



FALL 2018
GRAND FORKS,
NORTH DAKOTA

Chemical Engineering

CHAIR'S MESSAGE FRANK BOWMAN ASSOCIATE PROFESSOR

Welcome to another edition of Kinetics! The department continues to thrive and I'm excited for you to read about some of the great things that have happened this past year.



We saw some shuffling of personnel with various people coming, going, coming back, and taking on new responsibilities. **Yun Ji** was away on developmental leave to Finland [see pg. 14], **Brian Tande** left UND, but only temporarily, as he returned this summer to take a position as Associate Dean of the College of Engineering and Mines [see pg. 13], I started my first full year as chair, and staff member **Angie Reinhart's** duties changed from full-time ChE support with additional responsibilities for the EE and CS programs. All this meant we had a lot of big shoes to fill. Not surprisingly, the ChE faculty and staff stepped up, picking up extra classes and duties as needed.

Together we've had an extremely successful year as you'll read about in this newsletter. One item I'd like to specifically mention here is that with a total of 51 graduates, including 15 in our online DEDP program, this was by far our largest senior

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Join UND ChE On LinkedIn

We have a **UND Chemical Engineering** group on LinkedIn. This will allow our alumni to connect with one another and to get the latest updates from the department. We will also use this site to post job announcements for alumni and students. Join now and find out what over 220 of your fellow ChE alumni are up to!

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

Kinetics

THE UNIVERSITY OF NORTH DAKOTA
CHEMICAL ENGINEERING NEWSLETTER

UND STUDENT BODY PRESIDENT COLE BACHMEIER A UND CHE "LEADER IN ACTION"

Cole Bachmeier has always been interested in both engineering and politics. And this past year, saw the ultimate fulfillment of this unusual combination as he completed his BSChE degree while serving as UND's Student Body President.



"I have been involved with Student Government ever since the 8th Grade and have loved every minute of it" Cole said. "I decided to run [for UND Student Body President] with my close friend Erik Hanson [2017/18 Student Body Vice President and 2018/19 Student Body President] because we both saw areas on campus which we thought we could improve. Ever since I got to campus, I always knew I wanted to be involved in something. After serving for three years in various positions in student government, the opportunity opened up and we went for it."

RUNNING FOR OFFICE WAS ONE THING, BUT ACTUALLY WINNING? THAT WAS A SURPRISE!

As Cole says, "to be quite frank, I knew we were the underdog once the political teams announced they'd be running. We actually ran against the previous Vice President of the Student Body. I wasn't sure how well liked our team was outside our niches of engineering/residence life for myself and Greek/business for Erik, but we ended up pulling it off. It was extremely gratifying to see all the support we had, especially on election day. At one point I think we had 50+ student campaigners supporting us. It was a remarkable experience!"

Bachmeier ran on a three piece platform which became his governmental team's primary objectives: increasing the student

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FRANK BOWMAN, CHAIR AND TOM OWENS ASSOCIATE PROFESSOR (from pg. 1)

class ever. Fortunately the ChE job market has been growing and many of you have been letting us know about openings in your companies – Thank you!

Both last year and this year I have been teaching ChE 201 Chemical Engineering Fundamentals in both the fall and spring semesters. After a couple of years I've got the content and structure figured out and can focus more on helping students develop good problem-solving skills and habits. (Yes, drawing and labeling a diagram and writing out all your equations really will help you be a better engineer!) Last spring I also helped teach ChE 232 Lab I together with **Bethany Klemetsrud**. I'm beyond grateful that she graded all the written reports, which not only made the class much more enjoyable for me, but left me time for my research and chair duties.

As far as research, I continue to look at particulate air pollution. One of the graduate students in my group, **Humphrey Chukwuto**, finished his experimental work on the growth and cloud formation properties of diesel soot as it ages in the atmosphere. He graduated with his M.S. in May and we are currently writing up his results for a journal publication. Another MSChE student, **Nicole Larson**, is now using the experimental system to look at the formation of particulate mass from the photooxidation of gas-phase emissions from agricultural crops. A third student, **Carlos Bucaram**, is running atmospheric computer models to explore potential air quality changes in western North Dakota. I've also been busy leading our NSF-sponsored REU program, together with faculty from UND Chemistry and Atmospheric Sciences [see pg. 22]. We had a total of 13 undergraduate students from across the country here on campus working in our research labs this summer.

On the home front, we had two graduations in the Bowman family this year. My second oldest graduated from high school and is off to Clarkson University to study engineering. My wife Alisa, finished her Masters in Social Work at UND this spring and spent the school year interning for the Grand Forks Public Schools. Watching her take classes and write up her master's project reminded me again how happy I am to be on the other side of exams and assignments – still time consuming, but much less stressful.

Best wishes to all of you! Please keep in touch and feel free to stop by anytime you are in Grand Forks.«



UND AICHE STUDENT CHAPTER NEWS

by KayLee Smith, 2017/18 UND AICHE Student Chapter President

UND's student chapter of the American Institute for Chemical Engineers had another eventful past school year filled with both new and old traditions. We celebrated and bid farewell to about 30 seniors at our annual Senior Roast which was held at the Boardwalk Bar and Grill this year.

In March, we sent 10 students to the Regional AICHE conference in Provo UT, hosted by **Dr. Bowman's** alma-mater, BYU. It was an especially exciting conference trip as a group of dedicated students (pictured) were able to get our Chem-E-Car up and running in just one semester. This was the first time in 4 years that UND AICHE has competed in Chem-E-Car. Most of the team members were freshman so we look forward to having a strong team for many years to come. Chem-E-Car is a valuable way for new students to get involved with our chapter and gain hands-on engineering experience as well as learn valuable teamwork skills.



Members of the UND AICHE Chem-E-Car team at the Regional competition. From L-R, Alex Bennett, Cassie Schaffer, KayLee Smith, Andrew Dockter, and Zach Krill.

Our Chem-E-Car team relies on and greatly appreciates donations from alumni and/or companies to remain a growing fun, competitive experience. **If you are interested in supporting UND's Chem-E-Car team, please contact our AICHE finance officer, Mikaila Kringstad, at mikaila.kringstad@und.edu or the ChE Office [contact info on p. 23].**

In addition to competing in Chem-E-Car, we also continued many of our usual activities, including travel to the AICHE Annual Student Conference in Minneapolis, alumni guest speakers, picnics, student/faculty cook-offs, clothing sales, and plant tours. We continue to attend various community functions like Grand Forks Super Science Day and participate in the SUNRISE STEM outreach program, PowerON!. PowerON! uses ChE and other engineering students to demonstrate educational science experiments to kids of all ages [see p. 18].

We also sparked a new tradition last spring with our "Pie a Professor" fundraising event. This event was a hit [pun intended??] and we hope to get more professors/instructors from other departments involved in the years to come.

Overall, our chapter has had a positive year and looks forward to supporting our members' college experience and expanding our alumni network.«

COLE BACHMEIER, UND STUDENT BODY PRESIDENT

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voice in campus decision-making; helping to strengthen UND's identity, especially through the "fighting hawks" nickname; and improving UND's student culture.

THE STUDENT VOICE

Bachmeier's team increased communication and transparency between UND's administration and students – both with student government and with the student population at large. "That was really our tag line for the majority of the campaign 'Fighting for Your Voice'. We served as the medium for students to voice their concerns and impact their campus with the changes they wanted to see", Cole added.

UND'S IDENTITY – WHO WE ARE

Cole and his team wanted to establish an identity and campus pride based the current Fighting Hawks nickname. "We did this in a number of ways", says Bachmeier. "We completely revamped the tailgate experience [at football games], and for the first time sold out the student tailgate lot. Erik [Hanson] and I also focused on what makes UND "UND", including working on the UND **strategic plan** [to learn more about UND's strategic plan please go to <http://www1.und.edu/strategic-planning/index.cfm>] and helping rewrite the UND **Mission Statement** [see insert]. Finally, how UND looks is very important, so we championed President Kennedy's Coulee to Columbia initiative [for further information, please go to: <http://blogs.und.edu/und-today/2017/01/coulee-to-columbia/>] to help students get the most out of the beautiful campus that is UND. "

UND's Current Mission Statement

Our mission is to provide transformative learning, discovery and community engagement opportunities for developing tomorrow's leaders.

IMPROVING UND'S CAMPUS CULTURE

Bachmeier and his team strove to strengthen the UND culture by balancing services with finances. The student government recommended over \$1 million in savings for students by improving the student fee model. In response to student requests for more retail /food options, they started "food truck Friday" and championed public/private partnerships on the campus itself, like converting an underutilized dining hall into a Little Bangkok restaurant site. They also laid the foundation for housing developers and retail specialists to come to campus.

SLEEP OPTIONAL!

So, what was it like trying to be Student Body President while completing a full course load in what is arguably the hardest undergraduate degree program at UND? Well, it took a lot of compromising and a lot of late nights! "There were definitely a lot of sacrifices that I made to do both engineering and student government," Cole explained. "The largest one was probably my social life. I had minimal time to hang out with my peers. I felt bad for not giving those close to me as much attention as I would have liked."

"A lack of sleep was also a large factor, as I probably averaged less than 6 hours a day. Finally, my ability to fully participate in my courses was a compromise. I believe I learned the material. However I found myself continually skipping class for meetings throughout the day. This led to a lot of self-teaching or late nights getting notes from colleagues or watching videos to remain on track."

Fortunately, Cole was able to take advantage of UND's Distance Engineering program resources to help mitigate the impact of missing so many in-class sessions. UND is still the only ABET accredited undergraduate chemical engineering distance education degree program in the U.S. Local students like Cole often take advantage of their access to in-class session recordings that support on-line students taking the same courses.

OTHER ACCOMPLISHMENTS

"With this position [student body President], you never know what will be the hot topic issues that will present themselves to you", Bachmeier said. "I am happy to announce that when students return to campus [this fall] they should see a new ride share/bikeshare service scattered across UND, providing students with low cost transportation to connect them inter/intra-campus. We also partnered with the city on multiple occasions to get large programs for students to participate in. Finally, the opportunity to bring the mascot to life [for further info, please go to: <http://blogs.und.edu/uletter/2018/05/students-choose-new-mascot/>] was a fun project to work on. I would argue 50% of the work sort of falls in your lap; work you don't expect. Its handling this work and making the best out of it that's the fun part."

WAS IT WORTH IT?

Cole's answer is a resounding yes! "This was by far the most enriching experience of my college career," he stated. "I learned so much: from time management to negotiation skills. I think I learned more about myself and how I can best succeed and achieve in the one year in this position than I have in my entire school career. I have made life-long friends because of this office, and I can graduate knowing that I helped make UND a better university. Through all the stress, I couldn't imagine my senior year without such a fulfilling role."

ON TO NEW ADVENTURES

After graduating in May, 2018 Cole, a Fargo, N.D. native, packed up and moved to the Northern Bay Area of California for a job as a process engineer at the Andeavor (likely soon to be Marathon Oil) petroleum refinery in Martinez, CA.«



Cole at his new job

GAUTHAM KRISHNAMOORTHY, ANN AND NORMAN HOFFMAN ASSOCIATE PROFESSOR OF NATIONAL DEFENSE/ENERGETICS

Greetings! It has been a whirlwind of a year in the ChE Department at UND; one in which we have managed to accomplish so much, while having so little, simply due to our unwavering commitment to excellence, as you will read through the pages of this Newsletter.

With **Yun Ji** away on her sabbatical and our decision to offer Physical Chemistry to our Seniors in-house, our already lean team was stretched even more! In addition, our faculty and staff continued to selflessly lend their helping hand to the growing needs of the College and UND. In spite of the tumultuous year that was, we fed off of each other's energy and commitment and managed to see this academic year through! We all breathed a huge sigh of relief when Yun returned again this summer!

Last year, I taught: ChE 301 Transport Phenomena, ChE 493A Thermo and Kinetics II [our temporary replacement for PChem], ChE 332 Lab III, ChE 501 Advanced Transport Phenomena, ChE 532 Explosives: Theory and Modeling, and ChE 422 Capstone in Energetics.

I am actively involved in four research grants with a few more proposals awaiting a decision. I am truly excited to share some recent accomplishments of my graduate students: **Lauren Clarke**, MSChE May '18 started her PhD at M.I.T this Fall; **Ryder Shallbetter**, MS student started employment as a Research Engineer at the CEM Institute of Energy Studies; **KayLee Smith**, MS student received a Fellowship and is spending the Summer at the Department of Energy – National Energy Technology Laboratory, Morgantown, WV; and **Md. Ashiqur Rahman**, MSChE May '18 started employment at Gexcon US Incorporated, this Summer! There is truly nothing more fulfilling to a faculty member than the success of their students!

Wayne Seames and I are a part of a highly collaborative NSF US-NSF China Grant involving two Universities in the US (Utah and UND) and two in China (HUST and SEU). As part of this grant, I had an incredible opportunity to visit China last Spring and participate in discussions with our Chinese Collaborators. I made a "mini-vacation" out of it and took my family along. We were all immersed in a truly memorable and culturally rich educational experience during our visits to: Beijing, Nanjing and Xi'an! The photo is that of our family at the Summer Palace (Beijing).«



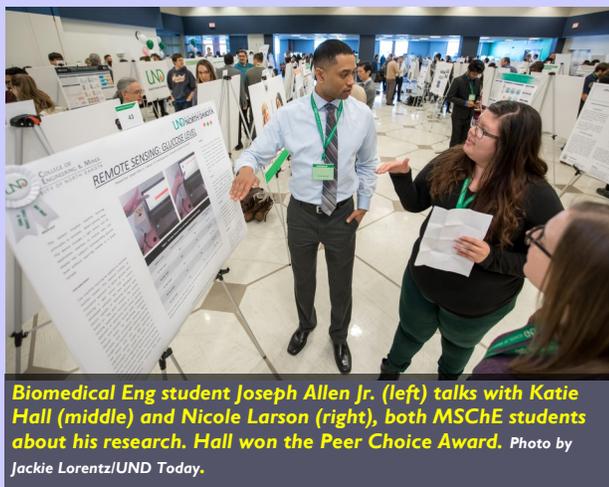
KATIE HALL AND JEREMY LEWIS RECEIVE AWARDS AT 2018 GRAD DAY

(note: portions of this article were extracted from a UND today article by Kaylee Cusack, UND University & Public Affairs posted 3/8/18)

Each February, the UND School of Graduate Studies sponsors an event where graduate students can showcase and explain their research to the University community and the public. This event, which used to be known as the Scholarly Activities Forum, is now known as the Graduate Research Achievement Day or more simply: GRAD day.

The goals of GRAD day are: 1) to give students a platform to perfect the communication of their research, 2) to foster collaboration between disciplines, and 3) to show the community how UND's students are driving societal change – a key role of the UND Strategic Plan's Grand Challenge initiatives. All of which help to foster interdisciplinary collaboration & communication and to showcase UND's research enterprise.

This year over 150 graduate students participated in the event's poster sessions. Participants were also offered a workshop to bolster their presenting skills and given extra time to walk around and check out other posters. There was also a quality competition where students had to explain their work to faculty from different disciplines as well as to the other graduate students participating in the event.



Student-to-student discussions led the graduate student participants to honor chemical engineering master's student **Kathryn Hall** (BSChE '17) with the GRAD Peer Choice Award for her crisp and relevant presentation of her research into novel lignin-based biocomposites [research advisor: Surojit Gupta, Mech Eng]. Hall won for her easy explanation.

"I wasn't expecting this at all!" she grinned, sparkling award in hand. "Currently, there's a global

waste problem, and that's how I started my presentation. We have a lot of plastic buildup, so I related it in that way. There's a biocomposite that is actually able to replace that – as a filler, or almost completely as a 100 percent biodegradable composite."

Jeremy Lewis, MSChE student was awarded 2nd place in the Engineering category for his poster explaining his research on mixed membranes for carbon capture [Advisor: **Ali Alshami**]. Mixed matrix membranes combine the properties of a polymer matrix with those of dispersed filler particles which enhances permeability and selectivity. One downfall of mixed membranes is

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EDWARD KOLODKA ASSOCIATE PROFESSOR



Another year at UND has come and gone. In the fall of 2017 I taught CHE 511 Advanced Kinetics (for the first time), CHE 303 Thermodynamics (for the first time in a decade) and CHE 331 Lab 2 (for the nth time). During the spring I taught CHE 321 Reactor Design, CHE 435/535 Materials and Corrosion, and CHE 416 Product Design. This was my first time teaching Product Design which is primarily a problem-based learning style of class where student groups develop a new product or product formulation. It was a lot of fun and they developed some interesting new products (self-heating lotion, plant-based road deicer, and shelf stable bath bombs are just a few).

This year will bring a new set of challenges as I start learning how to teach the CHE 411/412/413/414 Plant Design courses with **Wayne Seames**. These are our most challenging classes, both to take and to teach, and I have a lot to learn. I just hope Wayne doesn't take up cliff diving (or any other insanely dangerous hobby) in the near future! I am also teaching CHE 509 Advanced Thermo and team teaching CHE 431 Lab IV this fall and I will teach CHE 321 Reactor Design and CHE 232 Lab I in the spring.

I also continue to pursue research focused around polymer engineering. My current project is developing strategies to accelerate the degradation of commodity polymers such as polyethylene, polypropylene, and polystyrene without adversely impacting their properties or shelf lives.

Life in Grand Forks continues to spoil my family. My son Dimitri is in his second year of middle school while my daughter Alena is in 4th grade. Adding to the levels of insanity in our house, my wife Jenn has started a small business! This year our family vacationed on the east coast - New York, Boston, Washington DC, and Cape Cod (where the family picture was taken).«

KOLODKA RECEIVES CEM OUTSTANDING FACULTY MEMBER AWARD

ChE's **Ed Kolodka** was named one of the college's outstanding faculty members at the annual CEM Awards Luncheon. This award is given in recognition of outstanding performance through a combination of excellence in teaching, research, and service, relationship with colleagues, positive attitude, and the ability to relate their work to the vision of CEM.

In his nomination letter, colleague **Ali Alshami** wrote, "Ed demonstrates an exceptionally high level of commitment to teaching, advising and service. Per my advisees, Ed goes above and beyond to help students reach their potential and excel in their studies. He has taken on an extremely high teaching load with a big smile and is always willing to take on any new course, and/or unpopular courses to help out a colleague. Dr. Ed Kolodka is very committed, sincere, and cares a great deal about the professional well-being of CEM and UND."

We couldn't have said it better ourselves. Congratulations Ed!



CEM Dean **Hesham El-Rewini** presents **Ed Kolodka's** award to **Kathie Johnke**, ChE Admin Assistant. As all of his former student's will appreciate, Ed forgot to show up for his own ceremony (sound familiar?)!

GRAD DAY AWARDS

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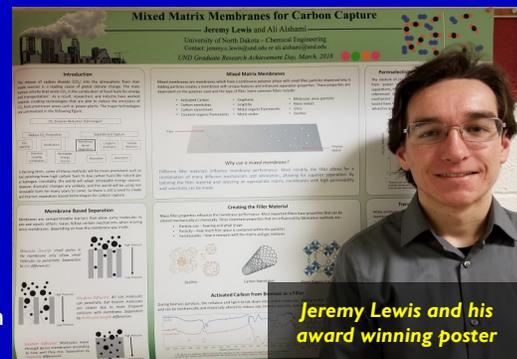
the poor interaction between the matrix and filler, leading to unselective pores and surface defects.

To combat this, Jeremy's research focuses on using activated carbon derived from sunflower seed hull biochar as the filler material. Chemically activating the biochar tends to lead to the formation of different functional groups which may yield mixed membranes with superior permselective properties.

"Another interesting effect results from the casting method", states Lewis. "Typically, membranes are cast and precipitated in an insoluble water solution. So far, there is evidence to suggest using dilute ethanol solutions as the casting solution results in better matrix-filler interaction."

One potential application for the membranes Jeremy is developing is the separation of CO₂ from N₂. While this research is still in its infancy, it is probable that some combination of activated carbon and casting conditions will lead to superior separation performance. Jeremy was recruited to UND through ChE's partnership with Cal Poly Pomona.

Congratulations Katie and Jeremy!«



MICHAEL MANN

CHESTER FRITZ DISTINGUISHED PROFESSOR AND EXECUTIVE DIRECTOR OF THE INSTITUTE OF ENERGY STUDIES



If you look at the accompanying picture you will have guessed my big news for the year. I became a grandfather last fall thanks to my son Justin (Ashley helped too). Sawyer has been a great joy. I am fortunate that Justin and Ashley live in Grand Forks, so I get to spend a lot of time with them. I am looking forward to spending time with and spoiling Sawyer. Other than that my personal story is much the same as always – I still shoot sporting clays and help my wife out in the garden. My son is now a junior in our ChE program and is finishing a co-op with Crystal Sugar. My daughter followed my wife's career, and is a graphic designer in the Twin Cities [Minneapolis-St. Paul metro]. My wife keeps busy with gardening and volunteer activities.

Professionally my time gets split between the department, the Institute for Energy Studies (IES), and providing administrative support for the college. I still teach ChE 102 Introduction to Chemical Engineering each spring. Each fall I teach a graduate level class, which rotates between ChE 404/504 Air Pollution Control, ChE 503 Fuels Technology, and ENG 590 Energy Systems Engineering (a new course I developed last spring). I advise about 40 undergraduate students and oversee a number of masters and PhD candidates. As director of the IES I administer a broad research portfolio, oversee a staff of 20-25 full-time staff and students, and serve as the graduate director for master's and PhD programs in Energy Engineering and Environmental Engineering. In addition to my ChE and IES duties I provide administrative support to the college on an as needed basis. My service as chair of the college's Research Council and as chair of the search committee for our new Director of the School of Electrical Engineering and Computer Science are a couple of examples of these CEM activities.

While most of my travel this year has been to the less exciting destinations like Bismarck, Valley City and Beulah, I did have the opportunity to spend two weeks in China last Fall. I was invited to give a keynote talk at the International Conference on Coal Science and Technology. I visited Taiyuan University of Technology as a part of this trip to sign a MOU facilitating the exchange of students and faculty between our two institutions. I did a return trip to China in June as a part of a grand opening ceremony for a company we are looking to work with for battery development work [see below]. While there, I presented a talk at a battery summit and visited South China Univ of Technology to discuss the exchange of graduate students.

This fall I will be starting my 21st year with the department (my 39th with the university). I continue to enjoy my interactions with the students and our alumni, and am looking forward to another great year.«

Mann Travels to China to Expand IES's Work on Battery Technologies

Mike Mann and his IES team are building an international reputation in the lithium ion battery industry. Mann traveled to China in June where he was one of five invited dignitaries to speak at the ribbon cutting ceremony for Mic-Power New Energy Company's new advanced manufacturing facility. Mic-Power is a leading manufacturer of micro-lithium ion batteries and a supplier to companies including Jabra and Apple.

While in China, Mann was also a keynote speaker at the Forum for Intelligent Manufacturing of Future Battery and Energy Technologies. UND's China connection was facilitated by **Clean Republic**, a Grand Forks based company and a partner in UND's battery work [see pg. 7].

These efforts provide exciting opportunities for students at all levels. The battery work has involved four undergraduate students, three REU students [see pg. 22], and one combined BS/MS student. This fall, one PhD student and a research scholar will be joining the current MS and PhD students to work on the battery development efforts. These new students will be made possible, in part, by a new partnership agreement between UND, Mic-Power, Clean Republic, and Central South China University that Dr. Mann helped forge while he was in China.«

Mike Mann Flag Marshal at Spring 2018 Commencement

UND holds general commencement ceremonies at the end of each academic term: spring, summer, and fall. For each ceremony a UND faculty member, chosen from the ranks of the Chester Fritz Distinguished Professors, carries the University Flag and leads the commencement procession.



It is an honor to be chosen for this service and is an acknowledgement by the university's administration of significant contributions by the Marshall to UND. The Faculty Flag Marshal at the Spring, 2018 ceremony was **Mike Mann**, Chester Fritz Distinguished Professor of ChE. This is Mike's second selection as Flag Marshal. He also led the procession at the Fall 2010 Commencement. Mike's selection further enhances UND ChE's reputation for excellence in all facets of academia and we are proud of his selection.

POWER TO THE PEDAL

NOT YOUR GRANDFATHER'S DURACELL: REVOLUTIONARY UND-DEVELOPED BATTERY PROPELS EVERYTHING FROM E-BIKES TO FISH FINDERS

(this article was extracted from the original UND today article by Jan Orvik, University & Public Affairs, 3/29/18)

When **Clean Republic**, a Grand Forks business started by three UND students began manufacturing their Hill Topper electric bicycle wheels, they realized the batteries used to propel the e-bikes left a little something to be desired. They needed more oomph. Enter **UND's Institute for Energy Studies (IES)** and North Dakota coal.

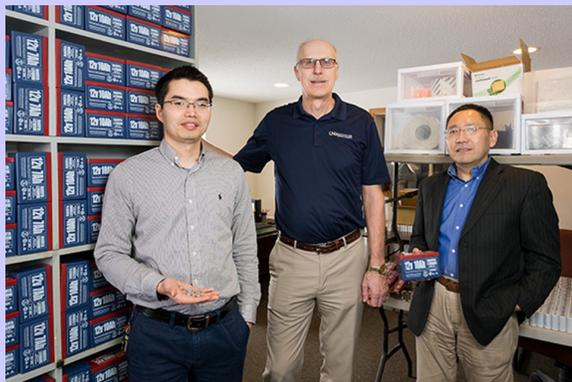
UND researchers and students are exploring the use of leonardite from ND lignite as a cathode material for a rechargeable super-battery that lasts longer and is more reliable, especially in cold temperatures. Plus, it costs less. Leonardite is a byproduct of lignite named after A.G. Leonard, the first state geologist and professor of geology at UND, for whom Leonard Hall is named.

Today, the lithium battery powers products from e-bikes to fish finders, and you can find Dakota Lithium batteries – made right in Grand Forks – on sporting equipment at Cabela's and other retailers.

"From prototype to pilot to the private sector, it's an example of UND research that improves technology, uses ND coal products, and powers jobs right here in Grand Forks," said ChE's **Mike Mann**, Exec Director of the IES.

"We started the battery development three years ago," said Mann. "Clean Republic's battery quality and reliability were poor, and they asked us to design and make a new battery that was higher quality, more reliable and less expensive."

"This is a farsighted project," said Yong Hou, materials research engineer at IES and co-founder of Clean Republic.



Xiaodong Hou and **Mike Mann**, both with the CEM Institute for Energy Studies, pose with Yong Hu, co-founder of Clean Republic. Photo by Tyler Ingham/UND Today.

"The big picture," said Yong, "is that a private company brings its problem to UND, and UND expertise, with support from public and private sources, finds new ways to use ND resources and builds jobs in the state."

"We started with one undergraduate student testing our ideas, and we figured out a possible solution," said Xiaodong Hou, an analytical chemist at IES. "After a year of promising results, we wrote proposals and received a grant from Research ND to commercialize the

product and helped Clean Republic bring in \$1.6 million from a private investment firm."

That led to setting up a pilot plant to produce the batteries. "We increased the performance of the battery by 15%, making a super battery," said Mann. "It's the same size with more power, longer life and a lower cost."

Now, the UND team is working on a second project with Clean Republic and funding from the Renewable Energy Program and the North Dakota Industrial Commission.

"This is a great example of how UND works with small business," said Xiaodong. "We were able to turn a small project into a big project, and a small business can help grow research at UND."

Today, Clean Republic's biggest problem is manufacturing the batteries and e-bike kits quickly enough.

"Our future depends on a successful business in Grand Forks," said Yong. "We generate revenue and jobs for UND students, who can find a career with us as the business grows."«

BELOVED CHE PROFESSOR EMERITUS DON SEVERSON PASSES AT AGE 98

Donald E. Severson passed away on April 7, 2018 in Leesburg, Va. He is survived by his wife, Rosemary, sons Alan, Ken and Russell Severson, daughters Eileen Bigden and Janet Rogers, 13 grandchildren and eight great-grandchildren. Born on Dec. 16, 1919 in Minneapolis, MN he received his PhD from the University of Minnesota and served in the OSS (forerunner to the CIA) in WWII.



Don was member of the UND CHE Faculty from 1949 until 1985. He was an early researcher on lignite gasification and liquefaction, which led to a multi-year, multi-million-dollar contract with the US Office of Coal Research that established Project Lignite in 1972. He was the first of three UND ChE Professors to achieve the rank of Chester Fritz Distinguished Professor, and a member of the inaugural group receiving that award.

Don was one of the most popular professors in the department's history and an endowment was established in his name at his retirement. **Donations in his memory can be made to the Donald E. Severson Chemical Engineering Endowment through the UND Foundation** [see pg. 18] or online at <https://undalumni.org/> -click Engineering and Mines give now, choose another fund and enter Donald E. Severson Chemical Engineering Endowment.«

WAYNE SEAMES

DISTINGUISHED PROFESSOR AND DIRECTOR OF THE ND SUNRISE PROGRAM

Greetings from UND ChE! Part of my service to CEM last year was to conduct a series of “Meet and Greet” events throughout the state [see pg. 11]. These events were designed to educate North Dakota civic leaders about research universities, using UND’s engineering college as the specific example, so that these leaders have a better understanding and can make more informed decisions that impact higher education. At least one meeting was held within around an hour’s drive from every location within the state. For most of these meetings I was joined by one or more engineering students and another member of the CEM faculty. I discovered that most North Dakotans do not know all of the many things we do in the college. I could feel the excitement grow as each meeting progressed and we introduced more and more of the many facets of teaching, research, and service that we provide and how those activities impact the attendees’ local communities.



You can help with this. Each graduate from our program becomes an ambassador for UND ChE. You demonstrate every day in your job how the foundation of knowledge, ethics, communications, work ethic, and other skills that you learned at UND translate into successful, fulfilling careers. On top of this, we hope that you will encourage your companies to hire more recent UND graduates and to look to UND as a potential partner for research and other collaborative endeavors. As part of my CEM service, I also help to facilitate corporate research activities. We want to make it easy for companies to work with UND. Think of me as a one stop shop for UND research. Contact me and I’ll find you the appropriate UND research expertise to help you.

Our record graduating class made last year a challenge due to the sheer volume of students in my classes. But it’s also exciting to work with each year’s cohort of students. Just as individuals are different, it seems that each ChE student cohort also has a unique personality. This year I am teaching ChE 408 Process Dynamics and Control and ChE 411 Process Design and Economics in the fall and ChE 412/413/414 Plant Design II in the Spring and Summer. **Ed Kolodka** is helping with the design courses this year. My final set of IRES weekly seminars is also on-going this fall. This 3 year program [see pg. 11] was a lot of work, but very rewarding. I got to work with an exceptional group of students and see them develop the same excitement for both research and travel as I have myself.

With the graduation of son Karl, our jobs as parents are now “officially finished,” but our jobs as grandparents are in full swing and my wife Janet spends a lot of time with our three grandsons who live just around the corner from us. Janet joined me for my Western ND Meet and Greet trip and we enjoyed seeing so much of the state. She, along with our daughter JoJo [see photo from the Standing Stones at Carnac, France] and her husband Andrew, traveled to Leeds with me and the IRES students. The four of us then spent some time in France. What a trip!

I always enjoy hearing from our former students, so please stop by, email, or message on LinkedIn! at any time and keep demonstrating that UND graduates are truly **Leaders in Action**.«

WAYNE SEAMES RECEIVES THE LYDIA AND ARTHUR SAIKI FACULTY AWARD FOR INDIVIDUAL EXCELLENCE IN TEACHING AT 2018 FOUNDER’S DAY CEREMONY

Last fall, both fellow faculty member **Gautham Krishnamoorthy** and ChE graduate student **Jasmine Kreft** nominated ChE faculty member **Wayne Seames** for a University-wide teaching award. Their recommendation was accepted by a panel of faculty who selected Seames to receive one of the two individual UND-wide teaching awards bestowed upon faculty each year. In his nomination letter, Krishnamoorthy wrote, “Wayne is one of the most energetic teachers in our department who has always gone above and beyond what was expected of him. He is extremely innovative and constantly looks for ways to address the needs of both online and on-campus students. In this regard, he was the first faculty member in our department to promote active learning techniques in our courses.”

Seames is no stranger to the Founder’s Day stage. He has now received UND-wide individual awards for excellence in teaching, individual research, and collaborative research. He also received UND’s faculty scholar award (Professor of the Year) in 2013 and has contributed to four Departmental awards for excellence in either teaching or research. It is safe to say that he is one of the most decorated UND ChE faculty members in the department’s history.«



NDUS Chancellor Mark Hagerott presents ChE’s Wayne Seames with the Award for Excellence in Teaching at the 2018 Founders Day Dinner

RAPID-FIRE RESEARCH

CHE PHD STUDENT IAN FOERSTER WINS BOTH LOCAL AND REGIONAL 3 MINUTE THESIS COMPETITIONS

(note: this article was extracted and edited from UND today articles by Jan Orvik and Kaylee Cusack, UND University & Public Affairs posted 2/1/18 AND 4/17/18)

Ian Foerster wants to turn soybeans into bicycle frames, helicopter blades, cars and planes. And he can tell you all about it in just three minutes. Foerster tied for 1st place in the regional Three Minute Thesis (3MT) competition held in Las Vegas on March 21, 2018. The contest brought together the best-of-the-best graduate research presenters from 12 universities.

To earn the right to represent UND at the regional competition, Foerster and seven other finalists took part in the UND Three Minute Thesis competition on Jan. 25, 2018 where he took home both the first place award and the people's choice award.

Foerster, a **doctoral student in chemical engineering [Research Advisor: Wayne Seames]**, is

working to convert waste products from soybeans into high-value carbon fiber, which is stronger and more stiff than steel, yet lighter. It's used in planes, cars, and even golf clubs. "I spent years raising soybeans," said Foerster, who grew up on a farm near Pisek, N.D. "There's more to them than meets the eye. I want to turn them into a high-value product."

Take it public

Founded in 2008 by the University of Queensland in Australia, the Three Minute Thesis (3MT) competition gives graduate students just three minutes and one slide to clearly and simply explain their research. "It's an opportunity to engage in public scholarship", said Grant McGimpsey, vice president for research and dean of graduate studies. "This competition gives students a chance to showcase their work to the public," McGimpsey said. "It's really important to be able to communicate your work in an understandable way to a lay audience. We haven't emphasized that as much as we should."

The eight finalists, all graduate students, explained their research in just three minutes to a packed room and five judges from the community and university. Topics included speeding up simulations to develop cleaner energy **[by MSChE student Lauren Clarke, advised by Gautham Krishnamoorthy, who just missed winning an award]**, child abuse and the brain, classifying galaxies, how to define infidelity, how the Solar System formed, and using detergents to recover petroleum from rock.



Lauren Clarke, MSChE student took 3rd place in the UND 3MT competition



Ian Foerster, a native of Pisek, N.D., and a doctoral student in chemical engineering, took first place in this year's Three Minute Thesis competition at UND as well as at the Regional Competition in Las Vegas. Photo by Shawna Schill/UND Today.

Competitive communicators

A 3MT contest has a strict set of rules – only one static PowerPoint™ slide, no props, and, of course, the contestants are racing a three-minute timer. The "elevator pitches" are judged on comprehension, content, engagement and communication. It can be a lot of pressure, but Foerster didn't let it get to him on that Las Vegas stage.

"I had managed to make it through my presentation without going over three minutes or making any real mistakes. I had done my best and was feeling pretty satisfied," he recalled. "Everyone had done very well and there was really no way to say who would be the winners. I was proud to have been associated with such talented individuals, and

winning was very exciting."

Pitch perfect

This is the second year the 3MT competition has been held at UND. It was brought to campus by Matt Gilmore, associate professor of atmospheric sciences.

"It's so important for graduate students to know how to present what they're doing to the public," Gilmore said. "We owe it to the taxpayers. And it's a great skill as students enter the job market. Your future boss may not understand what you do without an 'elevator speech.'"

"We are a public university that serves the public," said Chris Nelson, associate dean of graduate studies and associate professor of English. "We need to let people know what we're doing and why research matters. When dad asks at Thanksgiving what you're doing at school, you should be able to answer."

"It's so important to tell our communities about research," said Thomas DiLorenzo, provost and vice president for academic affairs. "It's really important to be succinct, short and clear, and to think of the audience."

"I never expected to win an award, much less the people's choice and first place," said Foerster. "It was unexpected. There were a lot of great presentations. This is an opportunity to justify what I've been doing. I want to make the world a better place."

Now that he's a titleholder, Foerster's immediate goals are to finish his research and graduate later this year. From there, he'll go wherever his experiences lead him. «

TRANSFORMATIONAL TEACHING CHE PROFESSOR WAYNE SEAMES IS ON A MISSION FOR A MUCH-NEEDED MODERNIZING OF A CORE CHE COURSE

(This article was co-written with Jan Orvik, university & public affairs; a version appeared in the UND Today Newsfeed on 2/6/18)

When UND ChE Professor **Wayne Seames**, was an engineer in Industry in the mid-80s through mid-90s, he ended up as a key participant in changing how process plants were managed and controlled. The invention of micro-processing and digital technologies allowed the process industries to increase the efficiency and safety of their facilities by replacing independent electronic controllers with integrated digital control systems (DCS). Seames had the opportunity to replace a number of the older systems as a project engineer and project manager including managing the largest such project completed in the 1990s.

In the mid-2000s, Seames finally was given the opportunity at UND to teach the senior-level process controls and dynamics course that is a part of every accredited chemical engineering undergraduate program.

"I was looking forward to teaching this course and to see new textbooks that reflected this 'revolution' in process controls", states Seames. "Imagine then my disappointment when I found that all the major textbooks in this field were still following the same format and with essentially the same content as textbooks published in the 1960s and 1970s! These books emphasize simplified mathematical descriptions of process dynamics using time-dependent linear ordinary differential equations and their analytical solutions using Laplace transform solution methodologies."

So Seames decided to take on the challenge of developing a completely new course. It took around four years for him to complete the project which included a detailed course outline, Powerpoint™ slides for each chapter, quiz questions for flipped instruction, and homework solutions.

UND Students Contributed to the Project

After Seames developed the first draft of the textbook, he used the material in UND's version of the class during the 2015 and 2016 fall semesters.

"Students are great at identifying where material is unclear and should be improved. They are also really good at finding typographical errors. Mostly they wanted more examples included with the text," Seames states.

Seames also enlisted the help of one of his doctoral students, **Ian Foerster** [see RAPID-FIRE RESEARCH article and photo pg. 9]. Ian served as the Teaching Assistant for the class each year and helped to develop the solutions to the homework problems. Between Ian and the students in the class, unworkable or unclear homework problems were quickly identified and corrected. Ian's contributions were so significant, that he is listed as a co-author of the solutions manual.

These efforts culminated in the publication of a new textbook, Designing Controls for the Process Industries by



UND Chester Fritz Distinguished Professor of Chemical Engineering **Wayne Seames** recently wrote a new textbook that may revolutionize how an important chemical engineering concept is taught. Photo by Shawna Schill/UND Today.

CRC Press/Taylor and Francis Group in September, 2017.

The students seem to appreciate the new course also. According to student senior exit interviews, the course has gone from being one of the most disliked courses to one of the most popular among UND ChE students.

"The way Dr. Seames teaches is more helpful to learn the way processes are controlled in industry," said **Brittany Rew**, a combined BS/MS ChE student from Roseville, Minn. "A lot of textbooks are hard to read. This was easy to read with a lot of examples that help you understand the material better."

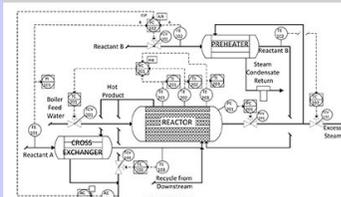
"I really enjoyed the class," said **Will Hammann**, another combined MS/BS ChE student from Grand Rapids, Minn. "Dr. Seames explained it totally differently, from the bigger picture rather than by explaining the controls themselves. He focused on the entire process. That helped me understand what we are trying to do with controllers. It was pretty helpful."

Transforming an Entire Academic Community

Seames is not alone in wanting to change the topical content of this course to reflect the present reality. A recent survey performed by the American Society for Engineering Education (ASEE) found that many instructors teaching this course would like to change the course topical content.

DESIGNING CONTROLS FOR THE PROCESS INDUSTRIES

Wayne Seames



CRC Press
Taylor & Francis Group

(Continued on page 11)

TRANSFORMATIONAL TEACHING (CONTINUED FROM PG. 10)

Now that the material is available, **Seames** is on a mission to spread the word to other ChE academics, and to try to convince them to change their course offerings. In August he led two 3-hour workshops for new ChE faculty at the 2017 ASEE Summer School for Chemical Engineering Faculty on the new material and how to use it in their classes. He also gave a similar, though shorter, presentation at the American Institute of Chemical Engineers Annual National Meeting in Minneapolis in October, 2017.



UND – a world leader in Undergraduate Education

Efforts like those of Wayne Seames help to support UND's reputation as a national leader in Undergraduate Education. In addition to his efforts to change this topic material, Seames has also conducted over a dozen workshops on how to use active learning techniques in science and engineering education, including eight workshops in the United Kingdom, attended by over 250 academics from around the world.

"It is important as we seek to increase our level of research activity here at UND that we do not compromise the quality of the educational experience that we provide the students", says Seames. "We can be both excellent at teaching and at scholarship. It is a question of talent, resources, and motivation".

If you are looking for a role model for achieving excellence in both teaching and research, look no further. **Wayne Seames** is not only an award winning teacher [see Award article on pg. 8], he is an award winning researcher, and North Dakota's only Fellow of the National Academy of Inventors. «

SEAMES APPOINTED CEM FELLOW FOR COMMUNITY AND CORPORATE ENGAGEMENT

Seeking to increase the college's engagement with both business and governmental stakeholders, Dean **Hesham El-Rewini** appointed ChE's **Wayne Seames** to serve as the first CEM Fellow for Community and Corporate Engagement.

Last year Seames organized and led a series of informal "Meet and Greet" events throughout North Dakota focused primarily for State Representatives, City Council members, and School Board members. Along with at least one other faculty member and one CEM student, Seames led a discussion that helped the audience understand what CEM does and how it impacts their communities. The events were highly interactive so that everyone's questions could get answered and everyone's feedback received.

Seames is also working to increase contacts between CEM faculty and corporate stakeholders to foster interest in participation and sponsorship of CEM research activities. He serves as a "one stop shop" for companies that would like to sponsor research, to answer technical questions they have, or to provide them with data. If your company is interested in such a service, let Seames know and he will either: 1) find the expertise at UND you need or 2) suggest another way to get your data if UND can not help you.«

SEAMES LEADS LARGEST COHORT OF STUDENTS TO THE U.K. IN FINAL YEAR OF NSF-SPONSORED IRES PROGRAM

Wayne Seames led another cohort of engineering students from the California State Polytechnic University at Pomona [CPP] Engineering College and UND to the University of Leeds (UoL) in the United Kingdom, under a grant from the National Science Foundation (NSF) International Research Experiences for Students (IRES) program. The cohort was hosted by Professor William Gale, the director of the Centre for Integrated Energy Research at the UoL.

This year's group of nine students almost doubled the student participants from the last two years. A combination of factors including a more favorable exchange rate and lower than anticipated costs during the first two years allowed the project to sponsor the additional four students. Six of this year's students were from UND and three from CPP.

Under the IRES, selected students participate in a year-long program beginning in January. During the winter/spring, they learn about their topics and develop the skills they need to perform their research under the guidance of a faculty researcher at either UND or CPP. During the summer, the students spend eight weeks at UoL conducting research. Upon their return, the students pre-



The 2018 IRES Cohort at the Leeds Railway Station waiting to catch a train to York for their cultural tour.

(Continued on page 12)

ALI ALSHAMI

ASSISTANT PROFESSOR



Another year passes and with it memories of happier times. Aside from the unusually long winter I have experienced thus far since relocating to North Dakota, everything else has been nothing but happy! Good things happened last year and continue to happen moving forward. We now have a new slogan “Leaders in Action” that is a spirited summation of UND’s students, faculty, staff and alumni. We also now have a new student-centered and mobile-friendly website; which I happen to like a lot. Many more good and happy things have been happening on-campus: major improvements and renovation to iconic buildings, new steam plant, substantial funds allocation for the UND Grand Challenges seed grants, and finally significant enrollment increase in our online education program. Good things are indeed happening at UND and the CHE department, and I am happy that I am a part of it.

As for teaching, the past year I taught four courses: 1) CHE 305, Separations in the Spring, 2) CHE 315 Statistical Data Analysis & Numerical Methods in the Spring, 3) CHE 431 Laboratory IV in the Summer and Fall, and CHE 515 Design of Engineering Experiments in the Fall. Additionally, I assumed the responsibility of teaching our CHE 397, Cooperative Education course. As an on-going experiment that is dynamic and forward looking, I have been implementing more active teaching and learning strategies in my courses with progressive assessment of the results showing incremental enhancements.

Research has been going well. We are starting to see results from initial efforts that are encouraging and promising. We are getting very close to concluding our phase one research into the potential production of high value biochemicals using carbon monoxide from coal gasification as the food source. We have obtained all the needed preliminary seed data for the next phase of funding. We also have progressed well in our membranes research for water and gas separation processes.

On the personal level, life has been great! My wife Amy changed jobs and landed a telecommute case management position; a position she likes very much since her office is in the comfort of her home. Our eldest son Ryan competes in swimming and gymnastics, so pretty much every weekend of ours is spent at a different meet location. Our younger son Zack keeps busy with soccer, but not yet competitively, thank goodness! All in all, it has been a pleasant and joyful year for us, and I hope it has been the same for you and your family. «

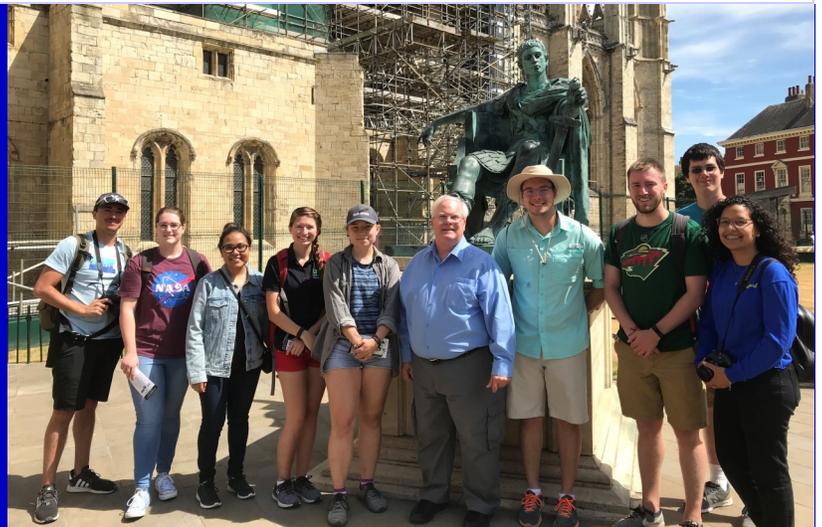
IRES PROGRAM

(continued from pg. 11)

pare their results for publication and give presentations to a variety of audiences.

This year’s students and their projects were:

- **Will Hammann**, UND MS/BSChE combined, “Carbohydrate Extraction from Algae”
- Kim Cerrillos, CPP BSIME, “An Evaluation of User Experiences in Smart Buildings”
- Jessica Damon, CPP BSME, “Social Equity and Environmental Justice: Exploration of Spatio-Temporal Traits and Influential Factors of Various Air Pollutants”
- **Andrew Kohler**, UND BSChE, “Conversion of Algae Carbohydrates to Fuel and Chemical Precursors”
- Mark Pintur, UND BSME, “Ocean Wave Energy Converters”
- **Jason Power**, UND BSChE, “Change Agent Modeling”
- Blanca Saavedra, CPP BSIME, “Improved Medical Implants”
- **Jiselle Thornby**, UND BSChE, “Creep Response of Mg/Carbon Nanotube Nanocomposites”
- Emily Walz, UND BSME, “A Dual Rotor Vertical Axis Wind Turbine”



The 2018 IRES Cohort at the York Minster with Constantine the Great (from left): Jason Power, Jessica Damon, Kim Cerillos, Jiselle Thornby, Emily Walz, “tour guide” **Wayne Seames**, Will Hamman,, Andrew Kohler, Mark Pintur, and Blanca Saavedra.

While at Leeds, students are matched up with British student ambassadors so they can learn about life in the UK from their peers and participate in technical and cultural field trips. «

BETHANY KLEMETSRUD INSTRUCTOR



I survived my first year at UND! I have learned so much this last year and hope that my students have learned as much as I did. I have been incredibly fortunate to have such a welcoming and supportive department here at UND. My office is across from **Frank Bowman's** and if he had a dollar for every question I asked him this year, he'd have college tuition money for all his kids.

The students were instrumental in my success this first year. They were incredibly patient with me as I explored different teaching techniques and their constant feedback was invaluable. I taught CHE 340 Professional Integrity every semester and had nearly 200 students from all of the various engineering departments. Having all of the different engineering backgrounds in class made for lively case study discussions and really pushed me to learn more about other fields as well. I also got to teach CHE 206 Unit Operations and this was so much fun! [Nerd status!] I hope all my students have a deep appreciation for Bernoulli and heat exchangers. I also helped teach Labs 1-4, and this summer I taught CHE 335 Summer Lab 2. The third semester is definitely the charm; it was my best class to date (don't worry I'm not done improving). It was great being able to see our distance students on campus and finally put faces and personalities to emails and exams. Fitting a semesters worth of lab into 10 days is basically insanity, but it works! This year I am basically teaching the same courses again, which should make it a bit easier for me.

For service to the college I have been helping develop new goals and events centered around entrepreneurial ideas for the Jodsaas Center [if you have any ideas or want to help out, please email me]. I was also asked to lead the Power ON! K-12 outreach program [see pg. 18]. I really can't consider this service, because it's so much fun! I've gotten to know a lot of the undergrad students this way and made connections in the local community. Having grown up in the area, outreach is incredibly important to me. Being able to give back to the community and to the college is one of the main reasons for me coming back to North Dakota.

I love living in Grand Forks. It's been great to be so close to home and to be able to make it to milestone birthdays and various events within the family. My family also loves the fact I live in Grand Forks. I am basically the Papa Murphy's delivery driver to Devils Lake and the hockey hotel for my cousins when there are games in Grand Forks. [I finally got the hockey bag smell out of my car!] Last winter I went to Spokane to visit friends from Grad School [see photo, I'm the one on right] and made a trip back to Michigan Tech for Winter Carnival. This summer was filled with hiking various State Parks in Northern Minnesota, one more Upper Peninsula visit and going to Minneapolis to see Beyonce!

When I'm not busy teaching or being the Papa Murphy's delivery driver, I've been focusing on how to work collaboratively with various departments at UND. My research lies in renewable fuel production along with life cycle assessments. The research projects I was a part of in graduate school and in my post doc focused on working in interdisciplinary projects to be able to get comprehensive views of research projects. I want to bring those same aspects to my future research here at UND.

It's been a great first year and I cannot wait for what the future has for me here at UND.«

BRIAN TANDE RETURNS TO UND AS CEM ASSOCIATE DEAN

Hello ChE alumni and friends. Yes, I'm back at UND! Last summer I left UND after 11 years and took a position at Kansas State University. I enjoyed my time there very much, especially the relatively mild winter (which people there still complained about!). I developed some interesting research collaborations and learned a bit about how another university operates. Overall, it was a great experience, but when I got the opportunity to come back to UND as Associate Dean, I couldn't pass it up. I realized two important things during the last year. The first is that I actually do enjoy (most of) the administrative side of academia. The second is that I'll probably never really feel as much at home anywhere else as I do here. I have deep roots in North Dakota and Minnesota and I am proud of the work we do at UND to support this region of the country.

What does an Associate Dean do? So far I've been dealing with various student and faculty issues, working on implementing and updating college-wide policies and procedures, and reforming our student advising process. As a special assignment, I am the interim director for the new School of Electrical Engineer-

(Continued on page 23)



YUN JI**ASSOCIATE PROFESSOR**

I cannot believe this is my 9th year at UND now! I am teaching ChE 303 Chemical Engineering Thermodynamics and ChE 515 Design of Engineering Experiments this semester. Next semester, I will teach ChE 332 Chemical Engineering Laboratory III and ChE 435/535 Materials and Corrosion. This is my first time teaching ChE 303. It has been a lot of fun to refresh my memory in thermodynamics.

I was on developmental leave for the 2017-2018 academic year. During the first half year, I started to explore new research topics in cellulose-based biofoams and collaborated with the researchers at the Eastern Regional Research Center of USDA, the University of Maine, and the Shaanxi University of Technology & Science (China). During the second half year, I was a Fulbright Scholar at the VTT Technical Research Center of Finland. VTT is one of the leading research and technology organizations in Europe. VTT has several locations in Finland: Espoo, Oulu, Tampere, Jyväskylä, Rajamäki, Turku, Kuopio, Lappeenranta, Kajaani and Raah.

I worked at the Jyväskylä center. The weather is similar to Grand Forks' weather so I did not have the weather shock moving to Finland in the middle of winter that others might experience. My research project in Finland was to improve fiber extensibility in order to make a paper product that is as flexible as plastic. I also visited the VTT facilities in Tampere and Espoo, Aalto University, Helsinki University, University of Jyväskylä and Åbo Academi University. I wish I had learned some Finnish during my stay in Finland. However, everyone spoke English and as someone told me "life is too short to learn Finnish!" My developmental leave was fruitful. I have learned a lot from other researchers and submitted five manuscripts with collaborators. But it feels good to be at home and at UND working with students again. «



KRSHNAMOORTHY COMPLETES CEM LEADERSHIP TRAINING PROGRAM

ChE Associate Professor **Gautham Krishna-moorthy** completed a year-long Diverse Leadership Development program (DLDP) led by CEM Dean **Hesham El-Rewini**. The program was designed as a training ground for junior and mid-career faculty members who aspire to leadership positions in CEM and beyond in order to increase CEM's future leadership diversity.

The program included completing a Strength Finder Module and conducting a Leadership Project (approved by the Dean) with inputs from academic and industry mentors while actively participating and engaging in discussions with other members of the DLDP cohort. «



Kinetics was produced by Wayne Seames with contributions from the faculty & staff of the UND ChE Department and by University & Public Affairs .

CHE ALUM HELPS TO ESTABLISH COOPERATIVE CHILD CARE CENTER

Laura Dronen, BSCHE 2001/MSCHE 2003, and her husband Jon were featured in an article in the March 2018 issue of *Prairie Business Magazine* for their efforts to help establish a cooperative Daycare Center in the Beulah/Hazen, ND area. Laura is a process engineering supervisor at the Dakota Gasification Company (DGC).

The project team was able to procure a recently closed church, Bethel Congregational Church, and renovate the area for the Daycare center. Aside from the plumbing and electrical work, the entire remodel project was completed by volunteers. The Dronens were among the most dedicated volunteers, working 10 hour days on Saturdays plus evenings and Sunday afternoons.

Laura and DGC have been great supporters of the UND ChE Capstone design program, having sponsored a number of projects over the past few years.



Laura Dronen (left), with one of the Plant Design Teams she sponsored and mentored at the 2016 May Awards Ceremony

**THANKS LAURA FOR ALL YOU DO
FOR UND AND FOR YOUR COMMUNITY!**

DECEMBER 2017 B.S. CHE GRADUATES

Pictured are the December 2017 Order of the Engineer Inductees:

Back from left: Michael Harycki, Andrew Knable, Jacob Jaspersen

Front from left: Jasmine Kreft, Kelsey Glatt, Brittany Rew

BSCHE graduates not shown: James Andersen (DEDP), Patrick Chapin, Cataldo Didonna, Ryan Gregg (DEDP), Nguyen Le (DEDP), Yi Shi (DEDP), and Ann Marie Stutz (DEDP)«



FACULTY RESEARCH HIGHLIGHTS

RESEARCH PRESENTATIONS

- [Johannes van der Watt](#), Daniel Laudal, Harry Feilen, **Michael Mann**, Srivats Srinivasachar, Teagan Nelson, "Attrition and Reactivity Analysis of Oxygen Carrier Materials under High Temperature Conditions", 2017 International Pittsburgh Coal Conference.
- [Sara Pourjafar](#) and **Wayne Seames**, "The non-catalytic decomposition of lignin into chemical and fuel intermediates", AIChE National Meeting, Minneapolis, Oct. 30, 2017.
- **Michael Mann**, Daniel Laudal, Steve Benson, "Maintaining Coal's Prominence in a Carbon Constrained World" that was a Keynote presentation at the 2017 International Conference of Coal Science & Technology.
- **Ali Alshami** and [Austin Tesser](#), "Bio-based Dielectric Substrate for Radio Frequency Antenna", AIChE National meeting, Minneapolis, November 1, 2017.
- [Johannes van der Watt](#), Ben Jensen, Daniel Laudal, Harry Feilen, Junior Nasah, **Michael Mann**, [Ryder Shalbetter](#), **Gautham Krishnamoorthy**, Srivats Srinivasachar, "Evaluation of a Spouted Bed Reactor for Chemical-Looping-Combustion of Solid Fuels", 43rd International Technical Conference on Clean Energy.
- [Jasmine Kreft](#), [Nicholas Garcia](#), [Eric Moe](#), Andrew Ross, **Wayne Seames**, "Microalgae Oil Extraction", AIChE National Meeting, Minneapolis, Oct. 30, 2017.
- [Johannes van der Watt](#), Daniel Laudal, Harry Feilen, **Michael Mann**, Srivats Srinivasachar, Teagan Nelson, Steve Benson, "Reactive Jet Attrition Analysis of Oxygen Carriers in Chemical-Looping-Combustion Systems", 43rd International Technical Conference on Clean Energy.
- Daniel Laudal, [Brittany Rew](#), Steve Benson, **Michael Mann**, "Technical and Economic Feasibility Analysis of Integrating Activated Carbon with Heating Plant" that was presented at the 2017 International Pittsburgh Coal Conference.
- Abdullah Al Hadi, [Nayeem Chowdhury](#), **Michael Mann**, "Design and Analysis of a Standalone DC Microgrid with Battery and Fuel Cell Energy Storage Penetration for Different Load Characteristic", 2018 IEEE International Conference on Power Energy, Environment and Intelligent Control.

NEW RESEARCH GRANTS

- **Michael Mann** led a team that was awarded \$2,511,144 from the US Department of Energy and various co-sponsors for a project entitled "Supercritical Treatment Technology for Water Purification".
- **Gautham Krishnamoorthy** was a member of a team (led by Envergenx LLC, Waltham, MA) that won a DOE-NETL SBIR/STTR Phase II Award for "Spouted Fluid Beds for Chemical Looping Combustion/Gasification." Award Amount: \$620,880; Period of Performance: 05/01/2017 to 04/30/2019.
- **Frank Bowman**, Guodong Du, and David Delene were awarded \$330,000 from the National Science Foundation for a 3-year project entitled "REU Site: Interdisciplinary and Renewable Collaborative (IREC)" [see pg. 22].
- Xiaodong Hou and **Michael Mann** were awarded \$242,266 from the North Dakota Renewable Energy Council for a project entitled "Preparation of Graphene-Modified LiFePO₄ Cathode for Li-Ion Battery" [see pg. 7].

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ANOTHER RECORD UNDERGRADUATE CLASS

For the second time in three years, ChE set a record for the number of students receiving their BSChE degree [see *Kinetics* 2016 pg. 5] as 51 student graduates in academic year 2017/18 breaks the record of 37 from the 2015/16 academic year!

SPRING/SUMMER 2018 B.S. CHE GRADUATES

Spring Pictured: Back row from left: Samuel Lerma, Conner Willits, Seth Welvaert, Tanner Ring, Hunter Sannes, Austin Tesser, Cole Bachmeier, Brandon Gill, Noah Peterson, Stewart Million-Perez, Justin Baker, and Jacob Ries

Front row from left: Alison Albrecht, Tanner Leslie, Abdullah Mahbub (Spring 2019 grad), Will Hamman, Jordan Nelson, Anthony Domingez, Tim Taylor, Eugene Akinor (DEDP, Fall 2018 grad), and Chad Myers

Spring Not shown: Ben Betzold, Mary Carpenter (DEDP), Russell Damsgard, Andrew Dawson, Michael Graalum, Katharine Hirl (DEDP), Sydney Jacobson, Michael Salemi (DEDP), Atul Stroha, Samantha Turner, Brad White (DEDP)



August: Candance Canerday (DEDP), Nicole Eisenschenk, James Gibbons (DEDP), Alexander (Von) Huber (DEDP), Nick Lander, Nicholas Njuguna (DEDP), Bryan Owen (DEDP), Brandon Severson (DEDP), Natalie Stjernen (DEDP), Edita Tello (DEDP)«

CHE ASSOCIATED MERIT AID SCHOLARSHIPS

Daryl L. and Diane A. Anderson Scholarship

Alexander Geritz - \$1200, Andrew Kohler - \$1000
Madelyn Jean - \$800, Joshua Roehrich - \$750

Boise Engineering Scholarship

Emily Skaare - \$1750
Alaura Anderson, Peyton Loss - \$1000 ea

Albert Cooley ChE Scholarship

Beau Tetreault - \$900, Michael Dahlson - \$500

Alfred & Florence Golde Engineering Scholarship

Mikaila Kringstad - \$2500

E. E. Gullekson ChE Scholarship

Samuel Johnson - \$1000, Nicole Paulson - \$900
Hannah Gombold - \$650, Rebekah Oliver - \$600
Alexander Bennett, Allison Zipp, Andrew Dockter, Emily Skaare, Levi Stegner, Zachary Krill, Zachary Meduna - \$500 ea

The Hess ChE Leadership Scholarship

Monica Kuznia - \$800
Mack Buchholtz, Mohamed Mohamed - \$500 ea

Koth Engineering Scholarship

Rachel Pietsch - \$600

Wayne R. Kube Memorial Scholarship

Jacob Geritz - \$800

Michael and Sitney Lodoen Engineering Scholarship

Carl Quandt - \$1500

William F. and Inez L. McDonald Scholarship

Sydney Dunham, Tyler Toensing - \$2000 ea
Paul Freimuth, Beau Tetreault - \$1500 ea

The Olson Family Scholarship

Taylor Roehl, Aubrey Hamilton, Gabrielle Donais, Cora Knipp, and Clara Kaufmann - \$1500 ea
Emily Skaare, Alaura Anderson - \$1000 ea

Wendy Sellheim Spent ChE Memorial Scholarship

Alicia Quamme - \$800, Mary Hilpisch - \$500

(Continued on page 17)

2017-18 ACADEMIC ACHIEVEMENT AWARDS

FRESHMAN

Zachary Krill – student of the year and AIChE Freshman Recognition Award winner
Allison Zipp & Levi Stegner– finalists



Your eyes do not deceive you, **Levi** (right) exceeds and **Zach** (center) almost reaches Dr. Mann's 6'6" height!

A.M. SOUBY SENIOR AWARD FOR EXCELLENCE IN PLANT DESIGN

Katharine Hirl, Alexander Huber, and Michael Salemi (these students participated in the joint UND/Benedictine College degree program, Technical Advisor: Scott Blonigen from Benedictine)



"Methane Chlorination"

SOPHOMORE

Tiffany Metzger (right) – student of the year and AIChE D.F. Othmer Academic Excellence Award winner
Monika Kuznia (DEDP) & Eli Peske (left) – finalists



THE CHE ALUMNI AWARD FOR EXCELLENCE IN SENIOR PLANT DESIGN

Andrew Dawson, Will Hammann, Austin Tesser, and Seth Welvaert



"Phosphoric Acid Production"

JUNIOR

Alex Geritz (left) student of the year,
Jissele Thornby (center) &
Brenden Jacobson (right) – finalists



CEM Design Expo ComDel Innovation Senior Best Process Design Award: Sydney Jacobson, Jordan Nelson, Tanner Ring, Hunter Sannes for their project: "SBR Rubber Process"

The ChE Group Nominated for the CEM Freeman Award was: Justin Baker, Joe Dietz, Sam Lerma, and Paige Marcy for their project: "Magnesium from Seawater"

SCHOLARSHIPS (CONTINUED FROM PG. 16)

A. M. Souby ChE Scholarship
 Mark Miller, Tiffany Metzger - \$1000 ea
 Mikaila Kringstad - \$900

Raymond & Edyth Sullivan Memorial Eng Scholarship
 Tiffany Metzger—\$2100, Andrew Kohler—\$2000

David A. Veeder Scholarship - \$1000 ea
 Rachel Pietsch, Malina Lindsey, Noah Ross, Peyton Loss, Clara Kaufmann, Taylor Roehl, William Moe, Rachele Amundson, Kaitlyn Boucher, Zachary Greniger, Cora Knipp

Everett Webb Engineering Scholarship
 Mark Miller - \$1800«

ALUMNI AND DEVELOPMENT

DEB AUSTRENG AND ROBIN TURNER

Greetings alumni and friends of UND's ChE Department. Last year UND adopted a new slogan, "**Leaders in Action**". In selecting this slogan, President Mark Kennedy stated, "A recurring theme I hear from alums is that UND graduates are in demand because they are prepared and committed to getting to work to make an impact, to lead". We believe that no department on campus provides a better example of this characteristic than ChE. As you read through the pages of this Newsletter, we think you'll agree with us. You see it in our current students like Student Body President Cole Bachmeier [see lead article on pg. 1] or Thesis presentation award winner Ian Foerster [see pg. 9]. You see it in our former students like Laura Dronnen [pg. 14] or Jason Laumb [22]. And you see it in our award winning faculty.

You'd hardly know from reading this issue of Kinetics that the department is operating under challenging state funding constraints. ChE's find a way to get the important things done! But these accomplishments are only possible because of the support we receive from many of you. So thank you for helping us to prepare the next cohort of Leaders in Action.

Whether you are interested in supporting student scholarships, endowed faculty positions, or the renovation of laboratories (we still have one student lab plus a couple of research labs that need renovation), you can make a difference with an outright gift, a pledge over time, or a bequest. Please let us know if you can help or if you have any other ideas of ways you'd like to help or would like to learn more about ways to support UND ChE, Contact us or go to: undfoundation.org/engineering and select "Chemical Engineering" from the Designation menu, or send a check with "Chemical Engineering" in the memo line to: UND Foundation, 3501 University Ave. Stop 8157, Grand Forks, ND 58202-8157«

TOM OWENS CHEMICAL ENGINEERING FELLOWSHIP CONTINUES TO GROW

We are still requesting donations for this endowment. Our goal is to eventually reach the "Endowed Chair" level, originally established at \$1.5 million.

Tom Owens was an inspirational leader and mentor for the hundreds of students that passed through the UND ChE program. We can think of no better way to honor him than with this endowment. If you haven't already, please consider a contribution to this endowment. The goal is to provide at least 50% of the salary for the Owens Chair so that we can maintain our increased faculty size well into the future. Additional support is needed to reach this goal – outright gifts, pledges, and testamentary provisions are just a few of the many ways to support this endowment.

For further information concerning the Tom Owens endowed chair in Chemical Engineering please contact Robin Turner (see above) or the ChE department. «



DEB AUSTRENG

Director of Alumni, Corporate and Public Relations
College of Engineering & Mines
Josdaas Center, Harrington Hall, Room 100D
243 Centennial Drive, Stop 8155
Grand Forks, ND 58202
Voice: 701-777-4249
Email: deb.austreng@engr.und.edu



ROBIN TURNER

UND Alumni Association & Foundation
Director of Development
701-777-1428 Work
701-739-3211 Mobile
Email: RobinT@undfoundation.org
3501 University Ave Stop 8157
Grand Forks, ND 58202-8157

POWER ON! CONTINUES TO INSPIRE REGIONAL YOUTH FOR SCIENCE



Power ON! had another successful year of outreach for our department and the college. **Beth Klemetsrud** took over day-to-day management of the program, from **Ali Alshami** [a big thank you to Ali for overseeing the program for the past few years]. This year we had eight outreach events, some of them on campus and others around our community. The highlights always include the Rydell Car Show, SuperScience Day, and visiting local schools.

It is always special to see the look of astonishment and awe on a child's face when we first turn on the Rubens' tube demo [a flaming piano]. That look is a perfect reminder of why it's so important for us to go into the community and share our love for science and engineering.

The undergraduate volunteers this semester were nothing short of amazing. We could not do this work without our dedicated students. Special thanks to **Fatmata Coomber** who helped organize all of the events for the fall semester and to **Zach Krill** who took over in the spring semester. We look forward to celebrating our 15th year and hope that we can continue being an integral part of science outreach in the Greater Grand Forks Community. «



ALUMNI CONTRIBUTION REPORT

Thank you for your generous contributions! This year we received \$6,814 for the Thomas Owens Endowment, \$31,241 for department priority needs, and \$49,277 towards student scholarship endowments.

UND ChE relies on your contributions to allow us to function, as state appropriations provide less than half of the operating funds we need to run the department. We expend more funds from Alumni donations on departmental operations than from state appropriated funds!

In addition to our day-to-day expenses like paper, photocopies, etc., alumni donations are used for lab supplies and maintenance and other unanticipated costs (like replacing old computers when they can no longer be repaired). Alumni-provided endowment funds also allow us to provide many enhancements to the program that directly benefit the students and the quality of education we deliver.

Alumni contributions also allow us to provide a small monetary gift with our Academic Achievement Awards, given to the top students in the freshman, sophomore, and junior classes, for the Excellence in Senior Plant Design Award, and for cake and punch at the ceremony where we present those awards [see pp. 16-17].

We continue to provide scholarships through the various endowments so graciously supported by our alumni. A list of these is provided on pp. 16-17.

Our 51 graduating seniors this year substantially exceeded our previous record of 37 from two years ago. We are pleased with the continued increase in popularity of our program, but it also means a higher fraction of our students cannot get the financial assistance for their education that we feel they deserve. Please give this need your consideration.

We would like to personally thank those who have given to UND ChE. If you contributed to the department and are not on this list, let us know, but please forgive us. We do our best to keep our database current, but we sometimes make mistakes.«

NEW CHE SCHOLARSHIP ENDOWMENT

The Estate of **Daniel** (MSChE 1966) & **Bette Boteler**, desiring to support the ongoing growth and development of UND established the **Daniel & Bette Boteler Family Scholarship Endowment** with a generous gift. The family's expressed desire was to allocate funds each year for scholarships to be awarded to Chemical Engineering students. The gifts qualified for the UND Promise match program which increased the impact of the gift by an additional 50%. The family asked that \$2,500 of the initial gift be used for immediate distribution and awarded for the academic year 2018/19. We are extremely grateful to the Boteler family for their generosity and support of our students.«

PERSONAL AND CORPORATE CONTRIBUTORS JULY 1, 2017 - JUNE 30, 2018

3M Corporation

Archer Daniels Midland (ADM)

Stacy J. Bjorgaard

Doyle H. Boese

Timothy & Tamela Bohan

Daniel C. & Bette C. Boteler

Timothy & Ruth Bredahl

Cargill

Thomas M. Clausen

A. M. & Beverly M. Cooley

Jack & Eileen Crystal

Dakota Gasification Company

Myles M. Dittus

Adam & Quinn Driscoll

Gary & Linda Dunford

Daren & Sheila Eliason

ExxonMobil Foundation

Larry T. Gast

Katherine A. Graham

Paul & Janet Havig

Hess Corporation

Norm & Ann Hoffman

Rodney J. Kadrmas

Kevin M. Kraft

Daniel & Rosalyn Kulik

John A. Little

Joy W. Lyche

Michael & Terrie Mann

Andrew D. Marg

Bruce & Sharon Miller

Susan & Parm Narveson

Richard & Barbara Owens

Michael & Terri Pedersen

Richard L. Peloquin

Jon & Anne Putnam

Timothy M. Russell

K. Wayne & Geraldine Rye

David P. Schaaf

Wayne S. Seames

Rodney & Lynne Sears

Scott M. Tapio

Mark & Kristi Thoma

James & Theresa Trouba

Sandra L. Weekley

Jerome R Zink

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!

GRADUATING M.S. AND PH.D. STUDENTS

December 2017

- **Humphrey Chukwuto**, MSChE, "Investigating Cloud Condensation Nuclei Activity and Particle Growth of Aging Diesel Exhaust Particles", **Advisor: Frank Bowman**

May 2018

- **Lauren Clarke**, MSChE, "Interfacing the CFD code MFIX with the PETSc Linear Solver Library to Achieve Reduced Computation Times", **Advisor: Gautham Krishnamoorthy**

August 2018

- **Lucky N. Mulenga**, PhD ChE, "Modeling of Detonations Using Scenarios With Hydrogen as a Fuel", **Advisor: Gautham Krishnamoorthy**
- **Timothy Taylor**, MSChE, "Novel bio-kinetic modeling and 2,3-butanediol productivity optimization of clostridium autoethanogenum", **Advisor Ali Alshami**

FACULTY PUBLICATIONS AND MAJOR PRESENTATIONS

(Continued from page 15)

- **Gautham Krishnamoorthy's** proposal "Super-Critical CO₂ Cycle Design and Analytics: A Disruptive Technology for North Dakota Lignite Coal Utilization," was awarded funding through UND's Post-Doctoral Seed Funding Program. Award Amount: \$120,000; Period of Performance: 07/01/2018 – 06/30/2020.
- Feng Xiao and **Michael Mann** were awarded \$149,000 from Research ND Venture Grants for a project entitled "Development of Next Generation Agriculture Soil Amendments: Phase II".
- **Ali Alshami** and Sima Noghian were awarded \$40,000 from the North Dakota NSF EPSCoR for a project entitled "Bio-Based Dielectric Substrate based on Sunflower Seed Shells for Radio Frequency Antennas."
- **Ed Kolodka** was co-PI on a \$27,800 grant awarded by ND NASA EPSCoR for a project entitled "Bio-inspired Membrane for Ultrapure Water Generation".

RESEARCH PUBLICATIONS (Student Authors Underlined)

- **Gautham Krishnamoorthy**, Md. Ashiqur Rahman "Assessing the Role of Turbulence-Radiation Interactions in Hydrogen-Enriched Oxy-Methane Flames", International Journal of Hydrogen Energy, Volume 43 (2018), Issue 11, pp. 5722-5736.
- Ganna Baglayeva, **Wayne Seames**, Charles Frihart, Jane O'dell, Evgenii Kozliak, "Penetration of n-hexadecane & water into wood under conditions simulating catastrophic floods", Forest Products Journal (2017), 67(3/4):401-412.
- S. Vijjamarri, M. Hull, **Ed Kolodka**, and G. Du, "Renewable Isohexide-Based, Hydrolytically Degradable Poly(silyl ether)s with High Thermal Stability", ChemSusChem in press.
- H. Wei, X. Chen, J. Shekuro, E. Kuhn, W. Wang, **Yun Ji**, E. Kozliak, M. Himmel and M. Tucker, "Kinetic modelling and experimental studies for the effects of Fe²⁺ ions on xylan hydrolysis with dilute-acid pretreatment and subsequent enzymatic hydrolysis," Catalysts, vol. 8, no. 1, 2018.
- Chris Buelke, **Ali Alshami**, James Casler, Jeremy Lewis, Maram Al-Sayaghi, Michael Hickner. "Graphene Oxide Membranes for Enhancing Water Purification for Terrestrial and Celestial Applications: State of the Art". Desalination Journal 2018.
- Chenguri Qu, Mo Zhang, **Michael Mann**. Effect of Combustion Temperature on the Emission of Trace Elements under O₂/CO₂ Atmosphere during Coal Combustion, IOP Conference Series Earth and Environmental Science, 2018.
- C. Silvernagel, G. Langelett, **Brian Tande**. The new intellectual property race: Run, walk, or sit it out? Entrepreneur perceptions of the America Invents Act. Journal of Entrepreneurship and Public Policy. 2018.
- Lucky Mulenga, **Gautham Krishnamoorthy**, Assessing the Impacts of Viscosity and Radiative Transfer in Internal Detonation Scenarios Involving Hydrogen-Air Mixtures, Global Journal of Researches in Engineering: C Chemical Engineering, Volume 17 (2017) Issue 3.
- J. Brzonova, E. Kozliak, A. Andrianova, A. LaVallie, A. Kubátová, and **Yun Ji**, "Production of lignin based insoluble polymers (anionic hydrogels) by C. versicolor," Sci. Rep., vol. 7, no. 1, 2017.
- Feng Xiao, Alemayehu Bedane, Julia Zhao, **Michael Mann**, Joseph Pignatello. Thermal Air Oxidation Changes Surface and Adsorptive Properties of Black Carbon (Char/Biochar), Science of the Total Environment, 2018.
- Shelby Amsley-Benzie, Swapnil Fegade, **Brian Tande**, Alena Kubatova, Evgenii Kozliak, **Wayne Seames**, "Catalytic 1-Tetradecene Reforming with HZSM-5 to Aromatic Hydrocarbons", J. Oil Chemists Society, (2018), xx:xx-yy.
- **Brian Tande**, T. Pringle, W. Rutala, M. Gergen, D. Weber. Understanding the effect of ultraviolet light intensity on disinfection performance through the use of ultraviolet measurements and simulation. Infection Control and Hospital Epidemiology, 2018
- Johannes van der Watt, Daniel Laudal, **Gautham Krishnamoorthy**, Harry Feilen, Junior Nasah, **Michael Mann**, Ryder Shalbetter, Teagan Nelson, Srivats Srinivasachar. Development of a Spouted Bed Reactor for Chemical Looping Combustion, Journal of Energy Resources Technology, 2018.
- **Gautham Krishnamoorthy**, "Assessing Uncertainties in Prevailing Methodologies for Modeling Radiative Transfer in Simulations of Oxygen-Enriched Methane Flames", Journal of the Brazilian Society of Mechanical Sciences and Engineering, Volume 39 (2018), Issue 10, pp 4231-4248.
- Will Gosnold, **Michael Mann**, and Hossein Salehfar. The UND-CLR Binary Geothermal Power Plant, Transactions-Geothermal Research Council, 2017.

IMAGES OF THIS YEAR'S SENIOR CLASS

If you've explored UND's new websites, you may have noticed a lot of images of ChE students. While taking photos for a UND today story on [Wayne Seames](#) [see pg. 10], UND photographer Shawna Schill took a number of photos of our senior students . We thought we'd share some of them with you . . . «

Stewart Million-Perez (left), Student Body President Cole Bachmeier (facing), Jacob Reis (back), and Allison Albrecht



Madalyn Tessier (facing)



Anthony Domingez (left) and Chad Myers



Nicholas Lander (left) and Atul Stroha



Foreground: Madalyn Tessier (left), Brandon Gill (center), and Connor Willits (right); Background left: Brytton George (on left), Ben Betzold (center, facing back), Noah Peterson (right), Chris Michalek; Far right: Ellen Walstad (facing back)



Connor Willits



Russell Damsgard



Foreground: Austin Tesser (left) and Will Hammann; Background left: Justin Baker (left), Sam Lerma (orange shirt facing back), Joe Dietz (red, right), and Paige Marcy



Noah Peterson (left), Ben Betzold (center), and Brytton George



Same group as image 1, above



Drilling into a new economy? EERC scientist, industry partners go big with \$6M carbon-capture project that could lead to new jobs and enhance oil recovery

(this article was extracted from the original UND today article by Jan Orvik, University & Public Affairs, 4/12/18)

Jason Laumb, UND MSCHE 2000, thinks he may be on to something “big.”

What’s got Jason thinking so big?

Laumb, principal engineer and coal utilization group leader at UND’s Energy & Environmental Research Center (EERC), says it’s all about reducing carbon emissions while enhancing oil recovery and benefiting the environment at the same time.

“This could mean a new economy, new business, a larger tax base and hundreds of jobs,” said Laumb, a principal investigator on a new project to capture carbon dioxide. “This could be a big deal for the state of North Dakota.”

To help facilitate this result, Laumb and the EERC are determining the cost to install a carbon-capture system at a coal-powered utility plant, the Milton R. Young Station power plant near Center, N.D., northwest of Bismarck. The power plant provides electricity to power cooperatives throughout eastern North Dakota and northwestern Minnesota.

“Burning fossil fuels produces primarily CO₂ and water,” Laumb said of the power plant. “We’re looking at grabbing the CO₂ out of the flue gas, and using it for enhanced oil recovery.”

Injecting the gas into oil reservoirs, he said, lowers the viscosity of the oil so it flows easier through the pores of tight

rock, boosting oil well output. The carbon dioxide used in the process is then permanently trapped deep in the reservoir.

Larger project

This is just the beginning, Laumb said. The goal is to complete the initial project and see if it’s cost-effective, and then continue with final design and construction plans. There’s already a small test pilot project at the EERC on the UND campus.

The \$6-million project was funded by the USDOE’s National Energy Technology Laboratory. It’s a collaborative effort, with an additional \$1 million from the ND Industrial Commission’s Lignite Research Program and \$250,000 each from ALLETE Clean Energy (ACE), a power supplier in Duluth, Minn., and Minnkota Power Cooperative. Other partners include technology vendor Mitsubishi Heavy Industries, and an engineering firm, Burns & McDonnell.

The EERC’s partners provide financial backing, engineering evaluations, site access, operations data and risk assessment and evaluation, Laumb said. He added that strong support also has come from state and federal elected officials, key regulators, labor unions, coal mines and other electric utilities.

Primary outcomes

In addition to determining design and cost estimates for a new carbon-capture facility, the EERC also hopes to gather more information on the economic benefits of carbon-capture equipment and related technologies. The results will support DOE’s goal of reducing carbon-capture costs to \$30/MT by 2030. It also could lay the groundwork for the largest integrated post-combustion CO₂ capture facility in the world. Laumb thinks the project’s technology could transfer to other power plants in the nation.

“If it looks feasible to build a post-combustion capture facility and move forward with a capture station,” he said, “That means new jobs.”

A new carbon-capture industry would benefit all of North Dakota, Laumb said, as well as have a positive effect on the environment.

So why is this such a big idea?

“The oil boom revitalized some communities and stopped population loss; this could do the same thing,” Laumb said. “The two biggest industries in North Dakota are agriculture and energy – lignite, oil and gas. Carbon capture and enhanced oil recovery could help grow this critical North Dakota economic pillar.”



BOWMAN LEADS UND CHE/CHEM/ATSCI NSF-SPONSORED REU

UND’s ChE, Chemistry, and Atmospheric Science programs were awarded another three year grant from the National Science Foundation for a Research Experiences for Undergraduate summer program. This summer marked the 14th consecutive year that UND has run the 10 week summer program. This year’s award is a renewal of the “Interdisciplinary Renewable and Environmental Chemistry (IREC)” version of the program that the three departments have co-sponsored recently. ChE’s **Frank Bowman**, who was the co-PI during the initial three years of IREC, is the PI for this three year period.





DEPARTMENT 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

TYLER SEIM'S HOBBY

Tyler Seim, BSChE '15, spends his workdays at the American Crystal Sugar Refinery in Hillsboro, ND. But in his spare time he runs a craft distillery, making vodka from sugar beets.

Seim's Red Pine Distillery was officially launched last February and he began shipping products to retail businesses in march. He produces about 50-75 cases of vodka a month with the capacity to produce 150-200 cases if necessary. He's also been experimenting with gin and other spirits, all made from sugar beets.

Seim makes his vodka from sugar beets and concentrated sugar beet syrup, both of which he obtains locally. Tyler also sells his product to Johnson Brothers Distributors of Fargo who have introduced his vodka to its restaurant and bar clients.

***So let's all raise a glass to a
UND ChE Entrepreneur!***

***Best wishes on a
successful venture, Tyler! «***

CEM Associate Dean Brian Tande

(Continued from page 13)

ing and Computer Science and helping integrate those two previously separate departments. We are searching for a permanent director and hope to have one in place by the end of the year. After that, I'll be spending more time working to advance our distance programs and our research activities.

On the personal side, the family is settled back in Grand Forks, not far from our old house. My wife continued her job in the UND College of Nursing's Nutrition and Dietetics Program remotely last year, so it has been an easy transition back to campus for her. My kids are happy to be reunited with their Grand Forks friends and remain in touch with those they made in Kansas. This year we'll have two students at Central High, one at Schroeder Middle School, and one at Phoenix Elementary.

[Editors note: Dr. Tande was readmitted to the ChE Dept. faculty, but works 100% of the time out of the Dean's office].«



CHEMICAL ENGINEERING DEPARTMENT
UNIVERSITY OF NORTH DAKOTA
243 CENTENNIAL DRIVE, STOP 7101
GRAND FORKS, ND 58202-7101

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