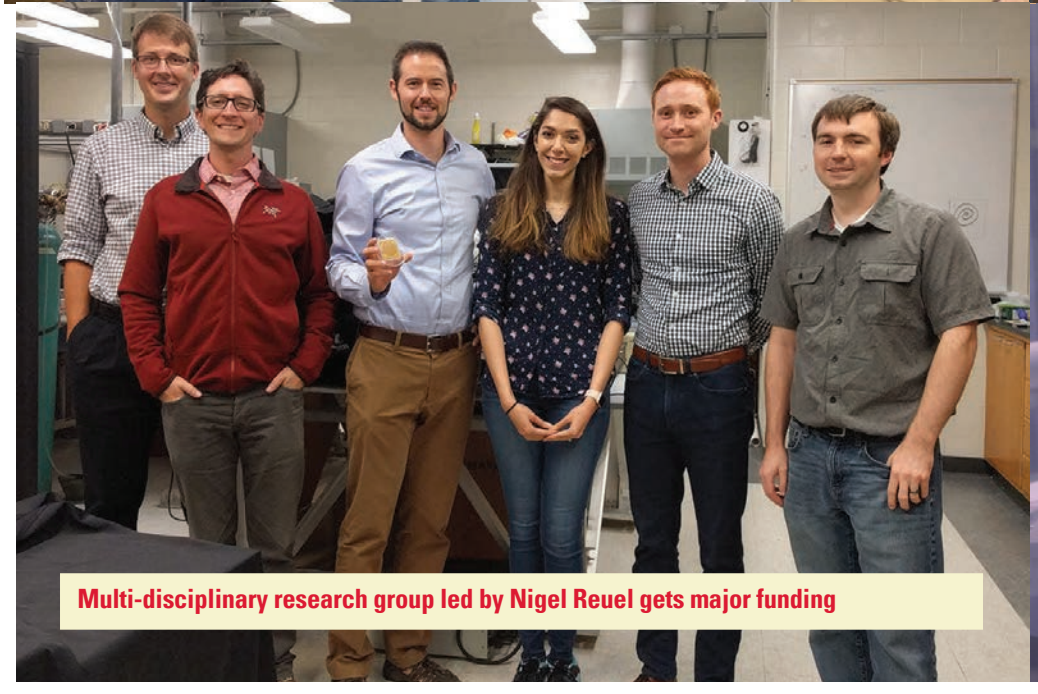
IOWA STATE UNIVERSITY
Department of Chemical and Biological Engineering

# activesite

2018 Issue 29

John Kaiser brings industry experience to teaching role for undergraduates

Study abroad, global perspectives enhanced by alumni gifts



Multi-disciplinary research group led by Nigel Reuel gets major funding

Small-Angle X-Ray Scattering System provides research opportunities for many

**Dr. Andrew C. Hillier**,
Professor & Reginald R. Baxter Endowed Department Chair,
Department of Chemical and Biological Engineering
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Dear Alumni and Friends,

Hello from Iowa State University. I hope you enjoy this year's issue of the CBE annual newsletter, Active Site. Inside these pages, you will find a number of stories and highlights from activities in the department, at various events around campus, and read about some of the accomplishments of our students, faculty, staff, and alumni.

The department continues to advance its mission of providing the highest quality chemical engineering education while pursuing innovative and impactful research and service to society. Based on our enrollment numbers, we continue to be a major destination of choice for chemical engineering students. Our undergraduate enrollment for the fall 2018 semester was 697 students, and we graduated 158 B.S. chemical engineers this past year, which is an all-time record for the department. The size and impact of our graduate program also continues to grow, with our graduate enrollment reaching almost 90 students this year, which is another all-time high.

As you will see in the following pages, this last year has included many successes for our faculty, staff, students and alumni through various awards, accomplishments and recognitions. We have added several new staff to the department, and are delighted to have John Kaiser join us as a senior lecturer after a long and successful career at Mars, Incorporated. Our research efforts continue to be accompanied by high-impact scholarship, technical innovation, and extramural funding, which this year totaled ~$9.2 million.

The successes and impact of our alumni continue to impress. Just of few of their recognitions include induction into the National Academy of Engineering and the CBE Hall of Fame, and awards that include the Professional Achievement Citation in Engineering, the Young Alumni Award, and the Marston Medal, to name a few. We are so very proud of the accomplishments of our alumni and delight in the chance to share their stories with you.

Our students continue to be highly successful and sought after by companies, graduate programs, universities and national laboratories. They are involved in a number of activities, including professional experiences through co-ops and internships, study abroad experiences such as the Oviedo summer lab, research experiences (Griswold Internship Program), and various events and competitions.

Thanks to all of our supporters for their time, energy, resources and friendship. We are so very blessed and thankful for the generosity and support of our many alumni and friends. The support we receive allows the department to do so many positive things, ranging from providing scholarships and fellowships to our students, renovating and upgrading our facilities, and allowing us to recruit and retain the very best faculty and staff. We are so very thankful for your support and generosity.

I hope you enjoy reading this issue of Active Site. Please send me any comments or suggestions you have for future issues of Active Site, and if you are ever on campus, please stop in and say hello. I would be delighted to visit with you and give you a tour.

My warmest wishes to all of you for a happy, healthy and productive year.

Go Cyclones,

Andrew C. Hillier

Andrew C. Hillier
Professor and Reginald R. Baxter Endowed Department Chair

# Help keep CBE strong!

Contributions help the Department of Chemical and Biological Engineering provide quality education for undergraduate and graduate students. Increasing enrollment makes the need for the best in personnel, facilities and equipment even more important. Your generosity helps with many important functions, such as:

- Flexible funds to support initiatives, such as the CBE Excellence Fund.
- Support of students through fellowships and scholarships.
- Support of department personnel through professorships.

Unsolicited gifts to any of the above areas are welcome. Use the "Make a Gift" electronic link on the home page of the CBE web site at cbe.iastate.edu. If you wish for your donation to be used for a specific purpose outside of the choices offered, be sure to note your intention in the "Notes/Instructions" box.

***Thank you for your support of CBE!***

# activesite




*Andrew C. Hillier*
Reginald R. Baxter Endowed Department Chair, Department of Chemical and Biological Engineering

*Michelle Stotts*
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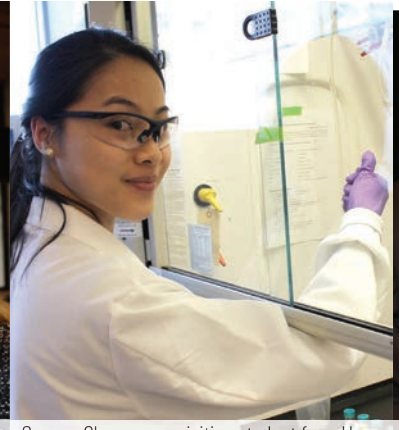
CBE alumnus and supporter Mike Steffenson and his daughter Sandra Tamkin at the 2018 Honors and Awards Banquet.



Season Chen was a visiting student from Hong Kong through the Fulbright Scholar program.

Akash Mitra (left) and Dakota Even, received the Lawrence E. Burkhart Outstanding Senior awards for the Spring 2018 and Fall 2017 semesters.

New senior lecturer John Kaiser and students enjoy the CBE "welcome back" ice cream social event in August of 2018.

Scholarship and fellowship recipients at the 2018 Honors and Awards Banquet gather for the traditional group photo.


BioMaP REU students prepare to dig into the cake at the group's farewell reception.

CBE senior Jenny Larson gets ready for a take in creating a "What is Chemical and Biological Engineering" undergraduate recruitment video.

CBE faculty members pose for a group photo at the 2018 Faculty Retreat

Scholarship sponsors Wesley Demmon and Linda Mittman Demmon are shown with scholarship recipient Omer Malik at the 2018 Honors and Awards Banquet.

# IOWA STATE UNIVERSITY
## Department of Chemical and Biological Engineering

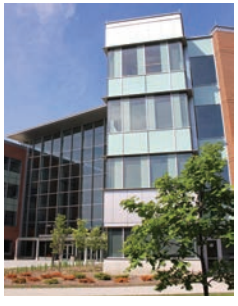
# by the numbers

## Enrollment (Fall 2018)
- Undergraduate: 697
- Graduate: 87 (new record enrollment)

## Scholastic Achievement
- Avg. GRE Scores (graduate, incoming fall 2018):

Verbal Reasoning 156.6
Quantitative Reasoning 163.9
Analytical Writing 3.5

## Facilities
**Sweeney Hall/**
**Biorenewables Research Lab**
- 35,000+ sq. ft. research space
- 9,000+ sq. ft. teaching space
- 3,976 sq. ft. computer labs
- 150 student computer work stations
- 9,000 sq ft. office space
- 1,000 sq. ft. conference space

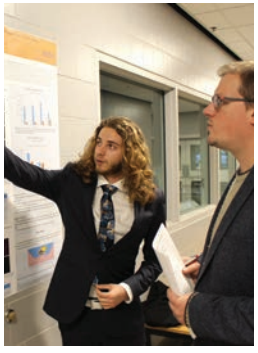



## Degrees Awarded (2018 Academic Year, Summer 2017-Spring 2018)
- B.S. 158
- M.S. & M.E. 5
- Ph.D. 10



## Department Faculty
- 4 Distinguished Professors
- 1 University Professor
- 5 Professors
- 8 Associate Professors
- 5 Assistant Professors
- 1 Adjunct Professor
- 5 Lecturers
- 8 Courtesy Professors
- 5 Recent Emeritus Professors

**Endowed Positions**
- 4 Endowed Chair Holders
- 4 Endowed Professorships
- 3 Faculty Fellowships



## Research
- Direct Research Expenditures: $9.2M (FY 2018)

## Scholarships & Fellowships
- 184 undergraduate scholarships awarded in 2018-19 totaling $350,998, impacting 142 students
- 20 graduate fellowships totaling $128,000

## Rankings
**(Iowa State University Chemical Engineering, U.S. News & World Report, Best College Rankings)**
- 34th, overall
- 22nd, public universities

**Department Vision:** To be internationally recognized as the Chemical and Biological Engineering department that best exemplifies the dual commitment to outstanding research and excellence in student education.

**Department Mission:** To provide a high-quality education in chemical and biological engineering at the undergraduate and graduate levels that prepares graduates for productive careers in engineering and related fields, and for life as educated, effective citizens and leaders. Discover and disseminate new knowledge in science and engineering through creative activity in research and scholarship. Provide service to the state, nation, and world by advancing the profession of chemical engineering.

# Recent Funding

**Eric Cochran, Professor**
- "Biopolymer Development, Pilot Plant Phase III," Argo Genesis Chemicals LLC, $597, 867, June, 2018
- "Commercial Demonstration of Asphalt Modifiers Comprised of Thermoplastic Elastomers Derived From High Oleoic Soybean Oil," Argo Genesis Chemicals LLC, $283,080, March, 2018
- "Controlled Polymerization of Lignin for Ideal Precursor of High-Quality Carbon Fiber," USDA-National Institute of Food & Agriculture, $500,000, July, 2018

**Wenzhen Li, Richard Seagrave Associate Professor**
- "High Rate Ammonia Synthesis by Intermediate Temperature Solid-State Alkaline Electrolyzer (ITSAE)," Iowa Economic Development Authority, $120,000, July, 2018

**Thomas Mansell, Assistant Professor/Qun Wang, Adjunct Assistant Professor**
- "Co-Culture of Probiotic Bacteria for Growth Factor Delivery in Minigut Organoids," National Institute of General Medical Sciences, $341,160, September, 2018

**Balaji Narasimhan, Anson Marston Distinguished Professor**
- "Nanovaccine-Mediated Immune Protection Against Influenza Virus," University of Iowa, $144,989, August, 2018
- "Nanovaccine Platforms to Combat Pancreatic Cancer," NIH-National Cancer Institute, $543,977, September, 2018
- "Optimizing an Immunocastration Ear Implant Vaccine to Prevent Pain Associated With Bovine Castration, " Kansas State University, $177,447, March, 2018

**Matthew Panthani, Assistant Professor**
- "Group IV Quantum Dots for Integrated Phonics," Department of Defense, Air Force Office of Scientific Research, $120,000, March, 2018

**Nigel Reuel, Assistant Professor**
- "Developing Flexible Resonator Sensors in an Industry/University Ecosystem," National Science Foundation, $750,000, September, 2018
- "Resonant Sensors for Monitoring Undercoat Perspiration to Indicate Heat Stress," DHS Federal Emergency Management Agency, $225,000, September, 2018

**Brent Shanks, Anson Marston Distinguished Professor**
- "EAGER: Assessing Potential Bioprivileged Molecules," National Science Foundation, $100,000, September, 2018
- "Identifying Performance Advantaged Biobased Chemicals Utilizing Bioprivileged Molecules," U.S. Department of Energy, $2.5M, September, 2018

**Zengyi Shao, Assistant Professor, Jack R. and Carol A. Johnson Faculty Fellow**
- NSF CAREER: "Exploring Nucleosome-Depleted Sequences for Novel Applications in Synthetic Biology," National Science Foundation, $428,367, March, 2018

**Jean-Philippe Tessonnier, Associate Professor**
- "Tailored Carbon-Supported Catalysts for the Conversion of Biomass in the Condensed Phase," National Science Foundation, $300,000, June, 2018

**Yue Wu, Associate Professor**
- "Control and Manipulation of Phase Change in One-Dimensional Ultrathin Nanowires Towards an Integrated Solution for Protecting Electronic Circuits From the Electromagnetic Attacks," Department of Defense, Office of Naval Research, $100,000, April, 2018/$597,867, May, 2018



# Recent Publications

**Kaitlin Bratlie, Associate Professor**
- Z. Xu, Z. Li, S. Jiang, **K.M. Bratlie**, "Chemically modified gellan gum hydrogels with tunable properties for use as tissue engineering scaffolds" ACS Omega, 2018, 3, 6998

**Rodney Fox, Hershel B. Whitney Professor, Global Initatives**
- **Fox, R.O.**, "Quadrature-based moment methods for multiphase chemically reacting flows," in Advances in Chemical Engineering, vol. 52, Ed. A. Parente & J. De Wilde, Elsevier, pp. 1-50 (2018)

**Andrew Hillier, Professor and Reginald R. Baxter Endowed Department Chair**
- M.M. Hossen, L. Bendickson, P.E. Palo, Z. Yao, M. Nilsen-Hamilton, **A.C. Hillier**, "Creating metamaterial building blocks with directed photochemical metallization of silver onto DNA origami templates," Nanotechnology, 29, 355603 (7pp) (2018)

**Laura Jarboe, Associate Professor**
- Yingxi Chen, Michael Reinhardt, Natalia Neris, Lucas Kerns, Thomas J. Mansell, **Laura R. Jarboe,** "Lessons in Membrane Engineering for Octanoic Acid Production from Environmental Escherichia coli Isolates," Applied and Environmental Microbiology, 2018-07-20

**Thomas Mansell, Assistant Professor**
- Fatima Enam, **Thomas J. Mansell**, "Linkage-Specific Detection and Metabolism of Human Milk Oligosaccharides in Escherichia coli," Cell Chemical Biology, 2018, July 12

**Balaji Nrasimhan, Anson Marston Distinguished Professor**
- JL McGill, SM Kelly, P Kumar, S Speckhart, SL Haughney, J Henningson, **B Narasimhan**, and RE Sacco, "Efficacy of a mucosal, polyanhydride nanovaccine for use against respiratory syncytial virus infection in the neonatal calf," Sci Rep 8, 3021 doi:10.1038/s41598-018-21292-2 (2018)

**Nigel Reuel, Assistant Professor**
- Charkhabi, S., Beierle, A. M., McDaniel, M. D., and **Reuel, N. F.** "Resonant Sensors for Low-Cost, Contact-Free Measurement of Hydrolytic Enzyme Activity in Closed Systems" ACS Sensors 3, no. 8 (2018): 1489–1498.

**Luke Roling, Assistant Professor**
- A. Kakekhani, **L. T. Roling**, A. Kulkarni, A. A. Latimer, H. Abroshan, J. Schumann, H. AlJama, S. Siahrostami, S. Ismail-Beigi, F. Abild-Pedersen, and J. K. Nørskov, "Nature of Lone-Pair–Surface Bonds and Their Scaling Relations," Inorganic Chemistry 57, 7222 (2018)

**Ian Schneider, Associate Professor**
- JAM Nuhn, S Gong, X Che, L Que, **IC Schneider**, "Microtissue size and cell-cell communication modulate cell migration in arrayed 3D collagen gels," Biomedical Microdevices 20 (3), 62, 2018

**Zengyi Shao, Assistant Professor**
- J. Sun, L. Zhao, **Z. Shao**, J.V. Shanks, and C. Peebles, "Expression of Tabersonine 16-Hydroxylase and 16-Hydroxytabersonine-O-Methyltransferase in Catharanthus roseus Hairy Roots," Biotechnology and Bioengineering, 2018, March, 115

**Brent Shanks, Anson Marston Distinguished Professor**
- Huo, J., Johnson, R.L., Duan, P., Pham, H.N., Mendivelso-Perez, D., Smith, E.A., Datye, A.K., Schmidt-Rohr, K., and **Shanks, B.H.**, "Stability of Pd Nanoparticles on Carbon-Coated Supports under Hydrothermal Conditions," Catalysis Science and Technology, 8, 1151-1160 (2018)

**R. Dennis Vigil, Professor**
- X. Gao, B. Kong, and **R. D. Vigil**, "Multiphysics simulation of algal growth in an airlift photobioreactor: Effects of fluid mixing and shear stress," Bioresource Technology, 251, 75-83 (2018). doi:10.1016/j.algal.2017.03.028

**Yue Wu, Herbert L. Stiles Associate Professor**
- Xu, Biao; Feng, Tianli; Agne, Matthias T.; Tan, Qin; Li, Zhe; Imasato, Kazuki; Zhou, Lin; Bahk, Je-Hyeong; Ruan, Xiulin; Snyder, G. Jefferey; **Wu, Yue**. "Manipulating Band Structure through Reconstruction of Binary Metal Sulfide towards High-Performance, Eco-Friendly and Cost-Efficient Thermoelectrics in Solution-Synthesized Nanostructured Bi13S18I2," Angewandte Chemie International Edition (impact factor 11.709), 2018, 57, 2413-2418, selected as VIP (Very Important Paper)

# John Kaiser brings healthy dose of industrial, real-world knowledge to CBE undergraduate experience

As a member and chair of the Department of Chemical and Biological Engineering's (CBE) Advisory Council, John Kaiser was always a very popular visitor whenever he'd come to Sweeney Hall. As a longtime employee of Mars Chocolate, Kaiser, who some nicknamed "The Candy Man," would bring samples of his employer's products to hand out to faculty and staff.

John Kaiser

Beginning with the fall 2018 semester, Kaiser, who has now retired from Mars Wrigley Confectionery, will be spending a lot more time in Sweeney Hall, as a senior lecturer in CBE. The department's newest faculty member will be sharing a lot more than chocolate in his new role.

"I will be bringing my many years of industry experience into the classroom in CBE," says Kaiser. "I will be stressing important aspects of working in the field to students – things like teamwork, and exposing them to industry concerns, especially close to home in Iowa and the Midwest.

"In my time with the CBE Advisory Council, where we would get input from chemical engineering students, I would hear feedback like 'What does a chemical engineer really do? I am exposed to all this great classroom activity, but what can I actually expect to be doing when I graduate and actually start working?' I will be drawing on my experience in the field and also working hard for more industry engagement in our students' education to help answer those questions."

Kaiser (front row, left) is shown with members of the CBE Advisory Council in 2018. He served as a member and chair of the group while employed by Mars.

Kaiser first came to the ISU Department of Chemical Engineering for a master's degree, which he received in 1987. Following his graduation, he went to work for Kraft, Inc., as a research engineer – a job he got through an ISU College of Engineering career fair. "Working for Kraft gave me an excellent foundation of how chemical engineers work in the food industry," he says.

Employment with Mars followed in 1989, which led to a nearly 30-year tenure in research and development. He led a multicultural global team responsible for managing all the company's new capacity projects, creating best practices and developing the next generation of cocoa and chocolate processing. He worked in six continents and in more than 30 countries.

With Mars he was involved with many processes and team effort required to develop, design, produce and launch products, as he worked closely with a variety of engineers and scientists and their various areas of expertise. "It was always a process of working with food scientists on tastes, flavor and creation of products – a matter of 'here is how you make it on bench-top' – and then handing things off to chemical engineers who would say 'how do we scale-up while maintaining the product design and reaching the financial metrics?'"

Kaiser was involved with overseeing the design and launch of a number of Mars Chocolate products, including several products in the Dove product line, and especially Dove caramel. But anything involving chocolate that Mars produced on a global basis saw involvement from Kaiser. He points with pride to the fact that M&Ms is the best-selling candy brand globally, and enjoys sharing how technically challenging food design and scale-up can be. It took years of R&D resources to create an efficient manufacturing line that could also meet the consumer experience for caramel M&Ms ("It needed to be creamy and smooth for an M&M center, but not so soft that it made a mess").


Kaiser is shown with students on the first day of fall semester prior to one of the classes he will be co-teaching.

Kaiser was also involved with other aspects of Mars which directly translate to his ability to educate. He worked as an instructor for the Mars University Chocolate School, which provided opportunities to deliver course content to business associates from marketing, operations, research and development and more. As a volunteer with the American Heritage™ division of Mars, a line that promotes authentic chocolate as made in the 18th century and supports the mission of education, he taught and engaged with participants of all ages.

"I had a rewarding career at Mars, which helped me to grow as a person, but then it became time to focus on what I wanted the next step to be," remarks Kaiser. "How can I continue to educate and coach and help others to grow? This new opportunity allows me to do that." Kaiser is co-teaching two undergraduate classes in the fall semester of 2018: ChE 210, Material and Energy Balance (with professor Zengyi Shao) and ChE 430, Process & Plant Design (with professor T.J. Paskach). "I would like to move further 'upstream' to those who are still early in their academic training, challenging students to perform at levels greater than they may think they can do," Kaiser says. "These interactions are mutual, as I expect to also benefit personally. I want to continue to learn."

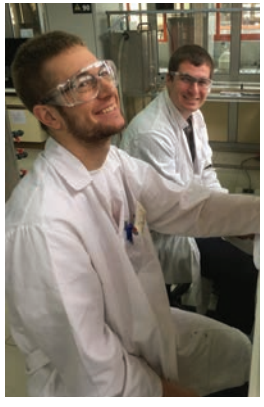
He received the Iowa State College of Engineering's Professional Achievement Citation in Engineering (PACE) award in 2014. He holds 13 U.S. patents in the area of chocolate raw materials, process and finished product innovation. Kaiser has three sons who majored in Industrial and Manufacturing Systems and Engineering, Electrical and Computer Engineering and Food Science, respectively, at Iowa State. All are working in their respective industries.

# CBE's Rodney Fox named to Whitney professorship, part of gift promoting global initiatives

Promoting international experiences and an awareness of "thinking globally" will hold a place of higher importance in the Department of Chemical and Biological Engineering's (CBE) curriculum and among its faculty thanks to gifts from a department alumnus.

The gift from Hershel (Chemical Engineering, 1949) and Ethel Whitney funds two important priorities in the department: the Hershel B. Whitney Global Initiatives Program, which offers support for student international travel; and the Hershel B. Whitney Professorship, Global Initiatives, which recognizes and promotes international involvement through support of a CBE faculty member. This endowed professorship will inspire and encourage the leadership, development, enhancement, promotion and sustainability of international experiences for the chemical and biological engineering department and Iowa State.

Rodney Fox



ISU CBE students like these, shown in a University of Oviedo lab, value international experience, but cost can be a factor. The Whitney program addresses that concern.

CBE's Anson Marston Distinguished Professor Rodney Fox has been named the inaugural holder of the Whitney Professorship. His title will now also reflect "Hershel B. Whitney Professor, Global Initiatives." Through this position, Fox will focus on promoting global initiatives through his teaching and research and by developing new international opportunities for students. Fox has extensive international experience, including a six-month appointment at Ghent University in Belgium as the International Francqui Chair in 2017.

One of those very opportunities is CBE's popular Oviedo, Spain Summer Lab Program. Students in this program have already seen benefits from the Whitney Global Initiatives fund, as all eight students who participated this year received financial assistance. Students who wish to participate in the program will also be able to apply for the financial support from the Whitney fund to help defray costs associated with travel, living expenses and tuition for the Oviedo Lab. The study abroad program is a cooperative venture between Iowa State, the University of Oviedo, Spain and the University of Wisconsin. The intensive five-week program offers a significant amount of valuable hands-on laboratory experience for participants, plus the chance to experience the culture and attractions of Spain. It is held from late May-mid June each year.

For many Iowa State students, a study abroad experience is their first time traveling outside of the Unites States and their first valuable opportunity to explore other countries and cultures. But participation can be expensive, and students wishing to participate in such programs often need financial support. The Whitney fund helps make this goal more attainable for CBE students in the Oviedo program.

Branden Moreau, a senior CBE major who made the trip with the benefit of the Whitney scholarship in 2018, is a prime example of one of those students. "The scholarship was the final push to get me to go on the study abroad," he said, adding "I had never been out of the United States before."

"Because I was going to be paying for the trip out of pocket, it really reduced the financial stress and opened the door for me to just do it. The money I saved on the tuition gave me more financial freedom to enjoy getting out and enjoying the culture in Spain -- going out to eat, seeing sights, doing more than just going to class during the day and staying in the dorm in the evening." Would he suggest other students take advantage of the Whitney scholarship? "It's 100 percent worth it," he said. "It was easily the highlight of my whole undergraduate education."

Scenes like this from the Oviedo, Spain summer lab experience may be available to a larger number of CBE students in the future with the Whitney Global Initiatives Program.

Andrew Hillier, professor and chair of Chemical and Biological Engineering, added "This generous gift helps us to make international experiences more affordable for our students, and to increase opportunities for them to enhance their global awareness, which is becoming increasingly important in today's world."

The Hershel B. Whitney Global Initiatives Program and Professorship honor the life and legacy of Hershel B. Whitney and his time at Iowa State. Whitney, who grew up in Kearney, Neb., received a B.S. in chemical engineering at Iowa State in 1949, and worked many years for Eli Lilly and Company in Indianapolis. His wife, Ethel, was also an Iowa State alum, graduating with a B.S. in family & consumer sciences, child development, in 1950.

Both Whitneys are deceased, but their support of Iowa State lives on through their gifts. They have also provided for the Ethel L. Whitney Opportunity Scholarship in the College of Human Sciences. That scholarship benefits undergraduate students (with priority on female students) in that college who demonstrate a financial need and are least the age of 22 when entering college for the first time. Ethel was 22 years old when she began her college education and graduated in the top five percent of her class.

***"The scholarship was the final push to get me to go on the study abroad."***

***(the scholarship) "really reduced the financial stress and opened the door for me to just do it. The money I saved on the tuition gave me more financial freedom to enjoy getting out and enjoying the culture in Spain; going out to eat, seeing sights, doing more than just going to class during the day and staying in the dorm at night."***

Branden Moreau, 2018 Oviedo Summer Lab participant

## NSF Catalysis Award to CBE's Jean-Philippe Tessonnier


Jean-Philippe Tessonnier

Department of Chemical and Biological Engineering (CBE) faculty member Jean-Philippe Tessonnier was awarded research funding through the National Science Foundation (NSF) Catalysis program in early 2018. The program is part of the NSF's Division of Chemical, Bioengineering, Environmental and Transport Systems.

Tessonnier's project is entitled "Tailored Carbon-Supported Catalysis for the Conversion of Biomass in the Condensed Phase." The award is a three-year, $300,000 grant, with Tessonnier as the principal investigator.

The basis of the project is that biomass, produced from agricultural waste and non-edible plants, offers an abundant, cheap and renewable source of chemical raw materials that can be upgraded to a wide range of chemical products. However, the complexity of the biomass-derived raw materials necessitates finely tuned catalysts that can attack specific chemical bonds within multifunctional bio-based feedstock compounds. In this study, catalysts consisting of noble metals dispersed on carbon supports will be tuned to produce desired chemicals, with emphasis on engineering the carbon materials in ways that direct the chemistry towards the targeted chemical products.

The science and engineering generated by the study will promote the production of chemicals from renewable feedstocks, thereby decreasing dependence on fossil resources, reducing the global carbon footprint, stimulating and diversifying rural economies, and promoting a range of educational opportunities.

## Mallapragada is plenary speaker at AIChE annual meeting

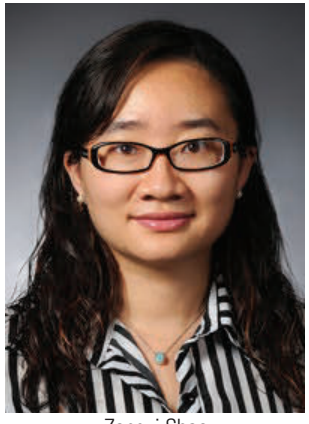
Anson Marston Distinguished Professor in Chemical and Biological Engineering Surya Mallapragada was invited to serve as a plenary speaker at the American Institute of Chemical Engineers (AIChE) 2018 Annual Meeting October 28 in Pittsburgh.


Surya Mallapragada

She received the invitation from the meeting executive committee for the Pharmaceutical Discovery, Development, and Manufacturing Forum (Area 26) and Pharmaceuticals (15B). Mallapragada's novel research in the areas of biomaterials for drug, gene and vaccine delivery and the strong interest in the subject by colleagues who were present at the meeting were cited. Mallapragada was quick to recognize the contributions of those in her research group in making her work noteworthy. "It is an honor to be selected as the plenary speaker and it reflects very positively on the terrific work that my students are doing," she said.

The AIChE Annual Meeting is considered the nation's premiere educational forum for chemical engineers interested in professional growth.

## Professor Zengyi Shao receives NSF CAREER Award


Zengyi Shao

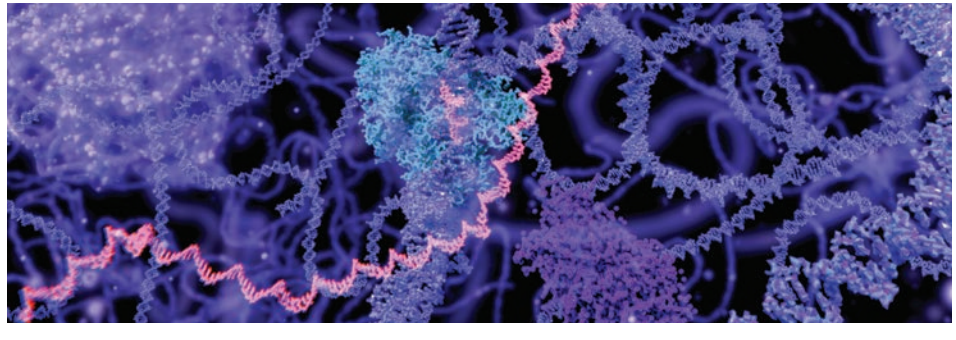
Department of Chemical and Biological Engineering assistant professor and Jack and Carol Johnson Faculty Fellow Zengyi Shao was named a recipient of the prestigious National Science Foundation (NSF) Faculty Early Career Development Program CAREER Award. She is one of eight recipients of the award from Iowa State in 2018, seven of whom were from the College of Engineering.

Shao's CAREER project is entitled "Exploring nucleosome-depleted sequences for novel applications in synthetic biology." It is an integrated research and educational program that deals with understanding how 3D genomic folding can affect cell behavior and the importance of this behavior in synthetic biology and the bio-based chemical industry.

The project addresses a central issue in synthetic biology involving specific DNA segments, which were previously thought to be of little use, that indeed have an important influence on cell metabolism. Shao's group will be using yeast as a testbed for studying cellular behavior and creating synthetic genetic elements.

When completed, this project will have developed new molecular tools for harnessing the power of biological systems to produce important products. It will also develop a uniquely-structured undergraduate research program that focuses on mentoring next-generation STEM (science, technology, engineering and mathematics) teachers, and promote the participation of underrepresented minorities and persons with disabilities in STEM fields. This project will create new molecular tools for harnessing the power of biological systems to produce important products and will help encourage and prepare highly-skilled students with diverse backgrounds to engage in STEM careers.

The CAREER Program is the National Science Foundation's most prestigious award in support of junior faculty who exemplify the role of teacher-scholars through outstanding research, excellent education and the integration of education and research within the context of the mission of their organizations.



## Promotions for CBE faculty members Cochran, Tessonnier

Chemical and Biological Engineering faculty members Eric Cochran and Jean-Philippe Tessonnier received promotions effective with the 2018-19 academic year. Cochran has achieved the status of professor and Tessonnier has advanced to associate professor.

Cochran, received his B.S. from the department (with a second B.S. in mathematics) in 1998. He received a Ph.D. in chemical engineering in 2004 from the University of Minnesota and was hired in CBE as an assistant professor in 2005. He was the Karen and Denny Vaughn Faculty Fellow in 2011 and 2012 and promoted to associate professor in 2013.

His research centers on polymeric systems and polymer chemistry. Cochran, along with Gerald and Audrey Olson Professor in Civil, Construction and Environmental Engineering R. Christopher Williams, planned, designed, launched and oversaw Iowa State's Bio-Polymer Processing Facility, which allows university engineers to research and develop the process for producing biopolymers with numerous commercial uses. He also spearheaded the installation of Iowa State's first Small Angle X-Ray Scattering System (SAXS) in CBE, which will assist researchers university-wide and at other state institutions. Cochran is also the department's Director of Graduate Education.

Cochran (right) and Tessonnier are honored in a department reception in the spring of 2018.

Tessonnier joined CBE in 2012 after receiving a B.S., M.S. and Ph.D. at the University of Strasbourg. He was CBE's Jack and Carol Johnson Faculty Fellow from 2012-2016.

He is a co-investigator with the National Science Foundation Engineering Research Center for Biorenewable Chemicals (CBiRC) at Iowa State, an associate scientist with the U.S. Department of Energy's Ames Laboratory and a faculty member with the Center for Catalysis (CCAT) at Iowa State University.

Among many honors, he was recently appointed to the Early Career Advisory Board (ECB) of the journal ACS Sustainable Chemistry and Engineering, becoming just one of 11 individuals worldwide to hold this honor. ECB members assist the publication's editors in identifying topics for special issues, identifying high quality presentations at conferences that should be invited for submission to ACS SCE and proposing topics for and writing creative editorials and ACS Axial blog posts. He has also been awarded research funding through the NSF Catalysis program (see story on page 8).

## Mallapragada named fellow in IAMBE, Indian science academy

Anson Marston Distinguished Professor and Carol Vohs Johnson Chair Surya Mallapragada was named a fellow in the International Academy of Medical and Biological Engineering (IAMBE) in September of 2017. The official induction ceremony was held in June of 2018 in Prague, Czech Republic.


Surya Mallapragada

The academy is composed of scientists from institutions of learning around the world who are recognized for their outstanding contributions to and leadership in medical and biological engineering. It conducts programs which encourage young people entering the field and promote their development in the early stages of their careers.

She was also named a Foreign Fellow in the National Academy of Sciences, India, in September of 2018. Founded in 1930, the academy provides a forum for publication of research, symposia and seminars, organizing meetings, working with students and promoting research concerned with national welfare.

## CBE honors at College of Engineering 2018 Convocation


CBE professor Eric Cochran (left) and research scientist Nacu Hernandez (right), shown with CCEE professor Chris Williams, were honored for a patent process in connection with Iowa State's Bio-Polymer Research Facility. They are shown with James L. and Katherine S. Melsa Dean of Engineering Sarah Rajala.



CBE associate professor Jean-Philippe Tessonnier, with Mike and Jean Steffenson Chair and Anson Marston Distinguished Professor Brent Shanks, were honored for a patent in connection with research in muconic acid. Tessonnier is pictured with James L. and Katherine S. Melsa Dean of Engineering Sarah Rajala.


Anson Marston Distinguished Professor Rodney Fox was recognized for being named to the Hershel B. Whitney Professorship, Global Initiatives in Chemical and Biological Engineering.

## Noted researcher, mentor Peter Reilly passes away


Peter Reilly

Department of Chemical and Biological Engineering Anson Marston Distinguished Professor Emeritus Peter J. Reilly passed away November 2, 2017 after a battle with duodenal cancer. Reilly, who retired as a full-time faculty member in 2014, came to the department as an associate professor and researcher in 1974 after a stint at the DuPont Company in its Organic Chemicals Department in Deep Water, New Jersey and the start of his academic career at the University of Nebraska in 1968. While at Iowa State he met his wife, Rae (Messer). They married in 1976 and to this marriage he brought his twin daughters, Diane and Karen.

He was born and raised in New Jersey, and graduated as valedictorian and with the title of "Outstanding Boy" from high school. He received an A.B. in chemistry from Princeton University in 1960 and a Ph.D. in chemical engineering from the University of Pennsylvania in 1964.

Reilly's research at Iowa State focused on enzymes – proteins produced by living organisms that accelerate chemical reactions – and in particular, enzymes that convert starch and cellulose found in plants into glucose. He also worked in the areas of computational biology, carbohydrate chromatography and utilization of agricultural residues. At the time of his retirement he was credited with more than 150 technical publications, more than 150 presentations at technical meetings and more than 250 invited presentations around the U.S. and the world.

Reilly with wife Rae at his CBE retirement party in 2014.

In addition to extensive traveling internationally both personally and professionally, Reilly also worked for many years with exchange students from Iowa State and other institutions. He founded an international program, unique in the world, that exchanged students, faculty and staff from across Iowa State with those at the University of Glasgow, Scotland. In addition, he founded university-wide exchanges for students with two different universities in Lausanne, Switzerland, which continue to this day. He enjoyed leading summer programs for chemical engineering students to University College, London and the Universidad de Oviedo, Spain. He also served on a number of doctoral committees in countries such as India and Sweden; and supervised 22 Ph.D. students from 11 countries, including Korea, Nigeria, the former Yugoslavia, Turkey, Taiwan, Portugal, Switzerland, India, and China, as well as the United States. He took particular pride in the fact that 11 of his students chose careers in university research and teaching. Reilly's devotion to the department and its students will live on with the Peter J. Reilly Endowed Graduate Scholarship, donated by his estate.

Beyond scientific pursuits, he enjoyed serving on and then chairing the ISU Library Advisory Committee. In his retirement, he served on the board of the Ames International Orchestra Festival Association, serving as its president for two years.

## Jarboe selected for Iowa State Biotechnology Council


Laura Jarboe

Department of Chemical and Biological Engineering (CBE) associate professor Laura Jarboe has been selected as a new College of Engineering member for the Iowa State University Biotechnology Council. She is one of four new members who have joined the group.

The council, part of the Iowa State University Office of Biotechnology, makes recommendations to the office on program activities, supporting biotechnology research, education and outreach. The council was established in 1984 and represents the five academic colleges involved in biotechnology research at Iowa State University: Agriculture and Life Sciences, Engineering, Human Sciences, Liberal Arts and Sciences and Veterinary Medicine. The ten-member council is chaired by Jeanne Serb, associate professor of ecology, evolution, and organismal biology.

Jarboe, who has also served as associate chair and chair of the Iowa State Interdepartmental Microbiology Program, joined CBE in 2008. Her research interests include many types of biorenewables processes, metabolic engineering, cell membrane research and more.

## Ian Schneider is new director of Biomedical Engineering minor


Ian Schneider

Associate Professor Ian C. Schneider was named the director of the Department of Chemical and Biological Engineering (CBE) biomedical engineering minor program, succeeding Surya Mallapragada in that role.

The biomedical engineering minor is a unique opportunity that gives undergraduate students a multidisciplinary life sciences and engineering background along with a foundation that consists of core biology and engineering principles. The requirements of the minor build on two core biology courses with an introductory course on the application of engineering principles to biomedical problems.


CBE professor Eric Cochran (second from right, with CCEE professor Chris Williams) received the Award for Achievement in Intellectual Property at the 2018 university awards ceremony. He's shown with Ivy College pf Business Dean David Spalding and ISU President Wendy Wintersteen.


CBE senior lecturer Stephanie Loveland is congratulated by ISU Senior Vice President and Provost Jonathan Wickert and ISU President Wendy Wintersteen after receiving the Award for Outstanding Achievement in Teaching at the 2018 university awards ceremony.

## Research led by CBE's Wu uncovers new catalytic potential


Yue Wu

Iowa State University College of Engineering researchers have demonstrated modification of a two-dimensional metal carbide, opening new doors for water-gas shift reactions. The research was published in May of 2018 in Nature Catalysis, "Reactive metal-support interactions at moderate temperature in two-dimensional niobium-carbide-supported platinum catalysts."

Yue Wu, Herbert L. Stiles Professor in Chemical Engineering, led the effort that looked at a chemical process that improved catalytic potential in this type of material. The process, known as reactive metal-support interaction, used an unconventional nanostructured carbide-based support to design and obtain functional bimetallic catalysts.

The journal article states that the chemical process "refers to a chemical reaction between a metal and the support that induces the formation of bimetallic structures that may not be easy to obtain by other synthetic methods." Wu and his team reported "an example of non-oxide-based reactive metal-support interaction between platinum and Nb2CT x MXene – a recently developed, two-dimensional metal carbide."

Wu said his research group took a unique approach when working with the family of the compounds to look for something other researchers were not seeking. "These materials have interesting properties that might be useful for power storage, but they also present big scale-up challenges," Wu said. "Our different angle on the process and the potential use as catalysts yielded surprising and promising results." Wu's work was funded by the Office of Naval Research and College of Engineering's Exploratory Research Program.

## Effort for testing new biobased chemicals gets $2.5M grant

Researchers led by the department's Brent Shanks is testing a new way of producing biobased chemicals that's backed by 10 years of working in laboratories, partnering with industries and launching startups.


Brent Shanks

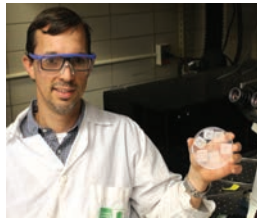
The researchers' work is based on the concept that certain "bioprivileged molecules" have unique properties and can be efficiently converted to chemical products. The idea is one result of a decade of studies by the National Science Foundation Engineering Research Center for Biorenewable Chemicals (CBiRC) based at Iowa State University.

Researchers will test the idea with a three-year, $2.5 million grant from the U.S. Department of Energy's Bioenergy Technologies Office. The grant will support development of a complete, start-to-finish system for identifying biological-derived molecules that can lead to new chemical products – in this case, anti-corrosive or flame-retardant chemicals.

"This is the alpha test for our concept," said Shanks, the director of CBiRC, an Anson Marston Distinguished Professor in Engineering and the Mike and Jean Steffenson Chair in Chemical and Biological Engineering. In addition to Shanks, the research team includes CBE associate professor Jean-Philippe Tessonnier and professor Eric Cochran. They are joined by three other researchers from universities around the nation.

Until now, the basic strategy for developing biobased chemicals has been opportunistic, Shanks said. It has been all about trying to find the molecules that could lead to one specific end product. "Here, we're trying to find out how we can do something more systematically than developing one product at a time," Shanks said. "This opens up a lot of different avenues." It also creates a challenge: "The problem is there are millions of biological molecules," Shanks said. "How do we identify the ones with the chemical structures that can lead to the end properties we want?" The researchers have come up with a three-step system to find those molecules. The goal, according to standards set by the grant, is to identify at least five novel biobased chemicals that boost performance by at least 10 percent over commercially available products.

## Joint CBE-MSE cancer research creates 3-D printed structures cancer cell research


Schneider holds an assortment of molds for use in the research created on a 3-D printer by MSE professor Michael Bartlett.

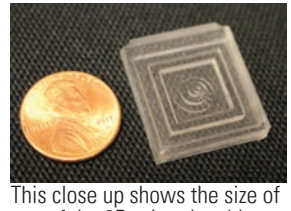
In 2017 research by Department of Chemical and Biological Engineering associate professor Ian Schneider received funding from an Iowa State's College of Engineering Exploratory Research Project Fund. The support was for work involving novel methods of controlling the mechanical properties in artificial cancer environments used for research on cancer cells.

The research focused on how stiff, or how "squishy," in Schneider's words, the environment around the cell is, and how that in turn can affect if the cancer cells metastasizes (spreads to other parts of the body). And that could play a big role in how cancer is treated in the future.

"Cells can sense other cells in their environment that tell them to metastasize," according to Schneider. "And they can also 'pull' on protein fibers in the environment and test the degree of squishiness and whether they should migrate. The tumor environment stiffens over time. Cells move toward areas that are stiffer and less squishy and may control metastasis. As researchers, we do not understand this process well. The idea is to look at how some cells sense firmness versus squishiness better than others. This could be a biomarker for metastasis. Furthermore, therapeutics could be designed to block this sensing ability to better diagnose and treat a cancer patient."

Now, Schneider has taken another step in a research arc in this area to look at alternative ways to control that "squishiness factor" in the cellular environment – and introduces the use of polymers, which are very large molecules with a large number of units linked together. The density of polymers and how they are tied together is one way to control the "squishiness" of the environment. This is most frequently done with photochemistries. However, this is a difficult task for researchers to do let alone non-experts that might be using this as a diagnostic, according to Schneider.

"This is all very challenging stuff for researchers unless you really know what you are doing," he says. "So we are looking at easier ways to control this, and basing it on topography – or shape – of devices that polymers are placed into. The idea is that a soft material can appear stiff if it is attached to a stiff material. This interface can be used to create a desired soft-to-stiff gradient. Experts in a lab can create such a device. But the payoff comes when someone else who is not an expert can fill the device with materials and analyze the results."

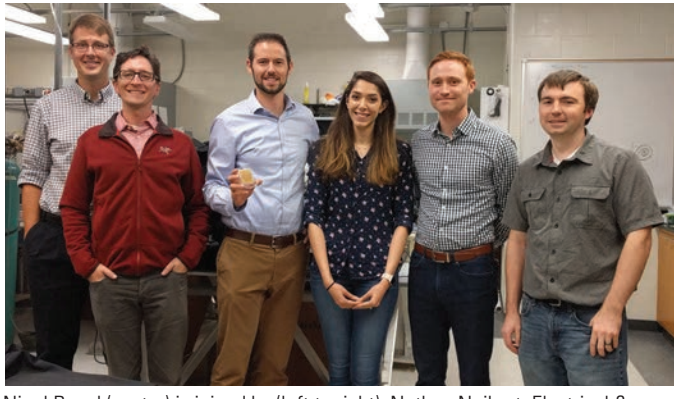

This close up shows the size of one of the 3D printed molds, this one in a spiral shape.

Schneider's current work on the project is to determine what device shape offers the best results to generate that sought-after stiffness gradient – and it's been discovered the devices can be made on a 3-D printer. Enter assistant professor Michael Bartlett in the Department of Materials Science & Engineering, who is doing that printing. The devices are small, but easily seen by the naked eye, with some about the size of a small coin. "We're working with some bizarre shapes in this exploration," says Schneider, "including pyramid and conical shapes and ramp structures that look something like the Great Mosque of Samarra." Bartlett helps in the design and 3-D prints the structures for these various shapes.

# Big grant for resonant sensor research consortium led by CBE assistant professor Nigel Reuel

A consortium of young Iowa State university researchers has gone where few like them have gone before – as recipients of a large grant from the National Science Foundation (NSF) to mature and translate a platform technology with a global industry partner.

The group, including four Iowa State assistant professors and one associate professor, have launched a project to develop materials and methods for scalable manufacturing of flexible resonant sensors and their wireless readers under support of a $750,000 award made available through the NSF Partnerships for Innovation (PFI) program. The industrial partner on this award is DuPont with two co-PIs from their Advanced Electronics business.



Nigel Reuel (center) is joined by (left to right): Nathan Neihart, Electrical & Computer Engineering; Marshall McDaniel, Agronomy; Sadaf Charkhabi, CBE graduate student; Michael Bartlett, Materials Science and Engineering; and Eric Zellner, ISU Veterinary Clinical Sciences.

Resonant sensors are simple circuits composed of inductive, capacitive, and resistive elements (LCR circuit) that tunes the resonator to oscillate current at a specific resonant frequency. The resonator can be used as a sensor by engineering the inductance, capacitance, and/or resistance elements to modulate when exposed to the desired analyte, which in turn affects the resonant frequency. This resonant frequency can be observed wirelessly at a step-off distance of 1-10cm using a low-power, vector network analyzer (VNA) coupled to interrogation antenna(s). Resonant sensors have been demonstrated previously measuring temperature, humidity, and pressure. The research team at ISU is developing a growing number of flexible sensors for detection of enzymes, proteins, biofilms, tissue types and ions.

"A new team getting this type of grant is pretty unusual," says Nigel Reuel, assistant professor and Black and Veatch Building a World of Difference Faculty Fellow in Engineering in the Department of Chemical and Biological Engineering, who is the principal investigator. "And for the project to be made up of a cohort of young academics and industrial partners makes it unique and exciting."

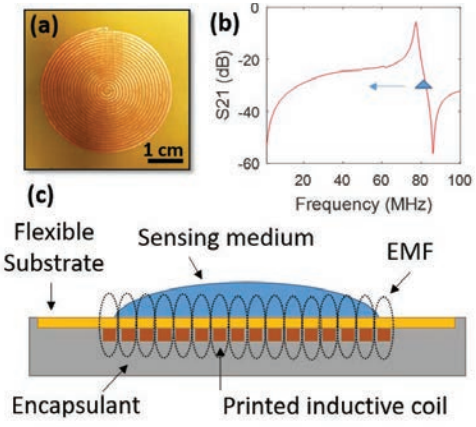
"Materials and Methods for Scalable Manufacturing of Resonant Sensors and their Wireless Readers" involves the work of Reuel; Nathan Neihart, associate professor, Department of Electrical and Computer Engineering (co-principal investigator); Michael Bartlett, assistant professor, Department of Materials Science and Engineering; Marshall McDaniel, assistant professor, Department of Agronomy; and Eric Zellner, DVM, assistant professor, Veterinary Clinical Sciences, College of Veterinary Medicine. The project also involves two co-principal investigators from DuPont – Dr. Sang-Hwan Kim and Dr. Lujia Bu who have expertise in flexible electronics and scalable manufacturing methods.

"As a recipient of a PFI grant from NSF, we are tasked with using research funds to impact economic development in the near term, to make products that will change the world. Grants such as this promote technology that have the potential to make a big difference – but the key is how do you get it out the door for market adoption?" says Reuel.

The PFI grant and the project brings together academic representatives and companies to develop scalable product prototypes. The end goal is that the group will create a startup company and apply for seed funding through two government programs, SBIR (Small Business Innovation Research) and STTR (Small Business Technology Transfer), which provide seed funds for public/private sector business partnerships.

"What we are developing is a platform technology," Reuel explains. A platform consists of technologies that are used as a base upon which other applications are developed. "There is a lot of potential for this type of sensor, and that is appealing to DuPont," he says, adding that a good deal of market data and proof of concept data went into a presentation to DuPont prior to the grant being received.

The NSF states that the potential of this PFI project is to enable commercialization of a platform sensor technology -- flexible resonant sensors -- that has many potential applications in consumer, agriculture, and health markets. In the consumer market, the sensor system can be applied to wearable technologies to monitor stretch and strain such as in performance athletic wear. In agriculture, the sensor system can be applied to soil and water quality monitoring. In health, the sensor system can be applied to monitoring manufacturing of biotherapeutics and the health status of closed wounds. Advantages of this sensor platform are its passive unit architecture (no on-board power), potential low cost, and ability to measure in closed systems.




The flexible resonant sensors and their wireless readers being developed through industrial partner DuPont will be applied to many different commercial uses.

In addition to technical innovation, the broader impacts of the research will include increased employment opportunities and economic development; and will involve and train graduate and undergraduate students with technical skills in materials, electronics, and characterizations tools in an interdisciplinary environment. They will also receive valuable innovation skills in product design, reliability, robustness and commercialization due to the project scope and inclusion of active industrial partners. It will also devote special attention to students underrepresented in STEM fields.

# ChE grad Jim Fay heads new ISU entrepreneur classes


Jim Fay

"Entrepreneurial product development engineering is exciting rewarding and real. It is the growth engine of companies both small and large. It is the process that brings new ideas to life," said Department of Chemical and Biological Engineering alumnus James (Jim) Fay (B.S.'74). Fay is an accomplished entrepreneur, consultant and instructor for the College of Engineering's new course called Entrepreneurial Product Development Engineering (E-PdE).

Starting with the fall 2018 semester, Iowa State engineering students have a new and unique opportunity to build their entrepreneurial skills through two courses developed by Fay. The first course teaches the skills engineers need to competently and successfully do for intrapreneurial or entrepreneurial product development: competitive analysis, market research, creativity, concept development, strategy, product development, marketing, packaging, project management, leading/managing/following, execution, prototyping, manufacturing, sales, customer service, finance and law. The second course will put into practice everything engineering students learned in the first course. Students will develop new products from their own ideas in a team-based, competitive, entrepreneurial environment that is real rather than theoretical.

The course is open to all engineering students at junior standing and is recommended for students who are interested in product development or starting a company. The class involves reading assignments, in-class discussion, student presentations, role-playing, individual and team projects and more. Fay also plans to bring in other entrepreneurs to share their experiences and knowledge. The course is offered in classroom and online formats.

"Said simply, the E-PdE courses will teach tomorrow's engineers how to turn innovative product ideas into successful products and companies," said Fay. According to Fay, people who start product-based companies are generally in two different phases of life: right out of college or in their mid-30s. Those right out of college, Fay says, have a significant failure rate due to lack of experience, skills, connections and money. "The objective is that the E-PdE courses will speed up and improve both the quality of the learning and the success rate. We're going to give students the skills, contacts and thinking methodologies that would take you 15 years to get on your own." Fay is partnering with Dave Sly, a senior lecturer in Industrial and Manufacturing Systems Engineering, as an entrepreneur and problem solver, in delivery of E-PdE courses.

After earning his B.S. in chemical engineering Fay worked for Monsanto, Procter & Gamble, American Can and Kimberly-Clark as an entrepreneur, developing Huggies® Disposable Diapers, Huggies® Pull-Ups® Disposable Training Pants, Huggies® Baby Wipes, oven- and microwave-safe paperboard trays, metalized packaging, boil-in bags and StarFire® charcoal. He then went on to become an entrepreneur, starting Delta Research, a consulting company specializing in product development, marketing, market research and innovation. He also was a founder of the companies that invented the Diaper Genie®, which is the #1 non-disposable baby product in the U.S, the ByteSize™ Reader, SUCCEED® equine nutritional supplements and the DEUS Rescue™ line of professional rescue equipment used by firefighters. A current interest is a new venture that makes shelter-in-place and self-rescue equipment for residents of high-rise buildings.

# Griswold internship: hands-on undergrad learning


Mickie and Gary Griswold (photo by Christopher Gannon, Iowa State University)

Gary and Mickie Griswold believe deeply that learning comes by doing. That goes for applying engineering knowledge in a laboratory and in trying out professional paths. For Gary Griswold (ChE'67), his time in the lab pointed him to a successful career protecting researchers' intellectual property as an attorney and leader in the field of patent law. For other students, it will point toward careers in research, teaching, or any number of other areas.

The Griswolds are giving a new generation of engineering students the opportunity to learn by doing in the Griswold Undergraduate Research Interns Program. The internship places undergrads into research laboratories, working alongside faculty members and graduate students.

Griswold interns are students majoring in chemical engineering who are matched with faculty in the Department of Chemical and Biological Engineering. The Griswolds' gift enables interns to gain valuable experiential learning and build professional skills. "These interns are treated as important members of the research team. These are paid internships, because the opportunity to work and produce results helps build good values – on top of the opportunity to learn," says Mickie Griswold.

A unique focus on intellectual property further sets the Griswold Internship apart from others. Interns attend workshops on intellectual property. These include exposure to the basics of patent, trade secret, trademark and copyright law and practice, including training on protecting research and discoveries. "It's incredibly valuable in research and business to have a basic understanding of intellectual property and how it works," says Gary Griswold. "Not too many undergrads can say they know the principles of intellectual property, but Griswold Interns do."

Andrew Hillier, Reginald R. Baxter Endowed Department Chair in Chemical and Biological Engineering, sees the exceptional value of the Griswold Internship to students, and to Iowa State's College of Engineering as a whole. "The Griswolds' generous support gives undergrads real-life lab experience, which helps both our students and our faculty members' research efforts," says Hillier. "More than that, the Griswold Internship is key in advancing the college's 'intellectual property culture' – a commitment to transferring the innovations we create to help society."


Eden Woldesenbet, CBE sophomore and Griswold intern

*"Doing research as an undergraduate can be tricky. You need to have the right contacts. The Griswold internship provides you with that," says Eden Woldesenbet, a sophomore chemical engineering major and Griswold participant who works with graduate student Anuraag Boddupalli and faculty member Kaitlin Bratlie on targeted drug delivery.*

*"It helps me to understand the 'why' behind research. I may understand the concept, but it helps to know WHY things are done in a certain way. It gives you such an understanding of the details of how chemical engineering research works.*

*"Eight to ten hours of lab work per week is not that bad. And it's actually a relaxed atmosphere, as they work around my schedule and understand when I need to spend time studying for an exam."*

*"I'd recommend this internship experience to anyone."*

# CBE alumnus Mark Saltzman is named to National Academy of Engineering, part of 2018 inductees


W. Mark Saltzman

W. Mark Saltzman, a chemical engineering graduate of Iowa State University, was inducted into the National Academy of Engineering (NAE) in 2018. Saltzman, who is the Goizueta Foundation Professor of Biomedical Engineering and Chemical Engineering at Yale University, was recognized by the Academy for his contributions in drug delivery, biomaterials and tissue engineering that have led to improved patient treatments.

Graduating with distinction from Iowa State with a B.S. in chemical engineering in 1981, Saltzman then earned admission to graduate school at the Massachusetts Institute of Technology, where he received an S.M. in chemical engineering (1984) and a Ph.D. in medical engineering (1987). He was appointed assistant professor of chemical engineering at Johns Hopkins University in 1987 and promoted through the ranks, becoming a tenured full professor in 1995. In 1996, he joined the faculty of chemical engineering at Cornell University, where he was named the first BP Amoco/H. Laurance Fuller Chair in Chemical Engineering. Dr. Saltzman moved to Yale University as the Goizueta Foundation Professor of Chemical and Biomedical Engineering in July of 2002, and served as the founding chair of Yale's Department of Biomedical Engineering in 2003-2015.

An engineer and educator, his work is described in more than 300 research papers and patents and he is the sole author of three textbooks. He has been recognized widely for his excellence in research and teaching. Among many honors and awards received are the Professional Progress in Engineering (2000) and Professional Achievement Citation in Engineering (2013) Awards from Iowa State University. He was inducted into the the Department of Chemical and Biological Engineering Hall of Fame in 2016 and also currently serves on the department's Advisory Council.

Election to the National Academy of Engineering is among the highest professional distinctions accorded to an engineer. Academy membership honors those who have made outstanding contributions to engineering research, practice, or education, including, where appropriate, significant contributions to the engineering literature and to the pioneering of new and developing fields of technology, making major advancements in traditional fields of engineering, or developing/implementing innovative approaches to engineering education.

## CBE welcomes former professor, chair Terry King to Hall of Fame


King receives his commemorative Hall of Fame plaque from Reginald R. Baxter Endowed Department Chair Andrew Hillier.

ISU Chemical and Biological Engineering (CBE) heralded the return of a former professor and department chair as Dr. Terry S. King was officially inducted into the department's Hall of Fame. King was a special guest and featured speaker as part of the annual CBE Honors & Awards Banquet in the fall of 2017. At the time of his recognition King had just retired from Ball State University, where had most recently served as interim president.

King received a B.S. in chemical engineering from Iowa State in 1975 and his Ph.D. from the Massachusetts Institute of Technology in chemical engineering in 1979. From 1979 to 1982 he worked at Exxon Chemical Company, and then began his professional academic career in 1982 at Iowa State in the Department of Chemical Engineering.

By 1990 King was promoted to professor and assumed the responsibility of department chair, which he held for seven years. By the time his 15 years at Iowa State concluded, he had conducted research leading to over 150 peer reviewed publications and invited presentations. He holds three patents and received grants primarily from the Department of Energy and the National Science Foundation. He supervised seven master's students, 12 doctoral students, seven post-doctoral associates, and two visiting scientists.

## Timothy J. Anderson joins CBE Hall of Fame in 2018 ceremony


Anderson receives his Hall of Fame induction plaque from Reginald R. Baxter Endowed Department Chair Andrew Hillier.

Department alumnus Timothy J. Anderson (ChE'74), distinguished professor and Dean of College of Engineering at University of Massachusetts Amherst, was inducted into the CBE Hall of Fame during the department's 2018 Honors and Awards Banquet.

His induction coincided with receiving the Anson Marston Medal from the Iowa State University College of Engineering during the annual university homecoming award ceremony (see story on page 16).

Anderson's 40-year career in academia began at the University of Florida where he achieved the rank of distinguished professor. He has had research published more than 260 times and has served as an editor to several scientific journals, including 19 years with Chemical Engineering Education. He has mentored more than 70 Ph.D. students during his career. He has served as editor to several journals, including 19 years with Chemical Engineering Education.

His efforts have been recognized with the Warren K. Lewis Award for Chemical Engineering Education and the American Institute of Chemical Engineers' Charles M. A. Stine Award, among others. He also received the ISU College of Engineering Professional Achievement Citation in Engineering (PACE) Award in 2007.

## Tim Anderson, Jim Fay recognized with university awards

Dr. Timothy J. Anderson, who received a B.S. in chemical engineering from Iowa State in 1973, and Jim Fay, who received a B.S. in chemical engineering from ISU in 1974, were both recognized by Iowa State University for their contributions to education, research and industry.

Anderson (top) and Fay receive their respective awards from James A. and Katherine S. Melsa Dean of Engineering Sarah Rajala at the homecoming awards ceremony.

Anderson received the Anson Marston Medal and Fay was the recipient of the Professional Achievement in Citation in Engineering (PACE) award, both from the College of Engineering, in homecoming award ceremonies during the 2018 homecoming celebrations. Anderson was also inducted into the Iowa State Chemical and Biological Engineering (CBE) Hall of Fame at the department's Honors & Awards Banquet the previous evening (see story on page 15).

Anderson is a distinguished professor and Dean of the College of Engineering at University of Massachusetts Amherst. His 40-year career in academia began at the University of Florida where he achieved the rank of distinguished professor. He is the 12th alumnus of the Department of Chemical and Biological Engineering to receive the Marston Medal.

After graduation from Iowa State Fay launched into a career in industry and product development that saw him work for such notable companies as Monsanto (while an undergraduate), Proctor & Gamble, American Can and Kimberly-Clark. He has been involved with the development and production of such notable products as Puffs® tissues, Bounce® fabric softener, Huggies Pull-Ups®, Huggies® disposable diapers, Depends® and Kotex® products and Northern® paper towels.

Later in his career Fay worked with a variety of startup businesses and consulting ventures, starting Delta Research, a consulting company specializing in product development, marketing, market research and innovation. He also was a founder of the companies that invented the Diaper Genie®, the ByteSize™ Reader, SUCCEED® equine nutritional supplements and the DEUS Rescue™ line of professional rescue equipment used by firefighters. Fay's latest venture is being part of a new College of Engineering course to teach undergraduates about being an entrepreneur (see a separate story on page 13).

Fay is the 86th CBE alumnus to receive the PACE award and the department has dominated the recipient list for that honor.

"We're in the best business ever," said Anderson, "because what we do helps people's lives."

## Chemical engineering grad Determan receives AIChE award

Determan receives his award from AIChE's Juan de Pablo at the 2018 AIChE Annual Meeting.

Iowa State University chemical engineering alumnus Michael Determan, a senior technical manager with 3M Company, received the Industrial Progress Award from the American Institute of Chemical Engineers (AIChE) at the group's 2018 Annual Meeting. The award recognizes significant contributions by individuals working in industries served by chemical engineers who have received their highest academic degree within the previous 17 years.

He received a B.S. from Iowa State in 2001 (with a double major in economics) and his Ph.D. in chemical engineering from Iowa State in 2006, under the guidance of Dr. Surya Mallapragada.

With 3M Company's Corporate Research Materials Laboratory, Determan leads a team of researchers responsible for developing the company's portfolio of sustainable, bio-based materials; high performance coatings; and new adhesive materials for a variety of industrial, electronic, and health care applications.

Determan received the Professional Progress in Engineering Award (PPEA) from Iowa State's College of Engineering in 2015.

## Alums Watt, Wu recognized by CBE for fall 2017 awards

Watt and Wu are shown with Reginald R. Baxter Endowed Department Chair Andrew Hiller.

Department of Chemical and Biological Engineering (CBE) alumni Meghan Watt (B.S. CBE'02) and Huiquan Wu (Ph.D. CBE'01) were recognized by the department in a reception held in late October, 2017.

Wu was the recipient of the College of Engineering Professional Achievement Citation in Engineering (PACE) Award and Watt was honored with the ISU Alumni Association's Outstanding Young Alumni Award.

Wu is employed as a research chemical engineer with the U.S. Food & Drug Administration in Washington, D.C. The PACE Award recognizes superior technical or professional accomplishments in research, development, administration, education and other engineering activities. It recognizes individuals eminently known for their professional competence and creativity.

Watt has spent her career working in various capacities for Dow Chemical. She currently works for Film Tec Corporation (a division of Dow) in Edina, MN. Watt is also a member of the CBE Advisory Council and is involved with campus recruiting activities for Dow at Iowa State and elsewhere.

The Outstanding Young Alumni Award recognizes ISU alumni, age 40 and under, who have excelled in their professions and provided service to their communities.

# New Small Angle X-Ray Scattering unit will benefit CBE researchers, many others at Iowa State

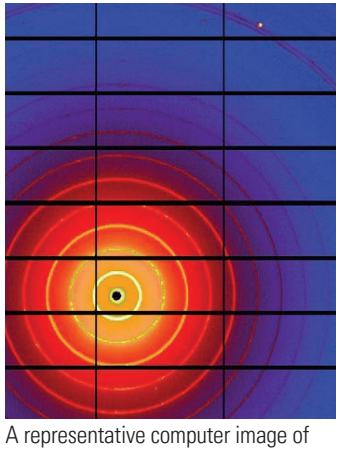
"It's a piece of equipment that's as easy to use as a coffee maker. And it's a very low-risk way to visualize materials to see if it tells you something new."

The simplicity, yet high value of, the Department of Chemical and Biological Engineering's (CBE) Small Angle X-Ray Scattering System (SAXS) is summed up in that one statement from Professor Eric Cochran, who oversees the department's impressive new addition to its lab equipment roster.

CBE graduate students in professor Eric Cochran's research group join Cochran (center) next to a portion of the department's massive SAXS unit.

SAXS offers researchers a major step up in their ability to gain highly detailed information about those materials – all kinds of materials. Not just the size and shape of particles that make up something, but information about the internal structure of systems – in some ways surpassing what can be done with an electron microscope.

"It's used as a complement to what you do with the electron microscope," Cochran says. "With electron microscopy you use an electron beam to have a look at an extremely small volume of material. You get a picture of what it looks like – and it looks just like an object magnified many times. Everyone can relate to that. X-ray scattering with SAXS gives you the same information, but the benefit is that information is averaged over a much larger volume." And then there is the all-important "no cheating" factor. "In regular microscopy you can 'cherry pick' images you get to make things look good. With SAXS, whether intentional or not, you don't get to cherry-pick things," he explains. "It is a true no-nonsense visualization. You can use the technology to study proteins, RNA, DNA, quantum dots, quantum rods, polymer melts, polymer solutions and many other things that scientists constantly use for research."



A representative computer image of what can be obtained with SAXS. The device allows many options for analyzing the structures of numerous types of materials.

What's unique about SAXS is the great range of control an operator has over the size of the features of something he or she wants to analyze. "With a microscope, you have different lenses you use for different things. In SAXS, we use the length of the instrument itself to control the size of things visualized, from minute to mesoscale," says Cochran. And, a highly valuable component of SAXS measurements shows the changes that materials undergo while they are exposed to different active forces such as heating, cooling, shearing and stretching. Cochran's goal is to have many departments on campus use the device – and an early test involved analyzing a sample of vibrationally-welded wood from another department. It's a newer technique that can rapidly produce wood joints for structural applications. "We used SAXS and looked at how things held up or changed across the weld that was employed between the two pieces of wood," he says.

Planning was long and detailed prior to the arrival of this new level of technology in the department. Two existing rooms in the Sweeney Hall basement were completely remodeled to accommodate the SAXS. They say good things come in small packages, but there was nothing small about the shipping of the unit's components from its country of origin, France. Fourteen crates ranging in size from that of a coffee table all the way up to "we're gonna need some extra guys on this one" arrived at Sweeney in the fall of 2017, six months after the original order had been drawn up.

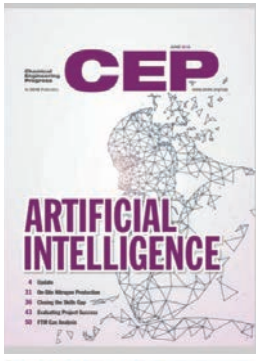
Cochran assists a graduate student with a task on the SAXS unit.

The planning and purchasing of the unit was a cooperative venture, as well as the use of it going forward. Iowa State's College of Agriculture and Life Sciences and College of Liberal Arts and Sciences joined the College of Engineering (totaling 12 different departments and 23 principal investigators) in a cost-sharing agreement for purchasing the unit. "In this way we were able to justify the cost of purchasing many different accessories for the unit," says Cochran, pointing out the versatility of the SAXS in being able to be easily set up for many different kinds of functioning. "Set up with the accessories, it really is a big Swiss army knife, a Jack-of-all-trades instrument." The total cost of the unit was approximately $1 million.

The SAXS components arrived from France in 14 different crates and required lots of man power for unloading and moving in.

Of course, graduate students in Cochran's research group and other ISU chemical engineering grad students will consistently benefit from the unit. User rates will be set up for other departments, and an agreement exists for a mail-in service for analyses and results with the University of Iowa chemical engineering and chemistry departments. Cochran says he would like to work toward hiring a full-time scientist to manage the SAXS unit to schedule use and oversee experiments done: "I want to see that unit in use 24 hours a day."

## Bio-Polymer Processing Facility subject of magazine story




The June 2018 issue of CEP, which includes the story about the monomers work at the BioPolymer facility.

Iowa State University's Bio-Polymer Processing Facility, which involves research and operation by Department of Chemical and Biological Engineering (CBE) educators and students, received national news coverage in an article published by CEP magazine, a publication of the American Institute of Chemical Engineers (AIChE). CEP is AIChE's flagship magazine and reaches more than 30,000 readers worldwide.

"Catalyzing Commercialization: A New Generation of Bio-Based Adhesives from Bioadvantaged Monomers," in the June, 2018 edition of CEP, describes the work being done at the facility by Iowa State and other researchers in the area of bioadvantaged polymers and a wide variety of applications where they may be used.

Among many other subjects, the article discusses how the Iowa State research team is working with other entities, including the Iowa Soybean Association, the U.S. Department of Agriculture and ten companies to evaluate soybean- and glycerine-based bio-polymers to be used as waterborne glues and pressure-sensitive adhesives – which includes scale-up efforts with a goal of generating hundreds of pounds of adhesive in the next few months; and work to produce full-scale wood panels for evaluation by major wood composite manufactures.

The article also discusses using a bio-inspired polymer instead of one that is chemically-produced that improves the quality of asphalts. The research will impact future production of adhesives, pavement products and much more.

The Bio-Polymer Processing Facility, located in Iowa State University's BioCentury Research Farm, was spearheaded by CBE professor Eric Cochran and Department of Civil, Construction and Environmental Engineering Gerald and Audrey Olson Professor R. Christopher Williams. It was commissioned in 2015 and saw its first successful production run of products in 2017. The facility is a one-ton per day biopolymer producing facility. It carries the benefit of "de-risking" the technology for companies that may be interested in producing large quantities of biopolymers.

Opened in 2015, the Bio-Polymer Processing Facility offers advances in manufacturing methods for industry and a hands-on laboratory experience for students.

## Two more Iowa State alums join CBE's academic advising team

Nicole Prentice

Nicole Prentice joined the Department of Chemical and Biological Engineering as academic adviser in December of 2017.

Though she comes to CBE from the University of Minnesota, Nicole is a Cyclone, having completed both her undergraduate and graduate education at Iowa State. She obtained a B.S in biology and B.S. in psychology in 2012 at ISU and a master's of education degree in 2015 through the College of Human Sciences Higher Education Student Affairs program.

Following one year of work with the Americorps program she began employment with the University of Minnesota as an advisor in the College of Biological Sciences.

Prentice is originally from Terril, in the Okoboji region of northwest Iowa.

Mackenzie Schwartz

New to the department in August of 2018, but no stranger to the neighborhood, academic advisor Mackenzie Schwartz holds a bachelor's degree from ISU's Department of Mechanical Engineering. While in that department, "I was drawn to the instruction and student engagement side of things," she says, "so for graduate school I decided to study higher education student affairs." She earned a master's degree in that discipline from Iowa State.

While in mechanical engineering she completed a practicum with the Academic Program for Excellence (APEX) for incoming multicultural first-year students and was an instructor in Engineering 101. As a graduate student she worked as an assistant in the Women in Science and Engineering (WiSE) program and completed an advising practicum in mechanical engineering.

## CBE academic adviser Janessa Boley awarded by national association

Academic adviser Janessa Boley was presented with the Excellence in Advising - New Advisor award from the National Academic Advising Association (NACADA) Global Community for Academic Advising. It was presented at the group's Region 6 conference in Minneapolis in May of 2018.


Boley with her award at the NACADA conference.

The Outstanding New Advisor Award is presented annually to individuals who have demonstrated qualities associated with outstanding academic advising of students and who have served as an advisor for a period of three or fewer years. Criteria include strong interpersonal skills; a mastery of institutional regulations, policy and procedures; availability to advisees, faculty or staff; frequency of contact with advisees; evidence of student success rates and more.

Boley started in her position in the Department of Chemical and Biological Engineering in 2015 and since that time has become part of the department's team that coordinates the student peer mentor program; was part of an advisor-student team that received the Outstanding Innovation Award for a new transfer student program with the department's learning community; and she, along with former department adviser Adam Dane and professor Monica Lamm, had an article they authored on diversity training for students published in Chemical Engineering Education magazine.

## College of Engineering's Dean Rajala announces retirement


Sarah Rajala

Iowa State's James A. and Katherine S. Melsa Dean of Engineering Sarah Rajala has announced she will retire from her post at the end of the 2018-19 academic year.

Rajala, a professor of electrical and computer engineering, has served as dean since 2013. During her tenure, the college has enhanced the breadth and quality of its educational offerings, expanded its research portfolio, renovated and built new facilities and raised more than $185 million in philanthropic support.

A national search for Rajala's successor has begun. The search committee is co-chaired by Luis Rico-Gutierrez, dean of the College of Design, and Gary Mirka, professor of industrial and manufacturing systems engineering and former associate dean and department chair. A search firm is assisting the committee.

## G. Paul Willhite steps down from CBE Advisory Council

G. Paul Willhite, Ross H. Forney Distinguished Professor of Chemical and Petroleum Engineering at the University of Kansas, has stepped down from the Department of Chemical and Biological Engineering's (CBE) Advisory Council after serving two three-year terms. He joined the council in 2013.


G. Paul Willhite

Willhite, originally from Waterloo, Iowa, received a B.S. in chemical engineering from Iowa State University in 1959. After receiving a Ph.D. in chemical engineering from Northwestern, he worked in the oil industry in Oklahoma before joining the faculty at Kansas in 1969. He is the author of the Society of Petroleum Engineers (SPE) textbook, Waterflooding, published in 1986 and the co-author of the SPE textbook, Enhanced Oil Recovery, published in 1998. Paul is a Distinguished Member of SPE.

He received the Distinguished Achievement Award for Petroleum Engineering Faculty in 1981, the Lester C. Uren Award in 1986 and the John Franklin Carll Award in 2001 from the Society of Petroleum Engineers (SPE). In 1995, he received the Professional Achievement Citation in Engineering (PACE) award from the College of Engineering at Iowa State. Paul received the IOR Pioneer Award at the 2004 SPE/DOE Improved Oil Recovery Symposium. He was elected to the National Academy of Engineering in 2006. In 2009, he received the Anson Marston Medal from the College of Engineering at Iowa State University. He was elected as an honorary member of SPE-American Institute of Mining, Metallurgical and Petroleum Engineers (AIME) in 2012. Willhite is also a member of the CBE Hall of Fame.

CBE extends it thanks to Willhite for his guidance and contributions to the department as part of the CBE Advisory Council.

## Jill Rollinger joins CBE to work in data, human resource areas


Jill Rollinger

The Department of Chemical and Biological Engineering (CBE) welcomed Jill Rollinger to the staff as Program Assistant for Business & Data Analytics. She supports many business activities in the department, including procurement; data collection, analysis and reporting; personnel/human resource activities and more.

Originally from Brunsville, Iowa, Jill is an Iowa State alumna, having received a B.A. in communication studies in 2008. She is currently working toward a master's degree in organization development. Prior to coming to CBE she held a position performing similar duties in ISU's Ivy College of Business.

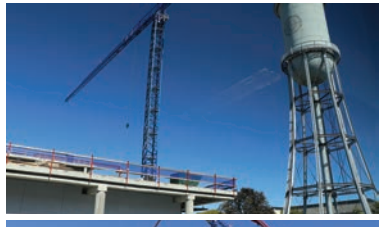
## New neighbor: Student Innovation Center offers unique options


An artists' rendering approximates what the SIC will look like when completed.

Rising just to the south of the Department of Chemical and Biological Engineering's (CBE) Sweeney Hall, construction of the new Student Innovation Center (SIC) is well underway, with a targeted opening date in the spring of 2020.

The space once contained the building affectionately known as "Old Sweeney," the original home of the Department of Chemical Engineering, opened in 1927, and the Nuclear Engineering Laboratory, originally known as the West Chemical Engineering Building, opened in 1935. Both were demolished as part of the first steps of the construction of the SIC.

An all-new type of facility in mission and purpose, the SIC is being designed to be a "destination" that will inspire students to innovate through experimentation, interdisciplinary collaboration and a free exchange of ideas in an inclusive environment; and will bring together partnerships for students, faculty and external sources with diverse backgrounds and experiences. College of Engineering departments, including CBE, will benefit from use of the facility.




A 120-foot tall crane is key in construction of the facility. A ground level view shows the size of the structure. Sweeney Hall is just out of the picture to the left.

The 140,000 square foot facility will be largely composed of glass that is produced overseas. The size of the work crews handling the project has varied, but as of the fall of 2018 an average of 70 people are at work on the structure each day. That number is expected to grow to more than 150 during peak construction in the spring and summer of 2019. An overhead crane, which stands 220 feet in the air and has a 262-foot boom used for the construction, towers over all other structures in the area, including the nearby historic Marston Water Tower. New underground infrastructure to serve the building was laid underneath Bissell Road during the summer of 2018 and was incorporated into a reconfiguration of the Bissell Road corridor from Osborn Drive to the aerial walkway that connects Hoover and Howe Halls.

A dedicated web site for the SIC has been developed and is available at www.sic.iastate.edu.

*We congratulate our 2018-19 graduate student fellowship recipients, and thank those who make our fellowships possible!*

**Saad Aftab**

George W. Parrott Centennial Graduate Fellowship

**Adam Carr**

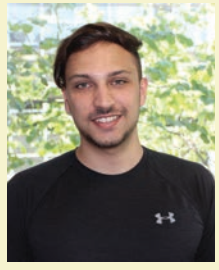
James Katzer Energy Fellowship, Miller Fellowship

**Prerana Carter**

Loren & Donna Luppes Graduate Fellowship, M.A. Larson Fellowship in Chemical Engineering

**Dustin Gansebom**

Frederick Martinson Chemical Engineering Scholarship

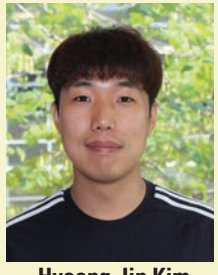


**Joseph Hadel**

Lanny A. Robbins Endowed Graduate Fellowship

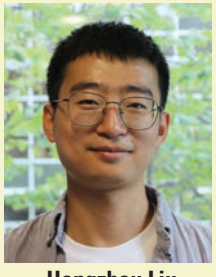
**Brittany Hallmark-Haack**

M.A. Larson Fellowship in Chemical Engineering, Peter J. Reilly Graduate Scholarship



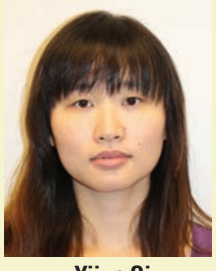
**Hyeong Jin Kim**

Frederick Martinson Chemical Engineering Scholarship Fund



**Hengzhou Liu**

James Katzer Energy Fellowship



**Yijun Qi**

Frederick Martinson Chemical Engineering Scholarship

**Alaric Siddoway**

Reginald R. & Jameson A. Baxter Graduate Fellowship

**Joseph Watkins**

Chemical Engineering Fellowship, Judson M. Harper Graduate Scholarship

**Zhanyi Yao**

Reginald R. & Jameson A. Baxter Graduate Fellowship, Sweeney Family Memorial Scholarship

## Chemical engineering grad student takes top honors in 3-Minute Thesis

Rainie Nelson (third from left) is shown with two other contestants and judges of the 3-Minute Thesis.

Chemical engineering graduate student Rainie Nelson took first place in Iowa State's final round of the 3-Minute Thesis (3MT)® competition, coordinated by the university's Graduate College.

Presenting "Shining a Light: The Power of Perovskites" with the three-minute clock ticking, Nelson garnered the highest score from a panel of judges rating presentations from eight ISU finalists. With the victory, Nelson qualifies for the regional 3-Minute Thesis® competition at the Midwest Association of Graduate Schools Annual Meeting March 20-22, 2019 in St. Louis, Missouri.

Nelson's project deals with the development of new materials for solar cells. She currently works on lead-free halide perovskites. Traditionally, a perovskite is a material with a cubic structure that contains three different elements. Lead-containing perovskites have been used in very efficient but unstable solar cells, so Nelson is trying to replace lead and make the material more stable.

## "Perfect Pitch" research presentations make debut in Iowa State CBE

In an all-new exercise for Iowa State chemical engineering graduate students, "Perfect Pitch" was launched in early 2018. With a concept borrowed from the 3-Minute Thesis program, students were required to present their research in timed, 90-second presentations. More than 40 students presented.

Judging was based on: What is the real-life problem you are addressing with your research? How does your approach uniquely solve the problem? What is the potential impact if your research is successful? Additional criteria included the quality of the visual aid and overall presentation style.

The top three finishers in CBE's Perfect Pitch, with winner Rainie Nelson second from right.

The top three finishers, in order, were Rainie Nelson, "Novel Halide Perovskites for Optoelectronics;" Anuraag Boddupalli, "Study of Collagen Organization in Cell-Laden Hydrogels and Animal Tissue Samples for Better Understanding of Wound Healing;" and Sujata Senapati, "Combination Vaccine Against Influenza." Nelson also won the Iowa State 3-Minute Thesis competition in November of 2018 (see story to left).

## Success continues for ISU teams in AIChE regional and national competitions

It was another banner year for student groups representing the Iowa State University Department of Chemical and Biological Engineering (CBE) in American Institute of Chemical Engineers (AIChE) activities in 2018.

Members of CBE's contingent at the AIChE regional conference are shown in the top photo. The Team Cy-onara Chem-E-Car team (bottom photo) took second in the distance competition at the regional conference and earned a spot to compete at the AIChE national student conference.

At the Mid-America Regional Conference in Tulsa, Oklahoma in late April, CBE's Team Cy-onara took second place overall in the Chem-E-Car distance competition and first place overall in the Chem-E-Car poster competition. With the second place finish in the distance competition the team qualified for the national showdown at AIChE's 2018 Annual Student Conference in Pittsburgh, Pennsylvania. It marked the third consecutive year an Iowa State entry took part in that event.

The events bring together undergraduates from around the nation to take part not only in competitions, but other development and fellowship events. The Chem-E-Car competition involves student-designed miniature vehicles that are both powered and stopped by chemical reactions, with greatest distance traveled recorded. Team Cy-Onara (with a payload of 250 ml of water on board), wound up 0.63 meters from the finish line on their second run in the regional conference. The success did not stop there for Team Cy-Onara, as their research poster detailing their Chem-E-Car project took first-place honors.

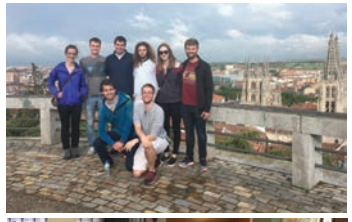
Getting their feet wet in the Chem-E-Car and poster competitions at the regional event were the members of "Cinnamon Cyndaquils," composed of all freshmen undergraduates, with the exception of team leader Drew Smith, a junior. This group will take part in more competitions in the future. In the Annual Student Conference Team CY-onara took a 12th place finish overall out of 39 entries in the Chem-E-Car distance competition, the best showing yet for an Iowa State team.

Also at the Annual Student Conference Grant Johnson received AIChE's Donald F. Othmer Sophomore Academic Excellence Award. It honors one AIChE member in a student chapter who has attained the highest scholastic grade point average during his or her freshman and sophomore years of college.

## Oviedo summer lab experience offers students scholarship aid in 2018

Eight Department of Chemical and Biological Engineering (CBE) students took part in the 2018 edition of the annual summer lab experience at the University of Oviedo, Spain.

For the first time students were able to take advantage of scholarships available through the Hershel B. Whitney Global Initiatives Program, part of a gift from department alumnus Hershel B. Whitney (see a separate story on page 7). The scholarships help reduce the cost of students to participate. "The scholarship was the final push to get me to go on the study abroad," said senior Branden Moreau. The five-week program got underway May 21, and uses the facilities and educators of the University of Oviedo. The intensive course work serves up a unit operations lecture and lab experience that garners each student seven semester credits that cover two chemical engineering courses. Course work is presented in English, with an individual option for Spanish language.



ISU CBE students enjoy free time in the Oviedo area during their study abroad experience.

Students conducted and wrote reports for a total of ten experiments, working with various faculty members from the University of Oviedo, Rafael Chavez from the University of Wisconsin, and Professor Karen Haman of Iowa State CBE, this year's faculty sponsor. The experience included manufacturing plant tours at Asturiana de Zinc S.A. (producing zinc and sulfuric acid), a Mahou/San Miguel Brewery, and a Bayer Pharma facility, where nearly 90% of the world's aspirin is produced. As always, sightseeing and enjoying the Spanish culture were also on the agenda.

Students are shown hard at work in a University of Oviedo chemical engineering lab.

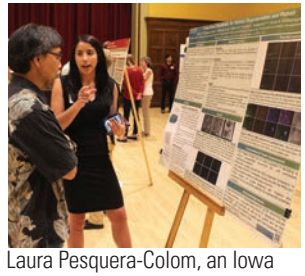
Student participants in this year's program were Maxsam Donta, Kaylin Kartaly, Matthew Lentner, Evan Mahoney, Sam Miller, Branden Moreau, Jason Peck and Tanner Phelps.

## Thirteen students spend a summer with CBE's BioMaP REU research program

Thirteen undergraduate students from around the nation made the Department of Chemical and Biological Engineering (CBE) their summer home with the 2018 BioMaP REU (Biological Materials and Processes Research Experience for Undergraduates) experience.

Trevor Simmons of University of Wisconsin-Madison worked with faculty member Tom Mansell on his research project.

The program brings college students to the Iowa State campus to work under the mentorship of ISU CBE faculty and graduate students to gain hands-on research experience in topics that match their educational interests and goals. It is coordinated by CBE professor Monica Lamm, who was assisted this year by graduate student Russell Mahmood. This year's participants were selected from 122 applicants. Academic levels ranged from incoming sophomore to incoming senior at respective schools in the fall of 2018, with majors, in addition to chemical engineering, including biology, biomedical engineering, anthropology, chemistry and more.



Laura Pesquera-Colom, an Iowa State University biology major, explains her research during the end-of-summer poster symposium.

Comments about the program included: "Great summer. Best I've ever had." "I really loved it. I came in with high expectations, but it went above and beyond that."

"Lots of research. Definitely helped me cement plans to go to graduate school." "It exposes you to so much more than what you learn in a classroom. It teaches you that in research you can't always plan everything ahead and you have to learn to make decisions as you go."

The department will begin receiving applications for the 2019 program in the early portion of that year.

The 2018 BioMaP REU participants gather for a group photo.

## Learning communities offer significant experiences to many CBE undergrads

Last year, approximately 120 first-year students participated in Department of Chemical and Biological Engineering (CBE) learning communities, while 20 transfer students and 100 upper-level students joined in learning communities' seminars and coursework, industry tours and more. It's all designed to give CBE students what they need to succeed. Learning community members grew their study and professional skills, made industry connections, and built valuable relationships with fellow CBE students.

Learning communities, launched at Iowa State in the mid-1990s, are small groups of students who take one or more courses together, may live in the same residence hall, and participate in career exploration, study groups, service learning and social activities together. Learning community participation is associated with better student retention and satisfaction rates.

CBE offers three types of learning communities to best meet the varying needs of first-year students, upper-division students and transfer students. "From job prep to test taking to presentation skills, you build knowledge you will use for the rest of college and in the real world," said Jamie Pryhuber, senior in chemical and biological engineering and a CBE learning community participant and peer mentor. "One of the most surprising things about being part of the CBE learning community is how many opportunities the community offers for its students – such as industry tours at companies like DuPont and REG and social events like cookie baking and picnics!"

Learning Community participants enjoy a tour of REG biorenewable facililties.

Learning communities offer an additional leadership opportunity in its peer mentor positions. Peer mentors, like Pryhuber, are previous participants in the communities who lead the group seminars and activities and serve as supportive resources for participants.

"The connections that our peer mentors make with the students they mentor is one of the most valuable outcomes of the learning communities. This connection is key to our incoming students' success because the mentor can provide real stories of how they handled the transition from high school to college," said Janessa Boley, CBE academic advisor and a learning community coordinator.

## Internships and co-ops supply valuable start on the road to an engineering career

During the 2017-2018 academic year, 75 Iowa State University CBE students had internships or co-ops with 43 employers.

Chemical and Biological Engineering seniors Sydney Johnston and Heidi Walthier, who had co-ops with Dow Chemical in Freeport, Texas and Bemis Company, Inc. in Neenah, Wisconsin, respectively, are just two students to enjoy the benefits: "The most valuable things I developed during my co-op was how to learn," Johnston said. "The most important idea is that you can find the answer to anything with persistence and dedication."

"It was very helpful to see the environment that my classes are preparing me for," Walthier said. "I can see the real-world application of my coursework because I've had the chance to experience it first-hand."


Engineering Career Fairs, with companies sometimes represented by CBE graduates, provide a significant resource for students seeking internships and co-ops.

Students had internships and co-ops with the following employers: 3M; Ajinomoto North America, Inc.; Alliant Energy Corporation; Anheuser-Busch Companies, Inc.; Archer Daniels Midland Company; Bayer; Bemis Company; Boston Scientific Corporation; Buckman; Cargill, Inc.; Caterpillar, Inc.; Dakota County, Minnesota; Dow Chemical Company; DuPont; Ecolab, Inc.; Encapsys; Feed Energy and FEC Solutions; Frontida Biopharm, Inc.; Grain Processing Corporation; Hutchinson Technology, Inc.; Hydrite Chemical Company; Ingredion Incorporated; International Paper Company; Iowa Department of Natural Resources Pollution Prevention Services; Iowa Department of Transportation; KemX Global; Keurig Dr. Pepper; LyondellBasell; Micron Technology, Inc.; Mondelez International; Nalco Corporation; Oregon's Wild Harvest; POET; Renewable Energy Group (REG); Rust-Oleum; Stratas Foods LLC; Top Glove; Tyson Foods, Inc.; United States Gypsum Company (USG); Valero Services, Inc.; Van Diest Supply Co.; Vanderbilt University; Vertex Pharmaceuticals.

Industry representatives are urged to go to www.engineering.iastate.edu/ecs/employers/ to learn more.

### "Old Sweeney" bricks are available as a keepsake

The original Chemical Engineering Building (more recently referred to as "Old Sweeney"), home of the Department of Chemical Engineering at Iowa State for nearly 40 years, was demolished in 2017 to make way for the new Student Innovation Center. A supply of bricks from the structure were saved and are now available free of charge to anyone who would like one. If you'd like to have a piece of ISU chemical engineering history, contact Elaine Smuck at 515-294-7642 or esmuck@iastate.edu (please note that bricks must be picked up in person. The department is not able to ship).


The Chemical Engineering Building was opened in 1927 (left photo). In 2017 it was demolished as a preliminary step in constructing the Student Innovation Center (see story on page 18).

The above photo shows site excavation for the Student Innovation Center in 2017, as viewed looking south from Sweeney Hall. At right is a view of construction as of October 2018, looking southeast from near the Sweeney Hall main entrance.

## UNDERGRADUATE SCHOLARSHIPS

*Congratulations to our 2018-19 scholarship recipients and thank you to all who make our scholarships possible!*

**Celia Abolafia**
Engineering Student Program Support
College of Engineering Scholarship Fund

**Sparsh Agarwal**
Nicholas L. Reding/Monsanto Scholarship in Engineering

**Surya-Tej Akavaram**
Thomas D. and Edra S. Wheelock Endowed Scholarship

**Zachary Alston**
Thomas D. and Edra S. Wheelock Endowed Scholarship

**Antonio Amadio**
Manley R. Hoppe Scholarship

**Austin Angel**
Chemical Engineering Scholarship Fund

**Davis Arbogast**
Eugene Devere Travis Scholarship

**Martin Asama**
Chemical Engineering Scholarship Fund
3M Endowed Scholarship in Engineering

**Shelby Baker**
Gretchen L. Bruffy and Mary R. Feroe Endowed Scholarships in Chemical Engineering

**Ethan Bauer**
Chemical Engineering Scholarship Fund

**Kari Beine**
Harry Oakley Price Scholarship Fund

**Mason Berg**
Eugene Devere Travis Scholarship

**Kayla Besthoff**
Chemical Engineering Scholarship Fund

**Kia Birnbaum**
Skogen-Hagenson Scholarship Fund

**Brett Bobko**
Chemical Engineering Scholarship Fund

**Bradley Boyd**
Chemical Engineering Scholarship Fund
Edward W. and Joyce C. Backhaus Scholarship in Chemical and Biological Engineering

**Alexandrea Bragdon**
Skogen-Hagenson Scholarship Fund

**Blaine Bristow**
Roderick Seward, Flossie Ratcliffe and Helen M. Galloway Foundation Expendable Merit Scholarship

**Alexander Britton**
Edward W. and Joyce C. Backhaus Scholarship in Chemical and Biological Engineering

**Ethan Brown**
Mike and Jean Steffenson Scholarship

**Jonah Brown**
Edward W. and Joyce C. Backhaus Scholarship in Chemical and Biological Engineering

**Laura Brown**
Engineering Student Program Support

**Anna Buchholz**
Chemical Engineering Scholarship Fund
Nicholas L. Reding/Monsanto Scholarship in Engineering

**Kaitlin Burdick**
Chemical Engineering Scholarship Fund

**Charles Byrd**
Chemical Engineering Scholarship Fund
Nicholas L. Reding/Monsanto Scholarship in Engineering

**Joel Clancy**
Engineering Student Program Support

**Roger Cruz**
Jane and Rod Crowley Chemical Engineering Scholarship

**Dale Cummings**
Engineering Student Program Support

**Weile Dai**
Barbara L. Feroe Scholarship

**Brynne Davis**
Chemical Engineering Scholarship Fund

**Linnea Dawley**
Edward W. and Joyce C. Backhaus Scholarship in Chemical and Biological Engineering

**Alexis Derk**
Chemical Engineering Scholarship Fund

**Noah Deroos**
Chemical Engineering Scholarship Fund

**Hannah Dietrich**
Lois and Manley Hoppe Endowed Scholarship
Roderick Seward, Flossie Ratcliffe and Helen M. Galloway Foundation Expendable Merit Scholarship

**Taylor Dockery**
Nicholas L. Reding/Monsanto Scholarship in Engineering
George R. and William G. Bathe Endowed Scholarship Fund

**Erin Donaldson**
Nicholas L. Reding/Monsanto Scholarship in Engineering
Tau Beta Pi Scholars Program

**Maxsam Donta**
Nicholas L. Reding/Monsanto Scholarship in Engineering
Chadwick Ethan Morris Memorial Scholarship
Hershel B. Whitney Global Initiatives Program

**Mason Dyess**
Engineering Student Program Support

**Emily Edwards**
Roderick Seward, Flossie Ratcliffe and Helen M. Galloway Foundation Expendable Merit Scholarship

**Danielle Eeg**
College of Engineering Scholarship Fund

**Jonathan Eiden**
Edward W. and Joyce C. Backhaus Scholarship in Chemical and Biological Engineering

**Tanner Eiswald**
Edward W. and Joyce C. Backhaus Scholarship in Chemical and Biological Engineering
A. Douglas and Helen F. Steffenson Memorial Endowed Scholarship
Riesselman Scholarship
Chemical Engineering Scholarship Fund

**Samantha Eltze**
Roderick Seward, Flossie Ratcliffe and Helen M. Galloway Foundation Expendable Merit Scholarship

**Jacob Ernste**
Edward W. and Joyce C. Backhaus Scholarship in Chemical and Biological Engineering

**Jaden Feauto**
Lois and Manley Hoppe Endowed Scholarship

**Brody Folkerts**
College of Engineering Scholarship Fund

**Tyler Franke**
Nicholas L. Reding/Monsanto Scholarship in Engineering

**Mason Furnish**
Roderick Seward, Flossie Ratcliffe and Helen M. Galloway Foundation Expendable Merit Scholarship

**Sandra Gale**
Engineering Student Program Support

**Tyler Gathman**
Lawrence E. Burkhart Memorial Scholarship Fund

**Hannah Gebur**
Edward W. & Joyce C. Backhaus Scholarship in Chemical & Biological Engineering

**Andrew Gilbertson**
Nicholas L. Reding/Monsanto Scholarship in Engineering

**Anders Glad**
Lois and Manley Hoppe Endowed Scholarship

**Mason Green**
Manley R. Hoppe Scholarship

**Haley Greiman**
Ralph S. Millhone Endowed Presidential Scholarship

**Katherine Gruman**
A. Douglas and Helen F. Steffenson Memorial Endowed Scholarship
Edward W. and Joyce C. Backhaus Scholarship in Chemical and Biological Engineering

**Marissa Gustafson**
Ross White Engineering Scholarship
Langerhans Chemical Engineering Scholarship

**Ashley Harris**
Johnson-Engel Scholarship Endowment in Engineering
Bestmann Family Scholarship in Engineering
Roderick Seward, Flossie Ratcliffe and Helen M. Galloway Foundation Expendable Merit Scholarship

**Liam Herbst**
Engineering Student Program Support

**Trang Hoang**
Clifford A. Shillinglaw Memorial Scholarship in Chemical Engineering

**Micah Hollenbeck**
Robert O. and Marie E. Dierks Scholarship in Chemical Engineering

**Beatrice Hosier**
Building a World of Difference Renewable Energy and Sustainable Water Scholarship in Engineering
Roderick Seward, Flossie Ratcliffe and Helen M. Galloway Foundation Expendable Merit Scholarship

**Brett Hostert**
Burton H. Friar Scholarship in Chemical Engineering Fund

**Clay Hugen**
Professor Eugene H. Wissler Scholarship

**Shawn Husgen**
Lyle J. & Marcia L. Higgins

**Jordan Icenogle**
Roderick Seward, Flossie Ratcliffe and Helen M. Galloway Foundation Expendable Merit Scholarship

**Abdul-Badi Issa**
Kenneth and Mary Heilman Scholarship in Chemical Engineering

**Kyle Jackson**
Hans Buehler Scholarship Fund at Iowa State University, College of Engineering

**Sarah Jacobson**
Thomas D. and Edra S. Wheelock Endowed Scholarship

**Hyungmin Jeon**
Chemical Engineering Scholarship Fund

**Grant Johnson**
Mike and Jean Steffenson Scholarship

**Sydney Johnston**
Roderick Seward, Flossie Ratcliffe and Helen M. Galloway Foundation Expendable Merit Scholarship

**Rachel Junck**
Roderick Seward, Flossie Ratcliffe and Helen M. Galloway Foundation Expendable Merit Scholarship
Chemical Engineering Scholarship Fund

**Kaylin Kartaly**
Edward W. and Joyce C. Backhaus Scholarship in Chemical and Biological Engineering
Hershel B. Whitney Global Initiatives Program

**Alex Kauffmann**
Beisner Scholar Award in the Department of Chemical Engineering

**Mason Kenkel**
Engineering Student Program Support

**Rachel Khor**
Eugene Devere Travis Scholarship

**Nathan Klein**
Edwin John Hull Endowed Scholarship

**Ethan Kluesner**
Roderick Seward, Flossie Ratcliffe and Helen M. Galloway Foundation Expendable Merit Scholarship

**Robert Knudsen**
Chemical Engineering Scholarship Fund

**Abigail Koep**
Chemical Engineering Scholarship Fund
Stuart M. Totty Scholarship

**Thomas Krohn**
Building a World of Difference Renewable Energy and Sustainable Water Scholarship in Engineering
Shepard Family Scholarship in Chemical Engineering

**Margaret Lashier**
Engineering Student Program Support

**John Lavey**
Mike and Jean Steffenson Scholarship

**Jackson Lee**
Manley R. Hoppe Scholarship

**Brittany Lende**
Mike and Jean Steffenson Scholarship

**Matthew Lentner**
Hershel B. Whitney Global Initiatives Program

**Katie Lyon**
Engineering Student Program Support

**Jack Maass**
Chemical Engineering Scholarship Fund

**Heather Macmurdo**
Chemical Engineering Scholarship Fund
Ralph S. Millhone Endowed Presidential Scholarship

**Evan Mahoney**
Hershel B. Whitney Global Initiatives Program

## UNDERGRADUATE SCHOLARSHIPS

*Congratulations to our 2018-19 scholarship recipients and thank you to all who make our scholarships possible!*

**Alexander Majors**
Ralph Luebbers Scholarship in Chemical Engineering
Chemical Engineering Scholarship Fund
Noel and Ruth Smith Family Engineering Scholarships

**Omer Malik**
Linda Mittman Demmon and Wesley Demmon Scholarship in Engineering

**Alec Maloney**
Chemical Engineering Scholarship Fund

**Sophia Masters**
Roderick Seward, Flossie Ratcliffe and Helen M. Galloway Foundation Expendable Merit Scholarship

**Reya Mathew**
Engineering Student Program Support

**Benjamin Matlock**
Building a World of Difference Renewable Energy and Sustainable Water Scholarship in Engineering

**Emily Matts**
Edward W. and Joyce C. Backhaus Scholarship in Chemical and Biological Engineering

**Logan Mayberry**
Nicholas L. Reding/Monsanto Scholarship in Engineering **Nicole McCullough**
Engineering Student Program Support

**Molly McCunn**
Gudron Cummings Student Support Fund

**Wesley Metcalfe**
Chemical Engineering Scholarship Fund

**Randy Metz**
Sadeghbeigi Chemical Engineering Scholarship
Chemical Engineering Scholarship Fund

**Samuel Miller**
Hershel B. Whitney Global Initiatives Program

**Sarah Miller**
Dr. Thomas D. Wheelock Scholarship

**Daniel Miron-Ocampo**
Chemical Engineering Scholarship Fund
Sullivan Scholarship in Chemical and Biological Engineering
Lois and Manley Hoppe Endowed Scholarship

**Kelvin Miskowiec**
Skogen-Hagenson Scholarship Fund

**Emma Mitchell**
Building a World of Difference Renewable Energy and Sustainable Water Scholarship in Engineering
Renewable Energy Group, Inc. Engineering Scholarship

**Branden Moreau**
Skogen-Hagenson Scholarship Fund
Hershel B. Whitney Global Initiatives Program

**Joseph Musielewicz**
Thomas D. and Edra S. Wheelock Endowed Scholarship

**Zachary Naatz**
Chemical Engineering Scholarship Fund

**Tyler Naughtrip**
Engineering Student Program Support

**Charles Neff**
Conrad N. Muzzy Scholarship Fund

**Jake Nelson**
Skogen-Hagenson Scholarship Fund

**Thi Nguyen**
Sullivan Scholarship in Chemical and Biological Engineering

**Jarrett Nisley**
Chemical Engineering Scholarship Fund

**Andrew Noel**
Chemical Engineering Scholarship Fund

**Amber Ogden**
Edward W. & Joyce C. Backhaus Scholarship in Chemical & Biological Engineering
College of Engineering Scholarship Fund

**Jaret Olderbak**
Ralph S. Millhone Endowed Presidential Scholarship
Chemical Engineering Scholarship Fund

**Urvi Pai**
Eugene Devere Travis Scholarship

**Tyler Pasut**
Roderick Seward, Flossie Ratcliffe and Helen M. Galloway Foundation Expendable Merit Scholarship

**Jason Peck**
Hershel B. Whitney Global Initiatives Program

**Jared Persch**
Ag Processing Inc Scholarship in Engineering

**Carrie Peterson**
Chemical Engineering Scholarship Fund

**Abigail Petheram**
Engineering Student Program Support

**Tanner Phelps**
Hershel B. Whitney Global Initiatives Program

**Nicholas Piento**
Beisner Scholar Award in the Department of Chemical Engineering
Larry J. McComber Engineering Scholarship

**Jamie Pryhuber**
Edward W. and Joyce C. Backhaus Scholarship in Chemical and Biological Engineering

**Eric Rasmussen**
Chemical Engineering Scholarship Fund

**Brittney Reding**
Kenneth L. Garrett Scholarship in Chemical and Biological Engineering

**Brennen Reynolds**
Dr. Owen A. Heng Chemical and Biological Engineering Scholarship

**Finlan Rhodes**
Ralph S. Millhone Endowed Presidential Scholarship
Kenneth L. Garrett Scholarship in Chemical and Biological Engineering

**Nathan Rider**
National Merit Scholarship-Engineering
Mike and Jean Steffenson Scholarship

**Nathan Roby**
Chemical Engineering Scholarship Fund

**Danielle Rodriguez**
Tau Beta Pi Scholars Program
Gerald and Barbara Montgomery Scholarship in Chemical and Biological Engineering

**Kaitlyn Roling**
David and Caroline Clizbe Memorial Scholarship

**Tyler Roling**
Edward W. and Joyce C. Backhaus Scholarship in Chemical and Biological Engineering
Edwin John Hull Endowed Scholarship

**Luke Rustin**
Roderick Seward, Flossie Ratcliffe and Helen M. Galloway Foundation Expendable Merit Scholarship

**Logan Ryerson**
Beisner Scholar Award in the Department of Chemical Engineering

**Matthew Schaschwary**
Edwin John Hull Endowed Scholarship

**Christopher Schnitzler**
Engineering Student Program Support
Edward W. & Joyce C. Backhaus Scholarship in Chemical & Biological Engineering

**John Schomers**
Nicholas L. Reding/Monsanto Scholarship in Engineering

**Kristian Shipley**
Hans Buehler Scholarship Fund at Iowa State University, College of Engineering

**Thomas Simon**
Alpha Chi Sigma Chemical Engineering Scholarship
Chemical Engineering Scholarship Fund

**Jaclyn Simons**
Nicholas L. Reding/Monsanto Scholarship in Engineering
Tau Beta Pi Scholars Program

**Kristine Skoby**
Engineering Student Program Support

**Joshua Slagle**
Nicholas L. Reding/Monsanto Scholarship in Engineering

**Jonathon Slobidsky**
Manley R. Hoppe Scholarship

**Cole Smith**
Chemical Engineering Scholarship Fund
Alexander Shaler Allen, VIII Scholarship in Chemical Engineering

**Drew Smith**
Edward W. and Joyce C. Backhaus Scholarship in Chemical and Biological Engineering

**Evan Snawerdt**
Roderick Seward, Flossie Ratcliffe and Helen M. Galloway Foundation Expendable Merit Scholarship

**Laura Snyder**
Mike and Jean Steffenson Scholarship

**Kaitlin Steward**
Engineering Student Program Support

**Bryce Stubbings**
Griffen Family Scholarship

**Will Thomas**
Roderick Seward, Flossie Ratcliffe & Helen M. Galloway

**Lindsay Timko**
Gerald and Barbara Montgomery Scholarship in Chemical and Biological Engineering

**Josephine Trager**
Erwin and DeLoris Whitney Scholarship in Chemical Engineering

**James Trettin**
Floyd Herman Cook Scholarship
Kenneth L. Garrett Scholarship in Chemical and Biological Engineering
Herb Erbe Memorial Scholarship

**Charles Truka**
Roderick Seward, Flossie Ratcliffe and Helen M. Galloway Foundation Expendable Merit Scholarship
Kenneth L. Garrett Scholarship in Chemical and Biological Engineering

**Brandon Vance**
Edward W. and Joyce C. Backhaus Scholarship in Chemical and Biological Engineering
Chemical Engineering Scholarship Fund

**Nolan Vollstedt**
Burton H. Friar Scholarship in Chemical Engineering Fund

**Brenden Waataja**
Patricia Werner Merten Memorial Scholarship Fund

**Anne Wallace**
Bob Kaiser Memorial Scholarship

**Cullen Walsh**
Chemical Engineering Scholarship Fund

**Justin Watkins**
Engineering Student Program Support

**Keith Weincouff**
Ag Processing Inc Scholarship in Engineering

**Emily Wilkerson**
Roderick Seward, Flossie Ratcliffe & Helen M. Galloway

**Benjamin Williams**
Nicholas L. Reding/Monsanto Scholarship in Engineering

**Emma Williams**
Engineering Student Program Support
College of Engineering Scholarship Fund
Donald H. Beisner in Honor of Dr. Morton Smutz

**Eden Woldesenbet**
Robert A. and Jacklyn R. Lane Engineering Scholarship
Chemical Engineering Scholarship Fund
Vander Linden Scholarship Fund

**Dayton Wright**
Nicholas L. Reding/Monsanto Scholarship in Engineering
Roderick Seward, Flossie Ratcliffe and Helen M. Galloway Foundation Expendable Scholarship

**Jordan Wright**
Roderick Seward, Flossie Ratcliffe and Helen M. Galloway Foundation Expendable Merit Scholarship
Roderick Seward, Flossie Ratcliffe and Helen M. Galloway Foundation Expendable Scholarship

**Michael Zembrzuski**
Chemical Engineering Scholarship Fund

### National Merit Scholars

**Ethan Brown**
**Laura Brown**
**Haley Greiman**
**Heather Macmurdo**
**Akash Mitra**
**Jaret Olderbak**
**Finlan Rhodes**
**Nathan Rider**

IOWA STATE UNIVERSITY
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