ceremony. Family, friends and colleagues gathered to observe the induction into the Academy.

Leaders of Today, Mentors for Tomorrow

The Alumni Academy Hall of Fame honors graduates whose careers have made a significant impact on their industries and communities. Their stories, preserved on plaques displayed in the Upson II Building, provide a source of motivation for current UND students by highlighting the achievements of those who once walked the same campus halls.

View the Alumni Academy Hall of Fame at

engineering.UND.edu/alumni/alumni-academy



Robert Cole

**B.S. Mechanical Engineering '76
B.A. Industrial Technology '79**

Celebrated for pairing a successful oil field career with a values-first leadership approach, Robert Cole later brought those same principles to students as a high school woodworking teacher.

Sandra Lindeman Cole
B.S. Chemical Engineering '79
Remembered for championing community and mentorship, Sandra Lindeman Cole credits the Society of Women Engineers and key supporters who helped her thrive and find belonging in CEM.



Michael D. Mann

**M.S. Chemical Engineering '79
Ph.D. Energy Engineering '97**

Michael D. Mann is honored as a highly respected Chester Fritz Distinguished Professor, researcher, advisor, mentor, department chair and interim dean. His legacy of service to UND elevated the students, CEM and UND.

Alumni Academy unites and welcomes newest members
Back row left to right: Dean Wieland, Mike Lodoen, Steve Burian, Sherri Bonacci, LeRoy Kuta, Mark Thompson, Ben Dove, Dwight Wendschlag and Kristine Hefta Brindle. Front row left to right: Robert Cole, Sandra Lindeman and Michael D. Mann.



UPCOMING ALUMNI GATHERINGS

Denver, Colo.
Houston, Texas
Minneapolis, Minn.
Phoenix, Ariz.

Living in one of these areas? Watch your inbox and mailbox for details.

UPCOMING EVENTS

Check us out on social media for year-round activities.

Fossil Preparation Sessions

Now through project completion
Wilson M. Laird Core & Sample Library, UND Campus

Do you like dinosaurs? We do too! We're looking for volunteers to help clean and stabilize the fossils of a duck-billed dinosaur called *Edmontosaurus annectens*.

Visit bit.ly/UND-Dinosaur to register for a session.

STEM Summer Camps

Registration begins April 1, 2026

Make your child's summer vacation one to remember. Unlock your child's ingenuity and creativity at CEM's local STEM-powered summer camps including: Minecraft Camp, LEGO Spike Prime Robotics Camp, Kerbal Space Engineers, Explore Civil & Environmental Engineering Camps, Geology Merit Badge Workshop and Youth Science & Engineering Academy.

Visit engineering.und.edu/outreach/k-12 to register.

University of North Dakota VEX Robotics Signature Event @ Mall of America

August 7-8, 2026
Bloomington, Minn.

We're taking over the Mall of America again this summer! The unofficial kick-off of the season, top middle and high school VEX Robotics teams from across the world will converge at this high-stakes competition.

Visit und.edu/vex for more event information.

CEM Homecoming Social

October 2, 2026 // 5-7 p.m.
Collaborative Energy Complex, UND Campus

Calling all CEM alumni and friends! We're thrilled to invite you back to our annual Homecoming Social back on campus during UND's Homecoming Week. During the social, we invite you to join us on a tour of the new and changing spaces around the college.

Visit bit.ly/CEM-Homecoming-2026 to RSVP.

UND Alumni & Industry Gathering in Seattle

October 15, 2026
Seattle, Washington Area

Connect with fellow UND alumni, friends and industry partners to create lasting memories at the Museum of Flight in the Seattle metropolitan area.

Contact [Deb Austreng](mailto:Deb.Austreng@und.edu) for questions.

IEEE Cybersecurity Awareness & Research Symposium

October 26-28, 2026
Memorial Union, UND Campus

The IEEE Cyber Awareness and Research Symposium (CARS) is a premier event bringing together researchers, industry leaders and students to explore cutting-edge cybersecurity challenges and advancements. Organized by the UND Center for Cyber Security Research, IEEE Red River Valley Section, IEEE Region 4 and University IT, CARS provides a unique platform for collaboration, knowledge sharing and hands-on learning in the evolving landscape of cybersecurity, artificial intelligence and critical infrastructure protection. With high-profile presenters, workshops, networking and hiring events and even a cybersecurity Capture-The-Flag (CTF) championship, there's something for every cyber-minded individual.

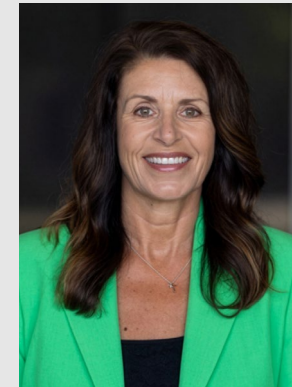
Visit und.edu/ieee-cars for more event information.

CEM Senior Design Expo

April 27, 2027
UND Memorial Union

The annual CEM Senior Design Expo is a showcase of student projects which highlight different areas in engineering, computer science and geology.

Visit engineering.und.edu/outreach/cecm-design-expo for more event information.



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Dir. of Alumni, Corporate & PR

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PHOTO: Interior rendering of the UND STEM Complex courtesy of Clark & Enersen.

To alumni & friends:

Every time you come back to campus — for Homecoming, a tour, a reunion or just to see what's changed — you remind us of something we never take for granted: once you're part of UND, you're always part of UND.

Thank you for believing in this college, for cheering on our students, for opening doors through mentorship and hiring, and for giving in ways that turn possibility into reality. Your support strengthens the hands-on learning that defines our engineers, computer scientists and geologists — the kind of education that equips graduates with the tools to make tangible impact.

This year, you'll feel that momentum in a big way as the STEM Complex takes physical shape here on campus. It's more than a building — it's an investment in the next generation of doers: students who will design safer systems, build smarter infrastructure, power new energy solutions and create the technologies that move our state and world forward.

If you've been thinking about contributing to the STEM Complex, there's still time to be part of history. Visit und.edu/stem-complex to learn more, or better yet, reach out to Robin or Brett to explore how your contribution can make a difference.

If you are looking to reconnect, Deb would love to hear back from you. Whether you're planning a campus visit, looking to engage with students or meet with leadership and faculty — your alma mater is here for you.

We're proud of what you've done since you left UND. We're even prouder that you still carry UND with you. We can't wait to welcome you back — and to show you what your support is building.

UND UNIVERSITY OF
NORTH DAKOTA
COLLEGE OF ENGINEERING & MINES

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University of North Dakota
Grand Forks, ND 58202-8155

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blogs.UND.edu/cem

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