# DISCUSSION DEPARTMENT OF MECHanical Engineering

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# One family, three generations of ISU alums

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Dear alumni and friends,

We are proud to share the achievements of not just the mechanical engineering department but also faculty, staff, and students, past and present. This fall, mechanical engineering at Iowa State University reached a new milestone by surpassing Georgia Tech University and becoming the largest undergraduate mechanical engineering program in the entire country!

Wessage from the Chair

To serve the growing number of students, the department has made many changes since our last issue of *Dimensions*. Five new tenure-track faculty members have joined the department: Sarah Bentil, Chao Hu, Jaime Juarez, James Michael, and Juan Ren. The department has also hired four non-tenure track faculty members: Mirka Deza, Margaret Mathison, Michael Messman, and Paola Pittoni. Features on all can be found in this magazine.

In addition to our growing faculty, our facilities have had major updates. The department has launched two educational facility clusters known as "The Hive" and "The Mine." The Hive, located in Hoover Hall, is focused on design education and includes studio, fabrication, and computer facilities. The Mine, located in Black Engineering Building, consists of five teaching labs with much new equipment. The department has also worked closely with Des Moines-based PUSH Branding to provide a new look for our teaching labs, design studios, hallways, and other spaces in Black Engineering, The Hive, and The Mine.

Among our faculty accomplishments highlighted in this newsletter, assistant professors Soumik Sarkar and Travis Sippel were recently awarded grant funding as part of the Air Force Office of Science Research's Young Investigator Program. This honor was bestowed upon 58 scientists and researchers nationwide, so it's quite remarkable that two professors in our department were selected!

Our graduate and undergraduate students kept busy with their classes, research, teaching, and other responsibilities. Read about Angadbir Singh Sabherwal, an undergraduate student who was recognized for his achievements in academics and leadership; a team of undergraduate researchers studying and designing safer football helmets; and updates from various student clubs and organizations.

Our alumni continue to achieve success and excellence in their careers and endeavors. This issue features stories about a family made up of three generations of ISU alums, two of whom studied mechanical engineering; an ME alum and Iraq War veteran who has implemented conservation practices on his Northern Iowa farm; and an alum who has found success with his geothermal drilling company in Colorado.

Our alumni are vital to the growth and success of mechanical engineering and industry in the U.S. and abroad. We enjoy hearing about your accomplishments. Please feel free to reach out and share your story. You can contact us at *mealumni@iastate.edu*.

Sincerely,

Caroline Hayes Department Chair Lynn Gleason Professor of Interdisciplinary Engineering

#### On the cover

Mechanical Engineering freshman Kiera Fodor gives a farewell salute as her team's boat sank during the inagural ME Learning Community Design Competition at Forker Pool on Nov. 17, 2016. Photo by Nick Fetty.

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### ISU surpasses Georgia Tech as nation's largest undergrad ME program

Iowa State University's Department of Mechanical Engineering (ME) recently surpassed Georgia Tech University as the largest undergraduate ME program in the country.

According to data provided by each institution, ISU's undergraduate ME program has 2185 students for the 2016-17 academic year, 28 students more than the Atlanta-based university.

"When I learned of the news, I felt some pride and satisfaction. Not in the sense of winning a competition, but that we were able to get to this point without a great deal of sudden disruption to our program," said Cris Schwartz, director of the undergraduate program.

Schwartz, who also serves as an associate professor in the department, has led the undergraduate program since 2013. Over the past decade, overall enrollment at Iowa State has grown by 44 percent, while undergraduate enrollment in ME more than doubled between 2007 and 2015. Schwartz said that while the university as a whole experienced substantial growth during that time, a strong focus on curriculum and logistical planning helped the ME department manage its incredible growth.

"We were in a period of high growth but not yet facing the truly explosive enrollment growth in ME that occurred in the two academic years [after I took over the program in 2013]," he said. "Those times were challenging, but because of the wonderful curriculum and space planning teams in the department, we were able to grow our program capacity very quickly and in a way that has retained the fundamental nature of the ISU ME degree."

Not only is ISU's ME program the largest undergraduate program in the country but it's also the largest undergraduate major on campus. Schwartz said he and his colleagues have developed planning tools and projections to help the department serve its many students in the most effective way possible.

"We have developed some fairly sophisticated models for predicting our program needs, and those tools give us some time to prepare the program for upcoming semesters. It is through these data-driven methods, along with truly excellent and motivated staff and faculty, that becoming the largest ME program in the country is just another step in our journey to achieve and maintain excellence as a program."

Schwartz also attributed the increase in undergraduate enrollment to the high job placement rate in the mechanical engineering field as a whole nationally.

"Without a doubt, ME enrollment has grown nationally and that is largely dependent on the favorable job market for mechanical engineers. We see strong evidence of this immediately after the ISU Career Fair, when a number of engineering students request to transfer to ME because that is the most sought after major among the companies visiting," said Schwartz.

lowa State's increased enrollment can also be attributed to the substantial increase it has seen in out-of-state students.

"In the case of our program, I think enrollment growth also has a lot to do with ISU's regional reputation coupled with our fairly reasonable costs of attending in comparison to peer institutions in neighboring states," said Schwartz. "In fact, the very largest segment of growth of our incoming freshmen class this year is students coming from Illinois."



Mechanical Engineering senior lecturer Jim Heise works with undergraduate students. Photo by Dan McClanahan.

Schwartz also pointed out that over the past six academic years, one out of every ten new students on campus chose to study mechanical engineering out of a field of about 150 undergraduate majors.

Schwartz was an undergraduate at Iowa State himself in the 1990s and went on to also earn his MS and PhD degrees at ISU. He then spent about six years on the faculty at Texas A&M University before returning to Iowa State as an associate professor in 2012. He said he thinks the department has retained the hands-on emphasis which he remembers as a student.

"I think one of most amazing accomplishments of this program is that it still has the fundamental hands-on, get-the-job-done value system that it had back when I was a student here. The department was less than one-third the size that it is now, but we have been able to keep a number of the resourceintensive laboratories that we had back then. It amazes to no end that we still have a manufacturing laboratory as part of our curriculum," Schwartz said.

"One of the most memorable things about my undergraduate time was the metal casting laboratory. I am delighted that we still have the resources and the ability to continue to teach that particular laboratory at a much larger scale than when I was a student."

In addition to a well-rounded curriculum, top-notch facilities, and dedicated faculty, Schwartz said the strong support staff has also helped to make ISU's mechanical engineering program one of the best in the country.

"One of the greatest improvements that I observe now, and am lucky enough to be involved with, is our excellent staff of full-time academic advisers," Schwartz said. "When I was a student, I was advised by a faculty member about what courses to take. Now, students and parents are able to do quite a bit of long-term degree planning and emergency action by working with our advising staff."

ME Department Chair Caroline Hayes said she sees Iowa State's position as the nation's largest undergraduate ME program as both an "honor" and a "responsibility."

"It is an honor that so many students and their families have chosen us for their education," said Hayes. "It is a responsibility because no other Mechanical Engineering department in the country has such a large impact on the mechanical engineering workforce. We have an ethical responsibility to provide our students with the very best education possible."

### Student design team updates

#### Team PrISUm

For the past 27 years, PrISUm has been developing one seat solar-powered vehicles and racing these cars across the United States. Now, PrISUm has set its goals on changing the paradigm of transportation by developing the world's first Solar Utility Vehicle. This vehicle will sit four adults, hold



13 carry-on bags, feature a touch screen infotainment system, and of course have cup holders. Once completed, Penumbra will race across the continent of Australia, and travel to all 99 counties in the state of Iowa.

#### **Cyclone Space Mining**

The Cyclone Space Mining team took part in the NASA Robotic Mining Competition in the summers of 2015 and 2016, remaining one of only a few teams to participate in all seven years of the competition's lifetime. The cumulative experience allowed the



team to take third place overall in 2016 and achieve a new precedent of competing with a dual-robot system. The team also made large advances in its outreach, social media, and public engagement programs.

*"Give us your mind and enthusiasm now, and we will give it back to you, sharp, trained, and ready to help."* 

~Henry Black, ME Department Chair 1946-1972

#### **Undergraduate student honors**

**Taylor Geick**, named Outstanding Senior for Spring 2015 commencement.

**Raul Hernandez**, senior, receieved Alliant Energy/Erroll B. Davis Jr. Award. Also named a 2015-2016 Exemplary Peer Mentor.

Erin Kollar, senior, named a 2015-2016 Exemplary Peer Mentor.

**Gabriel McCoy** was named Outstanding Senior for Fall 2015 commencement.

**Andrew Peterson**, senior, receieved the Franklin Energy Awards Energy Efficiency Experts of Tomorrow Scholarship.

**Angadbir Singh Sabherwal** was named Outstanding Senior for Spring 2016 commencement. He was also named a Wallace E. Barron Scholar.

### ISU undergraduate engineering students design, study safer football helmets



Three Iowa State University engineering students were featured in the *Des Moines Register* in August for their efforts in designing and studying ways to create safer football helmets that better protect against concussions, CTE, and other head injuries.

The research team consists of undergraduate students Tanner Hamelau (mechanical engineering), Zach Murrell (mechanical engineering), and Zach Taalman (materials engineering). The students teamed up with Cross Over, an lowa-based helmet design company started by a financial adviser and television producer from Carroll, to study the effectiveness of the new helmet designs. The project is part of the ME Capstone Design Program and the Multidisciplinary Engineering Design (ENGR 466) course.

Read the full story at desmoinesregister.com.

Do you have story ideas for the next issue of *Dimensions*? Send them to mealumni@iastate.edu



### Iowa State alumni find success with geothermal drilling

Dan Rau, a mechanical engineering alumnus, is making strides in geothermal energy. After he graduated in 1998, Rau began working as a mechanical engineer for a consulting firm that designed heating,

and safe drilling. Adding his experience to the mix has made Rau a oneof-a-kind driller who can do it all, a rare occurrence in the geothermal industry.

venting and cooling systems for commercial use. That's when he was introduced to geothermal technology and began to invest his time into researching the technology and the installation of geothermal systems. Now, he has his own geothermal drilling business.

When his wife, Kari (who earned her bachelor's in exercise and sport science from Iowa State in 2000), received a job in Colorado the couple relocated, and Rau took the opportunity begin his adventure to drilling. into geothermal another He shadowed



geothermal driller, hoping to gain as much information as possible. He says he learned many aspects about the business, such as what does and what doesn't work, a deeper understanding of hydraulics and how to drill more efficiently. He then utilized what he learned at Iowa State to improve and build more efficient, safe and streamlined equipment so installations require less equipment and manpower.

Rau says the education he received at Iowa State was a big help. The knowledge from his classes like machine design helped Rau design his drill as well as all the parts that go with it. Even more, classes like thermodynamics and fluid transfer helped Rau create more efficient

Because much of geothermal drilling is virtually invisible when compared to solar or wind powered operations, Rau says a big portion of his job is about educating clients on geothermal energy. His research in the field and being able to apply his extensive knowledge to his business helps him inform his clients about all aspects of his operations.

While he's enjoying success with his business, he says starting from scratch presented many challenges. He built the company right

before the recession, and that brought many worries as some of his biggest competitors began to go out of business. Rau powered through, and his business was able to grow each year.

Rau plans to continue providing Colorado and its resident's quality geothermal systems. His business is family-owned ran by Rau, his wife Kari, his father Doug, his brother Nick, and two other employees.



Sarah Bentil, an assistant professor in mechanical engineering, presented for the Mechanical Engineering Graduate Student Organization (MEGSO) seminar on Sept. 8, 2016. Photo by Nick Fetty

### ME's Sarah Bentil studies biological aspects of mechanical engineering

While mechanical engineering has historically conjured up images of grease and gears, assistant professor **Sarah Bentil**'s research aims to expand the field by focusing on what she considers "the ultimate machine": the human body.

"Just as with any machine, the body requires power to do work and it can also fail. The objective of my research is to apply engineering principles to soft tissue to mitigate damage and avoid catastrophic failure," Bentil said.

Bentil's research interests include soft tissue biomechanics and biomaterials. Her current research projects examine brain injury mechanisms due to both blast and blunt impact.

"We apply mechanical forces to the brain to study the tissue's response to these loads. Given the response, we investigate countermeasures that reduce, if not eliminate, the resulting damage to the brain. One such countermeasure is an improved safety helmet design," said Bentil. "For example, even with the National Football League's rule change The Ohio State University and then serving as a postdoctoral fellow at the Hopkins Extreme Materials Institute located at Johns Hopkins University. She also holds an MS in mechanical engineering from the University of Hawai'i at Manoa and BS degrees in mechanical engineering and mathematics from the University of Vermont. She said these experiences at different universities across the country have contributed positively to her professional development.

"My experience studying at various-sized universities in different parts of the United States enabled me to build an expansive and diverse network of collaborators. Working with my collaborators from academia, industry, and government has turned me into a more open-minded and adventurous person," said Bentil. "For a researcher, I think these are good traits to possess. Especially in my field, which requires us to develop innovative solutions to biomedical problems."

Bentil attended high school in Vermont and chose that state's flagship university because of its small class sizes as well as the financial aid package she was offered. As an undergraduate she strongly considered declaring pre-medicine as a major because of her interest in the workings of the human body. Bentil even completed the coursework to be admitted to medical school but ultimately decided to pursue mechanical engineering, a discipline that she saw as "flexible and diverse."

"While an undergraduate student, I worked on a research project in collaboration with the doctors and surgeons at the University of Vermont College of Medicine. During this project, I realized that there was a need for more engineers with a background in biology. These type of engineers, biomedical engineers, would serve as a liaison between the technical and nontechnical community of medical researchers and practitioners," she said.

"As my undergraduate research project progressed, I became interested in developing diagnostic tools and devices for use by clinicians, rather than working with the patients directly. A mechanical engineering graduate program was the best option for me to pursue these career interests, which is why I ultimately did not apply to medical school. The flexible and diverse nature of the mechanical engineering discipline allowed me to pursue my interest in medicine and biology, but from the perspective of a biomedical engineer."

prohibiting helmet-tohelmet contact between football players, impact to the helmet may still occur and potentially concussions cause or other brain injuries. We are investigating reducing injuries through brain modifications of current helmet designs."

Bentil – who serves as the William March Scholar in Mechanical Engineering – joined the ME faculty at Iowa State University in August 2016 after completing her PhD in mechanical engineering from



## Graduate student honors and awards

**Oswaldo Sanchez** was selected for the National Science Foundation's Graduate Reserach Fellowship Program

**Hossein Taheri** was named a fellow for The American Society for Nondestructive Testing

Fall 2015 Research Excellence Awards Wangyujue Hong Farrokh Sharifi Rahul Singh

Spring 2016 Research Excellence Awards Geetha Chimata Mohammad Mehrabadi Chenglong Wang

Fall 2015 Teaching Excellence Awards Prachi Deshpande Mahdi Ramezani Hossein Taheri

Spring 2016 Teaching Excellence Awards Chad Garber Cuong Huynh Hiep Tran

### ISU's ME ranks 9th nationally

Iowa State University's Department of Mechanical Engineering ranks 9th nationally among public universities, according to U.S. News & World Report's 2017 "Best Colleges" rankings.

ISU is in a three-way tie for the 9th place slot with the University of Maryland-College Park and the University of Wisconsin-Madison. Iowa State's ME program tied with the same two schools for 16th place when private universities are included too.

The Massachusetts Institute of Technology (MIT) took the top overall spot on the list while the Georgia Institute of Technology (Georgia Tech) had the top mechanical engineering program for public universities.

### **ME student named Wallace E. Barron Scholar**

Angadbir Singh Sabherwal (mechanical engineering) and Kaitlyn Aldrich (civil engineering) were named Wallace E. Barron Scholars in spring 2015 for their remarkable achievements in academics and leadership. The Wallace E. Barron Award was established by the lowa State University Alumni Association to recognize outstanding seniors who display high character, outstanding achievements in academics, and promise for continuing these qualities as alumni.

**Angadbir Singh Sabherwal** grew up in Mohali, near Chandigarh, India, where his parents were immensely supportive of his goals, from his travels to Germany and China,

to his journey to the United States. One of the reasons Singh came to lowa State was due his father. who was originally set his sights on coming to Iowa State to study computer engineering, but in the end was not able to attend due to the genocide that happened against Sikhs in New Delhi in 1984. Originally, Singh had applied to more than 25 universities around the world, but when he was accepted to lowa State, he knew it would be the university he would attend.

After considering a couple different degree options, Singh selected mechanical engineering because

he says it has allowed him to work in almost every area he has been interested in over the years.

Being involved in many organizations has helped Singh create a broad network of friends and support. He has been involved as a community adviser, teaching assistant for a manufacturing lab, co-philanthropy chair for Phi Eta Sigma and Alpha Lambda Delta, several volunteering & outreach activities, as an ambassador for Minds of Tomorrow, Board Member of the *lowa State Daily*, and an undergraduate assistant in the industrial assessment center. When asked about the variety of his activities, Singh says he likes to be involved in everything. "I like to be in the background working hard and supporting all these organizations," he adds.

Through Singh's studies, he has earned multiple internships with Van Gorp Corporation, a co-op in North Kansas City with USG Corporation, an internship with Compressor Controls Corporation in Urbandale and is presently pursuing an internship with Siemens PLM. Working with Van Gorp Corporation gave Singh the ability to put his coursework to the test in a small company feel where he was the only intern and wore many different hats, he is extremely thankful to his supervisor. He says working with USG Corporation in Kansas City was one of his most amazing experiences. "This was my first time working for a Fortune



Angadbir Singh Sabherwal, right, poses with Iowa State University President Steven Leath.

600 company. Luckily I was working in a small plant, so it still had the same small feel of my first internship," says Singh. He worked on everything from safety projects to equipment to environmental projects to interacting with Union contractors. Singh's most recent internship is his first actual "desk/computer based" job where he is working on a highly technical software project with Siemens PLM.

Receiving the Wallace E. Barron Scholar Award has had a profound impact on Singh. "I received the notification around 12:30 p.m. while I was attending my heat

transfer class, and it took a few hours for it to sink in. Then I called my parents, where it was 2:00 am in India, and we cried in rejoice," says Singh. According to Singh, the award is a signal to the end of his journey and it is bittersweet, but he believes it is a time to celebrate all that he has accomplished and sacrificed.

After graduation, Singh plans to go into the work industry while pursuing his social entrepreneurship projects, but does not know where. He hopes to find a job that allows him to travel, experience different fields of work, cultures and work with hands-on projects.

Contributed by ECR

### Studying force at a microscopic level

College of Engineering assistant professor researches microscopic fabrication of new materials

His research may involve working with small particles, but **Jaime Juarez**, an assistant professor in mechanical engineering, has big plans.

#### Simulation of colloidal materials

Before Juarez joined Iowa State University, he worked with colloids, or materials that have coexistence between two phases of matter, as a graduate student. "Milk is a colloid, because it's tiny little solid globules of butterfat in water, in a fluid medium."

Juarez's research in colloids revolved around using electric fields to take these colloids and bring them together into intricate structures. He would then study the physics of the structures to understand what forces were required to form them and how to tune those forces to create better structures.

A major problem Juarez faced was how to get a crystalline structure that was without defects. He would monitor the particles in real-time and then create a code from the information to develop the highest quality crystalline structure.

#### Flow cytometry

Moving to the field of flow cytometry as an NIH-supported post-doc allowed Juarez to involve himself with the betterment of people's healthcare. "You start with a sample that contains cells that are tagged with a fluorescent molecule. In flow cytometry, we pass the sample by a laser, allowing the cells to light up. This process helps us screen for a multitude of pathogens such as rare tumor cells."

Juarez's work led him to begin development on a more efficient cytometer. "One of the limitations in this field is that processing a sample of whole blood with a commercial cytometer today would take about 26 hours." To solve this issue, Juarez created a laser line using specialized optics similar to a flow cytometer. The technology can process samples up to 10 times faster than a commercial flow cytometer.

#### Microfabrication through micro- and nano-scale forces

Currently, Juarez's research at Iowa State University focuses on how to control forces at the microscopic level. He says understanding the behavior and interactions of these forces will allow him to create new materials at the nano-level.

The materials Juarez plans to create will hopefully aid in the advancement of optical computing or computers that run on light. Today, computing is traditionally done by microprocessors through the use of semiconductors, but is limited by how many components you can fit onto the microprocessor. Optical computing, on the other hand, uses photons produced by lasers to transmit a much higher bandwidth than microprocessors.



Juarez

According to Juarez, one of the problems that emerges on the microscopic and nano-level is Brownian Motion, or the random motion of particles suspended in liquid or gas. "A great example is if you watch a crowd play around with a beach ball. If you can imagine that the beach ball is very tiny, and all of the people are like the little molecules, so every time one of them hits the ball, it responds to that hit and moves in a different direction."

The problem lies in the fact that to be able to create new material for optical computing, Juarez has to apply a strong enough force to overcome Brownian motion, but not so much that it sends the micro-particles or nano-particles arrangement into disarray. To overcome this, Juarez uses electrical fields similar to his work with colloids as well as developing computer models that predict the response from the material in the electrical field.

Juarez's work integrates chemistry, so he's hoping to recruit people who share similar interests. "We're performing interdisciplinary and cutting-edge research. It's an exciting opportunity."

Outside of his work, he enjoys playing tennis, volunteering at animal shelters and doing activities that take his mind off of his work.

### Paola Pittoni focuses on engaging undergraduate students

As a young student in her home country of Italy, **Paola Pittoni** remembers it was strong teachers that had the greatest impact on her.

Now as a mechanical engineering lecturer herself, Pittoni hopes that she can leave just as lasting an impact on her students.



Pittoni

"The reason I wanted to be a lecturer is because teachers really help to positively shape students and students often remember their good teachers. Good teachers can truly affect their students," she said. "I don't mean to diminish my research in any way because I still enjoy research but at the end of the day if I can have an impact on the world, I feel that I can have a bigger impact on the students I teach than I can with the best research paper I could write."

Not only does Pittoni enjoy teaching more than researching, she also prefers working with underclassmen as well as their more senior classmates.

"I love to teach freshmen because it's one of the most impressionable years," she said. "Some of them come in not really knowing what mechanical engineering is and that's why I love to teach ME 160 [Mechanical Engineering Problem Solving with Computer Applications]."

Another part of Pittoni's teaching emphasis is to redefine the preconceived notions that students may have about mechanical engineering coming into the program. At the start of the semester, Pittoni has an exercise in which she presents a picture to students and asks them to identify the mechanical components. When shown a picture of a car students are quick to identify the transmission and other engine parts but when presented a picture of vegetables, students struggled more to relate it to mechanical engineering.



Pittoni encourages her students to think critically about all the seemingly invisible roles that mechanical engineering plays with the vegetable example. She points out that mechanical engineering goes into the planting and cultivation of the vegetable, combines and other mechanical equipment are used to harvest the vegetable, vehicles transport the vegetable from the farm to the grocery store, and refrigerators preserve the vegetable until it's ready to be eaten.

Pittoni said she knows that she's having an impact on her students because of the emails some send her after taking her classes. She said she's received notes from many different students, from those who have specifically cited her course as helping to prepare them

"I would suggest to everyone, especially undergrads, if they have the chance to go to another country to discover and learn, do it," she said. "They will discover that what they're used to is maybe not the only way."

Pittoni said she thinks almost all study aboard opportunities can be invaluable and remembered encouraging one of her former mechanical engineering students to study aboard with a program offered outside of the department.

Growing up in Italy, Pittoni said there was more of a bias against women pursuing engineering careers. She pointed out that while some Italian terms have both feminine and masculine forms, the term engineer (ingegnere) only has a masculine form. She also recalled being one



ME lecturer Paola Pittoni teaches her Heat Transfer (ME 436) course in Marston Hall on Sept. 23, 2016. Photo by Nick Fetty

for an internship to those who said they thoroughly enjoyed her class despite not performing as well as they would have liked. Pittoni has begun printing off notes and other quotes from her students to decorate a bulletin board she has in her office.

For Pittoni, not only have good teachers

played a substantial role in her personal and professional development but her experience studying in different parts of the world has also been important. Pittoni grew up in Milan, Italy and earned her BS in energy engineering from Politecnico di Milano. She also holds a PhD in chemical engineering from National Taiwan University of Science and Technology in Taipei. She said beyond the obvious academic impact, these experiences helped to give her cultural perspective that she would recommend to any of her students. of about a dozen women in her undergraduate engineering courses, a fraction of the nearly 400 men in the same courses.

Pittoni has channeled her passion for women in engineering by becoming involved with the Women in Mechanical Engineering (WiME) student group on campus. She said she hopes to help continue to grow the group into a strong support network and also offer more outreach that encourages young women to pursue careers in mechanical engineering.

"The reason I wanted to participate in this group is because I think generally speaking, young women are not exposed to what mechanical engineering is about," she said. "I still think that in certain parts of the world and even in the United States there is a bias about girls and women in mechanical engineering. I think this will change in the future I would love to help be part of that change."

### ME lecturer looks forward to his role as a teacher at ISU



ME senior lecturer Mike Messman leads his Mechanical Systems Design (ME 415) course in Hoover Hall on Nov. 8, 2016. Photo by Nick Fetty

With more than three decades of experience between industry and academia, mechanical engineering senior lecturer Michael Messman brings a unique perspective to the department.

Messman joined the lowa State faculty at the start of the 2016-17 academic year after spending nearly a decade at the Clemson University International Center for Automotive Research in Greenville, South Carolina. Previous to Clemson, he had 21 years of experience between General Motors and John Deere. While Messman's ISU position is considerably different than that at Clemson, he said he is enjoying the transition thus far.

"I have found the transition to be relatively smooth. The automotive research program at Clemson was tightly integrated with outside industry, so I was able to basically live in both the academic and the industrial worlds simultaneously. I was interacting with faculty and students at Clemson and engineers from industry on a daily basis," he said. "Now I am focused on teaching."

Messman added that he has felt welcomed by the ISU community during his transition.

"The environment here at ISU is great," said Messman. "Everyone has been so friendly, helpful, and supportive."

At Clemson, Messman managed a test laboratory with full-vehicle automotive testing equipment. His time was split three ways: providing engineering support to research projects, offering test engineering services to outside industry, and teaching. While teaching was about a third of his role at Clemson, he said he is eager to focus more on teaching in his role at ISU.

"I'm looking forward to working with students and continuing to learn. I feel very strongly about engineering and hope to encourage the students to embrace the profession that they are entering," he said.

Teaching actually runs in the Messman family as Michael's wife Joanne recently joined the faculty of the English department at ISU as a lecturer. Prior to that, she taught English full-time at Greenville Technical College in South Carolina.

Even though much of Messman's prior experience has been

in automotive engineering, he noted that many of the same principles apply to the field of mechanical engineering in general.

"The typical engineering skills and equipment used in the auto industry are also found throughout other industries, so I don't purposely make a distinction," said Messman. "However, many examples I use while teaching are related to automotive or off-road equipment since that is my base of experience."

This semester, Messman is teaching Mechanical Systems Design (ME 415), which is the capstone project often taken by fourth year undergraduate students. Messman said that he likes that the course allows students to showcase the knowledge and skills they've learned from the ME curriculum.

"The course, depending on individual projects, involves a wide range of engineering skills. That makes it a fun challenge. One of the things we emphasize is that the students follow practices that are common in industry. There is also a very strong project management element. We want to give the students a real world experience and apply the skills they have learned over the four years they have been studying engineering," Messman said.

Messman holds a BS in Mechanical Engineering and a MS in Engineering Mechanics, both from the University of Nebraska-Lincoln. The Nebraska native said that he has observed many changes in the field of mechanical engineering over the years.

"There is no question that the computer-electronic control and internet connectivity of nearly all engineered systems has been a huge change over the years," said Messman. "In addition, advances in materials and processing have been significant. I also think the pace of work in industry has increased so much that engineers don't always have enough time to put in as many engineering hours on projects that they would like or feel they need to."

Messman has dabbled in various subfields and settings within mechanical engineering, and he encourages his students to explore the diverse range of professional opportunities that a degree in mechanical engineering can offer.

"A degree in mechanical engineering can lead to a wide range of career opportunities as there are so many individual fields of practice under the mechanical engineering umbrella. I have observed colleagues staying 'technical' while others transition into management and have had very successful careers. Mechanical engineering is also a great degree for someone interested in pursuing advanced degrees in other fields such as business or law. There is a wide open world out there for a mechanical engineer."



ME senior lecturer Mike Messman works with student groups during his Mechanical Systems Design (ME 415) course in Hoover Hall on Nov. 10, 2016. Photo by Nick Fetty

#### Faculty and staff honors

#### Robert Brown, Professor

2015 Don Klass Award for Excellence in Thermochemical Conversion Science Patent for "Selective temperature quench and electrostatic recovery of bio-oil fractions"

Patent for " Method for PreTreating Lignocellulosic Biomass" Patent for " Bio-Oil Formulation as an Asphalt Substitute"

#### **Ganesh Balasubramanian,** Assistant Professor

2016 American Society of Engineering Education Mechanical Engineering Division New Educator Award

Matt Hagge, Senior Lecturer 2016 ME Professor of the Year

Nastaran Hasemi, Assistant Professor 2016 University Honors Committee Award for Teaching and Mentoring

Ming-Chen Hsu, Assitant Professor 2016 Thomson Reuters 's Web of Science Highly Cited Researcher

#### Shan Hu, Assitant Professor

2015 Black & Veatch Building a World of Difference Faculty Fellowship in Engineering

Valery Levitas, Professor 2016 ISU Award for Outstanding Achievement in Research

Mark Mba-Wright, Assitant Professor 2015 Black & Veatch Building a World of Difference Faculty Fellowship in Engineering

#### Alyssa Mittleider, Academic Adviser

2016 Professional and Scientific Council CYtation Award Winner

#### Soumik Sarkar, Assistant Professor

2015 Black & Veatch Building a World of Difference Faculty Fellowship in Engineering

2016 Air Force Office of Science Research's Young Investigator Program award

#### Travis Sippel, Assistant Professor

2016 Air Force Office of Science Research's Young Investigator Program award

#### Sriram Sundararajan, Professor

2016 Fellow of the American Society of Mechanical Engineers

John Wagner, Academic Adviser 2015 Superior Engineering Advisor Award

# Giving students more control of their learning

ME lecturer emphasizes interactive classrooms at lowa State

Growing up in Ames means having lowa State University in your backyard. For **Margaret Mathison**, it also meant the chance to experience engineering at a young age.

As a sixth grader, she and her friends built a solar-powered car and raced it at an event held on campus, and during the summer of her junior year of high school, Mathison attended an ISU engineering camp.

"Those hands-on, interactive learning opportunities have really stuck with me. I try to integrate that same approach in my classrooms, because it works so well for keeping students engaged in the subject," she said.

Mathison, who graduated from Iowa State in 2005, will be putting her philosophy to work in mechanical engineering courses as a lecturer for the department.

While she says there's still a lot that's familiar about her alma mater, she's glad to see a great deal of growth and advancement has taken place on campus since she was last here.

"There are new buildings to explore and new technologies developed since I graduated," she said. "But in this discipline, you can always count on things like thermodynamics to stay constant. There's been a good balance of building and innovating in mechanical engineering."

During her time as an undergraduate student, Mathison spent nearly as many hours in the Music Hall as she did working on her engineering coursework. She says her hobbies enriched her college experience and continue to provide her with an outlet.

Her undergraduate years were also when she learned about heating, ventilating and air conditioning, the focus area that would eventually become her area of expertise. "HVAC was the one thing I said I'd never study, and it ended up being the area I liked the most. Moments like that made me realize how important it is to be open to different opportunities. You never know what you could be missing," Mathison said.

After she graduated from Iowa State, she earned a PhD from Purdue University in 2011 and then worked as an assistant professor of mechanical engineering at Marquette University for four years. She says her experience has taught her a lot about management as well as effective approaches in the classroom.



Mathison

Now, she is teaching courses in mechanical engineering design and thermodynamics. "Design is a new area for me, but it's exciting to see how the course has evolved since I took it," Mathison said. "When I was here, we made adaptive devices for local children. Current students are designing micro-economy kits for developing countries."

Mathison will also work with Greg Maxwell, associate professor of mechanical engineering, to learn about the HVAC fundamentals and design courses he teaches. "Professor Maxwell taught me as an undergraduate and helped guide my career. It will be nice to continue learning from him in this new capacity," she said.

As she settles into her position, Mathison plans to get involved in the local and student chapters of ASHRAE – the American Society of Heating, Refrigerating and Air-Conditioning Engineers. She says Maxwell has built great connections between the HVAC courses he teaches and the professionals who are looking for HVAC engineers, adding that his coursework does a great job preparing students interested in this career path.

In her classroom, students can expect a mix of teaching styles.

"While there are a lot of new tools for teaching available, something as simple as giving students time to work on problems in class can make the experience more engaging and effective," Mathison says. "I'm looking forward to developing demonstrations and examples that allow students to relate their courses to their world."

# Using control-based approaches to study nano-biomechanical properties of cells

#### Assistant professor hopes to use her research in biomedical applications

While **Juan Ren** was growing up, she was surrounded by a family of teachers who kept a watchful eye over her studies. As she began working on her degree in engineering, she never planned on joining the family

tradition in education until she served as a teaching assistant during her PhD program at Rutgers University.

"I found I really liked to communicate and discuss problems with the students, and that made me start thinking I could be a college teacher, too," she says.

Now, Ren is a new assistant professor in mechanical engineering at Iowa State University. She will be teaching a course in controls and dynamics, which ties back into the fundamentals of her research studies.



Ren

"Although the application area of my research is in biomechanical studies, the approach we use is still based on control and dynamics theories," she says.

Her work focuses on the nano-biomechanical properties and nanomechanical properties of soft material samples and bio samples. These properties can include physical systems, such as elasticity, thermal components or temperature, as well as kinetics, or the study of forces on a mechanism.

Eventually, Ren indicates she wants to work with nano-controlled approaches to develop nano-devices that build complex bio samples to mimic the biological phenomenon. For example, something she could develop would be a small instrument that can replicate a cell in your body and carry out the functions of the original biological cell.

Before she can get there, though, she has to overcome some challenges, such as accurately modeling soft and biological samples. She also has to work to fill the gap between nano-mechanical properties and biochemical reactions where substances interact to create other substances on a cellular level.

To solve these issues, Ren plans to create a set of criteria to test nano-mechanical properties in order to find a correlation between nano-mechanical property changes and biochemical responses.

Ren's long-term goals consist of having a biomechanical study center with an atomic force microscope. This microscope will allow her to combine morphology scanning with property mapping of samples. She also wants to have a nanofabrication center to fabricate and manufacture nanostructures and biomedical devices.

Outside of her work, Ren enjoys playing the piano, hiking and riding bicycles with her husband. "I really love lowa, and I have family here, so I enjoy it very much. The whole family is very happy to be here."

Ren says she's looking forward to working with students interested in material properties and biomaterial studies. She also encourages female students to look into her research as well as to try their hands at physics and math, something she fell in love with once she gave it a try.

Contributed by ECR

#### James Michael: Following his engineering dreams with energy and combustion research

*ME* assistant professor uses applied physics and aerospace background to develop spectroscopy methods for thermo-fluids systems

Engineering has always been **James Michael**'s calling. The new mechanical engineering assistant professor says he knew from the age

of 12 that he wanted to be an engineer.

"Originally, I thought I wanted to be an astronaut, but most of them are engineers too," Michael says. This interest led to a start in aerospace engineering, where he became interested in combustion and energy.



wiichaei

Michael attended the University of Maryland for his bachelor's degree. He then went on to get both his M.S. and Ph.D. in mechanical and aerospace engineering from Princeton University, where he did work in plasma-assisted combustion and remote sensing.

"In graduate school, I picked up spectroscopy as a tool to study engineering systems, and that's what I've been building my research interests around," Michael says. "I work on developing spectroscopic tools to make measurements for thermo-fluid systems. Encoded in the light-matter interaction are thermodynamic quantities ranging from pressure to temperature to species concentrations in reacting and combusting systems."

Michael says what really stands out about his work is how it can provide intuition into the operation of complex systems. "My research has applications from chemistry at small scales all the way up to industrial scale power generation."

One of his current projects is with the Bioeconomy Institute, looking at fast pyrolysis, which he says is one potential route for the future of energy. He's also working on multi phase flow problems where he analyzes materials in mixed states. "There's a whole array of multi phase flow problems in energy and defense applications, where we have to study gas/liquid, gas/solid or solid/liquid mixtures."

At ISU, Michael is developing a research program to study multi phase and reacting flows, as well as teaching thermofluids classes in the mechanical engineering department



Mechanical Engineeriing lecturer Mirka Deza teaches a section of Engineering Thermodynamics at Town Engineering Building on October 18, 2016. Photo by Nick Fetty.

### ME's Mirka Deza focuses on biorenewables

lowa's role as one of the nation's agricultural leaders extends beyond helping to feed the rest of the country and other parts of world.

Corn, for example, can be used for everything from pharmaceuticals that keep us from becoming ill to providing the fuel that helps to meet our energy needs. The latter is part of the research emphasis of mechanical engineering lecturer Mirka Deza.

Deza comes from a family of engineers as her brother and one of her sisters have degrees in mechanical engineering while her other sister holds a PhD in civil and environmental engineering from Iowa State University. Deza's formal experience in mechanical engineering began when she was an undergraduate at Pontificia Universidad Católica del Perú where she graduated with her BS in 1997. She then spent some time working in Peru first at a cement plant and then at an agricultural product company before enrolling in graduate school at ISU in 2002.

She graduated with a MS in mechanical engineering and biorenewable resources and technology in 2006. During that time, she also served as a student engineer at the Industrial Assessment Center. She then went to Virginia Tech University where she graduated with her PhD in mechanical engineering in 2012 before returning to ISU as a postdoctoral research associate

Deza said the decision to come back to ISU was an easy one.

"I initially returned as a research because ISU is one of the major universities doing research in

biorenewable resources and energy," she said. "They have a pool of excellent faculty researchers and state of the art high performance computers to perform computational fluid dynamics - or CFD - simulations."

In addition to research, Deza also teaches undergraduate courses focused on thermalfluids and energy. At ISU she has taught Engineering Problems with Computer Applications (ENGR 160),

Mechanical Engineering Problem Solving with Computer Applications (ME 160), Engineering Thermodynamics I (ME 231), and Introduction to Mechanical Engineering Design (ME 270).

"Teaching is such a rewarding experience. I just got more involved with my classes, and turned out to be what I really wanted to do," she said. "ISU offers a multicultural and diverse environment and makes it very competitive and ideal for getting an engineering degree."

especially rewarding to see her students grow throughout their college experience and eventually gravitate toward certain subfields within mechanical engineering. She has had past students tell her how her classes have helped to prepare them for everything from internships to graduate school.

Deza was part of four new faculty hires in ME for the 2016-17 academic year which included assistant professor Sarah Bentil, lecturer Paola Pittoni, and senior lecturer Michael Messman. Deza said that by having more women on the faculty - considering the field has historically been dominated by men - it can be beneficial in recruiting young female students.

"Speaking from personal experience, since I started college and went through industry and academia, I believe having female faculty is beneficial to the field due to the inclusion of diverse ideas and contributions. It also gives female students who want to pursue a career in engineering a role model," Deza said.

In addition to promoting gender-balance on its faculty, another emphasis by the department has been to show the versatility that a mechanical engineering degree can offer to students. Deza said that a degree in mechanical engineering can help students prepare for everything from careers in industry to academia in many different subfields.

"We need to show students that ME can involve working in industry, doing research in a lab, programming in a high performance computing environment, or going to academia, which you can do in multiple fields such as medical, agricultural, aerospace, nuclear, and environmental," said Deza. "I always tell my freshman students, 'Whatever you decide to do, you must contribute to society. You will get all the technical knowledge you need



Colin Lapaczonek, a junior mechanical engineering major, takes notes during She added that it is Deza's class. Photo by Nick Fetty.

to succeed, but ultimately, the sense of serving society is what will keep you growing professionally."

### Alum creates cloud-based application to make payments easier between owners, contractors, and designers

Throughout his career, ISU alum John Trickel has been providing companies across lowa with engineering expertise for everything from electrical lighting to plumbing to energy efficiency. Trickel, who earned his bachelor's in mechanical engineering in 1993, owns the company VGI Design, and the impact of his work

popularity of the internet and e-processing in the construction industry. In early 2000 he got to pursue this interest when he signed on to help with the Des Moines Public School District's 10-year \$350-million renovation program as an adviser for the district's web-enabled project management processes.

can even be seen on Iowa State's campus through the application ezNetPay®.

Trickel created ezNetPay®, a cloud-based application designed to help make payments easier between owners, contractors and designers. Initially, the application was used to solve issues within the Des Moines Public School District, but it is now being utilized across the state and Midwest, including within ISU's facilities planning and management group.

"We evaluated ezNetPay® and

found that it was pretty economical, met our needs, and partly because John is an Iowa state alum and he has been a good partner," says Dean McCormick, the director for ISU's facilities planning and management group.

Trickel's drive to succeed started before he came to Iowa State to pursue his degree. He worked as a certified pipe welder and fitter, and later become a journeyman and master plumber. He started his education at the Des Moines Area Community College before transferring to Iowa State. Trickel continued to work at an engineering firm, and the commute from Des Moines made it hard for him to find time to study. "If I wasn't in class, I was working, spending time with my family or at the kitchen table at home. It was rare that I could find time to study," he says.

After he graduated from Iowa State, Trickel became interested in the ever-growing

**Faculty Promotions** 

Mark Bryden, promoted

Sarah Bentil, appointed William March

Abhijit Chandra, appointed Associate Chair

for Graduate Studies

Scholar in Mechanical Engineering

During this project, Trickel noticed that connecting payments between owners, designers, and contractors was a big issue during the design and construction process. For example, a large construction project can involve hundreds of labor and material cost items of documentation across multiple parties. Sorting through and organizing this information takes time, money and manpower.

That's where he got

the

idea for ezNetPay®. Innovating a mathematically complex software solution into a collaborative web-enabled database including a back banking e-payment process proved to be a huge challenge for Trickel, but he's glad he stuck with it. To date over a billion dollars of contract value has been processed through the ezNetPay® system.

Although Trickel has numerous patents with ezNetPay® he says he continues to look for innovative new market processes that eliminates the traditional time it takes for money to recirculate in the local economy. He says these processes will unlock the barriers that block the flow of funds between owners, designers and contractors, as well as educate those who make financial decisions. "Continued enhancement of the application will allow clients to focus more on project quality and completion, not processing payments," he says.

Contributed by ECR

Atul Kelkar, signed Intergovernmental Personnel Act (IPA) agreement as Program Director for the National Science Foundation's Dynamics, Control and Systems Diagnostics program

Song-Charn Kong, promoted to Professor. Also signed Intergovernmental Personnel Act (IPA) agreement as Program Director for the National Science Foundation's Visiting Scientist, Engineer, and Educator Program

### **ME alum selected for NSF** graduate research fellowship

Jill Middendorf, an alumna from lowa State's mechanical engineering program, received a graduate research fellowship from the National Science Foundation (NSF). She is currently working on her master's degree in Cornell University's mechanical and aerospace engineering program. Her research focuses on lubrication mechanisms associated with cartilage specifically related to temporomandibular joint, or TMJ, tissue. She is trying to determine the best treatment measures to better identify and treat the unique properties of TMJ disorders.



Middendorf

Middendorf will continue her research as an NSF fellow in her current department with professor of mechanical and aerospace engineering Larry Bonassar. She will also explore how research affects industry by visiting local hospitals and working with corporations. "I'm excited to have more flexibility in my graduate program and be able to spend more time researching," said Middendorf.

Pranav Shrotriya, promoted to Professor

Sriram Sundararajan, promoted to Associate Dean for Academic Affairs with the College of Engineering

Eliot Winer, promoted



Trickel



to Professor

to Professor

### Chao Hu: Improving reliability analysis and design methods

New ME professor explores engineering design under uncertainty and the design of lithium-ion rechargeable batteries

After he gained a B.E. in engineering physics from Tsinghua University and a Ph.D. in mechanical engineering from the University of Maryland, College Park, Chao Hu spent four years in the medical device industry. Now, he is ready to share his industry experience with students and engage in more research as an assistant professor in mechanical engineering at Iowa State.

Hu has two main focus areas for his research, the first of which is engineering design under uncertainty. In this research area, the

techniques of reliability analysis and design optimization are integrated develop reliability-based design to methodologies that offer probabilistic approaches to engineering design.

"Reliability-based design attempts to find the optimum design of an engineered system that will minimize the cost and satisfy a target reliability, while also accounting for uncertainty in parameters and design variables," he says.

Hu works with methods that enable efficient uncertainty propagation and reliability analysis. These methods drastically reduce the computational cost of reliability-based design, and have the potential to broaden the application of engineering design under uncertainty to complex engineered systems, such as aircrafts and nuclear power plants. "These are engineered systems that have large dimensions and/or involve expensive simulations."

The second focus of his research is on design for failure prevention of lithiumion batteries. Hu is working to develop

robust prognostic methods for improving the operational reliability and safety of the lithium-ion battery. "Compared to conventional batteries, a lithium-ion battery has a higher energy density, which contributes to its successbut also raises safety concerns," Hu says. "For example, a lithium-ion battery pack could rupture or even explode under shortcircuit conditions."

To address these issues, Hu is developing prognostic methods to

#### Alumni career updates

Steve Kistner (BSME '98) was appointed general manager of Sioux City-based Kalins Indoor Comfort in 2015. His responsibilities include improving business processes, managing operations, and organizational development. In addition to his mechanical engineering degree, the South Dakota-native also holds an MBA from the University of Minnesota's Carlson School of Management.

In November, Michael Mack (BSME '79, MSME '81) retired from his position as Group President, John Deere Financial Services, Global Human Resources and

predict the remaining useful life of a battery while taking into account various sources of uncertainty (e.g., cell-to-cell variations and future loading conditions).

His approach uses fast and efficient machine learning techniques to speed up data processing for on-board applications.

"The success of this research will produce major advancements in extending battery life and durability, and will potentially lead to

> development of battery-powered vehicles that are more reliable and efficient than current models and that can drive farther on a single charge," he adds.

> While Hu is very passionate about his research, he is thrilled to start teaching. "I love interacting with students and seeing that I can transfer my knowledge to students while also learning from them."

> Before coming to Iowa State. Hu worked as a principal scientist at Medtronic in Minneapolis, Minnesota. Medtronic is the world's largest medical technology company, specializing in implantable medical devices such as pacemakers, defibrillators and neurostimulators.

> These devices need batteries to run, so Hu's work on lithium-ion rechargeable batteries started at Medtronic. "I worked for a while on reliability analysis, modeling, designing and testing for the next generation of rechargeable batteries. After that, I started to focus on developing and evaluating new battery chemistries to meet emerging needs."

> Both Hu and his wife, Li, will be teaching at lowa State this fall (Li works in the accounting department in the College of Business). Their

jobs have kept them living in different cities since the time they met, so they are excited to finally be together in Ames.

"I would have to travel back and forth between Minnesota and Washington, D.C., all the time. It's been a long journey, but we are so glad that we are now working at the same place, and we will live together to raise our little one here in Ames."

Contributed by ECR

Public Affairs. The Waterloo-native began his career at John Deere as a summer intern and spent more than 30 years with the company in various positions across the United States and Europe.

Luke T. Mohrhauser (BSME '05) has recently been named a member of the law firm McKee, Voorhees & Sease, PLC where he was previously an associate attorney. Luke joined the firm after graduating with honors from Creighton University School of Law in 2009. Prior to that he clerked at the firm while still at Creighton. His undergraduate degree is in Mechanical

#### We want to hear from you! www.me.iastate.edu/alumni-submissions

Engineering (BSME 2005) from Iowa State University. Luke's practice focuses primarily on patent prosecution in the mechanical, electrical, and business method arts. Luke also practices in trademarks, copyrights, and licensing.

The CEO of Prince Manufacturing Corporation, George Sully, (BSME '72) began his retirement on April 1. He had been working for Prince since 1980 and was originally hired to develop the corporation's R&D laboratory. Sully will be succeeded by Dan Van Eldik.



Hu

### Engingeering runs in the family for three generations of ISU alums



From left, Lyle Feisel (BSEE '61, MSEE '63, PhDEE '64), Patty Cargill (BSME '80), and Allison Cargill (MSME '16).

For the Cargills, engineering is a family matter.

Three decades of Cargills have walked the halls of Iowa State University beginning with Patty Cargill's father – Lyle Feisel – who studied electrical engineering in the late 1950s and early 1960s. After earning his B.S., M.S., and Ph.D. degrees from ISU, Lyle went on to have a half-century long career in academia beginning as a professor at the South Dakota School of Mines and working his way up to Dean of Engineering at the State University of New York at Binghamton.

It was at ISU that Lyle met his future wife – Dorothy Stadsvold – who studied home economics. Both Lyle and Dorothy were first-generation college students who grew up as Iowa farm kids in Tama and Exira respectively.

Roughly two decades after Dorothy and Lyle roamed the ISU campus, their daughter Patty decided to follow in her parents' footsteps graduating with her B.S. in mechanical engineering in 1980. While Patty deviated from her father a bit by pursuing mechanical as opposed to electrical engineering, she said both parents played a major role in her education particularly at a time when women weren't necessarily encouraged to pursue careers in engineering.

"Both my parents encouraged me to go into engineering, once I decided that math and science were areas of interest. I certainly got minimal encouragement from teachers and counselors at my school. Girls in engineering were still something of a novelty in the 1970s," she said. "But my dad had female students and saw that they could do well, and that they were a welcome addition to the engineering school culture."

It wasn't just the family support that she had that attracted her to mechanical engineering but she also had a genuine interest in field.

"I really enjoyed seeing mechanical motion and learning to quantify and control it. And once I started learning fluid dynamics and seeing all the beautiful and fascinating possibilities of flow structures, I was hooked," she said.

Patty worked closely with Dr. Ted Okiishi (now a professor emeritus) who greatly influenced her interest in turbomachinery. She spent two summers working on automatic transmissions for General Motors in Indianapolis and one summer doing compressor research at the von Karman Institute for Fluid Dynamics in Brussels, Belgium.

After graduation Patty took a job with GarretTurbine Company in Phoenix, Ariz. It was there that she met her husband Greg and the couple moved to Cincinnati in 1987 after being offered jobs with GE Aviation, where both of them still work today. Not long after moving to Ohio the Cargills had their first child, Allison Anne.

Allison became the third generation of ISU alums in her family after graduating with her M.S. in mechanical engineering in August 2016. Her grandfather, mother, father (who studied mechanical engineering at Arizona State University), and aunt (Margaret Feisel Craig) were all influential in helping her to decide to pursue a career in engineering.

"Having so many engineers in my family, I was able to see first-hand that engineering can take you anywhere, from academia like with my grandpa to managing a technical group as my mom did to serving as executive leadership for technology companies like my mom's sister Margaret," said Allison. "It is really about problem solving and analytical thinking, and I think most people would agree that the world has all kind of problems to solve."

Allison also cited a fifth grade school project in which she wrote a biography about her grandfather as having a major influence on her to pursue a career in engineering. She was inspired by the fact that her grandfather grew up in rural lowa – about 60 miles east of Ames – but his career in engineering took him all around the world.

While Allison was greatly influenced by the elders in her family, she influenced her younger brother Jeff to pursue a career in mechanical engineer and both hold B.S. degrees from Purdue University. Allison considered ISU for her undergraduate studies but ultimately chose Purdue as the campus was only about three hours from her home, compared to ISU which is about three times that distance. Before college was even on either of their radars, both Allison and Jeff showed an interest in engineering.

"Growing up, my brother and I had toys like marble runs, Legos, and craft kits – all things that allow kids to create, construct, and problem solve. And we were always encouraged to ask why. For example, my mom says that she knew I would be an engineer when I asked her why bicycles keep moving even when the person stops pedaling," Allison said. Allison's childhood love for crafts has come full circle as she was recently hired by Horizon Group USA, a craft company based in Warren, New Jersey. She started earlier this month and works as a design engineer in product development. While many of her life experiences helped to shape her professional development, she said her graduate studies have been invaluable, especially in terms of working in an international setting and tackling long-term projects.

"I took two graduate courses with globalization focuses, ME 584 [Technology, Globalization and Culture] and ME 605X [Broader Impacts of Engineering], and those helped prepare me to work in a global setting by exposing me to diverse viewpoints and backgrounds," said Allison. "In grad school I was also able to work on a wide variety of projects, some that lasted a few weeks and some that lasted over a year. This prolonged project experience was really helpful in teaching me how to set long term goals and manage time and resources effectively."

During her time at ISU Allison worked closely with ME assistant professor Jonathan Claussen, who was beginning his career at ISU at the same time Allison was starting graduate school in the fall of 2014. Allison and Jonathan shared a Purdue connection – Jonathan earned his PhD in biological engineering from Purdue in 2011 – but that wasn't the only reason that Allison chose to work with The Claussen Lab.

"When we met to talk about research opportunities, I found that even though I didn't know anything about the topics he worked with [nanomaterials and biosensors] he explained them in a very clear way, and I could easily see the potential impact that they could have on end users. So I guess it was a combination of things that made his group attractive – the research was interesting and impactful, he is a very dynamic and enthusiastic professor, and we were both new to Iowa State," Allison said.

Even though she's only been away from Ames for about a month, Allison said she already misses her church – Harvest Vineyard, the "great local beer" at Alluvial and Torrent, and the strong community culture.

"The ISU and Ames communities have been so great to our family. When I moved to Ames two years ago I didn't know anyone, but I left feeling like a true part of the community," Allison said.

Not only did Allison feel that she was welcomed by the community but she also recognized that a large part of her family's history was







Patty (left) poses with Allison after Allison's commencement ceremony. shaped by ISU and Ames.

"In general, I loved being in a place that is such a huge part of my family history. My grandparents met on a blind date when they were both ISU undergrads, the apartment I lived in at ISU looked out onto the apartment my grandpa lived in when he was an undergrad, my mom played the bell tower carillon when she was at ISU so when I heard that I'd think of her, and the list goes on and on," said Allison.

"My favorite family story is about Beardshear Hall. My grandma had class in there and my grandpa had class on the other side of campus, and she would wait for him on the steps as he walked across central campus. I always thought of that when I walked across central campus, and it made me feel very connected."

Like daughter like mother, Patty too gets nostalgic when thinking about her time at Iowa State.

"I always loved lowa State's gorgeous campus through all the seasons. I find lowa people to be truly salt of the earth – intelligent and well educated, personally conservative with solid values, but accepting others and embracing their differences," Patty said.

As women in engineering, both Patty and Allison encourage girls and young women to pursue careers in the field, despite it historically being dominated by men.

"My first advice is to choose a field that really interests you. If you're lucky you will fall in love with it," Patty said. "That said, engineering can be a fantastic field for women. I have felt very little negative impact for being a woman. Men generally like having women around, and engineers can recognize good work and solid contributions, wherever it comes from."

Allison agrees with her mother's sentiment and also encourages aspiring female engineers to get involved with Women in Mechanical Engineering, the Program for Women in Science and Engineering, and other student groups on campus.

"My advice is to find a support network of like-minded women who will encourage, motivate, and inspire you," Allison said. "There were many times that I wanted to give up, but with the encouragement and advice from my friends and mentors I was able to work through the difficult times."



# ME professor emeritus William Bathie honored for service

**William Bathie**, P.E., of Ames, Iowa, has been awarded the National Council of Examiners for Engineering and Surveying (NCEES) Distinguished Examination Service Award for his dedicated service to NCEES and the engineering profession. Bathie received the award at the organization's 94th annual meeting, held August 19–22, 2015, in Williamsburg, Virginia.

Bathie began volunteering with the Principles and Practice of Engineering Mechanical Exam Development Committee in 1979 and has attended almost all of its meetings over the last 35 years. His service and leadership were key during two major transitions for the PE Mechanical exam. He served as vice chair of the exam's development committee from 1993 to 1998, during the exam's transition from essay only to a combination of essay and multiple-choice questions. He then served as chair from 1998 to 2003, during which time the exam changed to a complete multiple-choice exam with depth and breadth sections.

Today, he remains an active member of the PE Mechanical Exam Development Committee. This includes serving as "exam champion" for the Thermal and Fluid Systems module for two exams, which involves working with an exam from assembly through administration to the review of final performance statistics to ensure consistency. He also continues to be a resource and mentor for new leaders on the Thermal and Fluid Systems subcommittee.

A licensed professional engineer since 1968, Bathie is an emeritus professor of mechanical engineering at Iowa State University. He is also a graduate of Iowa State, receiving his bachelor's and master's degrees in mechanical engineering. He is a member and Fellow of the American Society of Mechanical Engineers. In memoriam

**Richard Pletcher**, mechanical engineering professor emeritus, passed away September 12, 2015 at the age of 80.

Dr. Richard (Dick) Pletcher was born in 1935 in Elkhart, Indiana. He graduated from Purdue University with a B.S. degree in mechanical engineering in 1957. He married Carol Robbins on



Pletcher

June 9, 1957 in Elkhart, and from there the couple left for Dick's active duty in the U.S. Navy in California. Dick served as Ensign and Ltig for 3 years with amphibious forces in the Pacific. He was an engineering officer of a landing craft and an assistant gunnery officer on a landing ship dock from 1957 to 1960. He spent 2 years with United Aircraft Research Laboratories in Hartford, Connecticut from 1965 to 1967. Dick returned to academia and attended Cornell University for graduate school, receiving M.S. and Ph.D. degrees in mechanical engineering. He joined the faculty of Department of Mechanical Engineering at Iowa State University in 1967 until his retirement in 2007, after 40 years. During his time at Iowa State, he also served as Director of the Computational Fluid Dynamics Center. He was a Fellow of the American Society of Mechanical Engineers and an Associate Fellow of the American Institute of Aeronautics and Astronautics. His life's work contributed greatly to the ISU Department of Mechanical Engineering's strong reputation in education and research. Dick received the ASME Heat Transfer Memorial Award in Science in 2009.

He was an associate editor of the Journal of Heat Transfer and served on the editorial advisory board of Numerical Heat Transfer. Dick conducted basic and applied topics in fluid dynamics and heat transfer. He served as principal investigator for numerous research grants from sponsors such as NSF, NASA, the Army Research Office, Allison Gas Turbines, John Deere, Department of Energy, Air Force Office of Scientific Research and served as a consultant to industry and government. He gave many invited lectures throughout the world. He authored or co-authored over 80 journal articles and several books, the most notable of which was Computational Fluid Mechanic and Heat Transfer, a textbook that survived three editions over a 30 year period. It was one of the first texts available in that emerging field made possible by the digital computer. He served as major or co-major professor for 33 doctoral students and 17 master's students. Dick was an active member of Collegiate Presbyterian Church, Town and Country Kiwanis, and an avid fan of ISU women's basketball. Dick loved his family, Brittany dogs, hunting, fishing and computational fluid dynamics. He is survived by his wife of 58 years, Carol, three children, and six grandchildren.

Contributed by ECR

#### In memoriam



Mischke

*Charles Mischke*, mechanical engineering professor emeritus, passed away September 10, 2016 at the age of 89.

Dr. Charles Mischke, a previous professor in mechanical engineering and former Division Leader of the Machines and Systems Unit in the Department of Mechanical Engineering,

passed away September 10, 2016 at Bickford of Ames assisted living facility in Ames. Charles Russell Mischke was born in New York City in 1927 to Reinhardt Charles Mischke and Dena (Scholl) Mischke. He earned his bachelor's degree in mechanical engineering from Cornell University through the Naval Reserve Officers Training Corps (NROTC) and served a two-year stint as an officer in the U.S. Navy upon graduation. He continued on in the Naval Reserve for 29 years after his active duty. In 1951, Charles earned his master's degree in mechanical engineering from Cornell University where he met and married fellow graduate student Margaret R. Bubeck that same year.

Charles completed his Ph.D. in mechanical engineering with honors from the University of Wisconsin-Madison in 1953. His 42-year academic career began at the University of Kansas in 1953 before moving to the Pratt Institute in Brooklyn, New York in 1957 where he served on the faculty and eventually the department head of mechanical engineering. Charles came to lowa State University in 1964 and served on the faculty in mechanical engineering until his retirement in 1995. During his three-decade career in Ames he contributed to advancements made in the field of computeraided design. He also published several mechanical engineering textbooks during his tenure, including the widely-used Machine Element Design. Outside of academia, Charles was active as a scoutmaster for Boy Scout Troop 269 in Ames and also served as a certified conductor, trolley motorman and diesel locomotive engineer for the Boone & Scenic Valley (B&SV) railroad for 15 years after his retirement from ISU. Charles is survived by his brother, wife, two sons, and two grandchildren.

#### Alumnus John William McKiernan (MSME '43) passed away April 7, 2016 at the age of 93

John McKiernan was born in Hannibal, Missouri in 1923. He earned degrees from the University of Missouri and Iowa State University before joining the Army Air Corps as a B-24 pilot and serving in Word War II. After his service, McKiernan worked as a mechanical engineer for Sandia National Laboratories in Carlsbad, New Mexico from 1951 to 1985. Throughout his carrer he was also active in leadership roles for the American Society of Mechanical Engineerings.



McKiernan



ME alum Dale Johnson flanked by aerospace engineering students Ben Waalen (left) and Matt Gustafson (right). Dale's wife, Jan Johnson, stands in the foreground.

### A scholarship with a purpose for all

Dale and Jan Johnson knew quiet retirement wasn't enough for them. For the past eight years, the couple has been investing in relationships with students and a future of engineering.

The Johnsons, originally from Marshalltown, Iowa, moved to Mahtomedi, Minnesota, in 1962 after finishing their time at Iowa State, Dale with a B.S. and M.S. in mechanical engineering and Jan with a B.S. in applied art. After working at 3M for 35 years, Dale started work with the local high school to build a district-wide focus on engineering.

At this time, the Johnsons looked at the endowments their family had already established at Iowa State to find ways the funds could be integrated into Mahtomedi's new engineering initiative. As a result, the endowments are now supporting scholarships offered to any graduating senior from Mahtomedi who comes to Iowa State to study engineering.

"We're not trying to make engineers in Mahtomedi," says Dale. "We're trying to show kids what project-based learning is and what they can do with their knowledge base to solve problems."

The scholarship, worth \$2,000 per student per year, has been offered for eight years, including to nine freshman this year, bringing the total number of students who have received the scholarship so far to just under 40. The Johnsons have also decided to expand the reach of the scholarship so that the same scholarship is now offered to students from their hometown of Marshalltown as well.

But what's perhaps most important to the Johnsons is staying connected to the students they are supporting. Matt Gustafson, a junior in aerospace engineering and a recipient of the scholarship, says he is appreciative of the guidance Dale has been able to give him. "Dale has been helping me with figuring out what I want to do. He really has a good idea of how the whole engineering world works, and it's great to talk to him about things like that."

Ben Waalen also says he is grateful for the hands-on support. "Especially in high school, it's a lot of stress trying to decide where to go when you're going into engineering," says the AerE junior. "The Johnsons were some of the few people who showed me around and said they'd help me go to college, too."

The Johnsons get all the scholarship recipients, past and present, together at least once every year so the recipients can get to know each other and keep in touch with Dale and Jan. "I feel like all of these students are part of my family, I really do," Dale says. "You feel like you've got all these conditional kids, and you want to help them and see them do well."

Mechanical engineering freshman Joe Broberg says this feeling of support has been one of the most meaningful parts of the scholarship. "It's nice to know someone believes in you and wants you to do well. It gives you extra motivation to work hard because it doesn't feel like you're going through school by yourself."

Dale and Jan say this involvement has allowed them to keep a purpose in their life. "It's really an opportunity to create something in your retirement to help build the future," says Jan. "All we're saying is to keep a purpose in your life and don't start living without one," Dale adds.

Contributed by ECR

#### Two ME professors receive Air Force research awards

Mechanical engineering assistant professors **Soumik Sarkar** and **Travis Sippel** are recent recipients of the Air Force Office of Science Research's (AFOSR) Young Investigator Program (YIP) award.

Sarkar was awarded for his research proposal entitled "A Neural-Symbolic approach to Realtime Decision-making in Complex Aerospace Systems" while Sippel's proposal is "Microwave Enhancement of Composite Solid Propellant

Flames." Matthew Panthani, an assistant professor in Chemical and Biological Engineering, also received the prestigious award.

In all, AFOSR awarded 20.8 million in grant funding to 58 scientists and researchers from 41 institutions. AFOSR received more than



Sarkar

230 proposals and ISU was among just a handful of institutions with more than one researcher receiving the award.

Additional info about the award

The YIP is open to scientists and engineers at research institutions across the United States who received Ph.D. or equivalent degrees in the last five years and who show exceptional ability and promise for conducting basic research.

The objective of this program is to foster creative basic research in science and engineering, enhance early career development of outstanding young investigators, and increase opportunities for the young investigators to recognize the Air Force mission and the related challenges in science and engineering.

### *"Give us an eager mind and we will give you back a disciplined and qualified mind."*

~Henry Black, ME Department Chair 1946-1972

#### IIE awards Outstanding Early Career in Business/Industry Award to recent ISU graduate

Carl Kirpes is being recognized by the Institute of Industrial Engineers for the incredible accomplishments he's made as a young professional.

Kirpes graduated from ISU with bachelor's degrees in both mechanical and industrial engineering in 2012. After his time at Iowa State, he went to work for GENESYS Systems Integrator, where he was quickly promoted to vice president of operations. Concurrent to his employment, he completed his master's in systems engineering remotely through Iowa State.

Outside of his work, Kirpes is heavily involved with IIE, currently serving as the chair elect for its Industrial Advisory Board. Kirpes also holds a seat on IIE's Construction Division Board and is a member of its Society for Engineering and

Managements.



Kirpes (center-left) pictured holding the IIE Outstanding Early Career in Business/Industry award with his wife, Nicole Basile (center right), the president of IIE, James Moore (far left), and the president-elect of IIE, Michael Foss (far right).

essential in helping him reach impressive achievements so early in his career. "Iowa State connected me with knowledge, leadership and personal development opportunities that I would not have had otherwise," he said. "I learned that individuals provide the potential but teamwork creates the results, and that lesson has helped me succeed in the field." During his time at ISU, Kirpes was an athlete on the Iowa State Football team and was involved in student organizations including Cardinal Key, Mortar Board, Alpha Lambda Delta, Phi Eta Sigma and the University Honors Program.

The award was presented at the IIE conference on June 1, 2015, in Nashville, Tennessee. Kirpes says being recognized is a great honor. "Awards such as the IIE Outstanding Early Career in Business/Industry award are milestones that recognize past successes and achievements yet to come. I cannot thank the support network enough that has helped me achieve these results to date, at Iowa State and otherwise, and I look forward to working with more individuals to build on this success in the future."

Kirpes says Iowa State was

### ME's Hernandez awarded scholarship

**Raul Hernandez**, a senior in mechanical engineering, was not always certain of what his future held. Born and raised in Mexico, Hernandez came to the United States in 2001, and he and his family settled in Rock Island, Illinois. Hernandez is the oldest of three and the first to attend higher education his brother is in junior high and his sister is in community college.



When it came to his decision on what to do after high school, Hernandez turned to his parents, who only had attended elementary school, for advice. They advised him to do whatever he thought was best for his future, because they never had an opportunity like this before. They also mentioned that they would support him in whatever he chose to do and so Hernandez went looking for more advice, knowing he had a number of options available. Hernandez turned to his cousins who were attending community college, and their experiences gave him the push that brought him to college.

Hernandez

Beginning in 2010, Hernandez attended Black Hawk Community College with the intentions of getting his associate's in applied sciences. At the time, he had no intention of transferring to a university but a mechanical engineering course got him thinking it might be his next step.

Hernandez looked to Kim Armstrong, the assistant dean of student services at Black Hawk for some direction and guidance. The next thing he knew, Hernandez was applying to both an Iowa and Illinois University.

He says both schools had quality engineering programs, but once he visited lowa State's campus he knew it was where he was supposed to be. "The campus was beautiful, the visit was very informative, and the transition process was very smooth," remarks Hernandez.

He admits his first few weeks at Iowa State were tough as he struggled with making the mental transition of being away from his family and support system. However, it did not take long for him to start getting involved with clubs and organizations around campus. He participated in the Society of Hispanic Professional Engineers, the Transfer Admissions Ambassador Program and the Student Support Services program, and he also co-piloted as a peer mentor for Women in Science and Engineering (WiSE). He says his fraternity, Sigma Lambda Beta, had the biggest impact on him. "We all faced similar challenges, we came from similar backgrounds, looking to better our lives and community, and we all wanted to graduate," says Hernandez.

Hernandez recently received the Alliant Energy/Erroll B. Davis Jr. Achievement Award. The award was created to honor Erroll B. Davis Jr. and his 30 years of service in the industry and is given to rising seniors in business and engineering that have displayed leadership in campus and community organizations with potential for future career success.

When Hernandez received word that he had earned the award, he did not know how to react. "Well, I told my parents I received a scholarship, and they were happy for me, but they did not know the extent of the award, nor did I," says Hernandez. It wasn't until he was working with his job as a peer mentor with WiSE that he learned how big the scholarship was. "When I realized how prestigious the award was I was extremely happy, because I knew my last year at Iowa State was taken care of financially and a huge pressure was lifted off my shoulders," says Hernandez. Along with this award, Hernandez also received the Exemplary Mentors Award.

Hernandez will be serving a co-op next semester and plans to see where his studies take him after graduation.

### Building a strong foundation in innovation

### Recent mechanical engineering grad is advancing his experience in research at UC Berkeley

When **Payton Goodrich** participated in his high school's robotics program, his passion for mechanical engineering ignited.

The Minneapolis native brought that energy to Iowa State and excelled in the classroom and in research projects. Now, he's starting



his Ph.D. at UC Berkeley, something he says has always been his dream.

Goodrich says while he was deciding on a university for his undergraduate degree, he knew he wanted to try living outside a city. The beauty of lowa State's campus drew him in, and once he got into the mechanical engineering program, he says it was a warm and welcoming environment.

"I quickly found that making connections and collaborating with classmates was critical to success within the major," he says. "For example, I am not the best at

Goodrich

MatLAB, but I had classmates and friends that helped guide me through the process."

Goodrich joined Nastaran Hashemi, an assistant professor in mechanical engineering, in her research lab to study microbial fuel cells and microfluidics as a sophomore. He threw himself into his research and began revising a draft of a paper about microfluidic fuel cells. Hashemi realized Goodrich's strong writing skills and encouraged him to become a main contributor to the paper. After three months of digging into dozens of research papers and adding important advancements to the initial draft, Goodrich's paper was accepted and published in Physical Chemistry Chemical Physics.

Goodrich then began working with Wenyu Huang, an assistant professor in chemistry, in the Science Undergraduate Laboratory Internship (SULI) program. While he only had one chemistry class under his belt, Goodrich quickly learned about synthesizing complex structured platinum nanoparticles. He researched electrochemistry and eventually installed an electrochemical work station, where he conducted experiments to test the catalytic ability of the synthesized nanoparticles. After SULI, Goodrich returned to work with Hashemi.

He picked back up on his research in microfluidics, but at one point broke a silicon wafer worth \$5,000. Goodrich says the expensive mishap inspired him to research and create new designs that mimicked the effect of the silicon wafer for considerably less cost.

"I learned that failure is not the only possible outcome from hardship, but the path to grow from my mistakes can be found by approaching the situation with an opportunistic eye," he adds.

Now Goodrich is settling in at a dream position with UC Berkeley in an industry-focused lab working on The Internet of Things (IoT).

As he continues to expand his research experience, he says one day he hopes to work in research management for a major tech company or create his own startup.

### THE ONLY REASON WE SLEEP IS TO DREAM.



### WHERE THE OFF SWITCH IS NEVER ON.

The new signage in the north hall of The Hive. Photo by PUSH Branding.

The new signage in the south hall of The Hive. Photo by PUSH Branding.

> ME worked with Des Moines-based PUSH Branding to launch The Hive in fall of 2016. The Hive is a 6400 square-foot area in Hoover Hall that consists of a fabrication shop, a computer lab, faculty offices, and a project assembly/CAD classroom. Much like honeybees, students in The Hive are constantly buzzing with innovative ideas that they CAD and build. The Hive is a space where "if you can dream it, you can build it".



Students in Margaret Mathison's Mechanical Design (ME 270) course design a pump in the Caterpillar Lab on Nov. 16, 2016. Photo by Nick Fetty





More branding in the north hallway of Hoover Hall. Photo by Nick Fetty

Students in Mechanical Systems (ME 415) work on their capstone project in the Caterpillar Lab on Nov. 17, 2016. Photo by Nick Fetty



Students in Mike Messman Mechanical Systems (ME 415) course brainstorm ideas in the Caterpillar Lab on Nov. 10, 2016. Photo by Nick Fetty

### **Black Engineering Building gets a makeover**



Crews installed the new signage for the 2016-17 academic year.



Jacques Arnoult, a sophomore studying mechanical engineering, adds blue dye to the "H" of the new ME sign.



Little Kyle - son of ME assistant professors Nastaran Hashemi and Reza Montazami - had fun with the ME sign during a recent visit to Black. Future engineer hard at work!



*ME assistant professor Alberto Passalacqua stopped by to take some measurements. Measure twice, cut once!* 



Students walking through often stop to check out the signage.



Halls throughout Black are also decked with other original graphics produced by PUSH Branding.



### Inagural Mechanical Engineering Learning Community Design Competition

Roughly 340 freshmen ME students participated in the inaugural ME Learning Community Design Competition in November. Teams used the skills and principles learned from ME courses to engineer boats using cardboard, foam, and duct tape. The students designed and assembled their boats in Beyer Gym on Nov. 15 and raced them in Forker Pool on Nov. 17. Judges made up of ME faculty and staff critiqued each team and gave out four awards: The Good Lookin Award for the best design; The Boaty McBoatface Award for the best design on paper; The Titanic Award for the most spectacular sinking boat; and The Usain Boat Award for the quickest boat.

### <u>Design Phase</u>











### **Race Phase**













*Visit* **www.facebook.com/ISUMechanicalEngineering** *for more photos and video from the event!* 



### **USDA Helps Iraqi War Veteran Enhance Conservation On Farm**



Adam Boge shows the height of the elevated ridges on his cropland and corn residue, key elements in his ridge till system to manage soil erosion and improve soil health. Photo by Jason Johnson, USDA.

The U.S. Department of Agriculture is helping Iraq War veteran Adam Boge improve technology and other efficiencies in his new farming operation, allowing the Ventura farmer to prepare for long-term success in the first full year on his own.

Boge enlisted in the Army directly out of high school. After his initial military service, he attended Iowa State University for Ag Systems Technology and Mechanical Engineering. College was interrupted, however, by his Iraq deployment. Boge represented the Army National Guard's 1133rd Transportation Company out of Mason City for 15 months throughout 2003 and 2004 in Operation Iraqi Freedom.

Upon his return to the United States, he continued his education and also began taking "hired hand" positions on farms near Ames. "That's when I started to think more seriously about developing a business plan to someday take over a farm," he said. "Unless you're born into it, though, it is really difficult to capture farming ground."

#### A Return to Iowa

Back in Iowa and still yearning to farm, Boge learned that his respected neighbor Dave Rosendahl could soon be retiring from farming. He quickly put together a proposal and approached Rosendahl about it. "That's when things started to come together for me," said Boge.

While Rosendahl discussed the proposal with his family, Boge took an opportunity to learn more about Rosendahl's management system. He helped a neighbor through the 2012 crop season, farming corn and soybeans in the Prairie Pothole region of Cerro Gordo County.

> Following the 2014 soybean harvest, Boge knifes nutrients directly into raised ridges that are the signature of his farmland. Photo by Jason Johnson, USDA.

Prior to the 2013 planting season, Boge and Rosendahl formed a handshake agreement to crop share for three to five years, eventually handing over all day-to-day farming activities to Boge. However, that timeframe was quickly moved up. Boge said, "During the 2013 harvest Dave and I passed through the last bit of corn and Dave looked at me and said, 'Here are the reigns. I'm complete. I'm satisfied.'"

Boge says his plan was to take over a couple hundred acres, but Rosendahl was ready to give up all 980 acres covering nine farms and five landlords.

#### Conservation

As primary operator of the ground, Boge was eligible to apply for local, state and federal conservation programs. Coincidentally, the 2014 Farm Bill provides benefits for veterans like Boge who are beginning farmers.





Boge visited the USDA Service Center in Mason City and spoke with Tony Moore, district conservationist with USDA's Natural Resources Conservation Service (NRCS), about conservation planning and programs for his new operation. Moore recommended Boge apply for the Conservation Stewardship Program (CSP).

When beginning veteran farmers apply and receive eligibility for CSP, they are given priority status by NRCS to receive funding. Boge became CSP eligible on all 980 acres.

He credits Rosendahl for his CSP eligibility, considering Rosendahl implemented many conservation practices on the land throughout the years, including filter strips along drainage ways, natural wetlands for wildlife habitat, and years of soil saving with ridge till. Filter strips, like the one NRCS District Conservationist Tony Moore (left) and Ventura farmer Adam Boge are standing in, helped Boge become eligible for the Conservation Stewardship Program (CSP). Photo by Jason Johnson, USDA.

"I want to continue what Dave was doing," said Boge. "The way Dave farmed and took care of his land, I see no reason to change it. There is ground here that hasn't been ripped in 30 years. There is an unbelievable amount of soil tilth out there created by earthworm activity."

Moving forward, Boge is implementing an enhancement bundle he chose through CSP, which include widening stream buffers, and improving nutrient and pesticide application techniques. "A lot of it is updating the technology and making the operation more efficient," he said. "Updated GPS will ensure I don't over-apply nutrients and pesticides. CSP is allowing me to take the operation to another level."

Boge says he's appreciative of USDA support for veterans trying to get a start in agriculture. "You spend time in a combat environment and come back, you think there isn't much you shouldn't be able to achieve, but you hit roadblocks and it gets discouraging after a while," he said. "As veterans, we don't ask for much from our country. I wanted to achieve everything on my own, but when you sit down and look at the bottom dollar, maybe I needed a little help. If CSP is the way to get it, then that's OK."

For more information about conservation plans and programs, visit your local USDA Service Center, or go online to www.nrcs.usda. gov.

> Story contributed by Jason Johnson, United States Department of Agriculture

Background image courtesy of Daren Mueller, Iowa State University



NRCS District Conservationist Tony Moore, right, helped Cerro Gordo County farmer Adam Boge through the Conservation Stewardship Program (CSP) process. Boge is improving nutrient management efficiencies using new enhancement practices through CSP. Photo by Jason Johnson, USDA.

**Department of Mechanical Engineering** 

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