FALL 2020
GRAND FORKS, NORTH DAKOTA

# Kinetics

THE UNIVERSITY OF NORTH DAKOTA
CHEMICAL ENGINEERING NEWSLETTER

## CHAIR'S MESSAGE

FRANK BOWMAN

Hello from UND and welcome to this year's edition of Kinetics! We hope you enjoy reading about all the exciting things that have happened with our students, alumni and faculty this past year.

In last year's newsletter I mentioned that we had a fairly normal year. This past year, and even more so in the coming year, that is definitely not the case. With the ongoing COVID-19 pandemic we have made, and are continuing to make, a variety of adjustments [see cover story]. We've all become very proficient at zoom meetings and my kids got to see a little more of what a college professor actually does ("You're writing a paper? You mean you're actually one of those scientist people?"). Instead of our annual senior dinner and roast we held a virtual happy hour with a slideshow of all the usual embarrassing childhood photos [see photo pg 4].

Providing a high quality education to all of our students remains our top priority. Collaboration and teamwork continue to be hallmarks of the

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### Join UND ChE On LinkedIn

We have a UND Chemical Engineering group on LinkedIn! This allows our alumni to connect with one another and to get the latest updates from the department. We also use this site to post job announcements for alumni and students. Join now and find out what over 350 of your fellow ChE alumni are up to!

To join, go to www.linkedin.com and search **for "UND Chemical Engineering" under groups.**

# AND THEN, EVERYTHING CHANGED!

## UND ChE works hard to minimize the pandemic's impact on student learning and progress towards graduation

On March 13, 2020 most of UND's students left campus for Spring Break. Little did any of us know that it would be the last time that semester we would see them face-to-face! Reminiscent of the Flood of 1997 which forced UND to cancel the last six weeks of the semester, the COVID-19 pandemic forced UND to convert from physical teaching to virtual teaching.

The initial decision was to delay a return to campus for two weeks after Spring Break so that any students who contacted the disease would exhibit symptoms and go into quarantine instead of bringing the virus into the classroom. However, once the extent of the spread of the virus became known, UND made an early decision to close for the

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# COPING WITH COVID-19

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rest of the Spring. UND also took an early, proactive approach to social distancing that minimized the number of students, faculty, and staff that contracted the disease. Summer classes were subsequently moved to 100% on-line delivery and this fall we are teaching under "minimal contact" conditions that limits the number of students in the classroom, avoids close group work, and other reasonable precautions.

Frank Bowman at his temporary "chair's office" in his home. Note the COVID beard!

## *IMPACTS ON TEACHING*

As the only ABET accredited distance BSChE program in the U.S., UND can truly claim to have been uniquely qualified to adapt to a totally on-line educational experience. For most of our courses, the transition was relatively painless. But for courses with lots of in-class problem-based learning, instructors could no longer teach by walking around and giving advice to student groups. Instead, most instructors recorded videos with step-by-step explanations of how to solve the problems. We were moving in this direction anyway as the ratio of distance to on-campus students has continued to increase, so this just accelerated this trend.

The biggest challenge was how to complete Spring and Summer labs. Fortunately, one of the great things about engineering is that so many of our day-to-day tasks can be explained using engineering phenomena. A lot of our DOE experiments have been replaced with baking or optimization of kitchen tasks. Some of the highlights of our take home labs include: determination of food dye concentration, reaction kinetics of brewing Kombucha, optimization of a perfect cup of coffee, and translating some of our in-lab experiments to be safe for performing at home. Dave Hirschman, ChE Laboratory Technician, has been fantastic at following directions set forth by CHE431 Laboratory IV students and allowing them to guide him remotely through Zoom as he serves as their eyes and hands in the lab!

Another major challenge was administering exams for our on-campus students and even some of our distance students. Most of our distance students were being monitored using a company called ProctorU which UND hired to oversee distance student exams. While these students continued to use this system, they often had to adjust their timing because ProctorU was overwhelmed with proctoring requests from other universities. However, some of our distance students were using a testing center to proctor their exams. These testing centers closed down along with the rest of the country during the Spring term.

**ChE Lab Technician Dave Hirschmann assembles lab supply kits that allowed students to have a hands-on lab experience while social distancing**

A number of approaches were explored to offer remote exams to the formerly on-campus students as well as the distance students that lost their testing proctors and we will be applying best practices beginning this fall. Some faculty converted their simpler in-class exams to multiple choice exams. Some wrote take home exams. Others used online software systems to proctor students in their homes. We were already using YuJa to record our lectures and to make tutorial type videos. YuJa also has a remote proctoring feature where each student is recorded while taking the exam using their own home recording device (laptop, cell phone, etc.). The instructor can then review the recordings later to ensure that students were behaving properly and ethically during the exam. Another option we explored was to use the Zoom video conference system for proctoring, lectures, office hours and meetings.

## *IMPACTS ON STUDENTS*

A significant, non-educational impact was the inability of many of our students to keep their part-time or in the case of many of our distance students, their full time jobs. With all of their college expenses, this represents a real hardship for many of them. UND quickly expanded its "Angel Fund" where students could turn for partial assistance [for

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# ChE Adapts in Response to COVID-19

*(Continued from page 2)*

further information on this fund, please go to: https://undalumni.org/angel or contact Robin Turner, see pg. 19]. Many students also reported that permanent or internship job offers had been rescinded last Spring.

DEDP student Luke Holtshouser let us know that he was laid off in April 2020 from his job with a wastewater treating services company in Alaska as the company's product sales dropped off due to the pandemic.

"Even though the world seems like a strange place to me and the country seems more polarized culturally and politically, I am still optimistic. I will continue to "take the next right action" and move forward in the chemical engineering program."

Luke Hotshouser using a simple calorimeter to determine the heat of ionization of water and the 2nd ionization of a diacid, malonic acid, in an at home ChE 235 Summer Lab I experiment.

Here are some other comments we received from our students on how the shutdown affected their educational experience (thanks to Justin Mann, Eli Peske, Mark Miller, and Jessica DeVillers for your input):

- "The shutdown only moderately affected the quality of instruction given as the course lectures are available online. In-class discussions were missing from these lectures but the instructors were available through email for any questions raised while watching lectures."
- "I think overall, the quality of classes was the same, the only thing really lost was immediate feedback on in class activities. I think our program is better equipped to handle online classes than most."
- "The biggest adjustment to working from home was self motivating. It was easy to slide into a routine that had the day beginning late in the morning, losing some of the most productive hours of my day. It was easy to be distracted at home and motivation lacked until a real daily schedule was established and work began to flow again."

Senior Eli Peske mostly studied while sitting on his bed.

- "The shutdown taught me the importance of clear communication in all forms. Communications during the shutdown over email, text messages, and even sometimes zoom, were often less clear and less concise than in person communication."
- "I think the biggest impact of the shutdown was no longer spending time with my classmates everyday. Most of us grew pretty close over the 4 years we were in the program together and to miss out on our final months together was sad. "
- "I missed having a senior banquet. Although the virtual banquet was a nice way to end, a virtual event can never replace having people around."
- "Regarding the virtual commencement, I was only interested in the slide of myself which was underwhelming. There doesn't seem to be a true substitute for walking across the stage with my classmates at the end of all of my coursework. However, I was able to somewhat experience this rite of passage with my family in a mock graduation that my wife organized."

## *IMPACTS ON RESEARCH*

While UND closed its doors completely for instruction, research continued but on a more limited basis. When possible, students worked remotely for literature reviews, writing of papers, theses, and dissertations, and to run computer models when software was accessible. Students needing to perform laboratory work or to use special computers/software continued to come to campus to complete these assignments. Balancing the need to social distance with the need for "two in the area" safety requirements for many of our labs was challenging. UND limited on-campus research activities to graduate students and faculty. This forced us to modify some undergraduate programs, such at the NATURE program, to only offer virtual research experiences. For others, we were forced to cancel summer activities entirely. For students at the end of their programs, thesis and dissertation oral defense meetings were held virtually using videoconference software.

Senior Mark Miller set up his study space on his kitchen table.

## *MAINTAINING EXCELLENCE*

Despite all of the limitations and challenges we faced, UND ChE continued and will continue to offer the highest quality undergraduate chemical engineering education available as well as continue to train engineering scholars and make significant contributions to improve the human condition through our research.«

# FRANK BOWMAN, CHAIR AND TOM OWENS ASSOCIATE PROFESSOR

(continued from pg. 1)

student experience and how our faculty and staff work together. We still have great alumni, including another 41 BSChE and eight graduate students who celebrated their graduation this past year.

Our alumni continue to support the program in a variety of ways that are greatly appreciated whether it be classroom visits, hiring and mentoring new graduates, sponsoring design projects, or financial donations. For those of you interested in making a donation this year, a fantastic opportunity is available to double your impact by contributing to the Thomas C. Owens Endowed Chair of Chemical Engineering due to the generosity of a donor who is providing a dollar for dollar match [see pg 19]. What a great way to: honor Tom who has influenced so many of you, support high quality teaching by faculty who share Tom's passion for education, and help the department continue to thrive in challenging budget times.

When not dealing with coronavirus planning, I managed to keep working on my teaching and research. I continue to teach ChE 201 Chemical Engineering Fundamentals in the fall and spring and this past spring I got the chance to teach ENGR 340 Professional Integrity in Engineering to over 100 students from all across the College. This course, previously ChE 340, was relabeled due to its popularity among non-ChE students. It was my first time teaching the course and I don't think I would have survived without the help, advice, and course materials from the regular course instructors, ChE faculty member Beth Klemetsrud, and ChE alum Stacy Bjorgaard, BSChE '10, PhD ChE '15, who works as an Instructor in the CEM Student Success Center.

My research has also been going well this year. Carlos Bucaram is completing his Ph.D. research exploring air quality in North Dakota and the upper Midwest region using state of the art atmospheric models. I have also been pursuing several new opportunities in engineering education research, including developing proposals on two separate K-12 STEM education projects, and leading efforts to establish an exciting new postdoctoral position in engineering education as part of a collaborative effort between CEM and the UND College of Education & Human Development that will help advance research efforts and cooperation between faculty in both colleges.

On the home front I'm starting to feel old as Ryon graduated from BYU with a degree in nursing, Allie is halfway through the ChE program at Clarkson, and Maia is going to be a senior in high school. It is strange and exciting to see my little girls turn into responsible adults. It doesn't seem that long ago that we were driving with the three of them up to Grand Forks from Nashville, but I guess that was 15 years ago now. Erin and Eli are also still at home, so life in the Bowman house is plenty interesting with all of their activities. Alisa continues to work as a school social worker for the Grand Forks Public Schools, splitting her time between West and Lewis & Clark elementary schools.

Best wishes to all of you! We love to hear from you, so please keep in touch and feel free to stop by anytime you are in the area.«


A screen shot of some of the participants in this year's "senior virtual happy hour", our replacement for the roast.

# Brian Brian Tande named College of Engineering and Mines Dean

(adapted by the original article published March 26, 2020 in University Letter, Jan Orvik, Editor)

Vice President for Academic Affairs and Provost Tom DiLorenzo [Dr. DiLorenzo retired from UND in June, 2020] appointed Brian Tande as Dean of College of Engineering & Mines (CEM). He was one of three finalists who interviewed for the position after a nationally competitive search that began last fall. After his appointment, Brian simply continued the job he took over as interim dean of the College in April, 2019.

"I'm delighted that Dr. Tande has accepted the deanship, and will continue to lead the College of Engineering & Mines," DiLorenzo said. "He's an innovative collaborator and natural entrepreneur who brings a wide array of academic and private-sector experience in the science of engineering, research and commercialization. And much of that experience was honed right here at UND."

"Being selected as the Dean of CEM is an incredible honor," Tande said. "I welcome the opportunity to lead the college I love and have been a part of for 13 years."

Tande, a Stanley, N.D., native holds chemistry and chemical engineering degrees from the University of Minnesota and a Ph.D. from the University of Delaware. He served as associate dean of the College until he was appointed interim dean. He was also director of CEM's Grand Challenge Scholars program, and served as interim director of the School of Electrical Engineering and Computer Science in 2018.

## *Outstanding Professor*

Tande served in UND's Chemical Engineering Department from 2006 to 2017, and was named Outstanding CEM Professor of the Year in 2010. In 2017, he briefly left UND for a stint at Kansas State University, where he was the graduate programs director and an associate professor of chemical engineering. He returned to UND in June 2018.

In the private-sector, Tande was a product developer working with high-performance polymers for GE Plastics, in Mt. Vernon, Ind.; and a director of operations and quality improvement manager with Fargo-based Tecton Products, LLC, a fiberglass composites manufacturer for the window and door industry. He's also a co-founder of two companies that have developed UV-reflective coating materials. One of these, Lumacept, Inc., has commercialized a patented coating technology that is used in the disinfection of hospital rooms. Tande is the author or co-author of at least 25 peer-reviewed research publications and holds 10 separate U.S. patents.

## *'Full speed ahead'*

Tande says that in his new role as dean, he wants to ensure the College fully supports UND's strategic plan by growing quality online programs, improving retention and graduation rates and expanding research. He's also committed to ensuring the college continues to support the Grand Forks region and the State of North Dakota, including in fast-growing areas like computer science, data science and cybersecurity.

"We contribute significantly to the workforce needs of North Dakota industry and I'm excited to expand our relationships with ND companies even further," he says.

"Dr. Tande is the right person to lead the College of Engineering & Mines," said Interim Provost Debbie Storrs. "He understands that now more than ever, the College must be nimble and responsive to workforce needs, the changing student demographic, and student interests. And, importantly, he can work effectively with his committed faculty to create an innovative and high-quality curriculum to meet such demands

"The College cannot afford to take its foot off the gas," Tande said. "I intend to keep us moving full speed ahead."«

## A Message From Dean Brian Tande

Dear ChE Alumni and Friends,

It was an incredible honor to be named as the next Dean of the College of Engineering and Mines this past spring. While I certainly didn't imagine becoming the Dean when I joined UND ChE back in 2006, I feel strongly that the mentoring I received by senior colleagues in the department helped prepare me for this job. That includes making students the focus of everything we do as well as striving for excellence and encouraging innovation in both teaching and research. This culture within the ChE Department remains very strong and I intend to use it as a model for the rest of the college. In fact, the department was once again honored with UND's Departmental Excellence in Research this year [pg 6]. Congrats to all of our hard working ChE faculty, staff, and students!

The pandemic had a significant effect on higher ed, but as you can see in this newsletter it didn't slow the UND ChE community! The department continued to do great things and serve our students in the best way possible. As we all worked hard to respond to the crisis, I was continually impressed by the resilience, creativity, and adaptability shown by our students and faculty. We can all be proud of how UND ChE was able to respond to this crisis.

I hope you enjoy this year's *Kinetics*. Please feel free to reach out to me any time. Best wishes and stay safe!

-Brian

# CHE RECEIVES UNIVERSITY-WIDE AWARD FOR DEPARTMENTAL EXCELLENCE IN RESEARCH

On February 27, 2020 the faculty and staff of the ChE Department made a familiar trip to the podium at the annual UND Founders Day Banquet where they received the UND Award for Departmental Excellence in Research. This is the fourth time the department has been so honored (1973, 2005, 2011).

In his nomination letter, Dean Brian Tande wrote: "Chemical Engineering is a shining example of how a faculty, working together as a team can reach excellence in both research and teaching while still providing significant service to the college, university, and chemical engineering profession."

Some of the indicators of the department's success in research are:

- Research expenditures for the past four fiscal years of over $2.5 million which is over $360,000 per full-time equivalent (FTE) faculty members for that period.
- Participation in 37 External and EPSCoR grant awards (5.5/FTE faculty) with a combined value of over $15 million ($2.1 million/FTE faculty)
- Contributions to 58 peer-reviewed journal publications (7.7/FTE faculty), most with UND student co-authors, in high quality scholastic journals. Faculty also made 40 presentations with an additional 82 by students at technical conferences.
- Numerous individual faculty research-related awards including two Fulbright scholar awards, one national academy induction, one UND collaborative research award, and three college-level research awards.
- Ten PhD and 18 MS student graduates over the past 5 year period with an additional 8 PhD, 10 MS, and 4 MEng students graduating in the current academic year or still in the program.
- ChE faculty collaborations in external and EPSCoR research proposals with researchers from 18 different UND departments/organizations and received awards with researchers from 12 of these groups. In addition, ChE faculty have collaborated with researchers at 18 other universities (awards received with 8), plus 16 companies/NGOs (awards received with 9) and one national laboratory.

CHE Department Faculty and Staff Receive the Award for Departmental Excellence in Research from Incoming UND President Andy Armacost (left) and Alumni Foundation CEO DeAnna Carlson Zink (2nd from right) at the 2020 Founder's Day Award Banquet

# Arlen Nordhagen, BSChE '78
## Inducted into UND CEM Academy

Arlen Nordhagen at his induction ceremony with his mentor, former UND ChE Chair and Fellow Academy Member Tom Owens

One of the highlights of Homecoming week in the UND College of Engineering and Mines each year is the Engineering Academy induction ceremony. The academy was established in the fall of 2003 to honor the achievements of alumni, and serves to encourage and motivate current students in their academic pursuits. This is the highest award bestowed on our alumni by the College. For more info, go to: https://engineering.und.edu/outreach/alumni-academy.html .

At the October 2019 ceremony, **Arlen D. Nordhagen, BSChE '78,** joined the illustrious ranks of UND CEM alumni who make up the Academy.

*A DIVERSE AND SUCCESSFUL CAREER*

After obtaining his UND degree Arlen had a long and successful career with the DuPont Company (1978-1986). With the encouragement of his former UND Professor Tom Owens, he earned an MBA from the Harvard Graduate School of Business Administration. In 1986 Arlen left DuPont to focus on business development activities, first with Synthetech, then with American Business Advisors, and finally with a company he founded, the Nord Capital Group. In 1999 he co-founded and led SecurCare Self Storage until 2013 when he founded yet another company, the National Storage Affiliates REIT. He also founded MMM Healthcare, the largest provider of Medicare Advantage health insurance in Puerto Rico. When he wasn't developing and running business development companies, Arlen was busy directing his own non-profit, the Nord Foundation.

CONGRATULATIONS ARLEN ON A GREAT CAREER!

# Red Pine Distillery in Grand Forks Switches from Vodka to Hand Sanitizer

(Extracted and updated from the original published in the Grand Forks Herald by Adam Kurtz, April 3, 2020)

Tyler Seim is producing hand sanitizer at his Red Pine distillery in Grand Forks. Photo by Eric Hylden / Grand Forks Herald

Those looking to enjoy a drink of sugar beet vodka will have to wait, as Tyler Seim, **BSChE '15,** owner of Red Pine Distillery in Grand Forks, is making the switch to hand sanitizer in light of the coronavirus pandemic. Seim has put his nearly 2-year-old vodka-making business on hold to make sanitizer, a product that was nearly impossible to find last Spring. He teamed up with the Red River Biorefinery, an ethanol plant with over 100,000 gallons of nearly pure ethanol available. What the Biorefinery didn't have was a bottling facility, something that Seim's business is capable of, as he bottles his vodka on-site, in 750-milliliter bottles. He said hand sanitizer bottles were hard to come by at first, but he now has sanitizer available for all local businesses or individuals who want it.

Seim sells directly to the public and through a number of local businesses. Santizer is available in a number of sizes, with a one gallon bottle priced at $35. He is posting Facebook updates each week with the days and times that people can stop into the distillery to get their hand sanitizer.

He doesn't sell it all. Instead he gives most of it away to places that need it the most.

"The majority of it is donated to places like Altru Hospital and nursing homes, with the rest made available to the public," Seim said. "As of June 1st, we had produced and distributed around 8000 gallons."

Thanks Tyler for putting those UND ChE skills to good use helping the community!

# MICHAEL MANN

## CHESTER FRITZ DISTINGUISHED PROFESSOR
## CEM ASSOCIATE DEAN FOR RESEARCH
## EXECUTIVE DIRECTOR, THE INSTITUTE FOR ENERGY STUDIES

This year marks my 40th year at UND! I started my career in February 1981 at the EERC. At that time the facility was operated by the Department of Energy, but much of the work was done by subcontractors, including UND. I made the move to the Chemical Engineering Department in 1999, so have spent more than half of my career here.

My role has changed significantly over the years and now most of my time is spent in support of CEM as Director of the Institute for Energy Studies (IES) and Associate Dean for Research. While these roles are more research focused, as the Graduate Director for the Energy Systems Engineering and Environmental Engineering graduate programs, I am able to stay in touch with the graduate students, and those undergraduates interested in taking graduate courses to meet their elective requirements. This year we added ENGR 554 Applied Project Management which has had a 50:50 split of undergraduate and graduate students. We have already had several students report that they have been able to take the Project Management Institute's exam and obtain their certification. Other courses I have been working to develop along with one of my PhD students are ENE 510 Energy Systems Engineering (a new addition) and Managing Engineering Systems (a retooling of ENGR 501 Energy Resources and Policy that I used to teach). I still include ChE 404/504 Air Pollution Control and ChE 503 Fuels Technology in my repertoire.

The big news on the personal side was the wedding of my son Justin on June 20th. He also graduated this spring from UND with his degree in ChE. It was kind of coincidental that he didn't have a graduation. The last time graduation was canceled was in 1997, the year of the flood, and also the year that I graduated with my PhD! Justin will be starting his career with Hess in the fall and will be stationed in Minot, which will be hard for us grandparents, but that is better than Houston. The family photo also includes my daughter Jessica along with her significant other, Riley. No date set yet, but we expect another wedding soon. They bought a house in Minnetonka, MN. where Riley and I have spent many hours remodeling, transforming it to open concept and redoing every room (taking them down to the 2x4 studs) except the bedrooms.

I still shoot sporting clays for fun, and do woodworking as a hobby. We built a workshop this summer as a pre-retirement plan. That way I won't need to hang around the house all day once I quit going to the office. There is still a lot of interior work to do on the shop, but that can be my winter project. My wife Terrie keeps active in her flower gardens, so I am blessed during the summer with the feel of living in a park.

Please keep in touch. We are all getting used to using Zoom and other video platforms. This has been great as I now see most people face-to-face (sort of) rather than just as a voice on the end of the phone line. Perhaps I can see some old faces during the upcoming year.«

## CHE'S MICHAEL MANN NAMED UND'S "PROFESSOR OF THE YEAR"

In case you didn't know, ChE's Mike Mann is one of the most successful members of the UND faculty and he added another plaque to his collection at this year's Founder's Day when he was awarded the UND Foundation/B.C. Gamble Faculty Award for Excellence in Teaching, Research or Creative Activity, and Service. More commonly known as the Faculty Scholar or UND Professor of the Year award, it is the highest annual honor UND awards because it reflects excellence in all three aspects of the faculty member's job—teaching, research, and service.

Mike has the strongest research record in CEM, is a versatile teacher, and has served the university and broader community in many ways. Mike's record in research speaks for itself. He has had continuous funding beginning his first year at UND allowing him to continually support graduate students. Seventeen doctoral students have graduated with Mike as their primary advisor. He has served as primary advisor for over 30 master's students. He is currently the advisor for 4 PhD and 4 MS students. All of his students are supported with GRAs funded from his grants. Mike is a very versatile teacher who is able to connect with students at all levels. He has a reputation as being fair and respectful of all students. Somehow he also finds time to participate in numerous service activities for CEM, UND, and the community.

CONGRATULATIONS TO MIKE ON THIS WELL-DESERVED AWARD!

# INSTITUTE FOR ENERGY STUDIES PROVIDES RESEARCH OPPORTUNITIES

The Institute for Energy Studies (IES) was initiated by former President Robert Kelly and former CEM Dean Hesham El-Rewini in 2010 as a vehicle to facilitate inter-disciplinary energy-related research and education across UND. ChE Faculty member MIchael Mann was assigned as the Executive Director in 2015 when former ChE faculty member Steven Benson, the founding director, moved to the EERC.

IES Director Mike Mann (2nd right) with IES student engineers (from left): Nolan Theaker, PhD ChE; Brittany Rew, MS/BSChE , and Joshua Oluwayomi , PetE MS

The IES has become a major research engine for the college, and provides many opportunities for students and faculty, and for alumni and the companies where they are employed.

While the IES is involved in many different projects, its current funded work falls into the following areas:

- Extraction of rare earth elements from North Dakota lignite and other coal-derived products
- Novel enhancements to chemical looping combustion and chemical looping reactions
- Improving the performance of lithium ion batteries
- Treating high salinity/brackish waters to produce clean water and recover valuable chemicals
- Evaluating energy cycles with a focus on increased efficiency, energy storage and load leveling
- Upgrading lignite coals for the production of value added chemicals including graphene and carbon anodes

The IES provides great opportunities for our students to gain experience in inter-disciplinary research. There are typically six to ten undergraduate and ten graduate students working with IES researchers at any given time. The IES team includes chemical, electrical, mechanical, geological and petroleum engineers. A "Junior Engineer" position that mimics traditional co-op/internship opportunities was created and is offered to outstanding undergraduate students.

IES Engineers Max McCann, BSChE '19 and Brittany Rew, MS'20/BSChE'18. conducting experiments in one of the IES laboratories in the Collaborative Energy Complex Building—CEM's newest«

Dr. Mann and others in the IES also work with faculty in the college to enhance their careers. Dr. Mann has been a mentor and Co-PI on recent projects with Ali Alshami (ChE), Hui Pu (PetrE), Frank Xiao (CE), Julia Zhao (Chemistry) and Gautham Krishnamoorthy (ChE). Four recent ChE graduates have become a part of the full-time research staff of the IES: Ryder Shalbetter (BS 2018), Brittany Rew (BS 2018), Sebastian Gardner (MS 2019), and Johannes van der Watt (PhD 2019). Two of the current IES researchers are working on their ChE PhD degrees on a part time basis.

While it's primary focus is on research, the IES also administers the MS and PhD programs in Energy Engineering and Environmental Engineering that were formerly administered by the ChE Graduate Director. Dr. Mann is the graduate director of these programs which currently have an enrollment of about 30 students. Many are taking advantage of the on-line offering of these programs. If you are looking for professional development opportunities for you or your employees, this option allows the student to get an advanced degree without leaving the company, and with the ability to do research directly related to the company [note: similar options are available for ChE MS, MEng, and PhD degrees].

The Institute has taken an aggressive approach to expand our research base to include industrial clients. While the Institute has worked with a wide range of companies, they are establishing a group of key companies that are considered "Industrial Affiliates" because of their close relationship with the IES. These companies have been partners on SBIR/STTR grants and also support each other through intellectual exchange of ideas. This core group also provides opportunities to students in the form of directed research, internships, and senior design projects.

Current affiliates:
Amistra Consulting Ltd, Clean Republic, Envergex LLC. Microbeam, and SysDynX.«

ChE PhD student and IES Engineer Nolan Theaker holds rare earth elements extracted from North Dakota lignite.
Photo by Mike Hess/UND Today.

# EDWARD KOLODKA

## ASSOCIATE PROFESSOR

Hello everybody. It's been a strange year and most of us will be glad to see the end of 2020! We've had to make a lot of adjustments on the fly, such as rapidly transitioning to all remote teaching. It's been a challenge, but I think we managed to maintain our high teaching standards. It's forced me to rethink a lot about the elements of my own teaching and I'll be making some changes going forward. During the Fall 2019 semester I took over ChE 102 Introduction to ChE from Mike Mann, co-taught ChE 411 Plant Design 1 with Wayne Seames, and ran the ChE Graduate Seminar Series. During the Spring 2020 semester I taught ChE 321 Reactor Design, ChE 416 Product Design, and ChE 232 Lab 1. This fall brings a new set of challenges as I will be taking over ChE 411 Plant Design from Wayne. I've co-taught the course with him for the past two years and believe I am ready for my first solo flight! To paraphrase Douglas Adams - There is an art to flying, or rather a knack. The knack lies in learning how to throw yourself at the ground and miss. Here's hoping I miss the ground! Along with ChE 411 I am also teaching ChE 102 and coordinating the Seminar Series.

Life in the age of social distancing has been a challenge for my family. Or rather for parts of my family. I'm a typical introverted engineer and we were born for social distancing! My son has (unfortunately for him!) inherited my disposition and has barely missed a beat transitioning to all online instruction and life spent almost entirely at home. My wife and daughter on the other hand had/have virtually terminal cases of cabin fever. Other news on the home front is that my son will be starting high school in the fall while my daughter starts junior high. My family picture (which is a year old) was taken on the beach in Belize as this year's vacation plans had to be delayed.

I also continue to pursue research focused around polymer engineering. My current projects are developing strategies to accelerate the degradation of commodity polymers such as polyethylene, polypropylene, and polystyrene without adversely impacting their properties or shelf lives and on developing polymeric membranes with novel properties.«

# AIChE STUDENT CHAPTER NEWS

## Ross Dietzsch, 2020 President

Dear Alumni and friends.

The past year has seen massive changes in everyone's life, including here at UND. Prior to the lockdown from COVID, our student chapter of the American Institute of Chemical Engineers held many successful events such as company info sessions and a resume building workshop. Many chapter members volunteered to support PowerON!, a ChE administered K-12 outreach program to get local kids excited about future careers in STEM. We also had 12 students attend the annual student conference in Miami where they participated in workshops for career development and networked with other students from across the country.

With the arrival of COVID-19 and the subsequent national lockdown we faced new challenges. Unfortunately, the April 2020 Rocky Mountain regional conference at New Mexico Tech was postponed and we were unable to attend in person. The chapters in the region are exploring ways to hold some of the events this fall while still complying with the various health and safety guidelines of each school and state. We also faced a major change with our traditional senior roast, which could no longer be held in person and instead became a virtual happy hour over Zoom [pg. 4].

We would like to thank our alumni and corporate sponsors for supporting the chapter this past year both financially as well as by giving presentations. We would also like to thank the volunteers who helped us organize and run our many events.

If any alumni are willing to give a presentation, please contact me at:

ross.dietzsch@und.edu.

For financial support please contact our treasurer Andrew at:

andrew.t.dockter@und.edu

or the ChE office [pg 23].

The spring 2020 ChE206 Unit Operations Class toured the East Grand Forks Am. Crystal Sugar Refinery in February

# WAYNE SEAMES CHESTER FRITZ DISTINGUISHED PROFESSOR

2020 is a milestone year in many ways, some that have nothing to do with the pandemic. Mike Mann finished his 40th year at UND while Frank Bowman finished his 15th. For me, 2020 marks the completion of my 20th year on the UND ChE faculty. I am also very pleased that my friend and formerly close collaborator (for a while we were practically finishing each others sentences) Mike Mann has finally received the Faculty Scholar Award [pg. 8]. I have learned a lot about patience, generosity, and civility (ok, I've still got a way to go) from him.

This fall marks another milestone for me as I turn over ChE411 Plant Design I to Ed Kolodka. I am still teaching ChE408 Process Controls this fall and ChE 412/413/414 Plant Design II in the spring and summer. With my extra teaching time I am making ChE408 more user friendly for on-line instruction by developing step by step instructions for the many example problems that we work together in class. I am also trying to finalize my plant design notes into textbook form so that it can serve as the primary resource for our students in our design sequence.

We had a record five sponsored plant design projects this year! My thanks to our alumni at 3M, Dakota Gasification, the Dakota Resource Council, and the CEM IES plus DEDP students at Chevron for arranging these projects. If you'd like to learn how you personally or your company can sponsor a project for the upcoming Spring semester, please contact me: wayne.seames@und.edu.

I also had a complete changeover of my research group this year as Jasmine, Andrew, and Ian (pending) finished their MS, MS, and PhD degrees, respectively. We should be submitting a lot of journal publications this year from this work. Our studies of sugars decomposition, which has been going on now for the best part of a decade, have finally reached a point of commercial feasibility for lignocellulosic crops like corn stover. In addition, our studies to develop ways to overcome barriers to microalgae-based biorefineries have also reached a point of likely commercial feasibility. Now if UND can only find companies that want to take these into the marketplace, I would be very satisfied. A third area we've been working on is to decompose lignin into useable chemicals. Those studies continue as progress has been slower in this area. I've also been the lead author on a book chapter on the production of aromatics from fatty acid oils and a contributor to a review paper on trace elements from coal. A lot of writing!

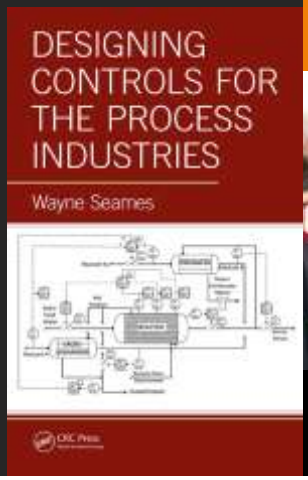
On a personal note, you can see in this photo that I'm now up to four grandsons, all courtesy of my daughter Christine. This was our first contact (in June) after social distancing all spring. I have had to be particularly careful as I am still suffering from fairly severe allergy-induced asthma. But one can only go so long without hugs from the grandsons!«

## WAYNE SEAMES AMONG UND TEXTBOOK AUTHORS HONORED AT NOVEMBER 18TH, 2019 RECEPTON

ChE's Wayne Seames was one of 22 faculty authors honored at a reception held at the Gorecki Alumni Center to recognize those who have published books or manuscripts over the past two years.

Tom DiLorenzo, UND vice president for academic affairs and provost, said, "It's important for the University to recognize those who publish a book because it's a significant, long-term project that can sometimes take years to complete."

Seames published his textbook, Designing Controls for the Process Industries" with CRC Press/Taylor and Francis in September 2017. The book is used by industrial engineers and in senior ChE Process Control Courses around the world.«




## ANDREW KOHLER PLACES THIRD AT UND'S 2020 3MT COMPETITION

The UND School for Graduate Studies held it's 3rd annual 3 minute thesis competition in January 2020 with the final round on the 29th. The contest requires the participing masters and doctoral students to succinctly relay their research endeavors in lay terms to an audience foreign to their field of study using only a single, static PowerPoint slide.

Competing in the final round of six was ChE Masters student Andrew Kohler, who placed third in the competition. «

ChE Masters student Andrew Kohler, 2nd from left, with the 2020 3MT finalists. This year's winner was Mona Thompson (2nd from right). Photo by Dima Williams/UND Today.

# GAUTHAM KRISHNAMOORTHY

## ANN AND NORM HOFFMAN ASSOCIATE PROFESSOR OF NATIONAL DEFENSE/ENERGETICS

Greetings! The quick adaptations of the UND ChE Department to the rapidly evolving COVID-19 situation this past spring was a true testament to our preparedness and flexibility in reacting to external situations that were beyond our control! But in all honesty, our guard is always "up" during the spring as we never know when the next polar vortex or heavy snowfall will hit! Anyways, as you will read through this newsletter we were able to transition completely and rather seamlessly to an online mode of instruction due to our unwavering commitment to student excellence.

Last year, I taught: CHE 301 Transport Phenomena, CHE501 Advanced Transport Phenomena and CHE 532 Explosives: Theory and Modeling. Since I was only teaching CHE 501 last Spring, I had three projects as deliverables throughout the course in lieu of the exams. Student feedback to this change was extremely positive. In spite of the fact that the projects demanded more time investment from the students, they seemed to appreciate the opportunity to learn and develop more familiarity with computational tools, and perform a more detailed analysis on real-world, open-ended transport phenomena problems instead of tackling partial differential equations in a time-bound exam! I have adopted a similar approach to the CHE 531 Rocket Propulsion class that I am teaching this Fall.

Research wise, I am actively involved in three research grants with a few more proposals awaiting a decision. I am truly excited to share some recent accomplishments of my graduate students: Samuel Cowart, PhD ChE May 2020 who is now on the faculty of the United States Military Academy, West Point, NY and KayLee Smith, MSChE (combined) Aug 2020 who now works for Danmare (Minnesota) as an Intermediate Process Engineer. There is truly nothing more fulfilling to a faculty member than the success of their students! Taking the place of these two students are Evan Bloom and Nicholas Voelker (currently Seniors but in the combined BS/MS degree program).

On the family front, the kids were able to adapt fairly well to distance learning and even managed to teach me a thing or two about ZOOM! The attached photo is from our trip to the Big Island (Hawaii) last Fall.«

## TWO UND GRADUATE STUDENTS RECEIVE AWARDS AT GRAD DAY

The UND School of Graduate Studies annual GRAD day event held on March 8th, 2020 was one of the last on-campus events of the Spring semester. Over 250 people took part in this event, which is focused around a poster session.


Prize sponsors included: JLG Architects; the UND EERC; the City of Grand Forks; Minnkota Power; the UND Office of the Provost; and AE2S.

Among the award winners in the Engineering Category were:

2nd Place: Trevor Taylor (photo right), MS/BS ChE combined student for his poster entitled, "The Effects of Mineral Scaling on RO systems"

3rd Place: Kaylee Smith, MS/BS ChE combined student for her poster entitled, "Predicting Ash Deposition in a Solid Fuel Combustor Using CFD Modeling".«

## MAY 2020 BSCHE GRADUATES

No photo this year (you can see some of them in the photo on pg. 4), but here is the list of our May graduates :


- Nikesh Acharya
- Reed Albrecht
- Todd Buchwitz, Jr.
- Nathan Carriere
- Fatmata Coomber
- Jessica DeVillers
- Nicholas Gaasvig
- Alexander Geritz
- Markal Giovannetti-Matthews
- Hannah Gombold
- Sarah Hamel
- Madelyn Jean
- Grace Kopel
- Justin Mann
- Tiffany Metzger
- Mark Miller
- Eli Peske
- Brandon Petrick
- Trevor Taylor
- Tyler Tedlund
- Sean Whitaker
- Andrew Wolff

# YUN JI ASSOCIATE PROFESSOR

## DIRECTOR OF CHE GRADUATE STUDIES

Hello everyone. This is now my 11th year at UND and I am very happy to be a member of this award-winning faculty!

I teach ChE 303 Chemical Engineering Thermodynamics and ChE 515 Design of Engineering Experiments in the fall semester and ChE 332 Lab III and ChE 435/535 Materials and Corrosion in the spring semester. Over the last year, I have also learned how to perform the responsibilities of graduate program director under the mentorship of the previous two directors, Gautham Krishnamoorthy and Frank Bowman. The number of our online master's (M.S. and M. Eng.) and Ph.D. students has steadily grown. If you are thinking about possibly obtaining a graduate degree but can't afford to return to university full-time, I encourage you to apply for one of the UND ChE online graduate programs.

Photo from left to right: Casey, Briley, Yun, Ethan, Corey

My life is going well. On the personal note, my daughter (Briley, 12) skipped a grade last year. She is in 8th grade now. My twins (Corey and Casey, 9) and youngest son (Ethan, 7) are in elementary school. We had a very interesting 2-month home school experience last spring due to COVID-19. I now believe it is easier to be a college professor than an elementary school teacher!«

# ANDREA HANSON, **BSCHE '02 RECEIVES** YOUNG ALUMNI ACHIEVEMENT AWARD AT 2019 HOMECOMING

(extracted from the original article published in UND Today 10/1/19)

At an October 2019 Homecoming Ceremony, Andrea Hanson, BSChE '02, was awarded the UND Foundation Young Alumni Achievement Award. The Young Alumni Achievement Awards celebrate alumni with a relatively recent graduation from UND who are already forging successful careers and strong commitments to their communities.

Ms. Hanson works at NASA's Johnson Space Center, where her expertise is in determining the best ways for astronauts to stay fit in space and to optimize performance of mission critical tasks. Up until a recent promotion, Hansen spent most of her time at NASA as part of the team implementing the exercise program for astronauts on the International Space Station. In her new position as Manager for the Central Nervous System/Behavioral Medicine/Sensory Motor Portfolio, Hanson is especially involved in the planning for a manned Mars mission.

**Andrea Hanson** with former ChE Chair **Tom Owens** at a reception in her Honor during the 2019 Homecoming week

Hanson grew up in Lake Park, Minn., and studied chemical engineering at UND. She was a member of Alpha Chi Omega, the Society of Women Engineers and the Student Alumni Association. Andrea got her first taste of research working on an independent study project for a then new assistant professor named Wayne Seames. She also worked as a counselor at Space Camp in Alabama during the summers, which influenced her decision to pursue a Masters and then a Ph.D. in Aerospace Engineering with an emphasis in Bioastronautics and Microgravity Sciences at the University of Colorado. After post-doc work at the University of Washington, Hanson landed her dream job with NASA.

It was special for those of us who knew Andrea as a student to see her again and hear about her experiences. She also took time to talk to current students in some of our classes, inspiring the next generation of Engineering Leaders. «

# ALI ALSHAMI, ASSOCIATE PROFESSOR

Dear Friends and Alumni, I hope each and every one of you had a safe and healthy year.

What a bittersweet year it has been for us here at UND. The year started in an especially sweet and celebratory mood, then turned bitter towards the end. It started with both UND Football and Hockey teams winning on homecoming Saturday; UND students with administrators broke ground for a brand new Memorial Union building [pg 17], and the Fall '19 semester began with an incoming freshman class with the highest ever collective GPA of 3.61. Additionally, for most of the year, UND enjoyed the leadership of two presidents who happened to possess the right complimentary skills for the job. At the college level, we were fortunate to receive a new dean [pg 5] who luckily happened to be a ChE and our previous department chair. The year continued with numerous celebratory events until early March 2020.

But as our lead article says, "then everything changed" at Spring break and we collectively began to do our part to "flatten the curve" to insure that student safety and well-being remained at the forefront. As faculty, we immediately started to think hard and implement measures to maximize student safety and minimize impacts on their learning experience. Thanks to the "age of the internet", our efforts were successful; whereby, students' well-being and learning continued to be unaffected. All of our students made it through, successfully completing their courses, and the ChE seniors celebrated their virtual graduation ceremony with each and every ChE faculty present to cheer them on and congratulate them.

Although the past year was a bittersweet one for us, it nevertheless taught us a lot about how to best respond to rapidly changing events. The year, and the pandemic in particular, forced us to innovate, to remain flexible, and to persevere when faced with the most difficult times. Above all, it taught us that our students are our strongest asset and must always remain our top priority.

During the past year I taught: CHE 305, Separations and CHE 315 Statistical Data Analysis & Design of Experiments in the Spring, CHE 431 Laboratory IV in the Summer and Fall, and CHE 511 Advanced Chemical Engineering Kinetics in the Fall. I also continued to serve as coordinator for our CHE 397, Cooperative Education program.

My research overall went pretty well despite interruptions to ongoing experimental work due to the pandemic . One graduate student, Joel Molina, successfully defended his M.S. thesis and graduated. One M.S. student is due to graduate by year-end, and two Ph.D. students are progressing steadily with their research activities. We received modest funding from the state and the college to continue our efforts in advancing the production of biofuels via fermentation of carbon monoxide from waste effluent gases, and also to continue developments of membranes for both gas and liquid separations.

On the personal level, the past year was a whirlwind of new experiences, classes, friends, and new challenges. The year was also one for goodbyes to souls we will never see again [Ali lost two close family members to the COVID-19 virus last Spring], and to people who we hope to cross paths with in the near future.

For the students who graduated the past year, my family and I say our hearts go out to you and we wish you all success and happiness in all of your future endeavors.«

*Kinetics* was produced by Wayne Seames with contributions from the faculty and staff of the UND Department of Chemical Engineering. Additional contributions were provided by UND's Division of Marketing & Communications

## ALI ALSHAMI AWARDED TENURE AND PROMOTED TO THE RANK OF ASSOCIATE PROFESSOR

Reflecting his outstanding contributions to the mission of UND's ChE department, Dr. Ali Alshami was promoted to Associate Professor and awarded tenure in the Spring of 2020. This is a recognition of Ali's high level of excellence in teaching, research, and service activities.

The practice of awarding tenure to faculty is an ancient and highly respected practice amongst the world's leading research universities. Faculty must demonstrate, over a period of time, that they have the capability, ability, and motivation to meet acceptable levels of achievement in teaching, research, and service activities.

Tenure provides faculty with the freedom to pursue scholarship in the manner they feel is most appropriate, without fear of losing their position. It does not give faculty the right to engage in incompetent teaching or research nor to engage in criminal or other inappropriate activities. For engineering faculty, tenure is a vote of confidence from the University that they will continue to strive and achieve excellence in academic activities.

CONGRATULATIONS ALI!

# BETHANY KLEMETSRUD ASSISTANT PROFESSOR

Three years! Wow does time fly! I've been here long enough that the sophomores I taught my first year have now graduated. I now feel old (well maybe nostalgic is a better word).

Reflecting on this past year has been challenging. We will have spent nearly 5 months working and teaching remotely and I really missed seeing my fellow faculty and staff members every day. As an overt extrovert, working from home and abiding by CDC recommendations has been a challenge. I am grateful for technology and being a part of a generation where this so easily is incorporated in teaching and working styles. I don't miss having to wait in the break room to heat up my lunch, but I do miss the small conversations and joking that happened during that time. I missed seeing the visual clues from my students when they're learning. But my students showed up almost daily for office hours and I actually got to know them all better despite our distance.

This past year I taught ChE 206 Unit Operations, ChE 311 Lab 2 and ChE 335 Summer Lab 2 all for a third time and ENGR 340 (formerly ChE 340) Professional Integrity for a seventh time. I also got to implement a brand new freshman course, ChE 103 Computing Tools for Chemical Engineers. It was rewarding and definitely more work than I thought it would be, developing and teaching a new course completely from scratch. To throw a wrench in things, we took a first year computing class and made it online. I was certainly kept busy with technology not working, freshmen not having the most confidence, and my attempts to teach them how to motivate and use project managing software.

One really positive part of having to go completely online, is that I got to try out new online-only teaching techniques. My students were more than patient and offered such great advice and feedback. I am continuously in awe of all our on campus and distance engineering students who exceed expectations and stayed motivated during this pandemic. This fall I am only teaching ChE 311 Lab 2 and am looking forward to some time to focus on my environmental and sustainability modeling research.

I am still ChE's participant in managing CEM's Jodsaas Center for Engineering Leadership. We would really appreciate any alumni help [if you have any ideas or want to help lead a workshop, please email me]. I'm also the faculty adviser for the UND Chapter of the American Indians in Science and Engineering Society (AISES). This past year I brought four of our Native American students to the national conference in Milwaukee.

The last big event I got to attend was UND's Feast of Nations. For those of you who live in the area, I strongly encourage you all to attend. I had the honor of getting to go with my AISES students and we had such a great time.

This past summer I enjoyed the great state of North Dakota. I went on countless social distance hikes to Turtle River, Whitehorse (formerly Sully's) Hill , and Teddy Roosevelt National Park. While this pandemic put a damper on my big travel plans to Alaska, it did allow me to continue to explore our local region that I've called home my entire life.

Due to the pandemic my sister's family hasn't been visiting me as often, which caused some tensions with my 4 year old nephew. Every Saturday he asks if they can go to "Aunty Beth's town". When my sister reminds him of the virus, he then threatens to ride his bike to Grand Forks.

I'm excited to see what my 4th year at UND brings!«

## AUGUST/DECEMBER 2019 GRADUATES

August 2019:

- Eshetu Abajifar
- Eugene Akunor
- Kyle Gietzen
- Brenden Jacobson
- Monica Kuznia
- Gabriel LaBarre
- Maxwell McCann
- Larnelle Peterson
- Alexandre Santos
- Sandra Vreeman
- Stephen Weilersbacher
- Joseph Winters

December 2019 Not shown:

- Tessa Alexander
- Navneet Dhaliwal
- Justin Schnee
- Cassandra Shaffer

CONGRATULATIONS TO ALL OF OUR 2019/20 B.S. GRADUATES!


December 2019 (from left): Tyler Rodriguez, Kalea Hoff, Tanya McGrady

# FORMER UND STUDENT BODY PRESIDENT COLE BACHMEIER, BSCHE 2019 ATTENDS MEMORIAL UNION GROUND-BREAKING DURING OCTOBER 2019 HOMECOMING


From left: Student Body VP Matthew Ternus, Student Body President Gracie Lian, State Board of Higher Education Student Rep. Kaleb Dschaak, Associate Dean of Students Cassie Gerhardt, former Student Body President Cole Bachmeier, former Student Body President Erik Hanson and former Student Body President Matthew Kopp at the Memorial Union ground breaking. Photo by Mike Hess/UND Today.

## M.S. AND PH.D. STUDENT GRADUATES

DECEMBER 2019

Johannes Van der Watt, PhD, "Modeling and Improving Oxygen Carrier Performance in Chemical Looping Combustion Systems", Major: Chemical Engineering, Advisor: Michael Mann

Sebastian Gardner, MS, "Supercritical Water Desalination: Model-Predicted NaCl Concentration Comparison", Major: Chemical Engineering, Advisor: Michael Mann

MAY 2020

Samuel Cowart, PhD, "A Computational Assessment of Flame Characteristics of Premixed and Non-Premixed Ethylene-Oxygen Combustion with a Reduced Chemical Reaction Mechanism", Major: Chemical Engineering, Advisor: Gautham Krishnamoorthy

Jasmine (Kreft) Olesik, MS/BSChE (combined), "Heterotrophic Microalgae, A Path Towards Renewable Fuels", Advisor: Wayne Seames

Jiselle Thornby, MS/BSChE (combined), "Time-dependent Plastic Deformation of Mg Nanocomposites: Ambient and Elevated Temperature Assessments", Advisor: Wayne Seames

AUGUST 2020

Andrew Kohler, MS/BSChE (combined), "The Conversion of Carbohydrates from Microalgae and Corn Stover into Building Block Chemical Acids ." Advisor: Wayne Seames

Joel Molina, MS, "Test Method Validation for Destructive Tests: Pull Testing for Joint Assemblies of Welded Platinum Bands", Major: Chemical Engineering, Advisor: Ali Alshami

KayLee Smith, MS/BSChE (combined), "Modeling of Gas-Solid Flows in Industry with Computational Fluid Dynamics Tools: An Assessment of Modeling Methodologies and Computational Challenges". Advisor: Gautham Krishnamoorthy

# Faculty Research Highlights

## AWARDED GRANTS

- Michael Mann was awarded $6.5 million from the US Department of Energy, North Dakota Industrial Commission, and various other commercial partners for a project entitled "Rare Earth Element Extraction and Concentration at Pilot-Scale from North Dakota Coal-Related Feedstocks".
- Gautham Krishnamoorthy was a member of a team (led by Barr Engineering, Co.) that won a DOE-NETL Award for "Mitigation of Alkali Promoted Ash Deposition and Emissions from Coal Combustion." UND Award Amount: $411,863; Period of Performance: 04/01/2020 to 03/31/2022
- Michael Mann was awarded $298,000 from the North Dakota Department of Commerce and ELF Technologies for a project entitled "Electrostatic Filtration of Large Oil Reservoirs".
- Michael Mann and Gautham Krishnamoorthy were awarded $237,000 from the ND Department of Commerce for "Support for the Commercialization of the Sandwich Gasifier." Period of Performance: 01/01/2020 to 06/30/2021
- Ali Alshami was awarded $200,000 from the State of North Dakota for a project entitled "Bioethanol Production via Fermentation, an alternative route to chemical synthesis, using synthesis gas from lignite coal-gasification".
- Frank Bowman and Beth Klemetsrud together with Julie Robinson, Ryan Summers, and Rachel Navarro from UND College of Education and Human Development were awarded $140,000 from the university's Division of Research & Economic Development, CEM, and CEHD for a postdoctoral seed funding award entitled "Building Our Capacity to Conduct K-12 Engineering Education Research".
- Wayne Seames was awarded $115,000 from Minn-Dak Growers, Ltd for a project entitled "The Extraction and Purification of Fagopyritols from Buckwheat".
- Wayne Seames together with Alena Kubatova, UND Chemistry were awarded $79,000 from the ND Corn Utilization Council for a project entitled "The Conversion of Corn Stover-Derived Lignin into Useable Chemicals and Materials".
- Wayne Seames and Yun Ji were awarded $75,000 from the ND Corn Utilization Council for a project entitled "The Conversion of Corn Stover-Derived Levulinic Acid into 1,4 Pentadiol".
- Michael Mann was awarded $4000 from Barr Engineering for a project entitled "CO2 Capture and Sequestration Short Course".

## PEER-REVIEWED PUBLICATIONS

(Student authors are underlined)

- Chris Buelke, Ali Alshami, James Casler, Yi Lin, Mike Hickner, and Isam H. Aljundi. "Evaluating Graphene Oxide and Holey Graphene Oxide membrane performance for water purification." Journal of Membrane Science (2019): 117195.
- Samuel Cowart, Gautham Krishnamoorthy, "A Comprehensive Assessment of Heat Loss Mechanisms on the Propagation of Lean, Premixed Ethylene-Oxygen Flames in Millimeter-Scale Tubes," Applied Thermal Engineering, (2020) DOI: https://doi.org/10.1016/j.applthermaleng.2020.115434
- Ganna Flanagan, Anastasia Andrianova, Jana Casey, Eric Hellrung, Bonnie Diep, Wayne Seames, Alena Kubatova, "Simultaneous High-Temperature Gas Chromatography with Flame Ionization and Mass Spectrometric Analysis of Monocarboxylic Acids and Acylglycerols in Biofuels and Biofuel Intermediate Products", J. Chromatography A, (2019) 1584:165-178.
- Lingyum Kong, Mehdi Ostadhassan, Xiaodong Hou, Michael Mann, Chunxio Li. "Microstructure Characteristics and Fractal Analysis of 3D-printed Sandstone using Micro-CT and SEM-EDS", Journal of Petroleum Science and Engineering (2019) 175, 1039-1048
- Evguenii Kozliak, Mark Sulkes, Ibrahim Alhroub, Alena Kubatova, Anastasya Andrianova, Wayne Seames, "Influence of Early Stages of Triglyceride Pyrolysis on the Formation of PAHs as Coke Precursors", Phys. Chem. Chem. Phys., (2019) 21:20189-20203.
- Jeremy Lewis, Mark Miller, Jake Crumb, Maram Al-Sayaghi, Chris Buelke, Austin Tesser, and Ali Alshami. "Biochar as a Filler in Mixed Matrix Materials: Synthesis, Characterization, and Applications." Journal of Applied Polymer Science 136, no. 41 (2019): 48027.
- Jeremy Lewis, Maram Al-sayaghi, Chris Buelke, and Ali Alshami. "Activated Carbon in Mixed-Matrix Membranes." Separation & Purification Reviews (2019): 1-31.
- Junior Nasah, Ben Jensen, Nicholas Dyrstad-Cincotta, Jackson Gerber, Daniel Laudal, Michael Mann, "Method For Separation of Coal Conversion Products from Oxygen Carriers", International Journal of Greenhouse Gas Control (2019) 88, 361-370
- Teagan Nelson, Johannes van der Watt, Daniel Laudal, Harry Feilen, Michael Mann, Srivats Srinivasachar. "Reactive Jet and Cyclonic Attrition Analysis of Ilmenite in Chemical Looping Combustion Systems", International Journal of Greenhouse Gas Control (2019) 91, 102837.

*(Continued on page 22*

# FOR OUR FRIENDS, ALUMNI, AND PARTNERS . .

The past few months have been nothing short of immense change in our everyday lives. We find ourselves in a completely different world than the last time *Kinetics* landed in your mailbox. The coronavirus pandemic has impacted all of us in ways we never could have imagined. While we are unable to be near many of you, there are two facts that continue to unite us: we love the university and we are inspired by you, our alumni and friends.

In light of the pandemic, support for our programs and our students is more critical now than ever before. Students like Luke Holtshouser [see pg. 2] who was laid off of his full-time job or our many local students who had their summer job offers rescinded (jobs they were counting on to help them get through the upcoming year) or lost their academic year part-time jobs, can all use your help. At the same time, a decline in enrollment coupled with anticipated budget cuts from the ND Legislature as they deal with the state's pandemic-generated budget deficit have led to shortfalls in budgets at UND at all levels, including the College of Engineering and Mines. If you are able, could you consider helping us alleviate either of these two urgent needs with a generous donation?

There are multiple ways you can help. One is shown on pg. 19. By contributing to the Tom Owens Endowment, you contribute to the faculty salary pool that ChE needs to balance their budget. Another is the Alumni Foundation Angel Fund, https://undalumni.org/angel, which provides direct assistance to those UND students who are most in need of financial assistance. Yet another option is to donate to the CEM Annual Excellence Fund. This fund is a priority needs initiative where we can direct funds to where they are needed the most for our engineering students. There are many other ways to designate your donation for ChE support or for other specific needs.

To learn more about providing support to UND ChE, contact Robin Turner by phone, text, or email.

To make a gift:

1) Visit undfoundation.org/engineering and select "Chemical Engineering" from the Designation menu
2) By check with "Chemical Engineering" in the memo line to: UND Foundation, 3501 University Ave. Stop 8157, Grand Forks, ND 58202-8157«

DEB AUSTRENG
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College of Engineering & Mines
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Grand Forks, ND 58202-8157

## TOM ERICKSON RECEIVES LEADERS & LEGACIES AWARD

Tom Erickson, BSChE '88, MS '90 was one of three recipients of this year's Leaders & Legacies Award from Prairie Business Magazine. Tom is currently the Director of the State Energy Research Center and Director of Intellectual Property and Technology Commercialization at UND's Energy and Environmental Research Center (EERC). He is a former CEO of the EERC [see *Kinetics 2019]*.

The magazine created the award last year to recognize executives in their field for achievements either recently, or over a lifetime of work. The three Grand Forks business leaders join a group of 10 individuals from across North Dakota, South Dakota and Minnesota who were nominated by their colleagues for their leadership and accomplishments.

CONGRATULATIONS TOM ANOTHER HONOR!

From Beth Klemestrud's Spring CHE 206, Unit Operations for Chemical Engineers class: top right (from left): Rachelle Amundson, Lindsey Malina, Clara Kauffman—group work improves learning!

# HONOR DR. TOM OWENS AND DOUBLE THE IMPACT

A donor has provided a dollar for dollar match of up to $250,000 through Dec 31, 2020, that will elevate the Thomas C. Owens Endowed Chair of Chemical Engineering to the next level.

## ADVANCE TOM'S GOOD WORK

Take this opportunity to honor Dr. Tom Owens, longtime faculty and leader in UND's College of Engineering & Mines, and ensure a position for high caliber faculty. Many have reaped the benefits of Tom's passion for education. **Today, we are calling on those who have been touched by Tom's unprecedented service to take up this match challenge.** Time is of the essence. Will you help us secure the funds and advance the good work Tom started? Your gift today will make a difference for tomorrow's engineers.

## DR. THOMAS C. OWENS

Dr. Tom Owens taught at the University of North Dakota College of Engineering & Mines for 33 years; serving as a department chair in Chemical Engineering for 23 years from 1974 to 2000. He also served as the interim dean of the College intermittently from 1989 to 2001. In addition to being an outstanding teacher, Tom developed strong relationships with students and went out of his way to help them achieve success. Tom retired in 2001, but his enthusiasm for excellence continues on through the Thomas C. Owens Endowed Chair of Chemical Engineering.

## THE ENDOWED CHAIR IMPACT

As leading scholars in their fields, endowed chairs are influential thought leaders whose expertise and leadership draw top-notch faculty and students. Their influence has a lasting effect on learning inside and outside the classroom. Endowed chairs secure research grants and private support, bring in national conferences, and foster media attention and partnerships. This is one of the few endowed chair positions at the University of North Dakota.

An endowed chair position was named after Dr. Thomas C. Owens in 2004.

Dr. Owens served as professor, department chair and interim dean of the UND College of Engineering & Mines.

## TO MAKE A GIFT OR GET MORE INFO:

**Robin Turner, '89**
Director of Development,
College of Engineering & Mines
701.777.1428
robint@UNDfoundation.org

Use this QR code or visit
**UNDalumni.org/owens**

UND ALUMNI ASSOCIATION FOUNDATION
LEADERS IN ACTION.

All ChE Faculty have shown their support of this opportunity by making their own personal donations.

**Won't you join them?**

# STUDENT ACCOMPLISHMENTS

2019-20 Academic Achievement Awards were conferred at a virtual ceremony held during the last week of the Spring semester:

### FRESHMAN

Student of the Year—Kelsey Baker
Finalists—Ethan Hunter and Caylie Graeber

### SOPHOMORE

Student of the Year—Gabriel Schettler
Finalists—Lindsey Malina and Cristy Jones
AIChE D. F. Othmer Sophomore Academic Excellence Award—Lindsey Malina

### JUNIOR

Student of the Year—Zachary Meduna
Finalists—Therese Hilpisch and Allison Zipp

### SENIOR

### THE AM SOUBY AWARD FOR EXCELLENCE IN PLANT DESIGN

Ali Abdikarim, Todd Buchwitz, Grace Kopel, and Mark Miller
"1,4 Pentadiol from Levulinic Acid"

### SPONSORED AWARDS IN SENIOR PLANT DESIGN

The 3M Company sponsored a design project entitled "High Purity Acrylic Monomers" which was completed by Alex Geritz, Brandon Petrick, and Tyler Tedlund.

The Chevron Corporation sponsored a design project entitled "H2 Recovery from Refinery Fuel Gas" which was completed by DEDP Students Benjamin Gallon, Brian Peacock, and Anthony Welling. All of these students completed their degrees while also working full-time for Chevron.

The Dakota Gasification Company sponsored a design project entitled "Recovery of Argon and Neon from Waste Nitrogen" which was completed by DEDP Students Casey Collins, Mark Holiday, Ackim Maduvu, and Anthony Youso. Their industrial advisor was Nigel Schmidt, DGC Engineering and UND BSChE '14.

The Dakota Resource Council sponsored a project entitled "Unbleached Pulp from Hemp Stover" completed by Fatamata Coomber, Jessica DeVillers, Eli Peske, and Sam Zandstra. Their advisor was Michael Graalum, UND BSChE '19.

The CEM Institute for Energy Studies sponsored a project entitled "Magnesium Production from Bakken Produced Waters" which was completed by Jakob Ableitner, Nicholas Gaasvig, Markal Giovannetti, and Tiffany Metzger. Their advisor was Nolan Theaker, an IES engineer and ChE PhD student [see pg. 9].

We appreciate the hard work of the students on these projects and the support and willingness to assist them provided by both external sponsors and ChE faculty advisors. **If you'd** like to sponsor a student design project, please contact Wayne Seames at wayne.seames@und.edu or 701-777-2958 to discuss your ideas.

### CONGRATULATIONS TO ALL OUR AWARD WINNERS!

## CHEMICAL ENGINEERING-ASSOCIATED MERIT AID & SCHOLARSHIPS

» The Daryl L. and Diane A. Anderson Scholarship
Levi Stegner, Zachary Meduna, & Gabriel Schettler — $1000 each
Emily Skaare — $500 , Joshua Wilmer — $450

» The Continental Resources Leadership Scholarship
Rachelle Amundson — $1500

» The Albert Cooley ChE Scholarship
Robert Strong & Morgan Schmitz — $300 each
Barry Takwa, Claire Weltz, Mason Smith — $250 each

» The E.E. Gullekson ChE Scholarship
Charlie Lien — $1000, Allison Zipp — $750
Annika Bastian — $575
Andrew Dockter, Mack Buchholtz, Paul Tomsche, Rachelle Amundson, Jalynn Janorschke, & Abbie Radermacher — $500 each
Mary Hilpisch & Lindsey Malina — $400 each

»The Olson Family Scholarship — $1200 each
Kelsey Baker, Caylie Graeber, & Morgan Schmitz

» The Professor Wayne Kube Memorial ChE Scholarship
Patrick Alicki — $363

»The Mark and Monica Musich Family Scholarship
Kelsey Baker — $350
Caylie Graeber & Braden Soderberg — $300 each

» The AM Souby ChE Scholarship
Morgan Schmitz—$1000, Patrick Alicki—$637, Kelsey Baker—$500, Barry Takwa—$485

» Wendy Sellheim Spenst Memorial Endowment—$600 each
Mary Hilpisch & Lindsey Malina

» The Raymond & Edyth Sullivan Engineering Scholarship
Lindsey Malina—$2300 & Emily Skaare—$1500

» The David A Veeder Scholarship
Nathan Manni—$1500
Rachel Blasczyk & Cole Brenner—$1000
Taylor Borowicz—$500

» The Anna Peterson Walsh Memorial Engineering Scholarship
Rachelle Amundson—$1500

» The Everett Webb Engineering Scholarship
Andrew Dockter—$2000 & Allison Zipp—$750

» The Whiting Petroleum Corp. Scholarship—$1000 each
Kelsey Baker, Rachel Blasczyk, & Caylie Graeber

» The Margo A. Wolff Scholarship
Allison Zipp—$750

# Alumni Contribution Report

Thank you for your generous contributions! This past year we received $118,450 towards student scholarship endowments, $13,449 for the Thomas Owens Endowment, and $35,271 for department priority needs.

UND ChE relies on your contributions to help us balance our budget each year. Direct contributions to the general department fund and earnings from endowment funds currently provide almost 10% of our annual budget. In addition to funding our day to day operating expenses like phones, copier operations, office and lab supplies, these alumni donations help us to upgrade lab experiments with modern controls, send students and faculty to conferences, provide academic achievement awards for the top students in each class, purchase lab supply kits to send to students taking our summer lab courses at home this year because of the pandemic, and even pay portions of faculty salaries.

Earnings from ChE and General Engineering scholarship endowments allowed us to award over $40,000 in scholarships to chemical engineering students for the coming year.

Thank you again to all that have given to the department this year and in the past. We are so fortunate to have such loyal and supportive alumni. If you are supposed to be on this list but we somehow missed you, please forgive us; it is not intentional. This is an amateur production!«

## ALUMNI AND CORPORATE CONTRIBUTORS

### GIFTS FROM INDIVIDUALS

- Diane Anderson
- H James Anderson
- Doyle H Boese
- Timothy & Tamela Bohan
- Lois D Borg
- Frank Bowman
- Kristine & Richard Brindle
- Robert J. Brugman
- Holly A Casillas
- Thomas M. Clausen
- A. M. Cooley & Beverly M. Cooley
- Jack & Eileen Crystal
- Myles M. Dittus
- Gary & Linda Dunford
- Donald C Fricke
- Larry T Gast
- Michael Graalum
- Jay & Diane Gunderson
- Paul & Janet Havig
- Gregory & Janet Helma
- Martin C Johnson
- Rodney J Kadrmas
- Kevin M. Kraft
- Sue & Giff Lewis
- Joy W. Lyche
- Michael & Terrie Mann
- Andrew D. Marg
- Bruce & Sharon Miller
- Richard & Barbara Owens
- Michael & Terri Pedersen
- Richard L. Peloquin
- Jon & Anne Putnam
- Joan & Ann Rolando
- K. Wayne & Geraldine Rye
- David P. Schaaf
- Wayne S. Seames
- Rodney & Lynne Sears
- Michael Swanson
- Guy Tangedahl
- Mark & Kristi Thoma
- David & Linnea Veeder
- Sandra L. Weekley
- Matthew Wuebben«

### CORPORATE GIFTS

- 3M Corporation
- Cargill
- Chevron
- Dakota Gasification Co.
- Dow Chemical
- ExxonMobil Foundation
- Marathon Oil
- NALCO
- ND Resource Council
- Xcel Energy
- Twin Cities Local Chapter of the AIChE«

## Online Course Development Initiative

This summer several ChE faculty are working with instructional designers from UND's Teaching Transformation and Development Academy (TTaDA) to improve the online sections of their courses. This is part of a 3-year plan to upgrade all of our undergraduate course offerings to fully incorporate current best practices for online learning. Faculty participating in the program this summer are Ali Alshami (ChE 315, ChE 431), Frank Bowman (ChE 201), Beth Klemetsrud (ChE 103, ChE 335, ENGR 340), and Ed Kolodka (ChE 102, ChE 235).

We've been teaching online for decades and already do many of the things on TTaDA's course design checklist, like using a clearly defined course website organizational structure, posting all course materials online, sending regular announcements, and responding promptly to student questions. One area where we are making changes is to supplement our typical single 50-75 minute in-class session recordings, which are only available after the class meets on campus, with 5-15 minute prerecorded videos focused on individual concepts or practice problems. This makes it easier for students to fit coursework into busy schedules and locate topics of interest for review. These videos will also be available to on-campus students. We're excited to continue the UND ChE tradition of providing a high quality learning experience to both on campus and online students!«

# EXTERNAL ADVISORY COMMITTEE MEETS WITH FACULTY TO REVIEW CHE PROGRAMS

An important contributor to ChE's assessment process for continual improvement is our External Advisory Board. This diverse cohort of alumni and external stakeholders meets with the ChE department faculty every other year as part of our quality assessment process. The board provides input and guidance on our curriculum, programs, and strategic planning. At the fall 2019 EAB meeting we welcomed several new board members, including two alumni from our online distance engineering program.

During the meeting we discussed the impacts of enrollment growth, particularly in the distance program, recent budget cuts, and how to maintain the atmosphere of a UND ChE family in the face of that growth. Suggestions for the undergraduate curriculum included the addition of project management training [this is being addressed at the College level], additional plant tour opportunities, and exposure to AI and big data tools. For our graduate programs the discussion focused on developing focused and appealing marketing materials and recruiting strategies to attract more high quality graduate students.

Their visit included a tour of the department facilities in Harrington Hall, Upson II, and the Collaborative Energy Complex to relive past memories and highlight recent upgrades to classroom, laboratory, and office space. During a Friday afternoon mixer, undergraduate and graduate students had the opportunity to talk one on one with our board members and learn from their experience. We also enjoyed attending a men's hockey game together and celebrating their overtime win against Bemidji State.

External Advisory Board members generally serve six year terms. In addition to the board meetings we also encourage board members to visit the campus annually to share their experience and wisdom with our students during a class, lunch seminar, or AIChE chapter meeting. We are always looking for volunteer members. If you are interested, please let us know.

THANK YOU TO ALL OUR PRESENT AND FORMER EAB MEMBERS FOR YOUR SERVICE!«

## Current External Advisory Board Members

Jim Albrecht, BS 84, ComDel Innovations
Myles Dittus, BS 96, Hess Corporation
Adam Driscoll, BS 06, Barr Engineering
Mark Jesh, BS 86, Medtronic
Scott Houghton, BS 12, Ford Motor Company
Lily Herzog, BS 14, Boeing
Ben Oster, BS 05/MS 09, Jabil
Brandon Pavlish, BS 06/MS 12, Cirrus Aircraft
Julie Renner, BS 07, Case Western Reserve Univ.
Steve Rosenau, BS 95 – American Crystal Sugar

# Faculty Research Highlights (continued from pg. 17)

- Jasmine Kreft, Eric Moe, Nicholas Garcia, Andrew Ross, and Wayne Seames, "Comparative Scoping Study Report for the Extraction of Microalgae Oils from Two Subspecies of Chlorella Vulgaris ," Clean Energy Journal (2020), 4(2).
- Maram Al-Sayaghi, Jeremy Lewis, Chris Buelke, and Ali S. Alshami. "Structure-property-function connections underlying performance of polybenzoxazole membranes derived from BisAPAF polyimides." Polymer 182 (2019): 121825.
- Austin Tesser, Ala Alemaryeen, Jeremy Lewis, Ali Alshami, Meysam Haghsehans, and Sima Noghanian, "Synthesis and Use of Bio-Based Dielectric Substrate for Implanted Radio Frequency Antennas." IEEE Access 7 (2019): 123268-123279.

RESEARCH PRESENTATIONS (Student authors are underlined)

- Moones Alamooti, Olusegun Stanley Tomomewo, Scott Johnson, Michael Mann, William Gosnold, "Modeling and Simulating the Effect of Oil Price Fluctuations on Well Developmental Decisions and Well Quality Using System Dynamics", System Dynamics Conference, Bergen Norway, July 2020.
- Furkan Altincicek, Soumya Banerjee, Xiaodong Hou, Michael Mann, Nuri Oncel, "Synthesis and Characterization of Quasi 2D-Chromium Sulfide", APS Meeting Abstracts, 2019
- Carlos Bucaram and Frank Bowman – "Evaluating WRF-Chem Model Performance for Baseline Summer Scenario over the US Northern Great Plains" American Geophysical Union Fall Meeting, San Francisco, CA, Dec. 10, 2019
- Gautham Krishnamoorthy, "Predicting Ash Deposition during Coal Combustion" presented at the 2019 AFRC Industrial Combustion Symposium, Waikoloa Village, Hawaii, September 2019.
- Sima Noghanian, Alshami, Ali, Alemaryeen, Ala, Tesser, A, Lewis, J, Haghshenas. M. "On the development of a bio-based dielectric material," International Symposium on Electromagnetic Theory (EMTS), San Diego, CA., May 2019
- Olusegun Tomomewo, N. Dyrstad-Cincotta, Michael Mann, M. Alamooti, C..Onwumelu, C. Tang, S. Srinivasachar, T. Nelson "Potential Mitigation of Wastewater Disposal Through Treated Produced Water in Bakken Formation, ARMA 20-1254, Golden Co; June 2020
- Olusegun Stanley Tomomewo, Moones Alamooti, Scott Johnson, Michael Mann, William Gosnold, "Modeling and Simulating the Effect of Well Quality on Oil Production and Profitability using System Dynamics Model", System Dynamics Conference, Bergen Norway, July 2020.
- Olusegun Tomomewo, Hadi Jabbari, N Badrouchi, C Onwumelu, Michael Mann, "Characterization of the Bakken Formation using NMR and SEM Techniques", 53rd US Rock Mechanics/Geomechanics Symposium, Aug 2019

UND UNIVERSITY OF NORTH DAKOTA

DEPARMENT OF CHEMICAL ENGINEERING

UPDATED INFORMATION

Please stay in touch! Remember, UND ChE alumni never really leave the department after graduation — they just do less homework!

NAME _____

DEGREE & YEAR _____

EMPLOYER _____

EMAIL ADDRESS _____

HOME ADDRESS _____

WORK ADDRESS _____

HOME/CELL PHONE _____

WORK PHONE _____

_____ Check here if you are enclosing a donation to the UND Chemical Engineering Department with your information form.

_____ Check here if you would like someone to contact you with more information about contributions supporting the Chemical Engineering Department or the Tom Owens Endowment.

Please send to: Department of Chemical Engineering
The University of North Dakota
243 Centennial Drive, Stop 7101
Grand Forks, ND 58202-7101

Fax: 701.777.3773

email: und.chemical.engineering@und.edu

## FROM DRAB TO FAB: Classroom Upgrades Improve Teaching and Learning

(extracted from the original article in UND Today by Jan Orvik, 9/12/19)

Serving students and helping faculty teach were among the goals of UND's summer 2019 classroom upgrade project. UND upgraded 13 classrooms as part of a master plan to upgrade learning spaces and broaden teaching techniques and innovations.

"Our goal was to create a learning environment conducive to how students prefer to learn in the 21st century," said Madhavi Marasinghe, UND's chief information officer. "I do believe we were able to do that in this round of upgrades."

Flipped classrooms and smart classrooms are more than just buzzwords. They help students learn. Instead of listening to lectures in class, students watch the lectures before class. Then the students come to class to apply their new knowledge, working collaboratively in teams, while the Instructor interacts with and mentors students throughout the class.

Among the rooms upgraded was Upson II 260, a room I'm sure many of you remember; and not fondly. Look at it now!«

THEN

NOW

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