2016

Engineering

CHEMICAL CIVIL ELECTRICAL GEOLOGY GEOLOGICAL MECHANICAL PETROLEUM

UNIVERSITY OF NORTH DAKOTA

UND Engineering Programs Receive Accreditation

All departments of the College of Engineering and Mines engineering undergraduate programs were reviewed for accreditation by ABET last November and have received accreditation by the Engineering Accreditation Commission of ABET, a major nonprofit, nongovernmental accrediting body.

- Chemical Engineering
- Civil Engineering
- Electrical Engineering
- Geology & Geological Engineering
- Mechanical Engineering
- Petroleum Engineering

Thank you to the coordinators of each of the College's academic units for their instrumental roles in securing accreditations. Those individuals are:

Frank Bowman, Associate Professor, Thomas C. Owens Endowed Fellow, chemical engineering

Harvey Gullicks, retired Chair and Associate Professor, civil engineering

Sima Noghanian, Associate Professor, electrical engineering,

Dexter Perkins, Professor, geology & geological engineering

I-Hsuan Ho, Assistant Professor, geology & geological engineering

Marcellin Zahui, Associate Professor, mechanical engineering

Bailey Bubach, petroleum engineering

Kegang Ling, Assistant Professor, petroleum engineering

The College's next accreditation visit is slated to take place in the Fall of 2021.

ABET has been accrediting college and university engineering programs for more than 80 years and is recognized by the Council for Higher Education Accreditation.

Hesham El-Rewini, Dean,
College of Engineering & Mines

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Engineering

CHEMICAL · CIVIL · ELECTRICAL · GEOLOGY · GEOLOGICAL · MECHANICAL · PETROLEUM

FEATURES

DEPARTMENTS/STORIES

On the cover: Big Ideas Gym (BIG) is located in the new Collaborative Energy Complex and is designed to be a collaboration hub for students ready to take on the next BIG thing.

UND UNIVERSITY OF NORTH DAKOTA
COLLEGE OF ENGINEERING & MINES

Think Big, *Imagine* BIGGER

MESSAGE FROM THE DEAN

I am so excited about BIG, the Big Ideas Gym that we just founded in the newly dedicated Collaborative Energy Complex (CEC). I envision BIG as an idea generator from which innovation and creativity will emerge. BIG, which will open its doors to students from all disciplines in January 2017, will provide an environment for students to explore futuristic ideas. Our goal is to incentivize teams of students from different disciplines inside and outside CEM to wrestle with creative solutions to improve the quality of life for humanity at large. Imagine a team of students from Medicine, Nursing, and Engineering designing less invasive devices for kidney dialysis, a team from Aerospace, Sciences, and Engineering creating an inexpensive way to produce clean water from waste, or a team from Arts, Business, and Engineering developing an innovative shopping cart for the future. The possibilities are limitless and the interdisciplinary teams will be rewarded for aiming high.

Our world is facing grand challenges that require novel solutions. The National Academy of Engineering (NAE) has identified fourteen such challenges that can be categorized into four broad areas: Sustainability, Security, Human Health, and Joy of Living. We are committed to play a major role in the national efforts to address these challenges. Our College was among the first twenty-five Engineering colleges in the US to be accepted in the NAE's Grand Challenge Scholars Program (GCSP). This program is aimed at producing graduates who are prepared to address and solve the grand challenges. The first cohort of CEM's students to participate in the GCSP was selected last summer and started the program in the fall. Each participant is expected to be involved in meaningful experiences covering five dimensions: 1) research related to one of the grand challenges, 2) entrepreneurship, 3) service learning, 4) global exposure, and 5) interdisciplinary course work. I am delighted to share that 80% of the members of first cohort are women.

Another big accomplishment that I am really proud of is the recent approval of the first graduate program that involves the two Engineering colleges at UND and NDSU. This collaborative

Celebrating the dedication of the CEC with Dean El-Rewini are his daughter Zeinab, First Lady Debbie Kennedy and President Mark Kennedy.

program in Biomedical Engineering is the perfect model of how faculty expertise from UND and NDSU can be utilized in a partnership that is greater than the sum of its components. UND's College of Engineering and Mines and School of Medicine and Health Sciences in collaboration with NDSU's College of Engineering will offer MS and Ph.D. programs on campus and via distance delivery starting Fall 2017. As the U.S. Department of Labor estimates that the job market for biomedical engineers will increase by 72% through 2018, I am confident that our program will attract students who will meet the demand and be able to solve challenges in the design of medical devices and systems.

As we are looking forward to the next big things of the future, it is also important that we look back and celebrate what we have accomplished together. Because of the tremendous dedication of our faculty, staff, and students and the incredible support of our executive board, alumni, and industry friends, our college has witnessed remarkable success over the past decade. The annual college expenditure more than doubled, total enrollment increased by 90%, distance education enrollment increased by more than 130%, faculty and staff positions grew by more than 50%, scholarship endowment increased by 83%, and annual research expenditure more than doubled between 2008 and 2012. The Department of Petroleum Engineering and the Institute for Energy Studies were established to support the growth of North Dakota's energy industry. We developed several new degree programs including eight Ph.D. programs, two M.S. programs, and a B.S. in Petroleum Engineering. We also raised more than $43 million to support major college initiatives. We named the "Harold Hamm School of Geology and Geological Engineering," and established several new endowed faculty positions. Last but not least, a new engineering building (CEC) will open its doors to students in January 2017. It's time to celebrate!

Hesham El-Rewini, Ph.D., P.E.
Dean and Professor
November 25, 2016

From the CEM's Executive Board

An update by Board Chairman Terry Severson and Board Vice Chairman Steve Burian

Terry Severson

Steve Burian

We had a milestone Executive Board meeting at Homecoming this year. It's not every year one gets the opportunity to include the ribbon-cutting for a really significant new CEM building—the Collaborative Energy Complex (CEC)—as one of the Board events. Then that afternoon our Board meeting became the first official activity within the CEC. That set a festive tone for our meeting. It was fun and rewarding as CEM alumni to be a part of such a significant event for our college as the CEC ribbon-cutting. As Board members we're afforded an opportunity to become reconnected and give back to the UND College of Engineering and Mines that prepared us all so well for our professional careers.

Initially—four years ago—it wasn't clear to faculty or students that the Board would add any value for them. I believe that now most faculty and students see the Board and its activities as positive factors that help them achieve their objectives. We are an active Board in that we stay engaged throughout the year through our standing committee and special group activities supporting Dean El-Rewini, department heads, and staff and faculty.

An example activity is the Alumni Perspective series which has become a part of CEM's wider curriculum.

Executive Board Members

Jim Albrecht, *President, ComDel Innovation, Wahpeton, ND*

Lisa Barnes, *Director of Engineering Business Management, Honeywell Aerospace Engineering Technology, Phoenix, AZ*

Karl A. Bollingberg, *Executive Vice President and Director of Banking Services, Alerus Financial, Grand Forks, ND*

Steve Burian, *CEO, Advanced Engineering and Environmental Services, Inc (AE2S), Grand Forks, ND*

Ben Dove, *(Retired) Vice President of Performance Excellence, Lockheed Martin, Besthesda, MD*

Kayla Effertz Kleven, *Olson Effertz Lobbying & Consulting, LLC owner, Bismarck Public Schools Foundation Executive Director, Bismarck, ND*

Thomas A. Erickson, *CEO, UND Energy and Environmental Research Center, Grand Forks, ND*

Robert (Bob) Harris, *Founder/Chairman of the Board, Harris Group, Inc., Seattle, WA*

Mike Jones, *Vice President of Research and Development, Lignite Energy Council, Bismarck, ND*

Charles (Chuck) Kummeth, *CEO and Director, Techne Corporation, Minneapolis, MN*

Charles (Chuck) MacFarlane, *President and CEO, Otter Tail Power Company, Fergus Falls, MN*

Sherri Bonacci McDaniel, *President, ATEK Products, LLC, Minneapolis, MN*

Robert (Mac) McLennan, *President/CEO, Minnkota Power Cooperative, Inc., Grand Forks, ND*

Keith E. Moe, *Chairman of the Board, MediGLIDER, Inc., Austin, TX*

Kathleen Neset, *President, Neset Consulting, Tioga, ND*

Craig Olson, *Vice President and General Manager, Business and Regional Systems, Commercial Systems, Rockwell Collins, Cedar Rapids, IA*

Judi Paukert, *Community Relations Manager, Xcel Energy, Grand Forks, ND*

Fernanda Philbrick, *Area Manager, Intel Resale Corporation, Excess Inventory, Metals Reclaim, NTM and Equipment Ops, Phoenix, AZ*

Terry Severson, *President, Trace Systems Inc., Tysons Corner, VA*

Grant Shaft, *shareholder at the law firm of Grant H. Shaft, PLLC, Grand Forks, ND.*

Robert A. (Bob) Solberg, *Chairman, JDR Cable Systems LTD, Houston, TX*

Klaus Thiessen, *President and CEO, Grand Forks Region Economic Development Corporation, Grand Forks, ND*

Barbara A. Walz, *Senior Vice President, Policy & Compliance/Chief Compliance Officer, Denver, CO*

Six times a year groups of four to six grads ranging from 1965 to 2013 have returned to CEM for a day to visit classes and respond to students' questions. Alums who have participated have uniformly commended the experience and many have volunteered to come back again.

Contact Board member Jim Albrecht (Jim.Albrecht@comdelinc.com) or CEM sponsor Dustin McNally (dustin.mcnally@engr.und.edu) if you think you might be interested in returning to CEM for a day to see what it looks like today and offer current students the benefit of some of your hard-earned lessons.

Another example is the support we're offering Dean El-Rewini and Professor Brian Tande for the new Grand Challenges program in which students address 14 fundamental global engineering objectives, e.g., provide access to clean water, develop carbon sequestration methods, and engineer better medicines. This is a new international program into which CEM has just been accepted, and the first cohort 10 students has been selected this semester to begin their individual three-year courses of scholarship.

We're up to 25 Board members now. Although the largest concentration of members is from ND and MN, we also have members from WA, NM, CO, TX, PA, and VA. Although most members are CEM alumni, we also have some who are "CEM friends," so we have an eclectic mix coalesced around our common affiliation for CEM.

The Board has settled into a practice of semi-annual meetings: on campus during Homecoming and in the spring in the Twin Cities area. Those face-to-face meetings keep our momentum going while individual committees continue work virtually in between.

One last thought. Although the doors are open to CEM's new $15.5M CEC, we still need an additional $1.1M to close the funding line. Please consider, from either a corporate or individual basis, contributing some amount to help close that bogie, e.g., participating in the "1,000 for a $1,000" campaign.

We extend an open invitation to contract us: Terry (tseverson@tracesystems.com) or Steve (Steve.Burian@AE2S.com)

This glider was built by UND Department of Industrial Arts and completed on May 22, 1930. The work was done entirely by students. All parts, metal and wood, made from raw materials including pulleys which were cast and turned from aluminum. This project was supervised by E. W. Bollinger, Head of the Department of Industrial Arts, UND. His son, John G Bollinger, found this photo among his father's records and sent it to CEM Dean Hesham El-Rewini. We are very grateful to John for sharing this bit of the past with us. Photo was taken very near the current site of Leonard Hall.

UND Collaborative Energy Complex

More than 200 attended the dedication of the Collaborative Engineering Complex dedication (CEC), on Friday, Oct. 14. The outdoor ceremony was packed with students, faculty, staff, donors and business and government representatives. All represented groups that worked together to power the project and make it a reality. The new front door to the College of Engineering & Mines opens into a bright atrium and collaboration areas, study spaces, active learning classrooms, new labs and a skywalk to the Wilson M. Laird Core and Sample Library. The Complex contains more than 37,000 square feet of research and teaching labs as well as collaboration areas and a first-of-its-kind Engineering Student Success Center.

Former Interim President Ed Schafer and UND President Mark Kennedy.

A FESTIVE ATMOSPHERE…

To cap the ribbon cutting, Engineering student representatives from student organizations, student athletes and members of the Pride of Dakota marching band played as commemorative footballs were launched into the crowd.

Rylan Limesand, Trevor Lachance, Lt. Gov. Drew Wrigley, Congressman Kevin Cramer, Steve Burian, Steve McNally (Hess), UND President Mark Kennedy, Dean El-Rewini, Bob Solberg, NDUS Chancellor Mark Hagerott, Deanna Carlson Zink, Kevin Melicher (NDSBHE), Jennifer Grinsteiner, and Craig Knutson.

INSIDE THE COMPLEX…

Top left: PE students Dylan Willoughby, Ross Skillman, Jordan Anderson, Tanner Hopfauf, and Mitchell Zebro with Dean El-Rewini.

Top right: Steve and Barb Burian stand in the entrance to the AE2S-Steve and Barb Burian Collaboration Corridor

Above: Hesham El-Rewini celebrates the generosity of the Solberg's gifts with Kristine Solberg and Bob Solberg and Bob's brother Bill Solberg

OPPORTUNITIES STILL EXIST!

There are numerous naming opportunities in the CEC: classrooms, computer labs, executive training room, the Big Ideas Gym to name a few

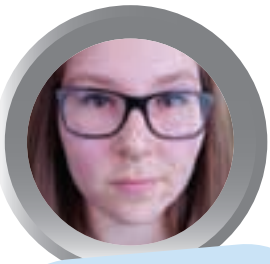
A crowd of over 200 gathered to celebrate the dedication

Jenna Greenlees
CE (2nd year)
Clean Water

Mikaila Kringstad
ChE (2nd year)
Engineering Better Medicines

Madlyn Tessier
ChE (3rd year)
Solar Energy, Clean Water

Alicia Quamme
ChE (2nd year)
Clean Water



Makayla Platt
Undecided (2nd year)
Solar Energy, Clean Water, Engineering Better Medicines

Margaret Ahmann
ME (2nd year)
Solar Energy, Clean Water

Quinn Huisman
CE (3rd year)
Clean Water, Improve Urban Infrastructure, Solar Energy

Martin Pozniak
EE (2nd year)
Secure Cyberspace

Bridget Heiland
Undecided (2nd year)
Personalized Learning, Health Informatics

Jennifer Grinsteiner
PE (2nd year)
Carbon Sequestration

NAE Grand Challenge Scholars Program

The National Academy of Engineering Grand Challenge Scholars Program is a combined curricular and extra-curricular program with five components that are designed to prepare students to be the generation that solves the grand challenges facing society in this century.

In 2008, the NAE identified 14 Grand Challenges for Engineering in the 21st Century. The Grand Challenges are a call to action and serve as a focal point for society's attention to opportunities and challenges affecting our quality of life.

In a letter of commitment presented to President Barack Obama, CEM along with more than 120 U.S. engineering schools announced plans to educate a new generation of engineers expressly equipped to tackle some of the most pressing issues facing society in the 21st century. (http://engineeringchallenges.org/GrandChallengeScholarsProgram.aspx)

PROGRAM OVERVIEW AT CEM

Having just gained approval in the spring of 2016, the UND Grand Challenge Scholars Program (GCSP) is still in its early stages. However, the GCSP is off to a great start, having recruited its first cohort of students and engaging faculty from each department in the College of Engineering and Mines (CEM).

Our GCSP was designed to offer a high degree of flexibility to students and allow them to meet the program requirements in the way that best suits their interests. While the UND campus offers many opportunities for GCSP activities, students are encouraged to be creative and entrepreneurial in identifying potential GCSP activities. An important feature of the UND GCSP is the financial support of a local organization, The Edson and Margaret Larson Foundation, which has provided $100,000 to date. Thanks to this support, students in the program receive a $1,000/yr stipend for up to three years. In addition, students are eligible to apply for additional support of up to $6,000 to support research, service learning projects, or global experiences.

OPERATING COMMITTEE

The day-to-day operations of the GCSP are coordinated by an operating committee, including the advisement and recruitment of students. This committee was assembled shortly after the program was approved and consists of the following individuals:

Director of the Jodsaas Center: Dr. Brian Tande, Associate Professor and Chair of ChE

Engineering department representatives

- Civil: Howe Lim, Associate Professor of CE
- Chemical: Ali Alshami, Assistant Professor of ChE
- Mechanical: Surojit Gupta, Assistant Professor of ME
- Electrical: Sima Noghanian, Associate Professor of EE
- Petroleum: Mehdi Ostadhassan, Assistant Professor of PE
- Geological: I-Hsuan Ho, Assistant Professor of GE

Representatives from other disciplines on campus

- Tim O'Keefe, Director of the School of Entrepreneurship
- One more TBD

Two student representatives from each class / cohort (eventually 6 total): TBD

In addition to the Operating Committee, a separate Strategy Committee will provide oversight of the program and review its activities each year. This committee consists of the Director, the Dean of Engineering, a representative from the Larson Foundation, the CEM Student Success Champion, and a student representative to be selected in the first year.

INITIAL COHORT OF STUDENTS

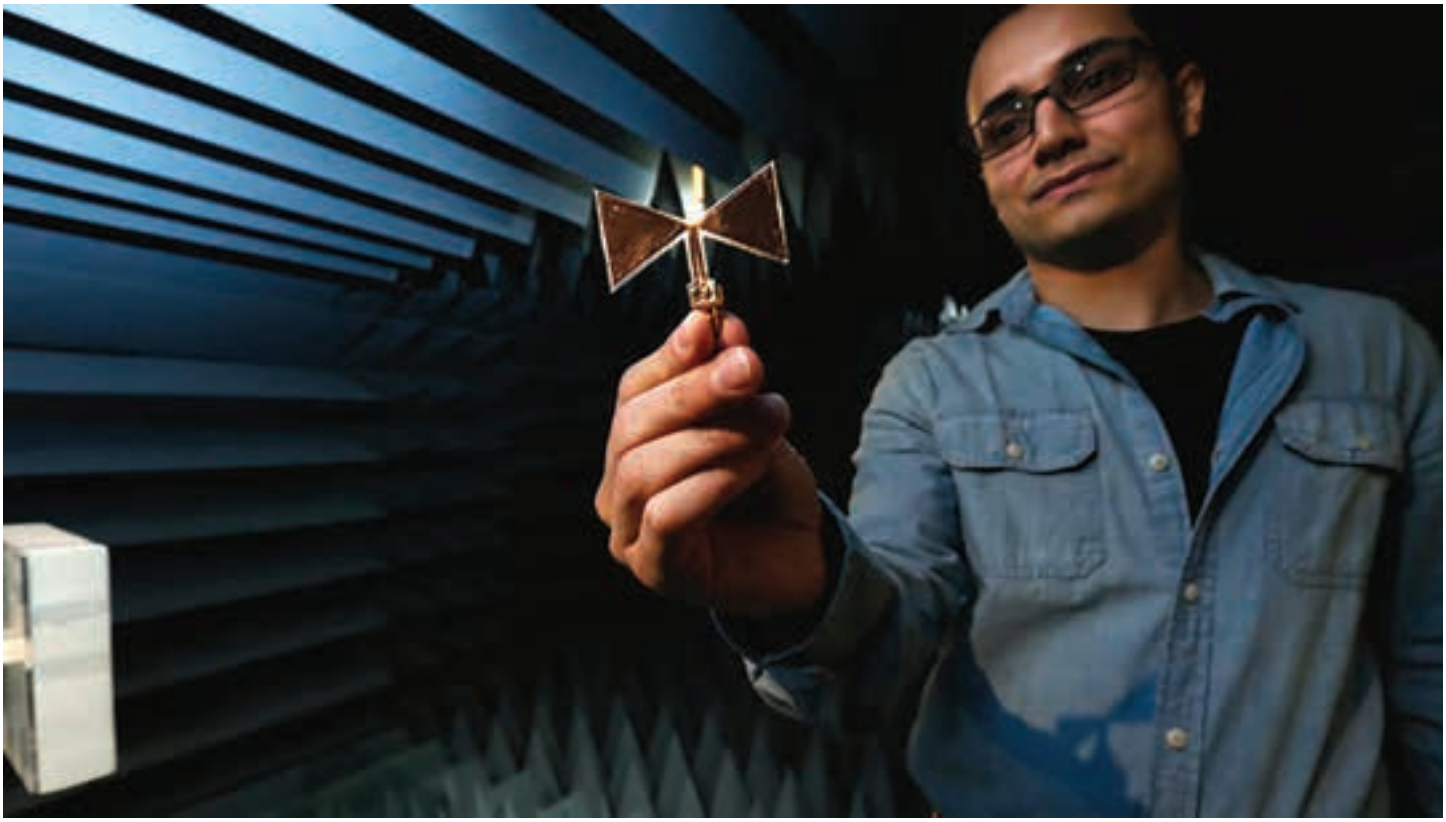
The first cohort of 10 students officially began the GCSP at the beginning of the Fall 2016 semester. These students represent each of the program in the College of Engineering and Mines, with the exception of Geological Engineering. Special attention will be directed toward recruiting in GE during this upcoming year.

FUTURE ACTIVITIES

In addition to advising students and recruiting the next cohort of students for the Fall of 2017, the highest priority activities planned for the next year are related to fundraising and corporate engagement. In order to ensure our ability to continue to offer students stipends and support their GCSP activities, we will launch a fundraising campaign aimed at alumni and corporations. The GCSP Director is working with the CEM development staff to prepare materials to market sponsorship opportunities, including the support of students or individual student activities. We have also identified several organizations already engaged with CEM who may share our interests in one or more of the Grand Challenges. Over the next academic year, we will work with these companies to find ways to gain their support, which could come in several forms: internships for GCSP students, joint research projects, facilitation of global experiences, or the overall sponsorship of one of the 14 Grand Challenges.

Another development in the college that will positively impact the GCSP is the construction of a new building- the Collaborative Energy Complex (CEC). The CEC will contain a room we have named the Big Ideas Gymnasium (BIG), which, among other uses, will serve as the hub of activity for the GCSP. The vision for the room is a fun and creative space with very high visibility, as it is located on the building's main corridor. Regular GCSP program meetings will be held there and it will also be available for the scholars to use for projects and other collaborative activities. The BIG will provide the program significant exposure in addition to facilitating Grand Challenge themed projects.

For questions please contact the GCSP Director, Brian Tande (brian.tande@engr.und.edu) or Dean of Engineering Hesham El-Rewini (rewini@engr.und.edu).



Milad Mirzaee, a first-year doctoral student, examines a miniature antenna inside an anechoic chamber.

Research Endeavors Explore New Ways to Use Technology at UND

When Sima Noghanian got into a cab in New York City and told her driver she was attending an antenna conference, he laughed and said the technology was outdated.

"Well what do you think those things are coming through?" Noghanian recalled responding as she gestured to the phone beside her. "You have Internet on your phone and things that are wireless, you just don't know it has an antenna."

Noghanian is an associate professor of engineering and chairwoman of the Antenna and Applied Electromagnetics Department at UND. After her brother urged her to pursue engineering rather than math, she became interested in antennas as an undergraduate student and has devoted herself to the field ever since.

Noghanian has worked with groups of researchers and sometimes students to look at ways to advance antenna technology for use in space, the human body, industry and even the transfer of power itself.

"Usually antennas in older systems are rigid and need to be in a good place to keep their shape but these days people are talking about needing something flexible," she said.

In a laboratory in UND's Harrington Hall, Noghanian handled antennas that looked like two triangles attached to a stick and were small enough to rest in the palm of her hand. Some were made of stiff plastic-like materials but others were on thin, flexible sheets of cloth or paper.

"We're trying different substances and conductive materials," she said.

FROM SCRATCH

Milad Mirzaee is a first-year doctoral student currently writing a paper about his research with the small triangular antennas he's testing. Mirzaee works on every phase of antenna development in UND labs, from initial computer schematics to physical creation and on to testing against the elements.

In order for an antenna to transmit and receive information it must be made of conductive material, like a metal. Mirzaee said most traditional antennas use copper in some way for this.

Much of his work is done using a 3-D printer; Mirzaee puts various types of conductive material into the machine and 3-D prints the antenna itself or makes a plastic mold he can then pour conductive material into.

The materials he uses to make the antennas are also created in a UND lab. Once an antenna is built it can then be tested, part of which happens inside an anechoic chamber that is sealed completely to keep out any waves or signals that might interfere with testing.

The inside of the chamber is completely covered in dark blue foam cones pointed inward and sound from the outside world is blocked entirely.

"If you go in, your cell phone wouldn't work, nothing from outside," Noghanian said.

The antennas are also tested in an oven, and Noghanian said they're working toward building a freezer for testing as well. These kinds of tests show UND researchers if the antennas they're making can be used in extremely harsh environments, like deep space.

Dr. Sima Noghanian

FORGING AHEAD

Noghanian has previously worked on biomedical antennas that could be implanted under patients' skin and used to monitor bodies, tracking cancer development or other things. She said the goal was to create an injectable nano-antenna, but the research did not get that far.

Now much of her research involves the booming field of unmanned aerial systems or space technology, something she said requires more art than science.

Part of her work looks at ways to incorporate antennas like the one Mirzaee is working with and install them into CubeSat satellites—small pieces of technology smaller than a volleyball that can be launched into space but require an antenna to communicate with Earth.

"You need to know your math and background but at the end of the day it's their creativity to come up with the design that works for that application," she said.

Another type of antenna she collaborated on went into high-tech space suits made by students in the John D. Odegard School of Aerospace Sciences as a part of the fabric rather than sticking out like a traditional metal antenna.

Noghanian said she knows her course on microwave antennas is a difficult one but it feels good when the occasional student really takes an interest in her field of study.

"I know we need people," she said. "If you think of the way technology is going we need talented people in this field, and I'm not there to have 100 percent of the class get interested in microwave antennas. But if we get two or three, they can get the training, and they're the kind of people who would bring (the industry) to the next level."

That next level, Noghanian said, is transferring power itself in microwaves via antennas to charge devices wirelessly. Not only are there regulations and safety to think of, but the process itself is extremely difficult.

Not only would this potentially change how the everyday cell phone battery recharges, but it could forever alter the use of solar power which could be transferred via microwave to earth, collected, converted to usable DC power and used as a power source.

"This is the big idea," she said. "It's been around for a while but there are challenges to do this."

Photo by Eric Hylden/Grand Forks Herald
Article: Anna Burleson

Slippery When Dry

UND mechanical engineer Suroijt Gupta is re-envisioning the modern engine through an agreement with the U.S. Army to reduce the need for oil-based lubricants

Assistant Professor Surojit Gupta works in his lab in Upson Hall II, part of the UND College of Engineering and Mines.

When people imagine the machines of the future, they might envision flying cars or engines that run without gasoline.

University of North Dakota Assistant Professor of Mechanical Engineering Surojit Gupta has his own futuristic vision: an engine that doesn't need oil.

Gupta recently started a Cooperative Research and Development Agreement with the U.S. Army Research Lab worth about $360,000 over three years. Per the agreement, Gupta and his team of graduate students will assist the Army in creating self-lubricating materials and high temperature propulsion systems. UND's Mechanical Engineering Department is part of the College of Engineering and Mines.

Part one of the project is to design solid lubricant materials. The materials will be able to withstand higher temperatures than current designs, making the need for oil a thing of the past. Part two involves designing high-temperature materials for high-powered turbines. Turbines are currently manufactured with nickel-based alloys, which have lower functional temperatures.

Though it's too early to say how long the materials would last, Gupta insists the materials will have a longer life than current traditional oil-based

UND Assistant Professor of Mechanical Engineering Surojit Gupta (third from left) and his team of graduate students will assist the Army in creating self-lubricating materials and high temperature propulsion systems. Photo by Jackie Lorentz.

machinery and will be better for the environment.

"As you can imagine, if you eliminate oil from machinery you can reduce the cost so much," says Gupta, who earlier this year was named the winner of the 2016 Global Young Investigator Award at an international conference in Florida.

CIVILIAN APPLICATIONS TOO

If Gupta and his team are successful, their designs would enable devices to fly for longer in complex combat and peacetime environments and provide improved medical support or protection to friendly troops on ground.

Gupta believes the day will come when his research will shift from creating self-lubricating materials to actually applying those novel materials to real-world machines.

He says the most realistic application for these new materials is in an aerospace environment, perhaps in the form of a shaft and gearbox that will be made of UND's new multifunctional materials.

These materials also might be used for numerous civilian applications, such as oil-free engines and other devices—such as polymer contact devices solid lubrication is needed," Gupta said.

"Normally when you have cars we tend to replace oil, and changing oil is always a problem," Gupta said. "Imagine if we have structures where you don't need to change the oil in the system; we can use the solid lubricants and eliminate the oil. We don't need any kind of coolant system—that will eliminate the cost of that as well as reduce pollution."

Matt Eidson
University & Public Affairs student writer

Above: Local grade school students participated in hands-on activities.
At left: More than 350 students packed into the Memorial Union ballroom at UND for an 11-minute radio call with NASA astronaut Tim Kopra, who is orbiting the planet on the space station.

OUTREACH

Kids from University Children's Learning Center visited Leonard Hall and the Triceratops to learn about dinosaurs.

FIRST LEGO LEAGUE 2016

Top right: The 2016 champions of the First Lego League Tournament from Kennedy Elementary School, South Fargo—Team Kick Back and LEGO.

MOMMY, ME & SWE

STEM DAY 2016

2016 ND STATE SCIENCE AND ENGINEERING FAIR

STEM Day 2016

STUDENT VISIT

Liberty Middle School, West Fargo, ND

A group of 58 junior and senior-high students participated in the INMED Summer Institute Program. They explored engineering in CEM labs, focused on biomedical, materials, chemical and petroleum engineering.

YSEA SUMMER CAMP 2016

2016 Engineering E-scape, organized by the E-Council for incoming freshmen, included activities and food at Turtle River State Park.

student ACTIVITIES

Students participating in tug-of-war, part of Engineers Week 2016.

UND College of Engineering & Mines student chapter of ASCE helped out with Red River Valley Habitat for Humanity, whose mission is based on the vision of developing partnerships between churches, businesses and concerned individuals to assist hardworking, low income people to build and own their own homes

Engineering Students Score at NASA Robotics Competition

The University competed with more than 50 universities from around the United States in a NASA robotics competition May 16-21, 2016 at the Kennedy Space Center in Florida. UND took first in outreach and second in presentation and demonstration, and placed fifth overall.

The objective was to design and build a robot capable of collecting and depositing Martian dirt. This raw material will become a high priority for manned space missions, as the oxygen contained within the regolith can be extracted for life support. It also can be used as an oxidizer for propulsion. The goals of the competition are to develop solutions that NASA can use to autonomously mine the Martian dirt as well as generate student interest in science, technology, engineering and mathematics (STEM).

The UND team comprises 10 students advised by Associate Professor of Mechanical Engineering Jeremiah Neubert and Associate Professor of Electrical Engineering Naima Kaabouch. The students involved were Nicholas Allen, Buffalo, MN; Ryan Ahrens, Little Falls, MN; David Laurion, Woodbury, MN; Bradley Messer, Richardton, ND; Jerod Nelson, Minot, ND; Erik Peterman, Apple Valley, MN; Daniel Smith, Grand Forks; Jack Heichel, East Grand Forks; Brian Koenig, Ridgecrest, CA; Charles Foxworthy, and Travis Winter.

The team designed a robot with a traction control system capable of mining icy regolith.

ASTRONOMICAL OUTREACH

The competition also required the teams to conduct outreach activities for K-12 students. UND's goal was to foster a diverse future generation of engineers and scientists. Students were taught about the opportunities in STEM fields, applications of robotic space mining, the robotics competition and NASA's goals for missions to Mars. The robotics team reached out to more than 1,800 kids from 24 cities across North Dakota and Minnesota.

Outreach through social media reached more than 5,000 people from all over the world.

This UND project was sponsored by the North Dakota Space Consortium, NASA EPSCoR, Cirrus Aircraft, Retrax, PS Doors, 3M, LM WindPower, AE2S, Technology Applications Group, UND Mechanical Engineering Department, UND College of Engineering and Mines Dean's Office, Office of the Vice President for Academic Affairs and Provost, and Student Organization Funding Agency.

JIM ALBRECHT | BSChE '84

UND College of Engineering and Mines

ACADEMY

Jim L. Albrecht

Born: January 26, 1962

Education: University of North Dakota, BSChE 1984
University of North Dakota, B.S. Applied Math 1984
St. Thomas College, MBA

Career Experience

1984-1988	Tape Lab Engineer, 3M, St Paul, MN
1989-1994	Production Engineer/Management, 3M, Wahpeton, ND
1994-1996	R&D Management, 3M, Wahpeton, ND
1996-1998	R&D Management, Imation, Wahpeton, ND
1998-2003	Production Management, Imation, Wahpeton, ND
2003-2007	R&D and Bus Dev Management, Imation, Wahpeton, ND
2007-Present	President, ComDel Innovation, Wahpeton, ND

Other Activities/ Awards

- Inventor on 8 patents for 3M/ Imation
- Management advisor for Imation sponsored UND Senior Design Projects - 1996 through 2007
- 2008 Governor's Choice Project of the Year Award - ComDel Innovation
- Business development coach for startup companies
- 2010 Entrepreneur of the Year in Manufacturing - ND Marketplace of Ideas
- UND Advisory Board for Chemical Engineering Department – 2011 to present
- UND CEM Board – 2014 to present

ComDel Innovation

Ali, Jim and Karen Albrecht

LISA BARNES | BSEE '88

UND College of Engineering and Mines

ACADEMY

Lisa Schmitz Barnes

Born: January 6, 1966, Princeton, MN

Education: University of North Dakota, BSEE 1988

Career Experience

1989 – 2000	Honeywell Aerospace, Phoenix, AZ, Advanced from general engineering to engineering management
1989 – 1991	Customer Engineer
1991 – 1998	Software Engineer
1998 – 1999	Project Manager
1999 – 2000	Technical Manager
2000 – 2003	AG Communications Systems, Lucent Technologies, Phoenix, AZ, Systems Engineer
2003 – Present	Honeywell Aerospace, Phoenix, AZ, Advanced from Principal Engineer to Director positions
2003 – 2006	Principal Engineer
2006 -2007	Technical Manager
2007 – 2011	Senior Technical Manager
2011 – 2014	Director, Engineering Business Management, Engineering Operations
2014 – Present	Director, Engineering Tools, Engineering Operations

Accomplishments

- UND College of Engineering and Mines Executive Board Member, Chair of Student Experience Committee
- Established UND College of Engineering and Mines Lisa and Todd Barnes Scholarship Endowment
- Presented at the 2012 Society of Women Engineers National Conference on Emerging Market Growth
- Mountain to Fountain Running Race Committee, Founding Member and Volunteer Coordinator
- Honeywell Corporate Engineering Tools Council, Founding Member

Honors and Awards

- Honeywell Corporate Performance Award for Orion Crew Exploration Vehicle Pursuit
- Honeywell Aerospace Development Program
- Honeywell Corporate Leadership Development Program
- Honeywell Aerospace Executive Sponsorship Program

Sherri Bonacci McDaniel, Lisa, Joyce and Rodney Medalen

ROGER FRENCH | BSEE '78

UND College of Engineering and Mines

ACADEMY

Roger French

Born: March 22, 1956, Grafton, ND

Education: University of North Dakota, BSEE 1978

Career Experience

1978 – 1982 Design engineer on electro-mechanical instruments and CRT Electronic Display Unit

1982 – 1988 Project Engineer on Electronic Flight Instruments and Engine Indication/Crew Alert Systems for Boeing 737, 747, 757 and 767 aircraft

1988 – 2000 Senior Engineering Manager for hardware development of display systems for Boeing 737, 747, 757, 767 and 777 aircraft

2000 – 2005 Principal Engineering Manager of Air Transport Systems Hardware and Software Support Department.

2005 – Present Principal Engineering Manager of Offshore Support Department

Rockwell Collins Achievements

- Collins Pioneer Leadership Award 1990
- Innovation Disclosure – "Efficient Backlight Systems for Avionics LCD Displays"
- 22 Years of Display Systems Design and Development Experience for Fokker, Beech Starship and Boeing aircraft types ranging from 737 to 787
- 20+ Years of Experience Working With Subcontracted Efforts in China, Costa Rica, India and Russia
- Creation of Rockwell Collins India Engineering Design Center in 2007

Accomplishments at UND

- UND EE Department Industry Board Member
- Supported Rockwell Collins Recruiting at UND since 1979
  - 140+ Active UND Alumni At Rockwell Collins
  - Chair of Rockwell Collins UND College Relations Team since 2000
- Provide Annual Guidance for Rockwell Collins Grant and Gifts & Charitable Donations to UND Student Organizations, EE and Computer Science Departments and Student Scholarships
- Donation of EMI Shield Room and Test Time in Rockwell Collins EMI/ENV Facility for UND International Space Station AgCam Project
- Guest Lecturer for EE Department Senior Design Class
- Mentor Students in UND Engineering Leadership & Entrepreneurship Program

Sheila, Roger, Ron French

DWIGHT WENDSCHLAG | BSME '71, MSME '75

UND College of Engineering and Mines

ACADEMY

Dwight Wendschlag

Born: May 1, 1949,
Hometown: Powers Lake, ND
Education: University of North Dakota, BSME 1971
MSME 1975

Career Experience

1971-1973	Ford Motor Company-Product Development Engineer, Engine Division-testing for environmental effects and performance of small (4 & 6 cylinder) engines
1975-2002	Amoco Production Company/BP-various technical and managerial positions
2006-2012	Cobalt International Energy-reservoir engineer
2012-Present	DDW Consulting, LLC-petroleum reservoir engineering consulting/teaching services to petroleum industry companies

Memberships and Activities

- Registered Professional Engineer in Wyoming and Colorado
- Member of Society of Petroleum Engineers
- Member of Industry Advisory Council-University of North Dakota Petroleum Engineering Department
- Board Member/President, Flathead Chapter, Lewis & Clark Trail Heritage Foundation, 2003-2007
- Design Team Leader & Construction Coordinator, Christ Lutheran Church, $7.5 million building project, 2003-2007

Technical Experience/ Expertise

- Technical expertise over the full range of reservoir engineering with special expertise/emphasis on secondary and enhanced oil recovery, gas-condensate injection projects and numerical reservoir simulation
- Exploration, appraisal and development in deep (>5,000') water

Leadership Experience

- Technical and production research organizations in support of oil, gas and gas condensate fields
- Design, development and delivery of executive education to mid-level through senior executives

Awards

Numerous corporate awards for technical contributions and personnel management/ leadership; especially for maintaining staff excellence and morale and fostering teamwork through difficult times.

Technical/ Professional Contributions

Numerous publications and presentations to professional organizations on topics ranging from numerical reservoir simulation and gas condensate depletion planning to executive education.

Rich Becker, Dwight, Joyce Medalen

CEM Alumni 2015 Sioux Award Recipient – David Veeder

After receiving his BS in chemical engineering in 1961 David Veeder began his career with Universal Oil Product Company, Des Plaines, IL, which took him throughout the US, Italy and Puerto Rico. He continued his engineering career from 1965-1969 with Conoco, Inc. While working full-time running a refinery during the day, Veeder earned a law degree by taking night classes at the University of Denver.

In 1972 he received his Juris Doctorate and started his own practice, Veeder Law Firm, P.C., in Billings, MT.

His background in oil and gas led to steady work in environmental law. He has been named in multiple years as one of the Best Lawyers in America in the practice area of Environmental Law. Veeder, who is now retired, also worked in the areas of tax law, real estate, labor and civil litigation. He has won several cases at the 9th Circuit Court of Appeals and has been an arbitrator in labor disputes as well.

David Veeder, BSChE'61

David met his wife, Linnea (Kranzler), '62, while at UND. They have been generous supporters of UND, including providing scholarships in Chemical Engineering and in Linnea's program, Medical Technology (now known as Medical Laboratory Science). Their generosity has also made possible renovations to the chemical engineering undergraduate laboratory.

The Veeders have three children and three grandchildren.

The Sioux Award is the highest honor given by the UND Alumni Association & Foundation for achievement, service, and loyalty. Since its inception in 1962, this distinguished award has been presented to leaders in government and business, high achievers in various professions, and alumni who have dedicated their lives to service for others.

Pictured are Dean Hesham El-Rewini, David and his wife Linnea.

FOUNDER'S DAY | 2.26.16

The Department of Chemical Engineering (below) received the UND Foundation/Thomas J. Clifford Award for Departmental Excellence in Teaching.

Professor Naima Kaabouch (left) received the UND Foundation/B.C. Gamble faculty Award for Excellence in Teaching, Research or Creative Activity and Service.

FACULTY/STAFF AWARDS

Outstanding faculty and staff awards presented to Pam Burkes, Harry Feilen, and Dr. Surojit Gupta (not pictured) on May 2, 2016.

FACULTY/STAFF RETIREMENTS

Left to right: Richard LeFever, Harvey Gullicks, David Poppke, Gary Dubuque, Connie Wixo, Ralph Johnson

A reception was held on May 10, 2016 to honor retiring CEM faculty and staff. Harvey Gullicks, Chair CE; Ralph Johnson, assistant professor ME; Richard LeFever, associate professor geology; David Poppke, equipment tech EE; Connie Wixo, admin assistant ChE; Gary Dubuque, research specialist ME

Signals Expert Seeks to Help Diabetic Patients

Among the thorniest health problems around is the upswing in Type II, or so-called adult onset diabetes. Left untreated, it's fatal, and before that certain eventuality, diabetes results in loss of feeling in extremities such as the feet—too often leading to amputations.

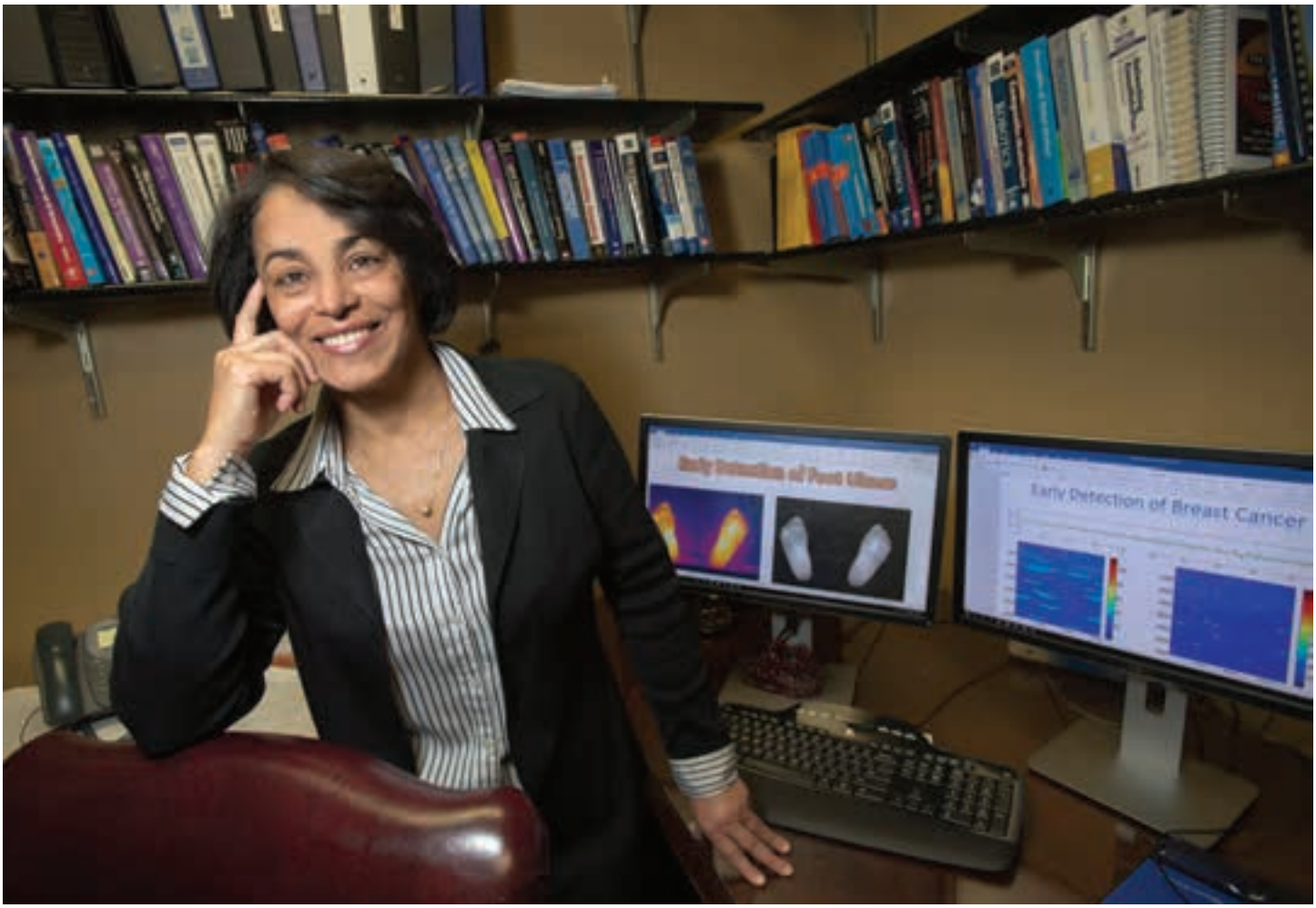
Signals expert Naima Kaabouch has been working for several years on technology that could provide earlier detection of foot ulcers in people like diabetics, before those ulcers break through the skin and lead to more serious health consequences, such as amputation.

With collaborators around the world, Kaabouch is also working on the earlier detection of cancer by finding signals that tell clinicians about microcalcification, early warning signs of cancers such as breast and prostate. Microcalcifications are very small calcium deposits and are the smallest particles that a mammogram can detect. They're normal as women age, but they also can signal the presence of cancer.

"In many organs, cancer starts at a microscopic level," said Kaabouch. "We are developing techniques that are safe and will enhance existing devices to show these microscopic hints about the potential for cancer before it becomes a tumor. It's about seeing more accurately.

"For foot ulcers, it's the same—we spend millions annually in this country on diabetes-related amputations," said Kaabouch. "These diabetic ulcers start invisibly. Then when you see them, it's too late. So we're developing technology to analyze the temperature of the foot, looking for areas where there are temperature differences, a sign that something is wrong."

"Among the ideas we've worked on—and are looking to develop—are temperature sensors in the shoes of diabetic patients."



Naima Kaabouch, associate professor of electrical engineering and director of the Signal/Image Processing Laboratory, College of Engineering and Mines

Coaxing Oil From the Rocks of North Dakota

Vamegh Rasouli embraces the term "unconventional" when it comes to North Dakota and the economic promise that it holds.

For most, the word suggests a deviation from the norm, a flirtation with the unknown. For Rasouli, that's the whole idea.

You see, Rasouli, the Continental Resources Distinguished Professor of Petroleum Engineering and chair of the department at the University of North Dakota, arguably has one of the most important jobs in the state. That is, he's figuring out how oil companies can extract more oil from deep within the rocky layers of North Dakota's subsurface—and do it more cheaply.

This is especially important in a cyclical industry, such as oil and gas production, in which prices can fluctuate, greatly impacting companies' bottom lines and their appetites for further development. This has a ripple effect—good or bad—on the economic well-being of states like North Dakota, which contains the second-largest source of oil in the United States.

The problem is that North Dakota's oil reserves, though abundant, are of the unconventional variety. There's that word again.

You've heard the idiom squeezing blood from a turnip. Rasouli explains that coaxing oil from the nanoscale pores in shale rock, 10,000 feet under the surface of North Dakota's western oil fields, is almost as difficult.

Vamegh Rasouli

"This rock is similar to a very tight sponge with many invisible holes," Rasouli said. "It does not provide an easy path for the oil to move inside the rock and toward the well bore (passage to the surface). The oil reserves in such tight rocks are known as unconventional reservoirs for which special treatment and technology are required to produce oil.

"The permeability (ability to move fluids inside rock) of unconventional oil and gas-bearing rocks is lower than concrete."

When times are good, oil companies have ridden the successes derived from hydraulic fracturing, creating a long breach into the shale rock, to expose and extract more oil.

"In low oil-price markets, operators are unwilling to drill new wells due to high costs; therefore, operation of new hydraulic fractures is not possible," Rasouli said.

That's why, with the current state of the oil economy, companies have turned to so-called smart technology to drive costs down and make production more feasible even when per-barrel prices dip.

Supported by a $60,000 research grant from UND's Post-doctoral Funding Program, Rasouli is studying the effectiveness of a concept known as re-fracturing. This is a technique used in conjunction with hydraulic fracturing. It's a second process that enables further enhancement of an existing fracture at greatly reduced cost, Rasouli explains.

"The re-fracturing technology is very new and needs extensive studies and investigation," Rasouli said. "This is the main objective of my research project."

Rasouli is collaborating with the UND Institute for Energy Studies, which is providing some technical input for the project as well as co-advisors for graduate-level students involved in the research. Other partners include local oil industry contractors that are allowing access to field data and other information important for the research.

"While the U.S. (and especially North Dakota) is leading the production of oil from unconventional oil plays," Rasouli says, "this technology will certainly be used in other fields and other countries, such as China, Algeria and Argentina, which have just started to develop unconventional reservoirs."

— David Dodds

Patent to Create Renewable Jet Fuel from Crop Oils and Other Natural Sources Awarded

It took almost eight years, but researchers from the University of North Dakota's College of Engineering and Mines (CEM) and the Energy and Environmental Research Center (EERC) have been granted a U.S. patent for a process that creates renewable jet fuel from crop oils, among other sources.

Wayne Seames

Brian Tande

The new U.S. patent, titled "Method for Cold Stable Biojet Fuel" (U.S. Patent 9206367), was issued on Dec. 8. The inventors are Wayne Seames, Chester Fritz Distinguished Professor of Chemical Engineering, and Ted Aulich, EERC principal process chemist for fuels and chemicals.

"This was the first of five patent applications UND submitted related to the production of transportation fuels and commodity chemicals based on a technique known as cracking, and the fourth one that's been approved," Seames said.

For these patents, the cracking technique is applied to one or more feedstocks from a class of oils known as triacylglyceride (TG) oils. TG oils include crop oils, oils from algae and oils from some bacteria. The cracking process uses high temperatures and an oxygen-free environment to decompose the large, complex TG molecules into smaller molecules that are more useful for the production of fuels and chemicals, according to Seames.

Crop oils can be edible like soybean or canola oil, or inedible like camelina.

The UND researchers have demonstrated that a range of product material from the cracking reactor can be processed into a renewable fuel that meets all of the American Society for Testing and Materials and military specifications for petroleum jet fuel, including a freeze-point specification of 47 degrees below zero Celsius.

GREEN CHEMICALS

In a more recent related development, UND secured a U.S. patent to produce benzene, toluene and xylenes, the so-called "BTX" aromatic compounds out of the same kind of renewable materials used for the jet biofuel. The named inventors for this technology are Seames and Brian Tande, UND professor and chair of the Chemical Engineering Department.

"BTX compounds are the starting materials for many polymers, resins and elastomers on the market," Tande said. "The most common method for the production of BTX is the catalytic reforming of propylene and/or propane, which is typically produced from crude oil."

Because UND's new technology allows these critical chemicals to be produced from renewable feedstocks, it increases the green content of the final products and reduces the overall carbon footprint for production, Seames said.

The U.S. Patent Office approved the patent, No. 9,273,252, "Production of Aromatics from Noncatalytically Cracked Fatty Acid Based Oils," on March 1.

Seames said production of these more environment-friendly chemicals involves the same cracking process used to produce renewable jet fuel and can be made with the same crop oils or other feedstocks. In fact, both inventions can be combined together to increase the diversity and economic potential of TG oil cracking.

When combined with UND's previous patents in this area, a robust biorefinery can be constructed that produces a wide variety of green fuel, chemical and material products.

The initial concepts for each of these patented ideas were developed under grants from federal sources. Once the concepts were shown to be viable, the technology was developed to a commercially usable status as part of the SUNRISE BioProducts Center of Excellence (COE), which was funded by the North Dakota Department of Commerce.

The SUNRISE BioProducts COE is the applied research and development arm of the Sustainable Energy Research Initiative and Supporting Education,

Canola oil is just one of the crop oils which can be used for the production of renewable jet fuel.

or SUNRISE, supercluster program. While administered out of UND, SUNRISE is a multi-university, multi-disciplinary research center with investigators from UND, North Dakota State University and others.

The patent application development and approval process for both of these inventions fell under the direction of Michael Moore, associate vice president for intellectual property commercialization and economic development at UND.

The University is actively seeking to license this suite of technologies for rapid and widespread commercialization.

— David Dodds

Assisting Physicians to Prevent Hemorrhages

Kouhyar Tavakoulian knows how dangerous hemorrhages are, and he's working on technology that will help physicians in the future to track major blood vessels that might fail and rupture.

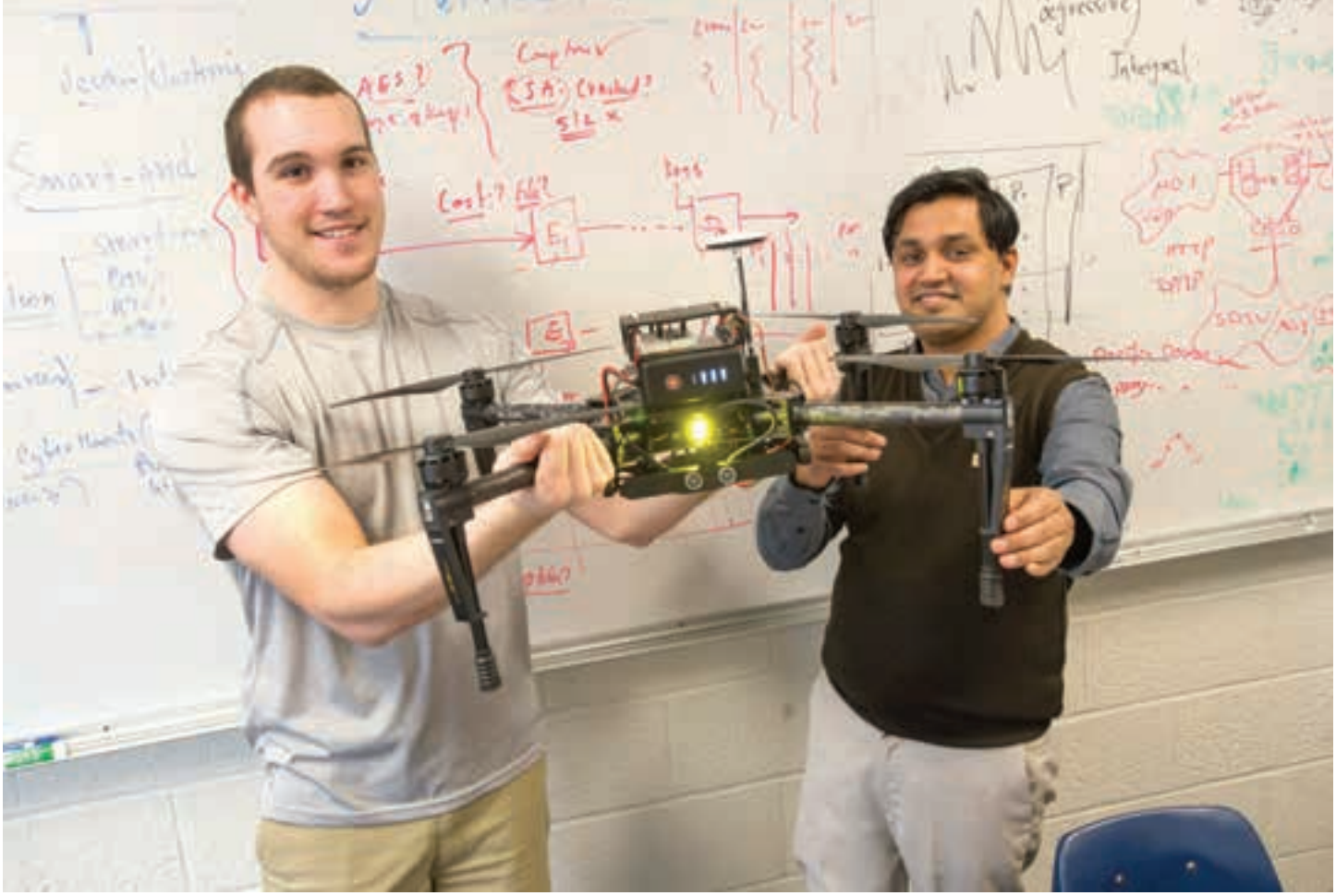
Hemorrhages, any profuse external or internal bleeding, are usually difficult to predict. A sudden hemorrhage of a major blood vessel, for example, during or right after childbirth, or bleeding as a result of battlefield wounds, can be fatal.

"Post-partum hemorrhaging is the No. 1 killer related to childbirth," said Tavakolian. "It's a big problem, especially in developing countries."

As a Ph.D. student at Simon Fraser University in Canada, Tavakolian was working on another diagnostic technology called seismocardiography: the science of closely tracking the heart's mechanical signals. While building and refining an improved heart-signal-sensing technology, he theorized that similar technology could be used to predict hemorrhages.

"The idea we're developing here," he said, "is a medical device that you can wear that would include a sensor on your chest and sensor on your finger that would detect mild drops in blood pressure or other cardiac signals that predict the potential for a severe hemorrhage."

Kouhyar Tavakolian, assistant professor of electrical engineering, and co-director of the Biomedical Engineering Research Complex



Electrical engineering major Eric Horton (left) and his professor, Prakash Ranganathan, hold a sophisticated unmanned aerial vehicle. Horton has been investigating cyberattacks on Global Positioning Systems datasets, a critical component in the navigation and control of these aircraft. Photo by Jackie Lorentz.

Engineering Researchers Work to Build Defense Mechanisms and Increase Cyber-Security

You could say electrical engineer Prakash Ranganathan and his team of researchers at the University of North Dakota's Secure Cyber Physical Systems and Data Sciences Laboratory are the elite special forces on a high-tech battlefield.

It's their job to identify vulnerabilities that make the world's growing fleet of unmanned aircraft system (UAS) and the nation's electrical utility grid susceptible to nefarious cyberattacks. Their mission, in the end, is to protect the public from a ubiquitous and hidden foe that's becoming more dangerous and tech-savvy every day.

Ranganathan's efforts have been recognized by North Dakota University System Chancellor Mark Hagerott, who asked the UND assistant professor to work collaboratively with University System partners on cybersecurity research as part of the chancellor's newly unveiled Nexus ND initiative. As associate lead, Ranganathan works closely with cybersecurity initiative leader Kendall Nygard, professor of computer science at North Dakota State University.

Ranganathan's lab is on the second floor of UND's Harrington Hall, part of the College of Engineering and Mines.

IN THE AIR

Most recently, Ranganathan and his team have been conducting cyber-security research for private-sector partner Rockwell Collins Corp., based in Cedar Rapids, Iowa. The goal of the project is to build defense mechanisms, through software algorithms, that fend off cyberthreats in UAS environments.

As part of this project, Eric Horton, an electrical engineering undergrad, has been investigating cyberattacks on Global Positioning Systems (GPS) datasets. GPS is the worldwide navigational and timing utility that provides accurate positioning services to publics on the move, as well as civil and defense agencies. It's also a critical component of UAS tracking and navigation.

"As an essential element of the global information infrastructure, cybersecurity of GPS faces serious challenges," Ranganathan said.

Some important public systems even rely on GPS as a security measure, but civilian GPS, itself, has no protection against malicious acts such as "spoofing" — security breaches caused when satellite signals are altered to provide erroneous location and timing data.

Ranganathan says this kind of spoofing can be a major threat to homeland security, and his research team is trying to understand the nature of these attacks and make civilian GPS more secure.

"We've developed a means to GPS spoof (UAS) and are now looking into several methods to defend against the spoofing attacks," he said. "Initial tests provide encouraging results."

Ranganathan and his research team are confident that this work will accelerate the development of defense technology against GPS-based attacks. And with the help of Roger French, a UND alumnus and lead Rockwell Collins engineer on the grant project, UND researchers will be a big part of that surge.

SIMULATED ATTACKS

Part of the research collaboration with Rockwell Collins is an opportunity for UND undergraduate students to complete a capstone course in cybersecurity. Currently, Ranganathan is advising five electrical engineering students in the capstone course: Kevin Casagrande, Joshua Friederichs, Clarissa Gonzalez, Tanya Humphries and Zachary Tindell.

A fun and valuable component of the capstone course is the development of a "UAS environment" that lets students experience simulated cyberattacks and defenses against them for fixed and rotary-wing UAS. The project is structured so the students are broken down into teams: a Red Team (Attack) and Blue Team (Defense).

PROTECTING THE GRID

Supported, in part, by a recent National Science Foundation (NSF) grant, Ranganathan's lab also is working with electric utilities to address security challenges for tomorrow's more technologically advanced power grid. Others involved in the project are co-principal investigator Naima Kaabouch, associate professor of electrical engineering, and Arun Sukumaran Nair, an electrical engineering Ph.D. student advised by Ranganathan.

Ranganathan explains this so-called "smart grid" is a massive and complex electrical utilities network of millions of interconnected devices utilizing advanced information and communication technologies.

Here, Ranganathan's research team is focusing on synchrophasors and phasor measurement units (PMUs), which make real-time monitoring, control and data analysis of the electric power grid possible. At the same time, however, PMUs can make smart-grid systems vulnerable to cyberattacks. This past summer, an undergrad exchange student working in Ranganathan's lab, Erwan Olivio from France, developed encryption and decryption algorithms with the GPS data embedded in synchrophasors, which showed signs of improved network security.

Other students doing important work on the smart grid project in Ranganathan's lab are electrical engineering grad students Nick Gellerman, Ranganath Vallakati, Anupam Mukherjee, Mitch Campion, Vedaste Mutambuka and Radha Krishnan.

In addition to Rockwell Collins and the NSF, Ranganathan's research sponsors include the Wells Fargo Foundation, North Dakota Community Foundation, UND Research Development and Compliance Office, and NASA's Experimental Program to Stimulate Competitive Research funding agencies.

According to the NSF, work such as that being undertaken in Ranganathan's lab is expected to transform the way people interact with engineered systems just as the Internet has transformed the way people interact with information.

All that, and they're protecting the world from cyberattacks that could spell doom for global defense capabilities and public utilities. All in a day's work for the UND team.

— David Dodds

An Engineering Degree Through Distance Education

HER STORY

My name is Maggie Carpenter and I am currently studying Chemical Engineering and Chemistry through a dual degree program with Benedictine College and the University of North Dakota. I just finished my junior year and only have two more years left to complete my degree. I am originally from Denver, Colorado, but attend school in Atchison, Kansas. This past summer I worked for Johnson Controls located in St. Joseph, Missouri through their internship program.

I am a distance student at the University of North Dakota because the engineering program at my school is currently not ABET accredited. The head of the engineering department at Benedictine College, Darrin Muggli, is a former UND professor. He left UND in order to start a new engineering program at Benedictine with the help of distance program offered at UND. I chose to study chemical engineering because I had a love for problem solving and math.

Engineering is a degree that directly impacts one's life on a daily basis because we create the processes that make products that consumer's use. I wanted to have a career that I could impact people on a daily basis that also utilized my skills in chemistry and mathematics. It really dawned on me how much the world needs engineers on a mission trip to Africa that I went on for spring break this year with some of my classmates. We constructed a water tower to make the process for the people getting water quicker and easier. They were extremely grateful for the work that we had done and it was then that I knew for sure I was in the right field.

I have really enjoyed studying engineering up to this point in my schooling as well as my distance classes at UND. All of the professors are extremely helpful and understanding to the fact that you are not on the same schedule as the on-campus students. I look forward to continuing my education and then getting out into industry working as a chemical engineer.

– Maggie Carpenter

BUSINESS AND FAMILY MEET

Zach Faber and Kayla Wyer have very different stories, yet they share a goal: To complete their chemical engineering degree online through the University of North Dakota's Distance Engineering Degree Program (DEDP).

"There are no chemical engineering programs in the Wichita area, and since I work full-time, I did some extensive research and UND was the best fit for what I needed as a working, non-traditional student," said Faber.

Wyer had the same challenge. No chemical engineering programs were offered in her area so she looked to UND's program.

Faber has a background in environmental science, and a degree in biology. He owns his own business, Strata, LLC, a holding company of various compliance businesses that focuses on environmental, health and safety compliance and engineering; solution mining; and natural gas and natural gas liquids underground storage.

While working as an environmental scientist, Faber gained knowledge of the chemical engineering field by working alongside professionals. One engineer explained how his work went beyond solving regulatory compliance issues for a facility. Another demonstrated the uniqueness and power of chemical engineering applications.

In addition to working full-time and completing his degree, Faber also takes care of his family; he has six kids. His hectic schedule was one of the reasons UND's chemical engineering program fit best for him.

Accreditation is another reason Faber looked to UND.

"Being ABET accredited, the Accreditation Board for Engineering and Technology, Inc., and being in the Midwest made UND the easy choice for me. Honestly, I couldn't find another program that provided the entire undergraduate curriculum at a distance," said Faber.

ROAD OF LIFE

Wyer wants her story to provide an example that obtaining a degree online is doable, no matter the circumstances and road life takes you.

"I had a baby in high school, when I was sixteen. I wanted to stop being a 'statistic' and do what others thought I couldn't," said Wyer.

After spending a few years raising three children and working full-time, she decided to further her education.

In 2013, after receiving an associate's degree, Wyer started studying biochemistry at a college in her hometown, but found she wasn't as passionate about that degree like she had hoped.

She had always wanted a degree in chemical engineering, but there wasn't a university close enough that offered the degree on-campus. So, she settled and started working on a degree she really didn't want (biochemistry). Soon after, Wyer began searching for universities that offer engineering degrees online. She found only one: The University of North Dakota.

"I have been enrolled in college full-time for six years now. I'm a wife, I work 20+ hours a week, and I care for my three children. My days are busy," said Wyer.

Wyer added that despite what some may think, online classes

are just as much work, if not more than on-campus courses. It's not easy but it's definitely possible.

She's looking forward to the required, on-campus labs, where she'll meet other students and her chemical engineering professors in a hands-on setting.

After completing her chemical engineering degree, Wyer hopes to do something with research or safety in the oil and gas field.

– Hannah Manske
Office of Extended Learning communications intern

MINNKOTA POWER ANDREW FREEMAN DESIGN COMPETITION

Left to right: Katelyn Randazzo–ChE , Jeremy Cole–ChE, Preston Schatz--EE, Leah Althoff–ChE, Samual Gradin–EE, Brendan Kennelly Senior Manager of Electrical Operations, MPC, Hesham El-Rewini, Dean, CEM, A.J. Warm–ME, Mike Hennes, VP, transmission, MPC, David Schoeberl–ME, Devin Drangstveit–ME, Scott McDaniel–ME, Dalton Reitz–ME

ASSOCIATED GENERAL CONTRACTORS SCHOLARSHIPS

Associated General Contractors of ND has a 52 year history of awarding scholarships to UND Civil Engineering Students. The following students received scholarships: Jonathan Olson (Walter I. Swingen Scholarship-Full Tuition), Keith Korman (John Jardine Memorial Scholarship-Full Tuition); Austin Alexander (Lindberg Construction Scholarship). Representing AGC are Paul Dietrich, President, Industrial Builders, Russell Hanson, Exec. VP, AGC, Carey Burke, accounting manager, Gratech.

A Land of Lava

March 9, 2016, Dr. Jaakko Putkonen boarded a plane to Hawaii along with 18 undergraduate and graduate students from the Herald Hamm School of Geology and Geological Engineering for a spring break trip that most students wouldn't typically experience. The students spent their days climbing peaks of volcanoes, studying many different types and variations of lava, and cascading down into lava vents.

The trip was divided into two sections on two different sides of the island. The first half of their trip was spent on the desert-like west side of Hawaii, and the other part of their trip was spent on the jungle-like atmosphere of east Hawaii, which receives heavy amounts of rain year round.

Students experienced a variety of self-discovery interactions with the island and the lava. One of these experiences involved students sketching landscapes to become aware of their surroundings. Putkonen says, "When you start drawing a landscape it makes you pay attention to every part of it." This has encouraged students to study a piece of land and be attentive to every detail; this was part of their daily routine. In addition, students studied the different types of lava on the island.

One of their daily discoveries was observing how lava has its own fingerprint. Lava has specific chemical makeup that can be traced back to the volcano it erupted from. The two main types of lava, pahoehoe (pronounced "paw-hoey-hoey") and aa (pronounced "ah-ah"), differ in various properties such as crystal and gas bubble content. Once cooled, pahoehoe and aa are easily identifiable by their characteristic textures. Pahoehoe has a smooth, billowy, ropy surface and has at times been likened to the surface texture of a pan of chocolate brownies. On the other hand, aa has a rough, jagged and clinker surface.

In the final days of the trip as the students hiked Mauna Kea, the highest volcanic peak in Hawaii: elevation 13,795 ft. Many students described this part of the trip the "hardest part" because of elevation and lack of oxygen; some didn't make it all the way up the mountain. Students agreed that visiting and studying outside the classroom on this land of lava was an amazing learning experience.

– Bethany Plemel Carrothers

Sketching on the rainy side of the island

Volcano

on the road with CEM

On April 25-26, 2016 CEM had their mid year Executive Board meeting in Maple Grove, MN. Pictured Left to right: Matt Cavalli, Barbara Walz, Mike Man, Terry Severson, Ben Dove, Craig Olson, bob Solberg, Hesham El-Rewini, Larry Wilken, Tom Erickson, Andy Bjerke, Sherri McDaniel, Levi Lewis, Lisa Barnes, Michal Wegerson, Jim Albrecht, Sima Noghanian, Brian Tande, Marcellin Zahui, and Trevor Lachance.

April 25, 2016. Dean El-Rewini, Deb Austreng and Andrew Bjerke toured Emerson Process Management/Rosemount in Shakopee, MN. Pictured left to right: Kristin Stahl, Andy Bronczyk, Kyle Kronforst, Dave Broden, Kevin Ivanca, Gerard Hanson, Renae Patrick, Andrew Bjerke, Deb Austreng, Karen Isaacson, and Hesham El-Rewini, Dean.

Nearly 40 CEM alumni joined in small group idea exchanges and enjoyed lunch together while getting an update from Dean El-Rewini.

On May 31, UND College of Engineering & Mines alumni held a dinner gathering at Ciao Bello, Houston. Attended by: Bret Fossum, Bob Solberg, Dean El-Rewini, Kim Hodenfield, Kyel Hodenfield, Andy Bjerke, Dylan Loss, Ashley Russell, Terry Lucht, Andrea Hansen and Kristine Solberg.

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–Hesham El-Rewini

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Andrew Bjerke, '01 | Director of Development
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