Hello alumni and friends of UND Chemical Engineering. As you will read in this edition of Kinetics, it has been a busy year for us and we have a lot of news to share with you.

Last year I reported that our upcoming ABET accreditation was consuming much of our attention. This fall, we are happy to report that we successfully passed our evaluation and have been fully re-accredited for another six years [see pg. 7]. The reviewers were very complimentary of the program and also had a couple of minor suggestions for improvement. While all of the faculty did their part to prepare, Associate Chair Frank Bowman deserves special recognition for spearheading the department’s assessment efforts and making sure this review went well. And since assessing our program is a continuous process, we have already started to prepare for the next review.

(Continued on page 2)

The University of North Dakota celebrated its 133rd birthday on Thursday, Feb. 25, during the annual Founders Day celebration in the Memorial Union Ballroom. During the Banquet, ChE was awarded the UND Foundation/Thomas J. Clifford Award for Departmental Excellence in Teaching.

Here’s what the Award committee had to say . . .

“Faculty in the Chemical Engineering Department are guided by their strong commitment to providing a rigorous, well-rounded engineering education in a collaborative and student-centered environment. Evidence of the faculty’s commitment to students can be seen not only in the growth of the department, but in the quality of its graduates.”

“An important part of this department’s success is how well the faculty work together,” said Brian Tande, associate professor and chair. “While we each have our own areas of expertise, we also realize that we do not teach our courses in a vacuum. Many of our courses rely on material taught in previous courses, and, often, students must see a particular concept multiple times before they become proficient. For these reasons, educating chemical engineers well requires a tightly integrated program and..."
Later this fall, the College of Engineering will open up a new building, the Collaborative Energy Complex. The CEC connects Upson I and Leonard Hall, provides additional lab and educational space, and creates a new front door for the college. Together with the expansion of the NDGS Core Library, the look of this entire corner of campus has changed dramatically. Petroleum Engineering and the Institute for Energy Studies, headed by ChE faculty member Michael Mann, will move into the new building. The rest of ChE expects to benefit by expanding into some of the newly vacated space in Upson II.

If you’ve been following UND news, you know that the university found itself in a budget deficit this year. While this has certainly caused some stress around campus, I am confident that the difficult decisions being made now will help us become a stronger university in the future. The university has also been transitioning to a new budget and funding allocation system that is projected to increase the fraction of state and tuition funding that comes directly to CEM and ChE. Here in ChE, our resources have not been able to keep up with our growth over the past few years, but I expect the upcoming changes to the UND budget model to help improve that situation. However, we must continue to rely upon the generosity of our alumni, stakeholder companies, and friends to cover all of our operating expenses each year (see pg. 20). If you are one of those who contributed to the program this past year, thank you! We truly couldn’t do what we do without you.

Last year we said goodbye to Bob Wills, and I’m sad to report that the retirement bug struck the department once again. After over 42 years of service to UND, Connie Wixo retired at the end of June (see pg. 4). She started at the EERC when it was still a federal lab and eventually joined ChE in 2009. Connie did a great job supporting the faculty and the students always appreciated her friendly smile (and her candy dish, of course). Connie, we miss you. Taking over for Connie is Brittany Tague (see pg. 18) who has worked for the department in a part-time capacity for the past couple of years.

All I can say about the Tande family is that we continue to survive. Our four kids now range from age 9 through 15, and life seems to be getting more and more complicated. Our oldest, Lucas, has started at GF Central High School and is also driving. Joel is still at Schroeder Middle School while Gabe and Adrianna are at Kelly Elementary. My wife, Desiree, is already in her 7th year in the Department of Nutrition and Dietetics. She was recently promoted to Associate Professor, and is now serving as the department chair.

I wish you all the best. Please keep us posted on your accomplishments and, of course, feel free to stop by anytime you’re in town. We’re happy to show off our renovated labs, introduce you to the new people in ChE, and hear about what you’ve been up to.«

Brian Tande-led Jodsaas Center Team Receives “Grand Challenges Scholars Program” Grant

The National Academy of Engineering recently approved UND’s Grand Challenge Scholars Program (GCSP). The program will offer undergraduate students the opportunity to broaden their academic and practical experience beyond a traditional engineering education, while helping to solve one of the world’s greatest technological challenges.

The GCSP Steering Committee noted that the grant proposal was thorough and that every aspect of the program was thought through. They liked that this program is being folded into and under the Jodsaas Center for Engineering Leadership and Entrepreneurship. The Committee was also impressed that preapproval of funding to support some of the activities of the students with stipends, etc. had already been obtained.

One unique aspect of the UND program is our goal of utilizing alumni to support the program.

Participating students will build a customized portfolio of activities, courses, and projects encompassing interdisciplinary, entrepreneurial, global, service, and research experiences, all related to one or more of the National Academy’s 14 Grand Challenges. They will have numerous opportunities to build their portfolios by leveraging the many existing resources both at UND and within the dynamic ND business entrepreneur ecosystem.

Here are examples of how students will meet the requirements of the GCSP by taking advantage of opportunities that already exist:

(Continued on page 5)
several ‘across-the-curriculum’ themes that are woven across multiple courses. This is not achievable unless the faculty are committed to the overall objectives of the program, rather than being focused on their own courses. Each of our courses is related to our 13 student learning outcomes and 10 across-the-curriculum themes.”

The Chemical Engineering Department consists of eight full-time faculty, one part-time instructor, and three staff members.

“Many of our curriculum development and improvement activities take place during our annual summer retreat, during which we focus on building a better program and a stronger department,” Tande said.

“During the retreat we scrutinize every aspect of our curriculum. We analyze student feedback and performance data and compare how we measure up to the ABET accreditation standards as well as our own higher standards.”

And the self-examination is clearly working. The ABET accreditation review in November 2015 found no deficiencies or weaknesses in the program. The department expects to receive full accreditation for the maximum of six years [see pg. 7].

The department offers undergraduate and graduate degrees in chemical engineering, administers master’s programs in environmental engineering and sustainable energy engineering, and teaches several service courses taken by other engineering and science majors.

“Our enrollment is now roughly 260 students and has more than doubled in the past 10 years,” Tande said. “While the department has long been one of the most research-active on campus, our focus continues to be on undergraduate education. A passion for teaching and working with students is the primary reason why we are all here. This is reflected in the way the department functions and how we select new faculty. It can especially be seen in the extent to which we make ourselves available to students.

“The Chemical Engineering Department believes that an open-door policy, rather than fixed office hours, is most conducive to student-faculty interaction. Students are told to feel free to speak to their instructors any time they are in their offices. Instructors strive to maximize their availability to students during normal operating hours and limit travel during the course of the semester. The open-door policy is extended to distance students by giving distance student email inquiries priority so that they obtain rapid and timely responses to their questions.”

Students clearly appreciate the open door policy and the department’s commitment to excellence.

“As a recent alumna of the department and current graduate student, I can speak of the educational and professional drive of Chemical Engineering at UND that motivates students to achieving their goals,” said Caitlyn Wolf.

“Specifically, their attentiveness to the student’s unique career goals, continuing improvement of curriculum, and commitment to teaching were essential in my growth as a chemical engineer.”

A HISTORY OF TEACHING EXCELLENCE

Here’s a list of some of ChE’s recent awards related to teaching excellence

2015: CEM Outstanding Faculty Award – Frank Bowman
2014: UND Outstanding Student Org Advisor – Frank Bowman
2013: UND Foundation/BC Gamble Faculty Award for Excellence in Teaching, Research, and Service – Wayne Seames
2013: CEM Outstanding Faculty Award – Michael Mann
2012: CEM Professor of the Year – Gautham Krishnamoorthy
2012: North Dakota Spirit Faculty Achievement Award – Frank Bowman and Wayne Seames
2010: CEM Professor of the Year – Brian Tande
2009: CEM Professor of the Year – Frank Bowman
2008: CEM Professor of the Year – Darrin Muggli
2007: UND Departmental Award of Excellence in Teaching
2006: UND Individual Award of Excellence in Teaching – Darrin Muggli
2006: CEM Professor of the Year – Wayne Seames
2005: UND Individual Award of Excellence in Teaching – John Erjavec
2000: North Dakota Teacher of the Year – Tom Owens
1992: UND Departmental Award for Excellence in Teaching

UND ChE is on LinkedIn
Go to www.linkedin.com and search for “UND Chemical Engineering” under groups and join over 220 of your fellow ChE alumni.
We also post job announcements and other news there.
Join US!
Jim Albrecht, ’84 BSChE, was one of four CEM alumni inducted into the CEM Alumni Academy on October 19, 2015, at a luncheon ceremony in the Grand Forks Alerus Center. Among the more than 70 guests were NDUS Chancellor Mark Hagerott, State Board of Higher Education Chair Kathleen Neset, current Alumni Academy members, the CEM Executive Board, department chairs, faculty, staff, and students of the College, and family members of the inductees.

Jim is the President and Business Development Manager of ComDel Innovation, a Wahpeton, ND based contract product development and manufacturing company. ComDel Innovation serves a variety of markets including data storage, automotive aftermarket, medical, agriculture and aerospace.

Originally from Alsen, ND, Jim began his career with 3M/Imation in St. Paul, MN before moving to the 3M Wahpeton location. When 3M closed the Wahpeton facility in 2007, Jim and two other Imation employees set out to preserve the company’s legacy, and save jobs in Wahpeton, by developing ComDel Innovation, Inc. In 2007, ComDel began with 65 employees and 12 customers. Today, ComDel services over 120 clients and employs over 200 people. In 2008, DelCom received the Governor’s Choice Project of the Year Award.

Jim relates that it was ChE Professor Emeritus Tom Owens who influenced him to become an entrepreneur. Tom brought his industry experience into the classroom and encouraged his students to be successful in their career pursuits. Jim generously gives back to UND by serving on both the CEM Executive Advisory Board as well as the ChE Departmental Advisory Board [see pg. 18]. Jim has a joint BS in ChE and Applied Math from UND and an MBA from St. Thomas College, Mn. Three of his children, Taylor (UND BSChE ’14), Ali (UND ChE sophomore), and Reid (incoming UND ChE Freshman) are following in their father’s career footsteps!

Established in 2003, the CEM Alumni Academy is the highest award given by the College.«
The Department of Chemical Engineering along with most of the rest of the College of Engineering and Mines has experienced tremendous growth over the past few years (see figure below). In fact, during the past ten years (Fall 2005 – Fall 2015), CEM has been responsible for over 59% of UND’s growth! UND’s total enrollment grew by 1997 students from 12,954 to 14,951 while CEM’s total enrollment grew by 1186 students from 871 to 2057.

To the best of our knowledge, this year’s 37 BSChE degrees represents the largest single year undergraduate degree awards in UND ChE history! For the college, CEM awarded 297 BS degrees, also a record.

Our student-to-faculty ratio was raised as an item of possible future concern by the ABET accreditation that recertified all of CEM’s programs this past year [see pg. 7]. CEM Dean Hesham El-Rewini, along with the rest of UND’s administration, is committed to finding ways to increase faculty numbers in response to this growth. Despite being in a period of budget cuts by UND, Interim President Ed Schaeffer (Jan–June, 2016) announced the reallocation of funding to support two additional full-time faculty positions in CEM—one in ME and one in PE (their growth has been even greater than ChE’s!). Our goal is to add one to two additional ChE faculty positions in the next 5 years.

**YOU CAN HELP!**

Please consider donating to the Tom Owens faculty endowment or simply designating a donation to ChE faculty position support. See page 19 on how to contact Deb or Andy to discuss your possible gift.«

**GRAND CHALLENGES** (continued from pg. 2)

- Conduct a research project through the Research Experience for Undergraduates (REU) program [see pg. 11], the ND EPSCoR AURA program, with a research center, or with an individual faculty researcher.
- Learn how to: a) start a business, and/or b) build and market innovative new products in an existing company at the UND School of Entrepreneurship through coursework and other extracurricular activities or work on real-world projects related to the Grand Challenges with startups or US market entry firms at the UND Center for Innovation.
- Gain a global perspective by participating in one of the numerous study abroad and international exchange programs coordinated by UND’s Office of International Programs, or work with an international company through CEM’s Jodsaas Center for Engineering Leadership and Entrepreneurship.
- Participate in service learning and engineering outreach projects through CEM’s Office of Student Outreach and Experience, or by joining the student chapter of Engineers Without Borders.
- Gain a broader perspective by taking advantage of the numerous opportunities on campus to learn from or work with people outside of engineering (business, policy, law, medicine, etc.).

The Larson Foundation, a local organization that supports students in our region, is the lead sponsor to help GCSP participants succeed in the program. Participants receive a $1000/yr stipend and are eligible for up to an additional $6000 to support research, service learning projects, or global experiences.

Additional sponsors are being sought to help expand the program and support more students. If you are interested in learning more, please contact Brian Tande at: brian.tande@ engr. und.edu. «
I was recently visiting with some friends and realized that I have now been at UND for 35 years, 18 at the EERC and the last 17 years in the ChE department! I had to do the math because it certainly doesn’t seem that long. While I still feel like ChE is my home, I do spend a lot of time on college-wide activities, and serve as the Executive Director of the Institute for Energy Studies (IES).

This past year I taught ChE 504 Air Pollution Control and ChE 102 Introduction to Chemical Engineering. The highlight was having my son as a student in the introductory class. Although I treated him as just another student, by the end of the year most of the students figured out the relationship, although one embarrassed student asked if he was my grandson! I guess that reflects the 35 years I mentioned earlier.

My research interests are still broadly anything energy related. Projects I have been involved in include demonstration of a geothermal power plant [see article below], sorbents for CO$_2$ capture, recovery of rare earth elements from coal by-products, chemical looping technologies, and development of lithium ion phosphate batteries. I am also working to develop research in the area of energy efficiency, with the goal of integrating advances in electronics and materials into smart systems.

In my role as director of the IES, I have also been working to use our experience in distance education to develop a master’s program tailored to those working in the energy industry. The program is designed to purposefully integrate social, political, economic, and environmental interests with a broad overview of energy technologies. The end goal is to facilitate management and policy decisions required to successfully integrate multiple energy systems in today’s ever-changing environment.

On the personal side, not much is new or exciting. I continue to shoot sporting clays with my son, Justin, as my main entertainment, and remain the “hands-on” person for my wife’s gardening activities. My photo is from a visit to Mayan ruins in Mexico.

**UN D and the U.S. Department of Energy (DOE) were awarded the Technology Advancement Award by the Geothermal Energy Association for launching the first commercial project co-producing geothermal power from an oil and gas well. The facility (shown in photo) started generating electricity for the first time in late April, 2016.

The project to design and build a system to generate electrical power using low-temperature geothermal fluids produced in oil field operations officially began in 2009 with ARRA funding from the Geothermal Technologies Office at DOE. The project team was led by PI Will Gosnold (UND Geology) and Co-PIs Mike Mann (UND ChE) and Hossein Salehfar (UND EE). Twenty four students have worked on various phases of the project.

Industry partners were Continental Resources, Basin Electric Cooperative, Olson Construction, and Access Energy while government partners included the DOE Geothermal Technologies Office, the ND Geological Survey, and the ND Industrial Commission. All played key roles in achieving the final goal of generating electrical power by utilizing existing oilfield infrastructure.

The system is capable of generating 250 kW h, using hot water from a Continental Resources oil production site near Marmath, Bowman County, N.D. An organic Rankine-cycle (ORC) engine is used to convert the hot water (~200 °F) into electricity (see figure below). The electricity is then used by Continental Resources on-site, reducing their external electrical load and costs. Previously, Continental Resources had been cooling the water prior to injection with two cooling towers for protection of their injection hardware. The pre-cooling achieved by the ORCs will permit taking the cooling towers off line, further reducing electricity demand at the site.

The project demonstrated that unseparated oil and water from produced wells can be used as a viable heat source for the ORC engine and much of the projected 2.9 GW of well-site power required in the Bakken/Three Forks fields can be supplied from these systems. This would reduce the need for power transmission infrastructure, which can be costly for remote locations. The projected capital costs of ORC-based systems are $2500-$3000/kW with no fuel costs.

This demonstration project is expected to have a significant impact on future oil field systems as well as inspiring a new geothermal industry with ND as it’s leader!«

**EXECUTIVE DIRECTOR, THE INSTITUTE FOR ENERGY STUDIES**

MICHAEL MANN

CHESTER FRITZ DISTINGUISHED PROFESSOR
It's been another exciting and productive year. For the first time in many, many years I didn't teach ChE 321 Reactor Design, but instead am now teaching the ChE 201 Fundamentals class. It's been fun to remember the tricks to solving mass and energy balances on recycle systems. In ChE 232 Laboratory I, there were 43 students this year so we split the class into two sections and I co-taught the course with UND ChE alum, Stacy Bjorgaard (BScHE 2010, PhD 2015). It was wonderful to have her help and be able to get all those lab reports graded in a timely manner. I also taught ChE 511 Advanced Kinetics which will help keep my reactor design skills sharp.

For the department I spent much of the fall semester getting ready for our ABET accreditation visit [see article below]. The entire department worked together to ensure a successful visit. I was also busy doing graduation audits for our record 37 B.S. ChE graduates [see pg. 5]. It's great to have so many new UND ChEs going into the world!

This year I continued my research efforts with the Center for Regional Climate Studies (a multidisciplinary group of 19 faculty researchers from 7 North Dakota universities and colleges) and the Interdisciplinary Renewable and Environmental Chemistry REU program (a joint effort between UND Chemistry, Chemical Engineering, and Atmospheric Science) [see pg. 11]. I have had three graduate students and three undergraduate students working on studies of diesel soot aging in the atmosphere plus emissions from ND crop lands and their effects on atmospheric chemistry and clouds. I also received funding to continue work with the You're Hired! STEM outreach program for middle school students and teachers. In collaboration with North Dakota State College of Science, we are using the You're Hired! program as a platform for providing teacher professional development and student assessment targeting math-related skills and career-ready practices.

Life at home continues to be busy with the activities of five children ages 5-18. My oldest graduated from East Grand Forks Senior High and is headed to BYU (my alma mater!) to study nursing. The youngest “graduated” from preschool and is starting kindergarten in the fall. On top of all of this, my wife Alisa is starting graduate school at UND, pursuing her Masters in Social Work. We will all be in school this year!

**CHE RECEIVES CLEAN REPORT AS ABET RECERTIFIES THE PROGRAM**

Thanks in no small part to the efforts of Associate Chair Frank Bowman, UND ChE received another clean report from the ABET accreditation team during their 2015-16 review of our program.

Evaluators for the Engineering Accreditation Commission of ABET visited CEM in November, 2015 as part of the process to renew accreditation of CEM’s six undergraduate engineering degree programs, including the ChE program.

However, this visit wasn’t the start of the accreditation process. Formal preparations for the visit began two years ago, but have really been ongoing since the last accreditation visit 7 years ago! The ChE faculty conduct assessment of student learning each semester and review results every year at our summer retreat.

Building on those efforts, the ChE faculty and staff then worked together to review the current state of the program and write a self-study report, one of the first steps in the accreditation process. The 180-page Self Study gives a detailed look at all aspects of the undergraduate program with chapters on students, program educational objectives, student learning outcomes, assessment and continuous improvement, curriculum, faculty, facilities, and institutional support.

A draft of the self-study was used as part of a trial run accreditation visit in the Spring of 2015 where consultants, including former UND ChE faculty member Doug Ludlow (currently Professor of ChE at Missouri S&T), gave us additional feedback on the program, self study, and other presentation materials. That June we submitted the final version of the self study report and then answered questions from our assigned evaluator in advance of the fall site visit.

During the three-day visit to UND, the ABET accreditation team toured facilities, met with faculty, staff and students, and examined collected examples of student work.

We received very favorable feedback from our program evaluator and are currently waiting for final notification as the evaluation team recommendations work their way through the ABET review and approval process, with a formal decision on accreditation expected by August 31.

Feedback from former and graduating students is an important part of the process, including our External Advisory Board [see pg. 18]. Our thanks to all who helped make the visit a success!
W ell, here we are at the beginning of another exciting academic year. This will be my 17th at UN D already! After a year away on sabbatical, the pace of our normal academic year was a bit of a shock to me last year. I’d forgotten how intense this job can get.

We’ve seen a lot of enrollment growth, which also adds to the workload with more questions to answer and assessment instruments to grade. In the fall I am teaching ChE 408, Designing Controls for the Process Industries and ChE 411, Process Design and Economics. Last fall I tried out the draft of a new textbook I wrote during my sabbatical for ChE 408 (hence the course name change). It went very well and I received lots of great feedback from the students on where the material was unclear. They also found pretty much every typo embedded in the text! I’ve been updating the text all summer and hope to get a publisher soon.

Last spring I taught ChE412, Process Project Engineering. We had a number of very innovative, high quality plant design projects this year [see pg. 16], which helped to keep it interesting. Three of the projects were sponsored by Industrial partners. My special thanks to Mike Steele and colleagues at AE2S, Laura Dronen and colleagues at Dakota Gasification Company, and Mike Mann and colleagues, in the Institute for Energy Studies for not only sponsoring the projects but also being full participants as advisors to their student groups. If you would like to consider sponsoring a project (for a modest $1500 contribution), please contact myself or the Department. I led workshops on active teaching and learning methods to faculty at UN D through the Office of Instructional Development, at an Electrical Engineering conference, and in the UK at the University of Sheffield where 63 people attended. Mentoring the next faculty generation remains an important and very satisfying aspect to my job.

I also started our new IRES program this year [see pg. 9]. In addition to sorting out all of the logistics (special thanks to Angie Reinhart, UN D SUN RISE and David Haynes, Univ. of Leeds for all of their hard work on this), we put together a weekly seminar series. Some of the sessions were serious, like “how to write a research plan,” and some were more “enriching,” like “a short history of Britain as told by an American”. This fall the students will be busy writing up their results and I’ll turn my attention to recruiting the next cohort of student participants.

While no longer at the levels of the heady days when I was managing $1 million+ per year in research expenditures, my research (like that of my colleagues) continues to provide opportunities for advanced learning in our graduate programs. I currently have two PhD students and three MS students actively working on their degrees. Our current work is focused on inventing and developing technologies for the production of renewable fuels and chemicals. A new area we started this summer was to cultivate and harvest our own oil-bearing algae strains so that we can develop improved conversion processes for these resources.

At home I try to keep up with my grandkids. My oldest daughter JoJo moved to Tucson last April. The other two are still local. I’d love to hear from you about your experiences since you’ve left UN D — by email, phone, in person, or through LinkedIn.«

Seames and Bowman listed among the “20 Influential Environmental Engineering Professors” by Online Engineering Programs on-line blog, April 8, 2016.

While environmental engineering is often considered a subfield of civil engineering, many consider it to be a related but entirely separate field of study. LiveScience defines environmental engineering as “the branch of engineering that is concerned with protecting people from the effects of adverse environmental effects,” (LiveScience, October 2014). And while it may seem new or modern, the study and application of environmental engineering dates back to the beginning of civilizations, when humans were first forced to deal with challenges posed by their natural surroundings.

Of course, the task of environmental engineers is just as important today, if not more, than it was millennia ago — and this is reflected by projected employment growth within the field. Indeed, the Bureau of Labor Statistics posits that job opportunities for environmental engineers will increase by 12 percent over the next decade, an increase of 6,800 positions overall.

Environmental engineers often perform extremely rewarding work that requires them to devise solutions that minimize impact to humans and the natural environment. However, before an individual may pursue a career in this field, he or she must obtain, at minimum, a four-year degree in environmental engineering. Generally speaking, it is in the aspiring engineer’s best interest to pursue study at an institution that employs respected and experienced professors who are influential in the field and have a record of helping to ensure their students are prepared for the demands and challenges of an environmental engineering career.

The 20 professors listed all fit this bill. Included on the list are Chester Fritz Distinguished Professor Wayne Seames and Associate Professor Frank Bowman of the University of North Dakota.«
Seames Leads National Science Foundation Sponsored International Research Experience for Students Program

UND chemical engineer parleys Fulbright assignment into opportunity for students to gain globally relevant research experiences abroad

UND Chester Fritz Distinguished Professor of Chemical Engineering Wayne Seames doesn’t need to figure out where to go on vacation the next three summers.

He’ll be taking three separate cohorts of five engineering students to the University of Leeds (UoL) in the United Kingdom, thanks to a grant from the National Science Foundation (NSF) International Research Experiences for Students (IRES) program.

Seames is no stranger to work abroad, and to the UoL in particular. He spent most of the 2014-15 academic year on a developmental leave assignment in Leeds, where he held a Fulbright Distinguished Chair.

Seames said his work with students on this new project will enable him to continue valuable energy research collaborations that were started during his Fulbright stint at UoL.

Seames, the principal investigator, and co-principal investigator Winny Dong, of the California State Polytechnic University at Pomona Engineering College (CPP), and international host Professor William Gale, the director of the Energy Research Institute at the UoL, were awarded $250,000 for a three-year program to establish an IRES focused on technologies to mitigate global climate change.

“The program aims to provide student opportunities for participation in high quality, globally relevant research conducted through a US-UK collaborative partnership,” Seames said.

Under-represented groups

The program also will boost student awareness of global climate change and strategies to address this crisis.

“We want to expose undergraduates from non-doctoral institutions, especially those from under-represented groups, to engineering research and its potential as a future career opportunity,” Seames said.

“We also want to expose US students to a different culture, one that has had great influence on the US and with which the U.S. frequently collaborates,” Seames added. “We want to foster US-UK research partnerships.”

Students selected for this program 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 8-10 weeks at UoL conducting research. Upon their return, the students prepare their results for publication and presentation to a variety of audiences.

At UND, research advisors are participants from the North Dakota SUNRISE (Sustainable Energy Research, Infrastructure and Supporting Education) program, a joint initiative between UND and North Dakota State; and the UND Institute for Energy Studies, part of the College of Engineering & Mines. CPP research advisors are faculty in its College of Engineering.

Long-term partnership

Seames said the program represents another step in a collaboration between UND and CPP that began a decade ago when he and Dong first launched a multifaceted partnership between their respective institutions. Today, UND and CPP have an articulation agreement to accept each other’s courses, as well as a combined bachelor’s degree at CPP/master’s degree at UND program agreement. CPP chemical engineering students also have participated in the annual SUNRISE Research Experience for Undergraduates program at UND for the past 10 years [page 11].

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.

The First Cohort

Seames took the first cohort of students over on July 3rd of this year and spent their first week with them, insuring that they had everything they needed for their stay. He took the group to York for their first cultural experience that first weekend. UND’s participating students were Ian Foerster, a PhD student, and Katie Hall, an undergraduate student. Katie grew up on the Turtle Mountain Indian Reservation.«
It’s hard to believe that I’m writing another faculty message for the newsletter already. The past year has positively flown past. Life here on the frozen tundra continues to spoil me. During the summer of 2015 my family and I spent a week in Rocky Mountain National Park in Colorado. We hiked family-friendly trails, watched the wildlife (sometimes from far closer up than expected) and just generally had a great time. This past summer we spent 1.5 weeks in England followed by a week in Wales. It was everybody’s first trip overseas, so we were all extremely excited.

Last year was rather special for me from a teaching perspective. I have been teaching ChE 201 Chemical Engineering Fundamentals (Stoich) for a long time (13 years) and during both Fall and Spring semesters since 2010. It was definitely time for a change. Therefore, Frank Bowman has officially become the “Stoich Teacher” starting with the Spring 2016 offering of the class. In return, I took over ChE 321 Reactor Design and will also teach ChE 509 Advanced Thermodynamics. It was a lot of fun teaching Reactor Design (it was my favorite class to take) and I don’t think I traumatized the students too badly (at least nothing a few years of therapy won’t fix).

This fall I am teaching two sections of ChE 331 Laboratory 2 (it’s still amazing to me how much we’ve grown over the past decade!) along with ChE 509 Advanced Thermodynamics. In the spring I will be teaching ChE 321 Reactor Design, ChE 435 Materials and Corrosion, and ChE 525 Polymer Engineering.

My family continues to flourish in Grand Forks. My son Dimitri started 5th grade this year while my daughter Alena is in 1st grade. My wife Jenn has been taking online classes in the evening in order to pursue her career in school counseling (only 3 classes to go!) while working as a school counselor.

I also continue to pursue research centered around polymer engineering. One project involves the production of block copolymers comprised of various biosourced polyesters. I have also begun studying the accelerated degradation of commodity polymers such as polyethylene, polypropylene, and polystyrene. I hope you remember your UND ChE years fondly! »

MAY 2016 BSCHE GRADUATES

Back Row (from left): Cody Pfeifer, Eric Mueller, Nicholas LaFosse, Tucker Woock (MS student), Mitchell Hunt, Michael Swenson, Antonijo Jurkic

Front Row (from left): Jameson Buehler, Samantha Sandeen, Erin Sislo, Danielle Waldschmidt, Andrew Eerdmans, Katelyn Randazzo, Alexis Tudy

Not pictured: Marwan Ahmed (DEDP), Leah Althoff, Jeremy Cole, Saadatou Djiwa, Keaton Hanevold, Jamison Jangula, Deniz Saka, Taylor Score, Todd Splonskowski, Robert Wagner
My how time flies! This is already my eighth year at UND! I am still teaching ChE 301 Transport Phenomena in the fall semester and in the spring I’ll teach ChE 515 Design of Engineering Experiments and ChE 206 Unit Operations.

This past year I taught the summer version of ChE 335 Laboratory II/III for the first time, primarily for distance students. Since I am one of the two distance student faculty advisors (Ed Kolodka is the other), I enjoyed interacting with the students and getting to know them better. I was impressed by our excellent distance students and the ability of so many of them to juggle a career with the challenging study of chemical engineering.

In addition to teaching the summer lab, I once again helped to coordinate the summer program for the Interdisciplinary Renewable & Environmental Chemistry (IREC) REU program [see below]. Two students from the Native Tribes worked in my lab during the summer. To continuously improve my teaching skills, I attended three industrially-sponsored Safety and Chemical Engineering Education faculty workshops this past summer (ADM, Cargill, and Chevron). I continue to write research proposals and share the departmental service load. My research work is going well and one of my graduate students, Asina, received her MSChE in May.

I am currently planning to take a developmental leave for the 2017-2018 academic year. I will be working with scientists at the Sustainable Biofuels and Co-Product unit of the USDA’s Wyndmoor, PA laboratory for 6 months. I am still looking for opportunities to work in industry for the other 6 months of my leave. Many of my fellow faculty in ChE have industrial experience and sometimes I feel at a loss in my teaching because I do not have this same background. While a six month assignment won’t completely cure this, it will at least give me a few stories to tell in my classes! If any of you know of a temporary applied ChE opportunity, please let me know.

On a personal note, I became a US citizen in June [see photo] and am very happy to call myself an American! My family still loves Grand Forks. My twins, Corey and Casey, are finally going to Kindergarten this fall while my older daughter Briley is in 3rd grade. Ethan, my baby, goes to day care. My life becomes easier as the kids grow older. «

This summer saw the completion of year 2 of our current National Science Foundation Research Experience for Undergraduates (REU) program: Interdisciplinary Renewable and Environmental Chemistry (IREC) Research. IREC is a collaboration between UND’s Chemistry, Chemical Engineering, Biology, and Atmospheric Sciences departments.

Led by Alena Kubatova, UND Chemistry, and UND ChE’s Frank Bowman and Yun Ji, the IREC REU provides undergraduate students a 10-week summer research experience at UND using interdisciplinary research projects. A distinguishing feature of the program is that all students are jointly mentored by a team of interdisciplinary faculty mentors, providing students with unique exposure to scientific approaches from different disciplines.

Thirteen students from a broad range of US institutions plus one ND tribal college instructor were selected out of a pool of over 120 applicants. 2016 research projects included: development of renewable chemicals from lignin and lignocellulose, organic synthesis, measurement and modeling of atmospheric processes, computational research, an epigenetic study, and performance of renewable fuel combustion systems. As a part of the program students also receive training in science communication, community outreach, and research professional development. ChE mentors include Drs. Bowman, Ji, Seames, Kolodka, and Krishnamoorthy.

The IREC experience focuses on students from primarily undergraduate institutions, with a special emphasis on students from tribal community colleges, who will conduct initial research projects at their college followed by a summer research experience at UND together with tribal college faculty. A primary goal of the program is to support and strengthen the students’ commitment to pursuing a career in science or engineering. »
Greetings! It has been another exciting and fun year at UND! With our growing enrollment and never-before-seen class sizes [see pg. 5], we as faculty spend a considerable portion of the year discussing and contemplating the impact of these numbers on instruction quality. However, all of our fears were allayed last spring when we saw the graduation of another outstanding group of seniors! Further, the strong camaraderie shared between the students and faculty certainly came through in our end of the year “Senior Roast.” This time, due to our increase in graduation numbers, the “faculty roast master” responsibilities were shared by the faculty. Anyway, at the end of the day, it was clear that the strong commitment to our student’s individual success that we maintain as our top priority was not compromised by our growing numbers!

Now that I have been promoted and also awarded tenure [see pg. 13], I am as excited as ever to start the next phase of my academic career as a continuing member of this team!

This past year, I taught ChE 532 Explosives: Theory and Modeling in the fall and ChE 501 Advanced Transport Phenomena in the spring. With each iteration of these graduate courses, I try to bring in more real-world examples to stimulate student interests in these areas and also highlight the practical implications of the material learned in the classroom. In addition, I continued to teach ChE 303 Chemical Engineering Thermodynamics and ChE 332 Chemical Engineering Laboratory III. In ChE 332, I added material on applying various numerical methods to estimate real gas properties. When I introduce changes, I continue to remain very sensitive to the response of the students while making sure that their learning experience is enhanced due to the added content. Thankfuly, student responses as reflected through teaching evaluations have remained positive over the years!

I enjoyed a bit more success in my research undertakings this year and was a member of three winning extra-mural research grants [see below and pg. 15]. My graduate students are making good progress towards their graduate degrees. I was also lucky that two outstanding undergraduate students who worked with me last summer decided to stay on and pursue their combined BS/MS degrees under my supervision. Involving our own undergraduate students in research activities has certainly been one of the most fulfilling aspects of my job!

On the family front, Shanta and I continue to cherish the lively activities of our daughter and son. Now that I have multiple collaborations with the University of Utah, we’ve been spending our vacation the past two summers in this wonderful part of the country. Our photo is Arches National Park in Utah. Like my colleagues, I would love to hear from you and know how you are doing in your career.

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**Krishnamoorthy-led Team Wins Department of Energy Grant**

Gautham Krishnamoorthy will lead a team that was awarded $400,000 to develop technology to boost the efficiency of fossil fuel use. Krishnamoorthy, an Associate Professor in ChE and a member of the SUNRISE research program, will lead a joint UND-University of Utah collaboration with a co-principal investigator, Utah’s Jeremy Thornock, on the three-year project. The grant is from the U.S. Department of Energy National Energy Technology Laboratory (NETL)-Managed University Coal Research (UCR) program.

The goal of the project is to develop computer code that quickly solves large, sparse matrix equations observed in advanced energy system simulations. This will enable power producers to conduct simulations of multiphase particle flows and is expected to lead to more efficient fossil energy-based power generation. The project will also be used to train undergraduate and graduate engineering students at both universities. This is one of six recently selected in August 2015 to receive funding through NETL’s UCR, administered by the Crosscutting Research Technology Program.

UCR funds research and development at U.S. colleges and universities for coal conversion and utilization. Its goal is to improve our understanding of chemical and physical processes for environmentally friendly coal conversion and utilization, byproduct utilization and technological development. Through this funding, NETL enhances the education of the next generation of scientists and engineers, while upgrading the coal research capabilities and facilities of the academic environments in which they study.
Some years ago I was attached to an Air Force Reserve unit that happened to perform its weekend drills at Johnson Space Center (JSC). Except for a few of us, members’ civilian jobs were NASA contractors, engineers and managers – plus a couple of astronauts. During that time I learned a lot about NASA culture, including astronaut selection. The last step of the selection process at that time was to submit a 500 word essay as to why the candidate wished to become an astronaut. It was apparent that I was not astronaut material when I quipped, “To get back to the mother ship.” The standard joke of “real” astronauts was, “It’s a good way to meet girls.”

In a sense, I have been recalled by the “mother ship.” My principal work at UND is as a research engineer at UND’s Energy & Environmental Research Center. For the past couple of years, EERC has been kind enough to permit me to teach part-time. The ChE department has allowed me to teach professional ethics, process control, and the controls portion of plant design; each of which presented unique personal challenges. During that time, I got to meet a lot of great students and I developed a sincere respect for the quality of the department’s faculty and program. At the same time, the EERC was expanding its expertise to include technologies that could resolve issues involved petroleum production – specifically facilities is- tile organic compound detection from gathering lines, and the reduction of hazards associated with Bakken crude rail transportation. EERC’s client and project list has grown to include many of the oil companies operating in North Dakota, as well as new projects addressing the needs of the State and the Department of Energy. My experience as a refinery operating and process control engineer is increasingly being called upon to support many of these projects – so many, in fact, that I need to step back from teaching and return full-time to the “mother ship.”

I’ve been very fortunate to have experienced a wide range of things during my life: working in operations and R&D of a major oil company; traveling internationally and sitting on the executive board of a European Union research consortium; temporarily serving as the deputy director of one of the Air Force’s research directorates; and, of course, getting to perform duty at JSC. I regard my experience teaching at UND as highly as I do any of those experiences and feel that it has been a pleasure and an honor to work with the students, faculty and staff of the department. While I will no longer be formally associated with the department, I hope to maintain a connection and, perhaps, periodically serve as a guest speaker in class or seminar settings.

I thank the department and my students for their patience and understanding as I went through the teaching “learning curve” and as I experimented with the professional integrity course in an attempt to make it more relevant and interesting. I wish all of you the best of luck in your future endeavors.«

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**Krishamoorthy Receives Promotion and is Awarded Tenure**

Reflecting his outstanding contributions to the mission of UND’s ChE department, Dr. Gautham Krishnamoorthy was promoted to the rank of Associate Professor and awarded tenure in the Spring of 2016. This is a recognition of Gautham’s high level of excellence in teaching, research, and service activities.

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

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

**CONGRATULATIONS GAUTHAM!**
One of my favorite quotes says, “The greatest thing in this world is not so much where we stand as in what direction we are moving.” Although I am standing at the end of my 2nd year at UND, what matters more to me is the direction I am heading as a member of the UND ChE department: forward!

The past couple of years have been both inspirational and rewarding. I have been inspired by the excellent students I have been privileged to teach and find that being a part of the best cohort of faculty members on campus very rewarding. My direction of success will be maintained and truly leveraged as long as I keep teaching such an outstanding pool of students and continue to work and collaborate with colleagues that are among the best in the profession of chemical engineering teaching and research.

The past year was a continuation of the previous one in working towards improvement and excellence of teaching. I continued to teach CHE 305 Separations and CHE 315 Statistics and Data Analysis & N umerical Methods in the Spring; CHE 431 Laboratory IV in the Summer and Fall, and CHE 505 Biochemical Engineering also in the Fall. Experience gained in the first year plus feedback from students were taken into account and implemented in teaching the same courses this past year. Course improvement is a continuous and dynamic process, but with the help of the students, I hope to have my courses perfected by next year — the third time’s the charm!

Related to my role in CHE 431, I received a UND Summer Mini-Grant for a project entitled “Chemical Engineering Laboratory Safety and Health” for safety-modules course development.

My research activities continued to progress and grow slowly as we continued setting up the laboratory facility and needed equipment and research tools. My main research focus is to identify/develop better separation membrane materials and assemblies for use in natural gas purification and upgrading, which will help make gas gathering activities in the Bakken shale oil field more attractive. We are hopeful that the fruits of our research will contribute to this issue, both here in North Dakota as well as nationally, especially where the nitrogen content in natural gas is above acceptable limits by targeted markets.

Another dimension of my research is trying to capitalize on the tremendous reserves of ND lignite coal (ND ranks 1st globally in reserve deposits) by looking into ways to utilize effluent gases from coal gasification technology as a feedstock to produce high-value, low-volume commodity chemicals via fermentation processes.

I took over as the day-to-day coordinator of the PowerO N! outreach program [see below] from Bob Wills last year, and this occupies most of my service time with events taking place on-campus, in-town, and out of town. It continues to be source of a joy for me and a cheerfulness outside of the office.

I also completed the 2nd year of the UND Alice T. Clark new faculty development mentoring program which has been an invaluable experience.

Finally, this past year has also been good to me and my family. We moved into our new house in preparation for an important member: the family dog! My two sons assumed their responsibilities of helping with lawn mowing and watering the plants.«

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**POWER ON! HAS ANOTHER SUCCESSFUL YEAR**

It has been a busy and fun year for PowerO N! Participation in events has been on the rise along with the number of requests from event organizers. Approximately 2800 children were served at a variety of events. Events included visits by students and their teachers from Grand Forks and West Fargo high schools, GirlsTech 2016, and the ND State Science Fair. In these visits, 8th to 12th grade students interested in STEM areas of study interacted with PowerO N! student volunteers, who conducted demonstrations to connect scientific concepts to real-life applications and to answer questions about UND and engineering as a degree program.

PowerO N! was also present at events held by local area schools, including the Science Night at Grand Forks Century Elementary, Sacred Heart School in EGF, and the GFAFB Elementary School. Children are truly a treat to interact with when science is the topic. They come up with the most fascinating questions, some of which we cannot answer! Their chain reaction questions end up teaching us things about our demonstrations that we had never thought of before. The joy we experience while interacting with these “little scientists” is indeed priceless.

PowerO N! continued our participation in two large community events, Super Science Sunday and the Rydell annual car show. These two events draw on average 1200 students and their families every year. In these two events, the parents accompanying their children tend to be more involved and participate in the conversation, and most often get their hands dirty by performing the
RESEARCH PRESENTATIONS


- Humphrey Chukwurto, Alexis Tupy, Da'Nay Lacey, and Frank Bowman, “SOA Formation, CCN Activity and PAH Products during Aging of Diesel Exhaust in a Laboratory Chamber,” 2015 American Association for Aerosol Research (AAAR) Annual Conference.


GRANTS

- Steve Benson, Dan Laudal, and Mike Mann were awarded $871,847 from the Department of Energy, N.D. Lignite Energy Council, Great River Energy, and North American Coal for a project entitled “Investigation of Rare Earth Element Extraction from North Dakota Coal-Related Feedstocks.”

- Gautham Krishnamoorthy will lead a joint UND-University of Utah collaboration on a three-year, $400,000 project to develop technology to boost the efficiency of fossil fuel use [see article on pg. 12].

- Harvey Link (NDSCS), LaCosta Potter (SEEC), and Frank Bowman were awarded $300,000 from the U.S. Department of Education through a Mathematics and Science Partnerships (MSP) program grant from the N.D. Department of Public Instruction for a project entitled “Community of Practice Focusing on Career-Ready Skills”.

- Mike Mann and Wll Gosnold were awarded $261,000 from the North Dakota Industrial Commission for a project entitled “Distributed Geothermal Power” [see article on pg. 6].

- Wayne Seames and Gautham Krishnamoorthy will receive $120,000 as part of a joint US-China National Science Foundation grant [see article on pg. 18].

- Ali Alshami and Mike Mann were awarded a $100,000 N.D. Research Venture Grant for a project entitled “2,3-Butanediol Production via Fermentation, an Alternative Route to Chemical Synthesis, Using Synthesis Gas from Lignite Coal Gasification”.

- Steve Benson, Dan Laudal, and Mike Mann were awarded $99,987 from the North Dakota Department of Commerce for a project entitled “Technical and Economic Feasibility Analysis of the Next Generation Valley City State University Heating Plant”.

- Surojit Gupta and Yun Ji were awarded a $99,852 N D Research Venture Grand for a project entitled “Commercialization of Novel Lignin Reinforced Bioplastics by Using Game Changing Additive Manufacturing Practice”.

- Feng Xiao and Mike Mann were awarded $93,661 from the ND Department of Commerce for their project “Development of Next-Generation Agriculture Soil Amendments”.

- Gautham Krishnamoorthy and corporate partner Envergex, LLC received $74,790 grant from the Phase I DOE/NETL SBIR grant entitled “Spouted Fluid Beds for Chemical Looping Combustion/Gasification”.

- Mike Mann was awarded $55,000 from Montana Dakota Utilities Company for a project entitled “Demonstration of the ORC for Low-Grade Heat Recovery”.

- Wayne Seames received a Doctoral Dissertation Fellowship Award in the amount of $21,872 from the ND EPSCoR program to help Che PhD student Sara Pouriafar complete her lignin thermal decomposition research project and dissertation.

- Yun Ji and Wayne Seames were part of a group that received an $18,248 ND EPSCoR equipment grant to purchase a carbon analyzer.

- Mike Mann and Harry Feilen were awarded $10,000 from Microbeam Technologies Inc. for a project entitled “Performance Testing of S-Sorb and H-Sorb”.

PEER-REVIEWED PUBLICATIONS

(Continued on page 19)
STUDENT ACCOMPLISHMENTS

2015-16 Academic Achievement Awards were conferred at a ceremony held during the last week of the Spring semester:

FRESHMAN
Student of the Year — Alex Geritz
Finalists — Mikaila Kringstad and Jiselle Thornby

AICHe Freshman Recognition Award
KayLee Smith

SOPHOMORE
Student of the Year — Jade Olstad (DEDP)
Finalists — Cole Bachmeier and Nicole Eisenschenk

AICHe Donald F. Othmer Sophomore Academic Excellence Award
Cole Bachmeier

JUNIOR
Student of the Year — Trevor Seidel
Finalists — Cataldo Didonna and Megan Wiens

SENIOR GROUP AWARDS

THE A.M. SOUBY AWARD FOR EXCELLENCE IN SENIOR PLANT DESIGN
(from left) Anthony Resvick, Austin Schultz, Taylor Score, and Michael Swenson
“Removal of Sulfur from Coal Power Plant Emissions”

THE CHE ALUMNI AWARD FOR EXCELLENCE IN SENIOR PLANT DESIGN
Ryder Shallbetter, Deniz Saka, Lauren Clarke, and Antonijo Jurkic
“Decaffeinated Coffee and Caffeine for Energy Drinks”

SPONSORED AWARDS IN SENIOR PLANT DESIGN

The Dakota Gasification Company sponsored a design project entitled “Production of Carbon Black from Tar Oil” which was completed by Andrew Eerdmans, Hanna Kim, and Nick LaFosse. Their industrial advisor was Laura Dronen DGC Engineering Supervisor, UND BSChE 01/MSChE 03.

THE CEM-WIDE FREEMAN AWARD FOR INNOVATION AND EXCELLENCE IN DESIGN
1st place was won by a group of ChE students this year; Jeremy Cole, Katelyn Randazzo, and Leah Althoff for their project “Produced Water Treatment.” This project was sponsored by AE2S. Their industrial advisor was Michael Steele, MSChE 15.

Valley City State University and UND CEM’s Institute for Energy Studies sponsored a design project entitled “Next Generation North Dakota University System Heating Plants” which was completed by Samantha Sandeen, Jameson Buehler, Mitchell Hunt, and Richard Ogado.

CEM Annual Design Competition
The poster presentation of students Althoff, Cole, and Randazzo (see Freeman above) was awarded 2nd place in the Process Projects category. We appreciate the hard work of the students on these projects and again the support and willingness to assist by both external sponsors and ChE faculty advisors.

If you’d like to sponsor a student design project, please contact Wayne Seames at wayne.seames@engr.und.edu or 701-777-2958 to discuss your ideas.

Graduating with Honors
Andrew Eerdmans and Alexis Tupy, graduated from the honors college program. Andrew’s Honors thesis based on his design project, “Dakota Gasification Plant Expansion to Produce Carbon Black” was selected for the George and Margaret Starcher Undergraduate Research Award for best research presentation. Alexis’ presentation based on her project, “Polypropylene from Propane”, was a close 2nd in the voting!

Wayne Seames served as their faculty advisor.

Upon learning of his award, Andy stated: “This was an exciting and unexpected award that I can certainly attribute to the excellent training and preparation that UND Chemical Engineering has given me for my future career. I was glad to represent the profession and the UND Department of Chemical Engineering well in front of a diverse academic audience.”

Society of Professional Engineers, ND Chapter
Outstanding Senior: Taylor Score
Outstanding Junior: Trevor Seidel

CONGRATULATIONS TO ALL OUR AWARD WINNERS!!
SEAMES AND KRISHNAMOORTHY PART OF US/CHINA RESEARCH COLLABORATION TO REDUCE CO₂ EMISSIONS FROM POWER PLANTS

Wayne Seames and Gautham Krishnamoorthy are co-Principal Investigators on a recently awarded international research grant to study barriers associated with oxy-biomass and oxy-coal combustion technologies. The project, “Deposition of ash and its effect on heat transfer during oxy-combustion of biomass and biomass-coal blends,” is a collaboration of the University of Utah (US lead), UND, Huazhong University of Science and Technology (Chinese lead), and Southeastern University (China).

This 4 year, $1 million project is jointly funded by the US National Science Foundation and the National Science Foundation of China. The overall objective is to provide information to enable implementation of oxy-combustion of biomass and biomass-coal blends for power generation. In oxy-combustion, oxygen is separated out of air prior to its use in the steam boiler. This generates a nearly pure CO₂ flue gas that is easy to reuse or sequester since the CO₂ doesn’t have to be separated from nitrogen. The issue here is the “nearly pure” part of the flue gas. A portion of the CO₂ is recycled back to the boiler because burning biomass or coal with pure oxygen generates temperatures that are too high for current boiler materials. However, replacing nitrogen with CO₂ affects fuel combustion characteristics and ultimately influences burnout and ash deposition. Further, contaminants build up on boiler tubes, reducing heat transfer efficiency and causing corrosion.

This technology is attractive because it can simultaneously produce electricity and remove CO₂ from the atmosphere, using conventional equipment. But the technology requires a knowledge of ash deposition and heat transfer under biomass oxy-combustion conditions, which are the twin thrusts of this research. The team aims to: 1) uncover deposition mechanisms and validate predictions of ash deposition rates and 2) understand how these impact boiler chamber radiation. UND’s primary role in the project is to carry out numerical simulations to compliment the experiments carried out at partner institutions. The project also explores the use of pressurized combustion systems. These proposed next generation systems may result in increased thermal efficiencies and reduced pollution rates compared to conventional combustors.

The groundwork for this partnership was laid nearly three years ago when Seames participated in a joint US/Chinese workshop focused on sustainable combustion technologies [Kinetics, 2014 edition]. At the workshop he met Minghou X u from HUST and they agreed to collaborate on future proposals. Dr. Xu was already collaborating with Utah’s Jost Wendt, who was Seames’ Doctoral Research advisor in the 90s [the combustion research community is truly a small world!] They all agreed to team up together to develop the project. Krishnamoorthy recently received another collaborative grant, from DOE, with Utah [see pg. 12] and completed his M.S. and Ph.D. degrees at Utah in 2002 and 2005, respectively.

MEET BRITTANY TAGUE, CHE’S NEW DEPARTMENTAL ADMINISTRATIVE ASSISTANT

We are excited to welcome Brittany Tague as our department’s new administrative assistant. While she’s not completely new here (she has been working with us on a part-time basis for about two and a half years), we are very pleased that she has now joined us in a more permanent position.

Brittany is originally from Rosemount, Mn and has a B.S. in Atmospheric Science from UND with a minor in Math. In her spare time, she coaches figure skating and also likes to travel, fish, and spend time with friends and family.

She knows she has big shoes to fill, but is looking forward to continuing her support of the ChE students, faculty, and staff.

EXTERNAL ADVISORY COMMITTEE

One important contributor to CHE’s assessment process is our External Advisory Committee. This group of alumni and external stakeholders meets every other year to review our programs and suggest opportunities for improvement. During the EAC’s October 2015 meeting, we discussed our undergraduate program outcomes, changes to our program’s electives, and ongoing trends in the industries that employ our students.

The feedback we received from the EAC is a critical piece of our continual improvement process and is reflected in the materials we use to support our ABET accreditation. During the October meeting we also had an opportunity to attend a UND women’s hockey game, where star goalie and ChE student Shelby Amsley-Benzie [pg. 21] helped UND defeat the Univ. of Minnesota Gophers. The EAC did its part by cheering loudly and helping to dispose of a few “beverages”.

Current members of the Advisory Committee are:

- **Jim Albrecht**, BS 84 – ComDel Innovations
- **Myles Dittus**, BS 96 – Hess Corporation
- **Adam Driscoll**, BS 06 – 3M [previously with Barr Eng]
- **Mark Jesh**, BS 86 – Medtronic
- **Michael Just**, BS 01 – Tesoro [previously with DGC]
- **Ben Oster**, BS 05/MS 09 – Global Patent Solutions [previously with POET]
- **Brandon Pavlish**, BS 06 – Cirrus Aircraft
- **Steve Roseneau**, BS 95 – Am. Crystal Sugar

EAC members serve six-year terms and we will be filling two openings prior to our fall 2017 meeting. **If you have an interest in volunteering, please let us know.**

KINETICS
Greetings from the UND Alumni Association and the College of Engineering and Mines Support Office. Well, it’s been an exciting year at UND, full of administrative changes, record CEM enrollment and graduation numbers, and budget cuts. But one thing remains constant, our commitment to support and assist both our students and our alumni to achieve their goals and their dreams.

We are extremely grateful for the generosity, support, and passion that the alumni and friends of UND ChE have demonstrated. Gifts enable us to continue to attract and retain top students and faculty members. With our current resource challenges, philanthropy is more critical than ever if we are to continue to provide the high quality education experience that UND ChE students have always enjoyed.

The ChE faculty have done an amazing job of keeping up with the added workload incurred due to our enrollment growth. As such, the department’s top priorities are donations to either: 1) fully or partially endow a faculty chair or 2) the Owens endowment so that we can add faculty to cover this growth.

Another priority area is general needs. As discussed on pg. 20, alumni donations cover the majority of the department’s annual operating costs. A third priority area is scholarships. Our pool of scholarship funds did not keep pace with the past decade’s rise in tuition costs for students and the fraction of student tuition we are able to offset has decreased.

We hope you will consider donating to one of these priority areas this year. Please contact either Deb Austreng or Andy Bjerke to see how you can help us continue to maintain the UND’s ChE department at its award-winning level of excellence for students this year and in the years to come.

Deb Austreng
Director of Alumni, Corporate, and Public Relations
College of Engineering and Mines
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Grand Forks, ND 58202
Voice: 701-777-4249
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Andrew Bjerke
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UND Alumni Association Foundation
3501 University Ave., Stop 8157
Grand Forks, ND 58202-8157
Voice: 800-543-8764 / 701-777-1428
Email: andrewb@undfoundation.org

TOM OWENS CHEMICAL ENGINEERING FELLOWSHIP ENDOWMENT
CAN WE GET TO THE NEXT LEVEL?

Thanks to the generosity of UND’s ChE alums, funds in the Tom O wens Endowment continue to grow, helping us to maintain our current faculty size by partially funding Frank Bowman’s position. We are currently at the Fellowship level (Endowment funds totaling $250,000 - $499,999). 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 who 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 O wens Chair so that we can reach our goal of adding additional faculty.

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 Kristi Brindle (303) 888-8317, khbrindle@msn.com, Andrew Bjerke (see contact info above), or the ChE department.

FACULTY RESEARCH HIGHLIGHTS (continued from pg. 15)


- Li, Jinhao; Dong, Huiling; Xiu, Huijuan; Zhang, Meiyun; Kamireddy, Srinivas; Zhang, Xuef ei; Ji, Yun (2016), “Extraction, separation and refining of microcrystalline cellulose from wheat straw using various pretreatment processes,” Int. J. of Agricultural and Biological Engineering, 9, 137-145.

We greatly appreciate your continued support of ChE! This year we received $8,258 for the Thomas Owens Endowment, $58,669 towards priority needs for the department, and $19,600 toward student scholarships. That's a total of over $86,000 designated for ChE departmental needs!

We are pleased that so many of you recognize the need for student financial aid and are willing to make a donation. Thanks to these contributions, along with the distributions from our endowments, we were able to award over $20,000 in scholarships to deserving ChE students during this academic year [pg. 17]. Our students also benefitted from another roughly $20,000 in scholarships from CEM. We do our best to impact as many students as we can, and this year over 40 ChE students were awarded a scholarship.

Your contributions help many of our students partially offset the high costs of a university education. The modern student has a lot of ever-increasing expenses, including tuition, books, fees, housing, and other living costs. While the people of ND, through the legislature, continue to be among the most generous in the nation (on a per capita basis), the fraction of the cost of education paid for by the state continues to decrease each year. As a result of your generosity, students are able to focus more time on their studies and, in many cases, reduce their reliance on student loans.

Your donations also directly benefit our students in other ways. For the past several years, we’ve been able to help students attend the regional and national AIChE conferences [pg. 4], where they are able to network with fellow ChEs, learn about new topics in the field, and compete in the ChemE Car competition. As you may have read in the AIChe Student Chapter Update [pg. 4], UND will be hosting the regional conference this upcoming year. Your continued support will allow us to provide them additional resources to ensure they are able put on a great event.

The other area I’d like to highlight is the important impact your support provides to the faculty. We have several endowments created specifically to support faculty, and, among other things, these funds have allowed us to hire additional faculty to better serve our students. Our goal over the next five years is to expand the department from eight faculty members to twelve. While this is an ambitious goal, it will bring our

(Continued on page 23)
CHE STUDENT ATHLETES CONTINUED TO EXCEL

SHELBY AMSLEY-BENZIE ENDS RECORD-SETTING CAREER

By any and all measures, Amsley-Benzie represents the very best of college athletics. She is one of the nation’s top goaltenders, a 4.0 student pursuing combined BS/MSCHE degrees, and tireless in her devotion to giving back in the community.

A three-time Academic All-American, a two-time, top-10 finalist for the Patty Kazmaier Memorial Award, a 2015 All-American and WCHA Goaltending Champion, and a First Team All-WCHA performer (junior season), Amsley-Benzie posted a 67-33-10 career record in 111 collegiate games, along with a 0.929 save percentage, a 1.69 goals-against average, and 22 shutouts. She is UND’s all-time leader in every major goaltending category, while in WCHA history she ranks sixth for shutouts, eighth for games played, tied for eighth for wins, 12th for save percentage and 16th for saves (2,474).

While compiling a prestigious and ongoing athletic career, which has also included invitations to four prestigious USA Hockey camps or training sessions, Amsley-Benzie has excelled academically. For her MS thesis, Shelby is taking data developed by numerous previous students and integrating that data into a comprehensive process design for a complex biorefinery. Her advisor is Wayne Seames.

A list of Amsley-Benzie’s Awards . . .

- 2016 Academic All-American Division I Women’s All-Large First Team
- NCAA 2016 Postgraduate Scholarship
- UND 2015/16 Female Scholar Athlete of the Year
- Capital One (CoSIDA) 2016 Academic Division I All-District At-large 1st Team (only women’s hockey player to win this award three times)
- WCHA 2016 Postgraduate Scholarship
- WCHA 2016 Outstanding Student-Athlete of the Year
- WCHA 2016 Third Team
- UND 2014/15 Female Athlete of the Year
- UND 2014/16 Female Scholar Athlete of the Year
- CoSIDA 2015-16 Women’s At Large First Team
- USCHO/College Hockey News 2015 First Team All-American
- CoSIDA 2015 Academic All-America First Team
- CM Division I 2015 Women’s Hockey Second Team All-American
- AHCA 2015 All-America Second Team
- WCHA 2015 Goaltending Champion
- WCHA 2015 Outstanding Student-Athlete of the Year
- Capital One 2015 Academic All-District 6 Women’s At-large Team
- CoSIDA 2015 Academic All-District Team
- UND Women’s Hockey Team 2015 Most Valuable Player
- USA Hockey’s Top 10 Finalist for the 2014/15
- WCHA 2015 First Team
- WCHA 2015 Academic Team
- UND CHE 2015 Souby Award for Excellence in Plant Design
- CoSIDA 2013-2014 Academic Division I All-District Women’s At-Large 3rd Team
- CoSIDA 2013-2014 Academic All-District Team
- WCHA 2013-14 Scholar-Athlete
- WCHA 2013-14 All-Academic Team
- UND 2013/14 Female Scholar Athlete of the Year Finalist
- UND CHE 2014 Junior Student of the Year Finalist
- UND CHE 2013 Sophomore Student of the Year Finalist
- UND CHE 2012 Freshman Student of the Year Finalist

Idowu named to 2015 Allstate AFCA Good Works Team

Officials from the Allstate Insurance Company and the American Football Coaches Association (AFCA) named UND senior linebacker and CHE student Dayo Idowu (Woodbury, MN) to the 2015 Allstate AFCA Good Works Team®, the most esteemed off-the-field honor in college football. The 22 student-athletes selected for this honor have made a positive impact on others and their communities.

In its 24th year, the Allstate AFCA Good Works Team® is comprised of athletes who have used their limited free time to perform inspirational acts of service. This summer, the program received an all-time record high 197 nominations from colleges and universities across the country.

“Allstate is proud to continue the legacy of recognizing student-athletes for their role in making a positive impact in their local communities,” said Pam Hollander, vice president of marketing for Allstate. “The ‘good works’ of these individuals is an inspiration to us all and we are thrilled to recognize another team of young men that are truly making a difference both on and off the football field.”

Idowu, who al-

(Continued on page 22)
Lauren Clarke Earns Multiple Honors as a Scholar Athlete

ChE combined degree senior Lauren Clarke was named to the CoSIDA Academic All-America Third Team and was selected as a Big Sky Conference scholar-athlete of the year. Clarke was a member of the UND volleyball team. A native of Naperville, IL, Clarke recently completed a standout career at UND that sees her name all over the school record book. She finished with the third-most digs in school history (1,626), and she posted two of the top 10 season dig totals at the school as well (531 in 2013, 6th and 518 in 2012, 7th).

“Lauren has been an absolute anchor for us, on the court, off the court, and in the classroom,” UND head volleyball coach Mark Pryor said. “She is a true leader. She leads through daily example in how she prepares for matches and classes. She has set a high bar as what being a productive student-athlete should resemble. The entire program celebrates this with her”.

Clarke was also a finalist for UND’s female scholar-athlete of the year and was named to the CoSIDA Capital One Academic All-District Volleyball Team for the 3rd time. She has received this award more times than any volleyball player in UND history.

“When not playing or practicing, Lauren has been working on her masters thesis with her advisor Gautham Krishnamoorthy.”

Idowu Good Works Award (continued from page 21)

ready holds a BSCChE degree and is working on his MScChE with his advisor Wayne Seames, has excelled both on and off the field during his time at UND, but his selflessness and desire to serve others are the primary reasons he was recognized among the 21 other football players on this prestigious team in New Orleans at the 2015 Allstate Sugar Bowl.

“Tn honestly,” Idowu said. “I have been given so much and the least I can do is simply give back. Here at UND, we pride ourselves on our service to others and it’s great to see that be rewarded on a national scale”.

Idowu served as the president of UND’s Student-Athlete Advisory Committee this past academic year and was instrumental in developing and implementing a number of community service projects for the football team that ranged from reading for elementary students to helping move and care for a family whose apartment had been destroyed by fire.

“This is a great honor for Dayo and great for our football program and athletics department,” UND head coach Bubba Schweigert said. “We take a lot of pride in community service and helping others and this award shows us what type of young man we have leading us in that area. Dayo is what we look for in a UND football player and he does an exceptional job representing us on the field and an even better job as a first-class individual off the field”.

UND athletics director Brian Faison had similar sentiments for a student-athlete he has grown to admire and respect during his time at UND. “I could not be happier for this young man,” Faison said. “Dayo is an impressive student-athlete across the board athletically, academically and in service to the University and the community”.

“The members of the 2015 Allstate AFCA Good Works Team® are excellent example of hard work and dedication, both on the field and off,” AFCA Executive Director Grant Teaff said. “These 22 student-athletes have shown, through their countless hours of community service and work on the football field, that you can give more of yourself to help those around you. It’s a privilege to team up with Allstate to honor these students”.

Cataldo Didonna Goes the Distance at Both the Track and in the Classroom

Cataldo Didonna, a junior in ChE, competed on the men’s Cross Country team in the fall and on the Track team in the spring. He was named to the 2015 Big Sky conference Fall Academic team and ran the eighth-best steeplechase in UND history at the NDSU Tune-Up. He was a finalist for the department’s outstanding junior scholar award.

ChE Senior Keaton Hanevold (right) completed his 4th year of contributions to the men’s track and field team this year throwing the javelin. He received his BScChE this Spring.

ChE Junior Dustin Britton (left) did not compete on the men’s tennis team this year due to an injury.”

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PowerON! has another successful year
(continued from pg. 14)

experiments themselves. Whether it’s the children or their parents, we always end up learning from them as much as they learn from us. Last year’s activities also included out of town events and holiday-themed participation for PowerON! The out of town event took place at Mayville State University (220 kids attended) in Mayville, ND; and the holiday-themed event involved participation in a two-day Halloween party organized by the Canad Inn’s Grand Forks Hotel (247 kids attended). Both events were a success and plenty of fun for both children and PowerON! student volunteers.

As we begin another academic year here at UND, we are looking forward to repeating most, if not all, of these events and most likely new ones as the word about PowerON! keeps circulating in and out of our local area. We hope and look forward to seeing our alumni with their children at future events.

[note: PowerON! materials and miscellaneous costs are funded by donations. If you’d like to help, please designate ChE PowerON! on your donation, which can be sent to the department directly or through the Alumni Foundation. Thank you for considering this worthy activity in your contribution plans.]«

FORMER UND CHE FACULTY MEMBER
SELECTED AS PRESIDENT AT WASHINGTON STATE UNIVERSITY

Kirk Schulz, is now the 11th president of Washington State University (WSU). Schulz, 52, is a Virginia native who graduated in 1991 from Virginia Tech with a doctorate in ChE. He worked as a professor at UND, Michigan State, and Mississippi State. Most recently, Kirk has served as President at Kansas State University for the past seven years.

We wish Kirk all the best on his new position.«

ALUMNI CONTRIBUTION REPORT
(Continued from page 20)

student-to-faculty ratio back down to a more comfortable level, bring us in line with our peer institutions, and allow us to increase the range of expertise within the department. Increasing our department’s endowments is one of several tools we will use to reach that goal. One way you can help is by supporting the Tom Owens Endowment [pg. 19], which, as we reported last year, is getting close to reaching the next level - the “Professorship Tier”.

We would like to thank those of you who have contributed in the past. Without you, this department wouldn’t be where it is today. Thank you!«