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IOWA STATE UNIVERSITY
Department of Mechanical Engineering

Message from the Chair



Dear alumni and friends,

We are proud to share the stories and achievements of our students, faculty, staff, and alumni after another busy semester in the Department of Mechanical Engineering at Iowa State University. Fall 2017 marked another record year for enrollment in both the undergraduate and graduate programs, and the addition of a new research center led by our faculty, CoMFRE [Center for Multiphase Flow Research and Education].

The department added three new faculty members at the start of the 2017-18 academic year: Carmen Gomes, Jongyuh Lee, and Beiwen Li. Profiles for each of them can be found in this issue of Dimensions. A fourth new faculty member, Paul Schafbuch, will join the department in spring 2018; you can read about him in our next issue.

Our student groups have had busy summer and fall semesters which are highlighted in this newsletter. Read about a team of ME graduate students and postdoc in the lab of ME professor Ted Heindel who won first place for a video they produced and presented at the American Society of Mechanical Engineers Fluids Engineering Division (FED) summer meeting, and an ME undergraduate student, Alexander Doppenberg, talks about how the department's curriculum helped him win the Disney Imagineering design contest.

The PrISUM solar car team toured their new solar car, Penumbra, around all 99 counties in the State of Iowa. The tour also served as a trial run for the 2017 Bridgestone World Solar Challenge, a race across the Australian outback, which was held in October. Over the winter break, students from the Iowa State chapter of Engineers Without Borders will travel to the village of Ullor in Ghana, West Africa, where they will begin drilling a borehole for a well. Our students' work will provide villagers with easier access to clean water.

Our graduates continue to achieve success after graduation. Read about the Weiler family and how their financial contributions are providing learning laboratories to train the next generation of mechanical engineers. Also read about an alum, Lu Li, who is applying his ME skills to owning and operating his Ames restaurant.

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.

Regards,

Caroline Hayes
Department Chair
Lynn Gleason Professor of Interdisciplinary Engineering

On the cover

Team PrISUM traveled to Australia in October 2017 to compete in the Bridgestone World Solar Challenge. Of the 15 team members who traveled down under, seven were ME students. Photo by Nick Fetty.

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ME's online master's program ranks 3rd for "Students Before Profits"

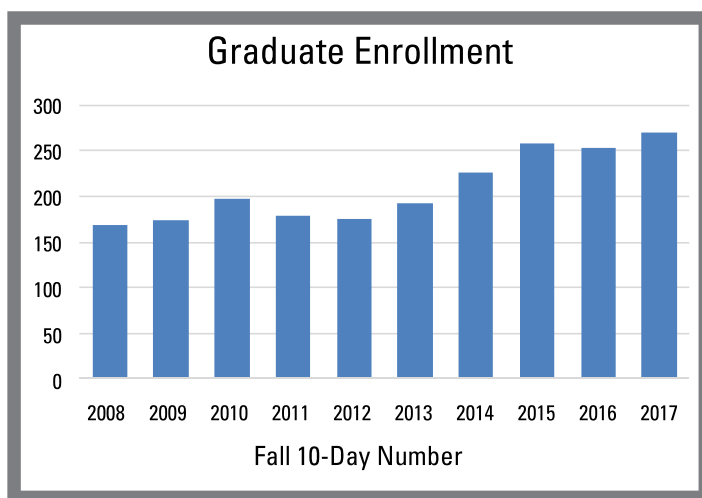


An exterior shot of Black Engineering Building, home to the Department of Mechanical Engineering.

Iowa State University's online master's program in mechanical engineering ranked #3 for the Students Before Profits Award, according to a list compiled by nonprofitcollegesonline.com.

The website "chose online Mechanical Engineering degree programs from nonprofit colleges and universities, accredited by independent and trusted accreditation boards, with lower than average tuition costs" and ranked them by affordability. The curriculum for ISU's program – which is accredited by the Higher Learning Commission – requires that students take 30 semester hours of coursework, up to 15 of which can be taken outside of the department. The program is entirely online and doesn't require students to be on campus in Ames. A breakdown of tuition fees is available on the Registrar's website.

Iowa State, along with Kansas State University (#6) were the only Big 12 conference schools on the list. ISU ranked ahead of powerhouse engineering programs at institutions such as Georgia Tech University (#12), University of Illinois at Champaign-Urbana (#13), and Purdue University (#14).



Data from the 2016-17 ME Annual Report.

Do you have ideas for the ME department history project?

Send them to mecommunications@iastate.edu

Student design team updates

Cyclone Space Mining



Cyclone Space Mining has been researching and designing their robots for their competition at NASA as well as teaching others about robotics, space, and science. The year began over the summer during the Iowa State Fair, where club members showed off their previous competition robots, Ketchup and Mustard. As classes began, the club participated in multiple welcoming events, such as Destination Iowa State and Club Fest. Giving back to the community is a large focus for Cyclone Space Mining, and this year the club has given talks and provided hands-on activities at Taking the Road Less Traveled and Edwards Elementary School's Science Night, to inspire the next generation of engineers, scientists, and space-lovers.

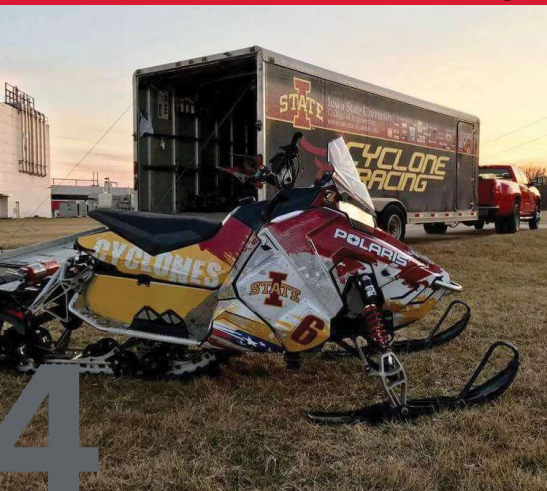
With a general meeting every Thursday and workdays every Saturday, the team is hard at work building the next competition robot, outreach robot, and a WALL-E robot. November 3rd through the 5th the team held a Design Marathon in which they researched, designed, and prototyped subsystems of the competition robot. Weekends such as the Design Marathon are critical to delivering a top-tier competition ready product by the time of the competition. As the team counts down towards the May deadline, a focus will be placed on testing, manufacturing, and assembling the final competition robot.

Baja



The Baja Team is currently working hard on the design of our new vehicle "Scorch"! Coming off a difficult and taxing competition season, the team is set to learn from our mistakes and make our strongest car yet. This year the focus is gaining validation of our designs through experimental testing, cost reduction via smart material and fastener selection for components, and to build on our past successes. Many new, experimental parts are being designed to not only gain a competitive edge but to learn various areas of engineering design. The execution of these goals is only possible through a passionate team with great breadth. The team has been expanding its recruiting efforts to put a large focus on non-engineering degrees. With many areas for our team to grow, such as Graphic Design, Business Management, and Accounting, there are many roles that allow students to develop skills and experience! Please, feel free to reach out to us at SAEBaja@iastate.edu.

Clean Snowmobile Challenge



After an early finish at the 2017 SAE International Clean Snowmobile Challenge (CSC), the Iowa State CSC team is going back to the drawing board for the 2018 competition. The goal of their challenge is to create a quiet, environmentally friendly snowmobile that exceeds EPA expectations, while maintaining the performance needs of the typical rider. Their aim for this year is to improve upon their exhaust designs from years past, and also experiment with using a 4 stroke engine rather than their typical 2 stroke. The team is hoping to further reduce their emissions and sound pollution by retrofitting a 750cc Weber engine into a Polaris 2014 Indy chassis. Once the engine is successfully swapped, the team will then put the sled through a variety of tests to show that their design is functional and effective. Afterwards, they will once again compete in the SAE International Clean Snowmobile Challenge in Houghton, Michigan from March 5th-10th 2018.

Formula



This summer ISU Formula SAE continued its trend of finishing the season strong. We traveled to Barrie, Ontario in early June to open the season at Formula North. The team ran well until the final event, where engine issues forced us to retire from endurance, finishing 16th overall. Two weeks after Formula North, the team traveled to Lincoln, Nebraska to compete in FSAE Lincoln. In Lincoln we ran very well, finishing top 5 in Skid pad, Endurance, and Fuel Efficiency. Cyclone Racing ended 4th out of 80 overall, just 7 points of 1000 away from a podium finish. This was the highest finish in club history, and catapulted Iowa State to 14th in the World Rankings, 4th in the United States!

This season the Formula team looks to continue to build upon the strengths of previous cars, while still introducing many new concepts. The largest change this season will be a redesign of the entire rear differential assembly. This redesign should lighten the car as well as increase adjustability of the drivetrain. Next semester the team will begin manufacturing, and preparing for competition this summer in Barrie, Ontario and Lincoln, Nebraska.

Design Expo



The fall 2017 ME Design Expo took place on Dec. 5. Due to growing enrollment, this year's event marked the first time that the sophomore designs (ME 270) and senior capstone projects (ME 415, ME/ENG 466) were showcased at different locations. The sophomore displayed their designs inside the Sukup Atrium while the seniors were in the atrium of Howe Hall. The event showcased the work of 246 sophomore students and 45 senior teams consisting of 231 students. Support funding from sponsors totaled \$88,000 from 13 partners in small industry, six from large industry, two from student clubs, four from ISU departments, and one outreach organization.

ME's Kong named ASME fellow

Mechanical engineering professor Song-Chang Kong has been named a Fellow by the American Society of Mechanical Engineers (ASME).

The status of Fellow is bestowed upon ASME members with 10 or more years of active practice and at least 10 years of active corporate membership in the organization. Of the approximately 130,000 ASME members, roughly 3,000 have attained the grade of Fellow.

"I felt very grateful that I had the chance to work with many colleagues and many more excellent graduate

students to have our work recognized by the ASME community. The type of research I am doing requires significant support, such as space and utility, from the department, which has indeed been very supportive," said Kong. "The most beneficial experience from my participation in ASME is the opportunity to see many respected scholars and engineers. They are good examples and good motivations to me."

A nominator submits materials on behalf of the potential Fellow and the materials are reviewed by the Fellows Review Committee.



Kong

Kong joined the ME faculty at Iowa State as an assistant professor in 2005. He was promoted to associate professor in 2011 and professor in 2016. His main research areas focus on internal combustion engines and bio-renewable energy. He holds a BS in Power Mechanical Engineering from National Tsing-Hua University in Taiwan and a MS and PhD, both in mechanical engineering, from the University of Wisconsin-Madison. In addition to his responsibilities at Iowa State, he also serves as a Program Director for the National Science Foundation, managing both the Combustion and Fire Systems Program and the Major Research Instrumentation Program in the Division of Chemical, Bioengineering, Environmental, and Transport (CBET).

Kong is the 12th current ME faculty member to hold the grade of Fellow from ASME.

Faculty and staff honors

Nicole N. Hashemi, Assistant Professor
2017 ISU College of Engineering Early Career Engineering Faculty Research Award

Jim Heise, Senior Lecturer
2017 ISU College of Engineering Superior Engineering Extension Award

Ming-Chen Hsu, Associate Professor
2017 Web of Science Highly Cited Researcher in Engineering and Computer Science

Song-Chang Kong, Professor
2017 Fellow of the American Society of Mechanical Engineers

Graduate student honors

Fall 2017 Research Excellence Awards

Yuanfen Chen
Tianyu Wang
Pengyu Yuan

Fall 2017 Teaching Excellence Awards

Sanvisna Kogelen
Adam Lawrence
Nelson Wiese
Kuan-Chen Wu

Alex Wrede, won first place at the second annual 3 Minute Thesis Competition hosted by ISU's Graduate College.

Undergraduate student honors

Sam Harms, named to the 2017-18 Iowa Farm Bureau Farm Strong Squad

Cole Tenold, named Outstanding Senior for Fall 2017 commencement

ME 324L Undergraduate Teaching Assistant CYtation Award

Colin Barker
Nick Bohlke
Jose Caro-Gonzales
Daniel Hemken
Zach Kooistra
Emily Olan
Ethan Pauly
Nick Terronez
Seth Woolston
Jared Trent
Carson Shollenbarger

ME's Allen receives Big 12 honors

ME's Chase Allen was among three Iowa State College of Engineering student-athletes to receive recognition from the Big 12 conference this fall.

Allen, a redshirt freshman studying mechanical engineering, was named a tight end for the second team All-Big-12 squad. The 6-foot-7, 230-pound, Nixa, Mo.-native started eight games in the 2017 campaign and pulled in four receptions for 39 yards. He was also named to the 2017 First Team Academic All-Big 12 squad with a 4.0 grade point average.

The other two CoE student-athletes recognized were Jake Campos, a redshirt senior in biological systems engineering who was a second team All-Big 12 offensive line selection, and Julian Good-Jones, a redshirt sophomore offensive lineman in civil engineering who was named an honorable mention.

Iowa State (7-5) will conclude its season against the 19th-ranked Memphis Tigers (10-2) in the Liberty Bowl on Dec. 30.



Alum named president of Nanyang Technological University



Dr. Subra Suresh graduated with a MS in mechanical engineering from Iowa State in 1979.
Photo courtesy of Carnegie Mellon University

ME alum Subra Suresh has been named president of Nanyang Technological University (NTU) in Singapore.

Suresh (MSME'79) most recently served as president of Carnegie Mellon University in Pittsburgh and before that served as director of the National Science Foundation. He holds a Bachelor of Technology degree from the Indian Institute of Technology, Madras, in First Class with Distinction and a doctorate in mechanical engineering from the Massachusetts Institute of Technology. He also completed postdoc appointments at the University of California-Berkeley

and the Lawrence Berkeley National Laboratory before joining the faculty at Brown University.

The appointment at NTU will be effective January 1, 2018.

Alum named general manager of Cedar Falls Utilities

An Iowa State mechanical engineering alum has been named general manager of an Iowa utility company.

The Cedar Falls Utilities Board of Trustees selected Steve Bernard (BSME'85) as the company's next general manager during their June meeting. The Cedar Falls-native will take over the post on January 1, 2018, replacing Jim Krieg who has served as general manager for the past 15 years. Bernard has been with the company for 21 years, 15 of which he was served as director of customer service and business development.

"I'm excited to work with our employees to continue CFU's tradition of innovative products and excellent service," Bernard said in a press release. "Cedar Falls is a wonderful community and we at CFU are proud to be part of it."



Steve Bernard's senior photo in the 1985 edition of The Bomb yearbook.

Photo courtesy of ISU Special Collections and University Archives

Stay up-to-date with the latest ME department news

www.me.iastate.edu/news

ME alum awarded William H. Webb Medal for 2017

Bruce Johnson (BSME'55) has been named the 2017 recipient of the William H. Webb Medal.

The award is bestowed upon those who exhibit outstanding contributions to education in the fields of naval architecture, marine, or ocean engineering. Johnson graduated from Iowa State with a bachelor of science in mechanical engineering in 1955. While in Ames he served in the Navy ROTC. He then went to Purdue University where he earned his MS in 1962 and PhD in 1965, both in mechanical engineering. Upon graduation he joined the faculty at the United States Naval Academy, serving as an associate professor in the Department of Naval Architecture and Ocean Engineering, from 1964 to 1970 and professor from 1970 to 1999. Since 2000 he has served as a professor emeritus.

While at the academy Johnson lobbied for the development of new test facilities which improved hands-on educational experiences for students. He also served as Project Manager and eventually Director of the Hydromechanics Laboratory as well as Program



Johnson

Director of the Ocean Engineering major. Johnson has published numerous books and professional technical papers during his career which has spanned six decades.

Johnson said that many of his experiences at Iowa State played a major part in shaping his career.

"Academically, I really remember knowing Professor Henry Black, Professor Ted Okiishi and Professor Don Young who got me started in my fluid mechanics career. I taught several semesters at USNA using their ISU-based textbook," said Johnson. "My extra curricular experience as an NROTC student, Drum Major of the ISC Marching Band, President of the 1955 Senior Class and President of the Student Union board also taught me about team leadership."

The William H. Webb Medal was established in 1987 to recognize "Outstanding Contributions to Education in Naval Architecture, Marine or Ocean Engineering." The award is named in honor of the 19th century shipbuilder and philanthropist who was a founding member of the Society of Naval Architects and Marine Engineers.

Iowa State Researchers Join New Carbon Economy Consortium

Researchers from Iowa State University are part of a “New Carbon Economy” consortium launched by the Center for Carbon Removal in partnership with several research institutions. The initiative has the goal of removing carbon dioxide from the atmosphere and converting it into valuable products and services.

Noah Deich, executive director of the Center for Carbon Removal, said the effort is urgently needed to “develop new businesses and reinvent the industries that powered the last industrial revolution – like manufacturing, mining, agriculture and forestry – to create a strong, healthy and resilient economy and environment for communities around the globe.”

Iowa State researchers participating in the consortium include Robert Brown, director of the Bioeconomy Institute and Anson Marston Distinguished Professor in Engineering; David Laird, professor of agronomy; and Dermot Hayes, the Pioneer Chair in Agribusiness and Charles F. Curtiss Distinguished Professor in Agriculture and Life Sciences.

“Iowa State University began exploring carbon removal technologies six years ago as part of a College of Engineering-sponsored Initiative for Carbon Negative Energy,” explained Brown. “This initiative focused on drawing down carbon dioxide from the atmosphere through the natural process of photosynthesis, with part of the resulting plant biomass being converted to biochar

as a long-term carbon sequestration agent. Our inclusion as a founding organization of this consortium is a direct result of ISU’s early investment in an emerging research area long before it received much attention in the scientific community.”

Arizona State University and Purdue University are also part of the effort. Lawrence Livermore National Laboratory participated in the launch event and has extensive expertise in alternative energy and new fuel sources.

The idea for the consortium came from a recent chance meeting between Arizona State President Michael Crow and Deich where they discussed rethinking the climate challenge in terms of economic opportunities.

At the launch event, assembled partners agreed to produce a roadmap that will outline the specific steps for translating relevant research into business and policy actions. The roadmap will consider design principles for engaging multiple parts of the economy in capturing and concentrating atmospheric carbon dioxide, ranging from biological approaches such as ISU’s biochar production and sequestration to engineered systems such as direct air capture of carbon dioxide.

Contributed by Robert Mills/
Bioeconomy Institute



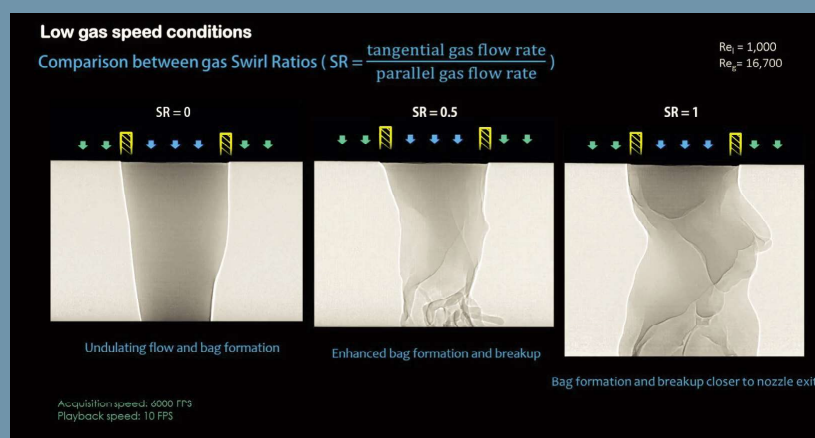
Iowa State’s Robert C. Brown, left, explains new pyrolysis technology to Karen Fletcher, leader of the RAPID Institute for manufacturing; and Mark Gaalswyk, leader of Easy Energy Systems in Emmetsburg; during a recent tour of the BioCentury Research Farm. *Photo by Christopher Gannon.*

Iowa State-produced video takes 1st place prize at ASME Fluids Engineering Division summer meeting

A video produced by an Iowa State University research team was awarded first place for the Inaugural Flow Visualization Competition and Prize at the American Society of Mechanical Engineers (ASME) Fluids Engineering Division (FED) summer meeting in Hawaii.

The research team was led by ME Bergles Professor of Thermal Science Ted Heindel along with graduate students Julie Bothell, Danyu Li, and Timothy Morgan. The video is entitled “High Speed X-Ray Imaging of an Airblast Atomizer” and features research utilizing the Advanced Photon Source at Argonne National Laboratory.

“The Advanced Photon Source allows us to acquire unique high-speed X-ray video,” said Dr. Heindel. “Our team is honored that we could share some of the video with the fluids engineering community and that the judges thought it was worthy of first place.”

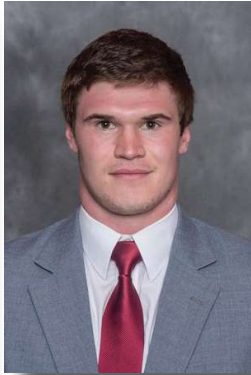


A screenshot from the video.

Three MEs named to Academic All-Big 12 teams



Allen



Harms



Epps

Three mechanical engineer students have been recognized because their success both on the field and in the classroom.

Tight ends Chase Allen and Sam Harms have been named to the 2017 Academic All-Big 12's first team while wide receiver Carson Epps has been named to the second-team by the Big 12 Conference. Allen, who has played all 10 games and compiled 39 yards this season, was nominated with a 4.00 GPA. Fourteen Cyclones were named to the first-team while eight were named to the second-team.

Student-athletes must maintain a GPA of 3.20 or higher while participating in 20 percent of games to be named to the first-team. Second-team honors are awarded to student-athletes who maintain a GPA of 3.00 or higher.

Harms was also one of three engineering student athletes to be named to the Iowa Farm Bureau Farm Strong Squad for "his tireless work ethic and commitment to excellence on and off the field."

Did you know?

Iowa State's first College Football Hall of Fame inductee and first All-American was an ME student. Ed Bock played guard for the Cyclones in the late 1930s. He was named a consensus All-American in 1938 after helping lead the Cyclones to a 8-7 win over the Cornhuskers from the University of Nebraska in Lincoln. It marked Iowa State's first win over their border rival since 1919. The Cyclones finished the 1938 campaign with a 7-1-1 record and were ranked 18th nationally. Bock turned down a contract to play for the Chicago Bears in the National Football League in favor of pursuing a master's degree in mechanical engineering at Iowa State during which time he served as a line coach for the Cyclones. The Fort Dodge-native went on to become CEO and President of Monstanto. He passed away in 2004 at the age of 87.

ME grad student wins ISU's 3 Minute Thesis competition



Alex Wrede, a graduate student in mechanical engineering, presents at the 3 Minute Thesis competition hosted by the Iowa State University Graduate College on November 6, 2017. Image courtesy of YouTube.

A mechanical engineering graduate student bested 42 of his peers to take first place at Iowa State's second annual 3 Minute Thesis competition in November.

Alex Wrede, who is pursuing a PhD in ME, discussed Traumatic Brain Injuries (TBIs) and the cavitation of micro bubbles during the competition which was hosted by Iowa State's Graduate College.

"My research focuses on creating a realistic model that illustrates the consequences that microbubbles have on neurons in a TBI situation," said Wrede. "Answers in my research seek to address not only athletic injuries, such as football, but also ties to TBIs that our veterans experience, someone who gets a TBI in something like a car accident, and even someone who might slip on the sidewalk and hit their head."

Contest participants have no more than three minutes and just one PowerPoint slide to explain their research to a "non-specialist audience." Participants presented to a panel of judges which included Board of Regents member Nancy Boettger, Ames Mayor Ann Campbell, and Des Moines Register columnist Kathie Obradovich.

Wrede, who works in the lab of ME assistant professor Nicole Hashemi, will receive a \$500 cash prize and an all-expenses paid trip to the Grand Rapids, Michigan in April for the annual conference of the Midwest Association of Graduate Schools. He will also be entered to participate in the Regional 3MT Competition.

"I am humbled to get first place at the 3MT competition. There was a lot of great research presented at the event and many of these speakers also deserve recognition. I would like to specifically thank my professor, Dr. Hashemi, for advising me through this project," Wrede said.

Two CoE researchers receive funding to improve energy efficiency in buildings

Kristen Cetin and Soumik Sarkar recently received research funding from the U.S. Department of Energy.



Cetin

Cetin, an assistant professor of civil, construction, and environmental engineering with a courtesy appointment in mechanical engineering, is the lead for a project entitled "Simulation, Challenge Testing & Validation of Occupancy Recognition & CO2 Technologies." Cetin's project falls within Category D: Testing and validation for residential and commercial applications. She and her team will receive \$736,210 in funding.

"The Iowa State University team will develop a comprehensive testing protocol and simulation tools to evaluate the energy savings and reliability of occupancy recognition sensor technologies for commercial and residential buildings. ISU's field test protocols will allow them to determine occupancy recognition sensor effectiveness and reliability in both laboratory and real-world conditions for residential and commercial applications. Laboratory test facilities will provide controlled environments to collect hard data on these technologies' performance. Their approach will test multiple sensor technologies across Categories A, B, and C, including occupancy recognition and CO2 measurement technologies."



Sarkar

Sarkar, an assistant professor of mechanical engineering, is partnered with researchers from the University of Colorado-Boulder on a project entitled "Battery-free RFID Sensor Network with Spatiotemporal Pattern Network Based Data Fusion System for Human Presence Sensing." Sarkar's project falls within Category A: Human presence sensors for residential use. He and his team – which also includes researchers from the University of Washington and the National Renewable Energy Laboratory – will receive \$2 million in funding.

"The University of Colorado Boulder team and its partners will develop an occupancy detection system employing a wirelessly powered sensor network that communicates using radio-frequency identification (RFID) related technology. The sensors will use privacy-preserving microphones and low-resolution cameras to detect human presence, relaying the information back

to a central hub that also monitors patterns of activity in the home's electricity use. Because the sensor system can be powered wirelessly, it can be deployed without costly and invasive rewiring. The sensor data will be combined in computationally efficient ways to enable high accuracy human presence detection."

Sarkar said he and his research team will study ways to make improve programmable thermostats.

"Today programmable thermostats that attempt to save energy using automated human occupancy detection have too many false alarms. Therefore, consumers typically avoid using such features and end up wasting significant amount of energy. Our research aims overcome this barrier using advanced sensing and data analytics techniques," he said.

Both projects are supported by the U.S. Department of Energy's ARPE-E program – Saving Energy Nationwide in Structures with Occupancy Recognition (SENSOR). The program aims to "develop a new class of sensor systems to enable significant energy savings via reduced demand for heating and cooling in residential and commercial buildings" and could provide an estimated energy savings of 2 to 4 quadrillion BTUs across the U.S. power system.

ME prof named 2017 Highly Cited Researcher

Mechanical engineering assistant professor Ming-Chen Hsu has been named a 2017 Web of Science Highly Cited Researcher in the categories of Engineering and Computer Science, according to a report by Clarivate Analytics.



Hsu

This marks the second consecutive

year that Hsu has received this honor. Highly cited researchers are identified based on papers that rank in the top 1 percent by citations published across an 11-year period. For the 2017 award, the period spans from 2005 through 2015.

"I am really happy to be named again this year," said Hsu. "This is really a collaborative effort. Many thanks to my students, colleagues, and collaborators. Without them, many of our proud works would not be possible."

Hsu is one of five Iowa State University researchers to make the 2017 list and the only from the College of Engineering. He is also the only ISU researcher to be awarded in multiple categories. Of the approximately 3400 scholars identified as Highly Cited Researchers, just 147 of them are named in more than one field of research.

"I think this shows mechanical engineering studies today are vibrant and collaborative with other disciplines and academic communities. My research focuses on computational fluid-structure interaction, which is highly interdisciplinary in its nature," Hsu said.

Hsu joined the ME faculty at Iowa State in 2013 after serving as a postdoctoral fellow for the Institute for Computational Engineering and Sciences at the University of Texas at Austin.



Members of the Weiler family pose in front of the entrance to the Weiler Laboratory in Black Engineering Building during a dedication ceremony on Sept. 2, 2017. Photo by Breehan Gerleman.

Cardinal and gold runs in the blood for the Weilers

Being a Cyclone runs in the blood for the Weiler family.

Patrick Weiler graduated with a BS in agricultural engineering in 1980 and established Weiler in Knoxville, Iowa in 2000. He has not only been supportive of his alma mater since leaving campus but has also encouraged his children to attend the university he knows and loves.

"Because of my desire to pursue engineering and to stay somewhat close to home, Iowa State was a natural fit for me when choosing where to pursue my undergraduate degree," said Weiler's youngest daughter Katelyn (Weiler) Freeseaman ('12 civil engr). "My favorite Iowa State memories involve tailgating. As the youngest of my siblings, I remember coming up for football games when Megan and Joel were students at Iowa State. That tradition continued during my years at Iowa State and we have kept up the tradition long after we all graduated."

Weiler's eldest daughter Megan (Weiler) Green ('06 finance) echoed her sister's sentiment.

"My favorite memories from my time at Iowa State all center around tailgating," said Green. "When I attended Iowa State, it was the perfect excuse to catch up with the rest of the family and now that I've graduated, it's the perfect excuse to come back to Ames. When I was looking at schools, I truly leaned

against attending Iowa State because of the family connection, but I couldn't look past the incredible opportunities the school provided and it was certainly the right decision for me."

Brother Joel was in line with his siblings in agreeing that some of the greatest memories of his time at Iowa State centered around Cyclone athletics.

"My favorite memories from Iowa State are in Hilton and Jack Trice. The ups and downs of Iowa State athletics have given me a lot of opportunities to make memories with friends and family over the years. I also met some life-long friends and my wife while attending Iowa State, so thanks for that," said Joel Weiler ('10 nutr sci). "My father attending Iowa State, a scholarship opportunity, and strong human science programs were all influential in my decision to attend Iowa State."

Megan, Joel, Katelyn, and the rest of the Weiler family were on campus for the Cyclones' season opener against the University of Northern Iowa. During this time, they toured the Weiler Laboratory and other facilities in Black Engineering Building. The Weiler Laboratory was named after the family in 2016. The 596-square-foot teaching lab includes computers and Haas CNC simulators for ME 324: Manufacturing Engineering.

"Students choose engineering so they can become high-tech professionals," said Caroline Hayes, chair of Iowa State's Department of Mechanical Engineering, which is housed in Black Engineering Building. "You can't get there with yesterday's technology. The Weiler's gift allows us to keep our manufacturing education focused on the future."

The Weiler family said they liked what they saw during their visit back to campus.

"The engineering labs were quite impressive," said Green who works as Counsel and Procurement Manager for Weiler. "You can tell that the faculty are motivated to provide space where students can flourish and get the most out of their time at Iowa State. Companies are increasingly focused on collaborative work environments, so these areas will prepare students well for the future."

Freeseaman, who is an adjunct assistant professor of civil, freconstruction and environmental engineering and also serves as a research engineer with the Institute for Transportation, was also impressed by the facilities.



College of Engineering dean Sarah Rajala talks with the Weilers outside of the Weiler Laboratory on Sept. 2, 2017. Photo by Breehan Gerleman.

"We are grateful to the Weiler family for their generous donation to the Black Engineering Building ME-IMSE joint learning laboratories. It's contributions like theirs that allow our students to pursue their passions in outstanding facilities, surrounded by world-class faculty. The role alumni and donors play is crucial in helping our students succeed," Kremer said.

As alums of the university, the Weilers said they are proud to help support future generations of Cyclones through their financial contributions.

"We all have a great sense of pride in being able to give back to the Iowa State community and to improve the experience of future students. We hope students will see our family's name outside of the lab and be encouraged to give back themselves when the time is right," said Green. "Our family has many great memories of our time at Iowa State which provides an emotional reason for our support. But the practical reason is that we want to support the next generations of engineers who can lend their talents to Weiler, the state of Iowa and the U.S. at large. Elevating the value of an Iowa State education is a benefit to every alum."

For more information about supporting Iowa State University with your own gift please contact Ryan Harms, Executive Director of Development, at rharms@foundation.iastate.edu or 515.294.0743



Mechanical Engineering department chair Caroline Hayes gives the Weilers a tour of The Mine during their visit on Sept. 2, 2017. The Mine is a 6,317 square foot area in the basement of Black Engineering Building which includes labs for fluids, instrumentation, controls, and heat transfer, as well as a capstone design lab and classroom. Photo by Breehan Gerleman.

"While I have used lab spaces in other buildings on campus, I had never been in Black Engineering prior to our visit. I am continuously impressed by the improvements that are being made to campus to keep Iowa State's reputation as a top science and technology university."

Joel Weiler, a dentist for Recker Dental Care in Pella, said he thinks that students will enjoy the renovations.

"Comparing the existing lab space with the renovated labs was very impressive. The project clearly has a vision and is resulting in a much more inviting and modern place to learn. Being in the old lab was a little nostalgic though – reminded me of some of my old classrooms in other buildings on campus," he said.

Gül Kremer, C.G. "Turk" & Joyce A. Therkildsen Chair of the Department of Industrial and Manufacturing Systems Engineering housed in Black Engineering Building, said that contributions such as those from the Weilers help to elevate the value of an Iowa State education.

Industrial Manufacturing and Systems Engineering department chair Gül Kremer talks with Patrick Weiler inside the Weiler Laboratory on Sept. 2, 2017. Photo by Breehan Gerleman



Alum applies ME skills to operating restaurant



Lu Li (BSME '15) poses with the pasta machine at his restaurant Grandpa Noodle Gallery.

One Iowa State alum is taking the skills he learned in the mechanical engineering curriculum and applying them to his restaurant.

In May, Lu Li and his wife Shuyu Wang opened Grandpa Noodle Gallery, 926 S. 16th St., on Ames' east side. Li first came to Ames in 2008 to study at Iowa State and said his decision to attend ISU was two-fold.

"Because I grew up in a very big city, I wanted to try small-town living," said Li. "On the other hand I heard that Iowa State University has a really good engineering program. I'm into engineering because I like machines and all of that stuff."

He initially planned to study electrical engineering but switched to mechanical because he felt machines were his true passion.

"I love all the machines. I liked tractors, cars, airplanes, and trains when I was a kid so it was always a dream I had," he said.

Li finished his BS in mechanical engineering in 2015. Since first coming to the United States, Li and Wang have had the opportunity to travel all around the country. Li said that the people in Iowa were a large part of the reason why he and his wife chose to stay in Ames and open a restaurant.

"The people that I've met here in Ames are the nicest people I've ever met in the United States," he said. "Ames people are very open to other cultures. When we opened the restaurant a lot of local Ames people were really excited and wanted to come here and try it. They're open to different food. The people in Ames are the key reason why we wanted to stay here."

Li came from the city of Hefei in east central China. His hometown has a population of roughly seven-and-a-half million which is more than twice the size of the entire state of Iowa. In addition to the people, Li said that he likes the cooler climate of the Midwest, compared to warmer regions in the country.

"I like when you can sit at home and can see snow outside and you have a fireplace in front of you," said Li. "That's my kind of dream life."

Moving to the United States was another dream that Li had growing up and now with their restaurant, he and Wang are making that dream a reality. Wang studied finance at Iowa State and handles many of those duties with the restaurant, but Li actually applies his ME skills to the management and other responsibilities he undertakes.

"I learned a lot from the Department of Mechanical Engineering at Iowa State. First off, and I think the most important thing for a restaurant, is team-working skills," said Li.

"Mechanical engineering is about trying to solve a problem using a team. That's kind of a similar concept when operating a restaurant. After opening the restaurant we encountered all kinds of problems, we have to try to figure out how to solve those problems. So me, and my employees and my wife, we all work as a partnership, and I try to apply those team-working skills from mechanical engineering."

Li added that having a knowledge of mechanical engineering is helpful so he can perform repairs when his kitchen machines and equipment have issues. One such machine creates fresh, homemade noodles, which Li hopes will be one of the restaurant's hallmarks.

"Our noodles are different from other noodle restaurants in central Iowa. We make all of our noodles from scratch," he said. "Fresh noodles sound really complicated but it's actually really easy."

Li explained that the process involves mixing semolina (which is similar to flour) with water to create a dough. The dough is then put into a machine which pushes the noodles out through a die. He said the most complicated part of the process is knowing how much water to add, which can be affected by humidity levels and other local conditions. In order to provide the most flavorful noodles possible, Li's staff make up a fresh batch at the start of each day.

In addition to fresh noodles, Li also aims to provide the freshest meats and vegetables available.

"We try to use local ingredients as much as we can. We use Iowa-grown pork and beef. We also try to use fresh vegetables from the surrounding area," he said.

One specialty item on the menu not served everyday is Pepsi chicken which combines the American soda with traditionally Chinese cuisine.

"This is a very unique dish from China. People want to use Pepsi as an ingredient to get the sweetness," he said.

Li added that while Pepsi is an American company, "it's the kind of product you can find all around the world" within "many different cultures." The restaurant was also recently granted its alcohol license and will serve beers from the United States, China, and Japan.

In addition to the menu items, customers can also build their own bowl from more than a dozen meat, vegetable, and sauce options. Dishes range from about \$10 to \$12.

Q&A with Disney Imagineering design contest winner Alexander Doppenberg

Alexander Doppenberg, a senior studying mechanical engineering, was part of Iowa State's winning team at the 26th Walt Disney Imagineering Imaginations Design Competition in California earlier this year. Between his busy semester and his action-packed summer the Spencer, lowa-native was able to talk with us about his summer internship, the contest, and his studies.

Some quotes have been lightly edited for length and clarity

Tell me a bit about your internship with Disney this summer and what you will be doing.

My title is intern-mechanical/special effects systems at Walt Disney Imagineering in Orlando. What I'll be doing is working on a few scopes for a new attraction that has yet to be released to public. A scope is a specific effect that happens in an attraction that enhances the show.

How do you think your ME studies have prepared you for this?

Although Iowa State is not typically known for its role in the entertainment business I believe that my courses have enhanced my problem-solving abilities and enabled me to approach new problems and solve them. The classes that really expose students to the type of work that I will be doing during my internship are the engineering design and capstone classes. On top of the course load I do think it is important to seek out classes outside the college of engineering to learn how work with people outside the science and technology field.

How (if at all) do you think the Walt Disney Imagineering Imaginations Design Competition prepared you for what you'll be doing with your internship?

The competition really exposes the cooperation needed between different disciplines that is needed to create the success in the entertainment industry. It also allows us to get a little more insight



Alexander Doppenberg poses with his trophy from the Walt Disney Imagineering Imaginations Design Competition. From left: John Wagner, Lead Academic Adviser; Dr. Caroline Hayes, Chair of Mechanical Engineering; and Doppenberg.

on the type of work that goes on in the company as well as how they operate.

When did you become interested in engineering?

Both my dad and step dad are diesel mechanics so I've always grown up around mechanics. They were both do-it-yourselfers so I had the exposure at a young age of problem solving in mechanical systems which is where my interest festered from.

Why did you choose to attend Iowa State?

It was really a simple decision for me. I wanted to go to school for mechanical engineering that was affordable. Being from Iowa, Iowa State was the clear choice.

Why did you choose to study mechanical engineering?

Getting to solve mechanical problems at a young age I knew I wanted to go to school to be an engineer, but I wasn't sure at the time what exactly I wanted to do with it. When I was a freshman in college, the Disney College Program recruiters came to Iowa State and shared about the program and some of the philosophies of the company. They said that they believed in the power of storytelling, and that stories create happiness which can change the world. Pushing technologies to make one of kind creations that inspire a generation has been a trademark of Disney's, and I want to be a part of that.

Is there anything else you want to add?

Any success I have obtained through my life is through a lot of trial and error and through the support of many. I'd like to share two quotes that I think have really keep things in perspective.

When asked about the creation of the light bulb and all the failures he sustained in his trials Thomas Edison simply said, 'I have not failed. I've just found 10,000 ways that won't work.'

And also a quote by Walt E. Disney himself: 'All of our dreams can come true as long as we have the courage to pursue them.'

Do you have story ideas for the next issue of *Dimensions*?

Send them to mealumni@iastate.edu

ME's Lee sees potential for research collaboration at Iowa State



ME assistant professor Jonghyun Lee lectures to his Manufacturing Engineering (ME 324) class in Hoover Hall on Sept. 13, 2017.

For Jonghyun Lee, it was the potential for research collaboration that attracted him to Ames.

"I don't think I could find a better place for success in my career and that's why I chose Iowa State," he said.

Lee was recently hired as an assistant professor of mechanical engineering. He hopes to not only collaborate with faculty, students, and researchers within the ME department but he also plans to work with the Departments of Materials Science and Engineering and Physics & Astronomy as well as the Ames Lab. During his interview, Lee said he felt a "collegial atmosphere" in the department which he attributed as another reason for why he accepted the position.

Much of Lee's research focuses on thermomechanical and thermophysical properties of metals and ceramics.

"Basically I'm at the border of mechanical engineering and materials science engineering," said Lee. "I've been using the tools of mechanical engineering to solve the problems in the field of materials science."

One part of Lee's research uses the "non-contact methods" to study the properties of different materials, mostly metals. He uses electrostatic

and electromagnetic levitators to suspend a sample material in the air and then uses a laser to heat and eventually melt it. This research takes place on the International Space Station and he takes the data from his experiment to use it for future simulations.

Another part of Lee's research is cold spray which consolidates micron-sized metal particles accelerated by a supersonic nozzle. The research has military applications.

For example, the gear box of the Seahawk helicopter is made of magnesium, a material that provides strength at a light weight. But magnesium is susceptible to corrosion. After the corroded region is machined off, aluminum powder is cold sprayed over the machined surface. After dimensional restoration, the part can be put back in service.

Now that he's at Iowa State, Lee hopes to expand his research to include additive

ME assistant professor Jonghyun Lee lectures to his Manufacturing Engineering (ME 324) class in Hoover Hall on Sept. 13, 2017.

manufacturing.

The fact that Lee ended up in the field of engineering was somewhat by chance. When applying for college in South Korea he expressed interest in studying medicine but was not admitted into the program so he pursued his second choice — mechanical engineering — because of his interests in math and physics.

"It was by accident that I found my way," he said. "I actually didn't like it when I was a freshman but during my second year when I began taking some mechanics courses I had a lot of fun. It was very interesting so I decided to stay in this field."

Lee graduated with his BS in ME from Inha University in his hometown of Inha, South Korea. He came to the United States in 2002 to pursue graduate studies, graduating with his MS in ME in 2004 and PhD in ME in 2007, both from the University of Massachusetts-Amherst.

After finishing his doctorate, Lee moved back to South Korea and spent nearly five years working in industry, as an internal consultant providing technical consulting services to design, manufacturing, and field engineers. His particular focus was on materials selection, design optimization, failure analysis, and troubleshooting during manufacturing processes.

Having spent most of his life living in big cities, Lee said that he likes the small town feel of Ames, adding that he appreciates the friendliness people in the Midwest. Outside



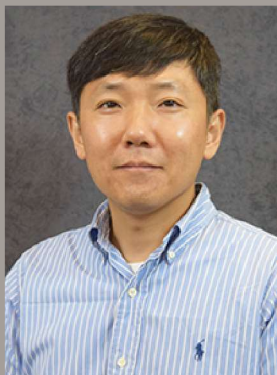
of work, his free time is usually spent with his family.

"I don't really have free time though, I have three kids," he said with a laugh. "But I like to go fishing when I have time."

Whether he's at work or at home, Lee also enjoys listening to music. He considers classical and jazz to be his favorite genres and listens to everything from Chopin and Mozart to John Coltrane, Miles Davis, and Sonny Rollins.

Dr. Jongyhun Lee

Assistant Professor



Education

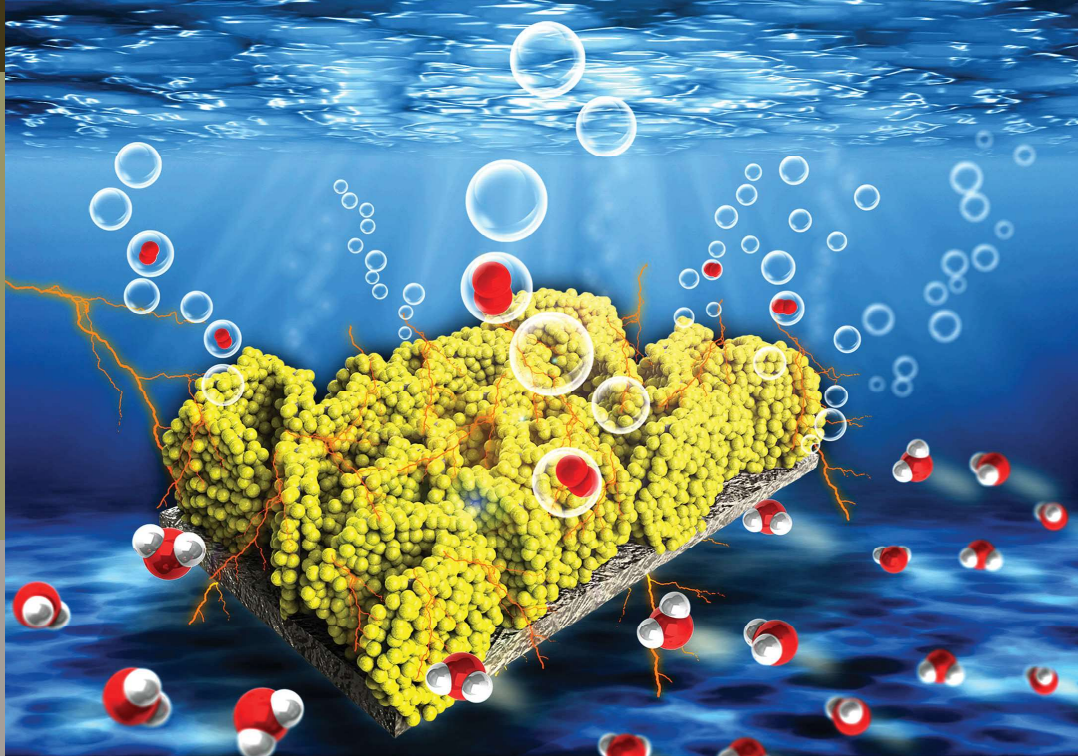
PhD, Mechanical Engineering, University of Massachusetts-Amherst, 2007

MS, Mechanical Engineering, University of Massachusetts-Amherst, 2004

BS, Mechanical Engineering, Inha University, 1999

Interest Areas

- Additive Manufacturing
- Containerless Processing
- High Temperature Materials
- Thermophysical Properties of Metals and Ceramics
- Transport Phenomena in Molten Metals and Ceramics
- Musculoskeletal Biomechanics
- Finite Element Analysis
- Computational Fluid Dynamics



Nanoscale Catalyst Splits Hydrogen From Water Quickly and Efficiently

At the macroscale, rust is a common, everyday material. But at the nanoscale, it might hold the promise of sustainable clean energy. Shan Hu, an assistant professor of mechanical engineering, is developing new catalysts made of rust nanostructures that convert light into fuel faster and cheaper than other leading catalysts.

"Rust, or iron oxide, is an excellent example of how seemingly ordinary materials show very unusual, useful properties when we make them into nanostructures," says Hu. "At the nanoscale, iron-oxide becomes photosensitive, able to absorb sunlight and convert it into electrons. That opens up the door to many new possibilities."

One such possibility is using iron-oxide nanostructures to drive hydrogen out of water in a process called water splitting. Driving, or "cranking," hydrogen from water is a first step in using hydrogen as a renewable fuel source, but the process comes with many challenges.

"Typically, these types of reactions happen really slowly, reducing how many electrons transfer from the iron-oxide to the water and crank out the hydrogen," says Hu. "So, we developed a new type of nanoparticle catalyst to speed up and improve the reaction."

Hu and her research team found that their new nanoscale iron-nickel catalyst can beat the performance of ruthenium, a benchmark water splitting catalyst material. And, replacing the scarce and expensive ruthenium with abundant and cheap iron and nickel helps reduce costs.

Hu's catalyst also requires less voltage to activate the reaction than other water-splitting processes. "Usually this type of reaction requires 1.5 or 1.6 volts to crank the hydrogen, but our new catalyst does the job with only 1.2 volts, a huge energy savings," says Hu.

After making the breakthrough in water splitting, Hu has now turned her attention to harnessing the potential of nanostructures in other areas.

"We have a lot of big challenges facing society – energy needs, illnesses – just to name two. The never-seen-before abilities of nanostructures may be the new piece of the puzzle we need to solve our pressing problems," says Hu.

Contributed by Breehan Gerleman/Engineering College Relations



ME's Li returns to Ames to begin his career

From the moment he arrived on campus in the fall of 2012, Beiwen Li felt welcomed by the Iowa State University community.

"I still remember my first day as a student at Iowa State I got lost on campus," Li recollected. "I was holding a map and trying to figure out where to go and then a couple of people stopped by to ask if I needed any help. I felt very welcomed here and the people were really nice. I just really like the people here in Iowa."

Li graduated with his MS in mechanical engineering in 2014 and then followed his major professor – Dr. Song Zhang – to Purdue University where Li graduated with his PhD in ME in 2017. Before even defending his dissertation, Li applied for a job as an assistant professor at Iowa State, and shortly after graduating he was offered the position.

In addition to being familiar with area, Li said his decision to come back to Ames was largely attributed to the research taking place on this campus.

"I can see there's potential for having a bright future here at Iowa State so I did not hesitate to accept this job," he said.

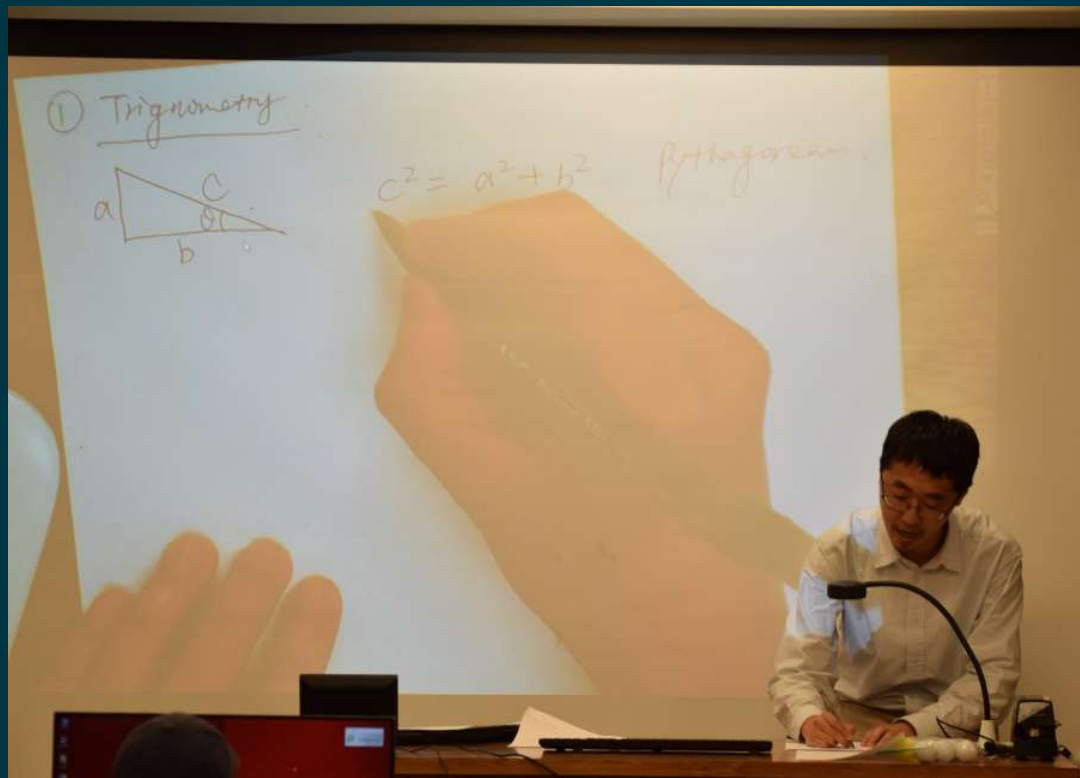
undergraduate students to gain research experience at Iowa State which he thinks can be invaluable when applying for jobs and graduate programs.

Li said that he also likes the breadth of the ME curriculum at Iowa State, which includes

instruction in traditional ME concepts like controls, fluids, and heat transfer as well as emerging areas such as computer visions/graphics and geometric modeling.

Li's interest in mechanical engineering can be traced back to his upbringing in Jinan,

ME assistant professor Beiwen Li teaches his Mechanical Engineering Problem Solving with Computer Applications (ME 160) class in Black Engineering Building on Sept. 18, 2017.





Dr. Beiwen Li

Assistant Professor



Education

PhD, Mechanical Engineering, Purdue University, 2017

MS, Mechanical Engineering, Iowa State University, 2014

BS, Optoelectronics, Beijing University of Aeronautics and Astronautics, 2012

Interest Areas

- Superfast 3D optical sensing
- Multi-scale 3D optical metrology
- Machine/computer vision
- Differential geometry
- In-situ inspection
- Biophotonic imaging

China, a city with a population of just over seven million roughly 265 miles south of Beijing. He became interested in physics and math in high school and studied optoelectronics at Beijing University of Aeronautics and Astronautics.

"I was always fascinated by optics," said Li. "Phenomena like rainbows were always a mystery to me so that's why I chose to study an optics related field."

In graduate school, Li's focus shifted more toward three-dimensional (3D) scanning and optical metrology.

"When I was a PhD student my major focus was how to develop a faster and more accurate 3D scanner, so our focus was on how to get higher quality data and how to make the algorithm better and more robust," he said.

As a PhD student Li did 3D imaging for a bio-inspired robotics study in collaboration with a professor at Purdue where he measured a flapping-wing robot with the intention of eventually measuring the flapping wings of a real animal such as a humming bird.

"The goal of the research was to see if we could create a flapping-wing robot that would mimic the mechanics of a real flying

animal," said Li. "We were interested in knowing the strain and stress of the wings so we could do a mechanics analysis to get some insight. After measuring the flapping-wing robot I was trying to develop a strain and stress computational framework using the 3D data we obtained."

Li said that the research helped him to learn more about differential geometry and computational mechanics.

"What I like about this research is that I'm no longer just simply developing algorithms for 3D scanning but I'm also doing some analysis upon that, which will also be my focus at Iowa State. I want to do analysis to create insight from 3D data for different applications," he said.

Outside of his research and academic responsibilities, Li enjoys playing table tennis and soccer and is a supporter of the Chinese national team. He also likes music, particularly Bruno Mars. He has played piano since he was a child and picked up the guitar around the time he went to college. He said that having the knowledge of the piano, gave him the theoretical framework that made it easier to learn guitar. Li also sings when he's in the confines of his home, adding that "although I'm not good, I like it."

Did you know?

Dr. Li is one of eight current ME faculty members to have at least one degree in mechanical engineering from Purdue University: Jonathan Claussen (MS, PhD); Ted Heindel (MS, PhD); Beiwen Li (PhD); Margaret Mathison (PhD); Greg Maxwell (PhD); Sonal Padalkar (PhD); Travis Sippel (MEng, MS, PhD); and Xinwei Wang (PhD). Two emeritus faculty members also have degrees from Purdue: Joseph Baumgarten (MS, PhD) and Mike Pate (PhD).



ME's Gomes brings her expertise in food engineering, safety to ag-focused Iowa

Given her background in food and agricultural engineering, recently hired mechanical engineering associate professor Carmen Gomes feels that she's bringing something unique to the department.

"I believe I can bring my expertise when it comes to chemistry, biology, and interactions with interfaces in materials to the mechanical engineering world," she said.

Gomes excelled at biology, chemistry, and physics classes while attending high school in her hometown of Viçosa, Brazil but said that she thought it was easier to see the practical application of engineering as opposed to physics and math, which she saw as more abstract. Her interest in becoming an engineering professor was also spurred by her father, a physicist with a background in forest engineering, as well as her mother, an educator. Gomes added that her enjoyment of hands-on activities also encouraged her to pursue engineering when it came time for her to select a major in college.

"I was inspired to study engineering because I always liked hands-on activities. I was always beside my father either helping to fix a car or helping with the wires on electronics," said Gomes. "I was always curious about how things work, how things are made, and how to make them better so I guess engineering was an easy decision."

She attended the Federal University of Viçosa in her hometown, where she graduated with a BS in Food Engineering, which was one of the top majors at the university. She then attended Texas A&M University where she graduated with a PhD in Biological and Agricultural Engineering in 2010.

She served on the faculty at Texas A&M after graduation and joined the faculty at Iowa State in the fall of 2017. Her research falls within the department's Nanoscale and Bioengineering & Translational Health research areas, with her particular research focused on food safety. She said that she thinks engineers can serve an invaluable role in making food safer for consumption.

"I like to say 'Doctors save lives but engineers also do.' Doctors save one life at a time but engineers save thousands of them if we develop better equipment, methods, etcetera," said Gomes. "The idea is to develop new processes that can make food safer and also to be able to detect bacteria or pathogens before the food product hits the market."

Part of Gomes' research uses biosensors to detect contaminants in food. She hopes to continue to develop the portability and interfaces on her biosensors to make them more practical in the field, as opposed to just in the lab.

"It's about being able to detect the contaminant as soon as possible so we can take the necessary measures to remedy the situation," she said.

In addition to studying methods for detecting contaminants, she also studies ways to neutralize the bacteria or contaminant. She

has developed delivery systems composed of natural antimicrobial compounds that can control the growth of bacteria.

Her past research used these biosensors to study fresh produce such as spinach, which is a major crop in Texas, but said these sensors could also be used on food products such as poultry and pork, which are major commodities in Iowa. Additionally, the sensors could be used to measure water and soil quality.

Gomes said the opportunities for collaboration were something else that attracted her to Iowa State, adding that she hopes to not only collaborate with researchers within the ME department, but also those from the Department of Agricultural and Biosystems Engineering as well as the College of Agriculture and Life Sciences. These collaborations also open her up to pools of students from ME as well as other departments who might be able to contribute to her research.

"What attracted me most was being able to join a mechanical engineering department and being able to expand my research area and collaborate with other people who are doing biosensor work," she said.

Gomes said she has liked the lack of traffic and the friendliness of the people since moving to Ames. She also said she likes the variety of local restaurants in Ames and has already tried Iowa staples like sweet corn and pork chops. Gomes also enjoys cooking, citing that she likes the variety of techniques

used in preparing food and also the social aspect of it as well as the "instantaneous satisfaction" that it brings.

One similarity Gomes said she has noticed between Texas A&M and Iowa State is the loyalty fans show to their university's respective sports teams.

"I like how the people here really embrace the spirit of the university," she said.

Gomes is also an avid supporter of the Brazilian national soccer team, adding that growing up it was a national holiday whenever the Brazilian team would play in the World Cup.

"You will probably won't see me in the office whenever Brazil is playing," she said, adding that even if the match is in the middle of the night she'll wake up to watch it.

"I like how people here embrace the spirit of the university."

ME associate professor Carmen Gomes teaches her Engineering Thermodynamics I (ME 231) in Durham Center on Sept. 20 2017.

Dr. Carmen Gomes

Associate Professor



Education

PhD, Biological and Agricultural Engineering, Texas A&M University, 2010

BS, Food Engineering, Federal University of Vicosa, Brazil, 2003

Interest Areas

- Design of novel nanoscale materials using biopolymers
- Design of biosensors using nanotechnology approaches
- Stimuli-responsive nanostructures
- Delivery systems and sensing platforms
- Food safety and shelf-life extension of food products



Did you know?

Elmina Wilson was hired as an instructor in 1895. Mechanical engineering drawing was one of the courses she taught, likely making her the department's first female faculty member. She held a bachelor's (1892) and master's (1894) degree in civil engineering from Iowa State. She along with Anson Marston (ISU's first dean of engineering) assisted in the design of Marston Water Tower. She was hired as an assistant professor of civil engineering in 1902.

Meet the Team



Name: Jason Baldus
Hometown: West Des Moines, Iowa
Year: Sophomore
Major: Electrical Engr.

Role on Team PrISUm

I am responsible for maintaining and repairing the electrical systems on the car. My main role is to make notes of anything we do on the car as well

as any problems that may arise so we can have those solutions ready for the next time that it happens.



Name: Matt Biederman
Hometown: Osage, Iowa
Year: Senior
Major: Mechanical Engr.

Role on Team PrISUm

Leader of suspension, steering, and braking system design, integration, and testing.



Name: Andrew Bonde
Hometown: Humboldt, Iowa
Year: Senior
Major: Mechanical Engr.

Role on Team PrISUm

I fabricate custom parts so we don't have to rely as heavily on sponsors.



Name: Thomas Burnett
Hometown: Algona, Iowa
Year: Senior
Major: Mechanical Engr.

Role on Team PrISUm

I am the Structures Manager on the team where we design, build, and test the roll cage and the carbon fiber tub of the vehicle. The Structures team and I collaborate

with Aerodynamics, Dynamics, and Composites teams to ensure the body of the car will meet their functions and will protect the occupants. I also help out with a variety of composites work.



Iowa State's solar car team goes down under

ADELAIDE, AUSTRALIA – PrISUm Solar Car finished the 2017 Bridgestone World Solar Challenge in classic Iowa State style: blasting Neil Diamond's "Sweet Caroline" as they crossed the finish line in South Australia's capital city.

The team finished the 3021-kilometer journey around 2 p.m. local time on Friday, October 13. The race began in Darwin on October 8. Hundreds of spectators saw the cars off as they departed the Northern Territory's capital city for the six-day journey along Australia's Stuart Highway.

Throughout the race the team encountered a slew of challenges from hilly terrains to wet and cloudy weather conditions. Despite the inconsistency of the sun, the solar car, Penumbra, was able to store a sufficient amount of energy in its battery for much of the race.

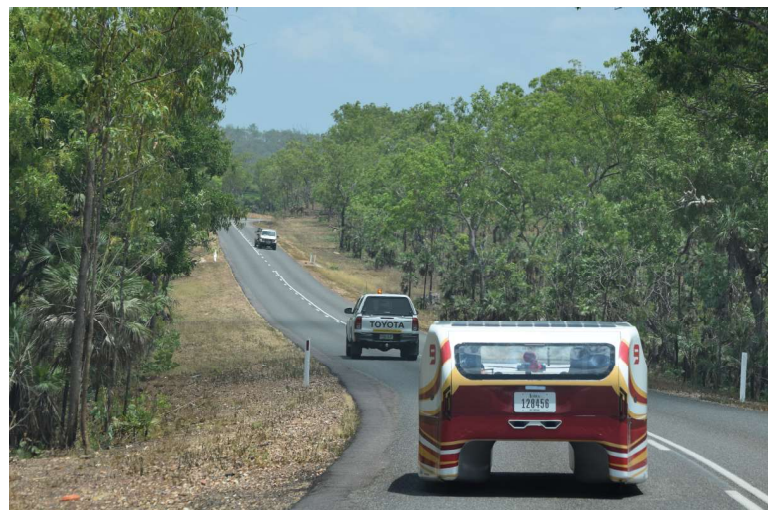
"The advantage of having a battery in addition to the solar panels is that you can charge when it's sunny so you can still go when it's not," said Lucas Ince, the team's Strategy Director. "For instance you could drain the battery on your drive to work, have it charge while you work and then drive home."

Hundreds of locals, solar car team members, and others greeted the car as it passed the finish line in Adelaide, a coastal city with a population of over 1.3 million. Not only did this mark the end of the six-day race, but it also marked the end of their college adventure for many of the team's graduating members.

Ince, a computer engineering senior from Lakeville, Minn., said the experience in Australia was unforgettable.

"The race was a challenge and at times very stressful, but being here in Adelaide and looking back on everything I did to make this car a possibility it has been my greatest college experience," he said.

Andrew Bonde, a mechanical engineering senior from Humboldt, Iowa, said it was a testament of his Iowa State University education.



"This race has been the culmination of everything I have learned while at Iowa State. The countless hours I have spent on this project have been displayed and tested while in Australia," he said.

Bonde, who earned the nickname of Frostee, has been with PrISUm since his freshman year and said his time on the team has taught him how to apply what he's learned in the classroom in a hands-on way.

"I have learned a lot from my classes at ISU and PrISUm has taught me how to use that knowledge in a practical manner."

For Matt Goode, a materials engineering senior from Coggon, Iowa, the race was a prime example of experiential learning.

"The race this year was an extraordinary learning experience for myself. Leading a team of such talented individuals was remarkable, and allowed myself to further my technical, leadership, and interpersonal skills. Not only was this my first time traveling abroad, this was the team's first time competing in another continent. Fortunately, the team was remarkable and we overcame all setbacks thrown at us during the challenge. I am going to follow the team closely in the future as they learn from our experiences and continue to change the paradigm of transportation."

Goode will graduate in December and will then depart for Los Angeles where he'll work as a lead build reliability engineer for the second stage at SpaceX. He said his experience with PrISUm helped to prepare him for his future career.

"SpaceX and other start-up companies are high work load and high commitment level companies. The individuals found at these companies are passionate about their work and truly believe in the mission for which they stand. PrISUm is the exact same environment and has fully prepared me for a start-up style work environment. Thinking outside the box, long nights, challenging issues, and lots of coffee can be found both in the workforce and PrISUm and I can't thank the entire team enough for creating and maintaining this environment."

Dylan Neal, a mechanical engineering senior from St. Louis, Mo., was tearing up as he hugged his teammates, all of whom took a dip in the Tree River Fountain in Adelaide's Victoria Square, a tradition for those who finish the Bridgestone World Solar Challenge. He said finishing the race was a nice bookend to his college career.

"Crossing the finish line here in Australia, is the culmination of 28 years of dedication and dreams," he said, referring to PrISUm's 28 years of existence. "The team, two and a half years ago, set out to do something different. For years, whenever visiting with the public, everyone would always ask 'when can I use a solar car?' That motivated our team to really challenge the way people think about solar transport and build the future. It was a crazy idea back then, with many doubts. Yet, here in Victoria Square, we have proven that any dream can become a reality. This program has represented my desire to make a difference in the

Meet the Team

Name: Jason Cheng
Hometown: Cedar Falls, Iowa
Year: Sophomore
Major: Electrical Engr.

Role on Team PrISUm

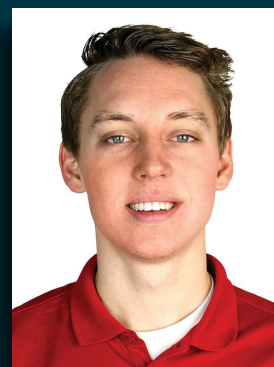
I'm an Electrical Project Director as well as serving as an Electrical Hardware Manager whenever that position is needed. I make sure projects get all the support they need as well as managing, designing, and testing all the custom electronic boards that go in the car.



Name: Sean Collins
Hometown: Sun Prairie, Wisconsin.
Year: Junior
Major: Aerospace Engr.

Role on Team PrISUm:

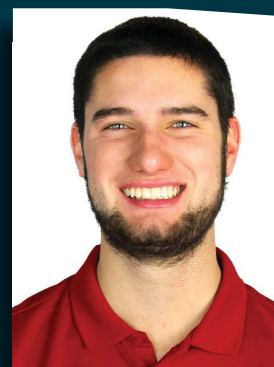
As the Aerodynamics manager, my primary job is making sure the car is as sleek and aerodynamic as possible. However, there are a lot of factors to consider when building a practical vehicle. I work with other groups on the team, such as suspension and ergonomics, to fit their requirements into the shape of the car.



Name: Nathan Coonrod
Hometown: Norwalk, Iowa
Year: Senior
Major: Electrical Engr.

Role on Team PrISUm

Electrical Lead for the Bridgestone World Solar Challenge. As the Electrical Lead it is my role to ensure that Penumbra's electronics including the vehicle drivetrain, array, and battery function reliably and safely.



Name: Matt Goode
Hometown: Coggon, Iowa
Year: Senior
Major: Materials Engr.

Role on Team PrISUm

Over the past two years, I have been serving as the project director and race team lead for PrISUm. While the team was constructing Penumbra, (continued on page 22)



Meet the Team

(continued from page 21)

I was in communications with BWSC race officials to ensure that the car was built to their regulations and to ensure the team was able to compete in the competition. Once in Australia, I acted as the liaison between race officials and the team, while also organizing PrISUm to ensure we ran a smooth, clean, and efficient race.



Name: Lucas Ince
Hometown: Lakeville, Minnesota
Year: Senior
Major: Computer Engr.

Role on Team PrISUm

Strategy Lead. My goal as Strategy Lead is to take in as much data as possible and use it to calculate what speed the car should maintain each

day depending on sunlight availability and other factors.



Name: James Kuhman
Hometown: Greendale, Wisconsin
Year: Sophomore
Major: Aerospace Engr.

Role on Team PrISUm

Electrical Leadership Member



Name: Andrew Mallek
Hometown: Clarendon Hills, Illinois
Year: Senior
Major: Mechanical Engr.

Role on Team PrISUm

As the Systems Director, I spearhead our requirements analysis for the new vehicles and overlook the project from a systems perspective.

This means early before the design phase, the systems division spends time outlining ways to manufacture and optimize the main interactive features of the car: door latches, dashboard, seating, etc. Through the design and manufacturing phases of the car I work with our timeline manager to develop a comprehensive project timeline on top of ensuring co-dependent systems will function reliably.



world by coming to Iowa State. I am so thankful for the individuals I have the pleasure of calling my colleagues and friends. PrISUm is like my second family. I am so excited to see what the future holds for the organization and I am honored to know I had a part to play."

Under the leadership of Neal and Goode, Team PrISUm has grown from roughly 20 members in 2013 to more than 120 today. Neal attributed the growth to the team's strong focus on "changing the paradigm of transportation."

"It is all about our mission and purpose," he said. "We spent weeks trying to lock down what PrISUm represents. I truly believe because myself and Matt motivated the program to build a normal car, that will change the paradigm of transportation and inspire the future, is the reason for the growth. We gave the program a revitalized direction and purpose. That purpose, is to make the world a better place. Every member of PrISUm that put in work to the project can know that their part, large or small, is changing the future."

With the race now behind them, Neal said he hopes that future generations of PrISUm will be able to return to Australia to create the same memories that he knows will be with him for the rest of his life.

"I could talk on and on about the technical details. But, in essence, there are always things to learn and improve on. The batteries, the efficiency, the electronics, the mechanical function, and anything you can think of. It won't be easy, the times will get rough, and sometimes there will be no light at the end of the tunnel. The most important part about this program, every outreach event, every interaction, and the World Solar Challenge, is that it is built upon the foundation of dreams. Where there is a will, there is a way. Do the impossible and challenge yourself – with great challenge comes great reward. Keep dreaming, always."



The Route



Image courtesy of the Bridgestone World Solar Challenge.

Quick Facts

Bridgestone World Solar Challenge

- Inaugural year: 1987
- Biennial event
- 40 teams from 21 countries across six continents
- Three race classes: Challenger, Cruiser, Adventure

Team PrISUM

- Founded: 1989
- Membership: 140+
- Newest car: Penumbra (14th generation)
- Faculty Advisers: Dr. Emmanuel Agba (ME) and Dr. David Ringholz (Industrial Design)

Meet the Team

Name: Dylan Neal
Hometown: St. Louis, Missouri
Year: Senior
Major: Mechanical Engr.



Role on Team PrISUM

Project Director and Team Lead. I am part of the team's leadership guiding the direction of the project. I have participated in many aspects including manufacturing, engineering, sponsor relations, and business management. I ensure that all the behind the scenes work is being taken care and the resources are available so the whole project can succeed.

Name: Jeremy Rurup
Hometown: Tiltonka, Iowa
Year: Senior
Major: Mechanical Engr.



Role on Team PrISUM

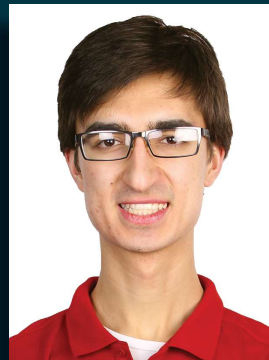
I am the manager for the entire Mechanical Division of Team PrISUM and am in charge of making sure all mechanical related design and build projects are completed.

Name: Elliot Suiter
Hometown: Johnston, Iowa
Year: Junior
Major: Mechanical Engr.



Role on Team PrISUM: Hatch project lead. I also work with media, and am managing cooking on the Australia trip.

Name: Matt Swift
Hometown: Cortlandt Manor, New York
Year: Senior
Major: Materials Engr.



Role on Team PrISUM

Composites Manager – in charge of all the carbon fiber and fiberglass processing, such as the aeroshell of the car or structural monocoque tub.



Engineers Without Borders returns to Ghana for clean water project



By easing access to clean water, Ullo villagers will need to spend less time pumping and transporting water.
Photo courtesy of Engineers Without Borders-Iowa State University

While most students travel home during the winter break, seven members of Iowa State's chapter of Engineers Without Borders will be traveling to the west African country of Ghana.

Engineers Without Borders (EWB) first visited the village of Ullo in northwest Ghana in 2014 to meet with locals and assess their needs. This initial trip led to the construction of an earthen dam as a way for Ullo villagers to store water. The dam was a project by the local government – with no connection to EWB – and ultimately did not work as planned. EWB returned to Ullo in 2016 for another assessment trip. This time they decided that a borehole would be the best method for providing access to clean drinking water. During EWB's upcoming trip they will begin drilling that borehole.

"This means that the community will finally have access to water," said EWB member Will Parr.

Parr is among the seven students from four engineering disciplines participating in the upcoming trip. The others include Abby Dolejs (civil engineering), Kyle Finseth (mechanical engineering), Michelle Friedmann (biological systems engineering), Amanda Marach (mechanical engineering), Kylar Oh (civil engineering), Kevin Prince (civil engineering), and Matthew Schweitzer (chemical engineering).

Parr, a junior in software engineering, said he has taken the skillset that he has developed

in the curriculum and applied it to this project. Those skills include pump sizing, soil testing, geophysical surveying, and cost analysis as well as project management, technical writing, and human centered design.

Kelsey Brandt, a senior in chemical engineering, said she too has taken the skills she learned in her department's curriculum and applied them to this project. Those skills include process design, fluid dynamics, project management, and technical communication. Brandt has been with EWB since 2013 and has served as the Program Director as well as the New Engineers Without Borders (NEWB) Director. She traveled with EWB to Ghana in both 2014 and 2016.

Even though he has taken certain skills and aspects from the curriculum and applied them to this project, Parr said the firsthand experience he has gained has been different than anything he has learned in the classroom.

Ullo villagers utilize wells such as this one to access groundwater.
Photo courtesy of Engineers Without Borders-Iowa State University



"In the classroom setting the flow typically involves the teacher explaining a concept and then you apply the concept to solve the solution. In our situations we are typically presented with a problem and may or may not know the concept to solve the issue, so we must learn it ourselves or reach out for professional help to learn the skills," said Parr. "Everything is hands-on in these settings, there is no more reading word problems

in textbooks, it is applying everything in real time and seeing the results immediately."

Once the borehole is drilled, EWB will determine the well's yield and will also install a hand pump for use while the rest of the system is being designed. The EWB team will also survey the land to map out the piping routes and determine the best place for a storage tank as well as distribution access points. Throughout the project EWB will be working closely with Ullo villagers so that the water system fits their needs. Specifically, EWB will administer surveys to determine the village's financial capabilities and will select system components based off of this information as the villagers will be responsible for the system's operation and maintenance costs.

While providing easier access to clean drinking water is one direct benefit of this project, it will also impact Ullo villagers in other ways.

"Another benefit that might be overlooked from an outside view is the impact that this will have on education," said Parr. "Students now may skip school because they spend the entire day looking for water, or if they decide to go to school then they will be sluggish and tired due to dehydration. Access to water will help students get back to school and that is something we as a club are focused on."

Brandt said she thinks the project will be enriching for both Ullo villagers as well as the EWB students involved.

"The Ullo Water Supply Project will not only provide water for entire community but it will also empower them to take important steps towards a better future," she said. "The students involved in the designing and implementing of this project are gaining important skills that will allow them to continue this work and make an impact on other communities throughout the world."

Since the 2016 trip, EWB members haven't only been busy with the technical aspects of this project but they've also spent a good deal of time fund-raising, which included volunteering at orchards, concessions stands at football games, and hosting weekly pizza sales.

"We are also in contact with several companies for managing donor relations and how they can support our project," said Parr. "Most of our donations come from companies, but the highest volume is people who see our project and believe in our vision. We have raised about 40,000 dollars this year and we plan on raising 200,000 dollars for the next two years in order to implement our distribution system."

Both Brandt and Parr said that their decision to be part of EWB had to do with their desire to help others.

"I wanted to be involved with EWB because it gave a purpose to the work I was doing," said Brandt. "Instead of solving theoretical problems out of a textbook, I have applied my knowledge in a real world setting. I have seen the impact that I can personally make on a community 6000 miles away from me."

"I personally chose to get involved with EWB because I wanted to use my education and resources in order to help people who may not receive that chance," said Parr. "I wanted to use the privileges I have been given to help other people improve their quality of life because they may not have that same privilege."

While "engineers" is in EWB's title, the group has opportunities for students in all fields. ISU's chapter of EWB also has students studying accounting, environmental science, genetics, global resource systems, and physics, just to name a few.

"I would say that engineering is not everything you think it is when you are entering college for the first time. It is not all reading out of books and calculations, and EWB does a great job of showing the real side of engineering," said Parr. "Seeing this project advance forward has been one of the highlights of my college career. Knowing that I played a part in helping this community receive access to water and getting kids into school is an amazing feeling."

Members of the Iowa State chapter of EWB pose with Ullo villagers during their winter 2016 assessment trip.

Photo courtesy of Engineers Without Borders-Iowa State University





Ryan Saunders, an ISU mechanical engineering graduate, poses at Proterra's headquarters in Greenville, South Carolina.

Photo courtesy of Ryan Saunders

ME student's independent study project aims to electrify campus buses

CyRide buses frequently spotted around campus and other parts of Ames could soon be getting a facelift.

Ryan Saunders, a recent ISU mechanical engineering graduate, spent the past semester studying the feasibility of electrifying CyRide, the campus and city bus system. The project, which Saunders is working on as part of an independent study course, has been one way he has been able to combine his two passions: mechanical engineering and sustainability.

"My passion since I've been young has always been sustainability. I think the electrification of our transport system is a huge step in reducing our nation's carbon footprint," said Saunders. "Electrifying public transit systems has a huge impact not only on carbon reduction but also emission reduction from NOx emissions, particulate emissions, things that really have a negative impact on the communities these buses serve and that's why I focused this project on the electrification of CyRide."

Aside from just focusing on the science and the numbers, the project has given Saunders the opportunity to examine other macro-level aspects as it "went from an engineering project to a communication and relationship building project."

"As a mechanical engineering student during your coursework, you mostly focus on the hard numbers but when you get into industry it's more about how you can use those numbers so people can make a decision and this project really embodied that," said Saunders. "I had to use my ability to analyze data then form an argument with that data so people can make informed, intelligent decisions. I was able to meld the communications skills I gained through internships

with the technical, mathematical, and analytical skills I gained through my ME degree."

Energy sourcing has been an important factor that Saunders examined with this project. He said that the idea of an electric bus can be counterintuitive if the electricity used to power the bus is generated from high-carbon sources such as coal. The economics are another factor that Saunders has considered during this project.

"One of the big benefits [of switching to electric buses] is cost. Your operational costs of CyRide will go down massively and since CyRide is mostly funded by student fees this could help reduce that fee for students going forward," Saunders said, adding that the electric buses are also quieter than their diesel-powered counterparts for those both inside and outside of the bus.

Saunders has worked closely with ME lecturer Howard Shapiro who has served as an adviser on the project. Shapiro, whose research interests include thermodynamics and energy efficiency, said this project has given Saunders the opportunity to develop skills that are hard to teach in a traditional classroom setting.

"One element that relates to the engineering but that I think is harder to teach in the curriculum is the economics of it," said Shapiro. "This project makes a lot of sense from an economic standpoint if it's done right. That's something that's harder for us to teach in the classroom but engineers need to really think about the bottom line and make decisions that are based on that."

Shapiro said that Saunders has also been able to develop his interpersonal and communication skills through this project.

"He was able to take his own personal interest in sustainability and couple it with what turned out to be not only a very important and significant technical application but also the skills to go out

and work with it in the public and try to make what you learn, and what you're able to do technically, understood by people without a technical background," said Shapiro. "So I think there were many elements of that that relate to engineering that we can't teach the same way in a class situation."

Shapiro first joined the Iowa State faculty in 1975 as an assistant professor of mechanical engineering after graduating with his PhD in mechanical engineering from The Ohio State University. He eventually worked his way up to vice provost before retiring from Iowa State in 2004, when he took a position as an associate vice president at Wayne State University in Detroit. He then retired from Wayne State in 2012 and returned to Iowa State in 2013 as a lecturer.

Outside of his university responsibilities, Shapiro also served on the Ames school board from 1988 to 1997, which included six years as the board's president. All of this experience gave him a strong base of both administrative and technical expertise. This expertise and the connections he's developed over the years came in handy when working with Saunders on this project.

"I have a long background with the city government in Ames and also with the university administration. CyRide is an example of a university-city partnership so I did have those contacts and was able to pull them in and make the connections for Ryan. He did a lot to connect with professional and business people off campus and who provide technical support to this kind of thing. So he was able to connect in that arena and I was able to get him connected in the city arena. I think that also made the project very much stronger," Shapiro said.

Throughout the project Saunders has also worked closely with Proterra, an electric bus company based in Greenville, South Carolina. CyRide will begin working with Proterra in January to analyze various routes and determine the feasibility and cost of implementing electric buses. If CyRide decides to proceed with the project they will continue to work with Proterra, and possibly CTE (Center for Transportation and the Environment), to pursue grant funding for electric buses and charging infrastructure.

Saunders came to Iowa State from Geneva, Ill., a suburb about 40 miles west of Chicago. He chose ISU because he liked the engineering program and felt it was more affordable than other options. He added that he liked the faculty, the engineering campus, and the availability of resources which he said made the decision to come to Iowa State a "no-brainer."

Upon arriving on campus in the fall of 2013, Saunders was undecided about what to study but ended up choosing mechanical engineering because he felt it offered him flexibility.

"I was drawn to mechanical engineering because of how broad it was. You start with the math and physics and once you have a better idea of what you want to learn you can focus your degree toward that so that's what really drew me to mechanical engineering. It allowed me freedom and choice which I really enjoyed," said Saunders. "Because of that I focused my degree on sustainable energy systems and a lot of my technical education credits focused on wind energy, renewable energy systems, energy economics, and things of that nature. I was drawn to mechanical because of its broad appeal and options and really the impact that I could have with that degree."

Saunders said he also appreciated that the curriculum allowed him the flexibility to take an independent study where he was really able to hone in on his interests. Not only did the independent study give the opportunity to work on something he's passionate about but it actually led to a full-time job with the Proterra office in South Carolina. He graduated this month and will start the job after that.

"Through this project I was able to get a career that fits my passions and also they were able to find someone that they were looking for that would work well with their company, so it's a win-win. I would really recommend for any student that hasn't felt completely fulfilled in their coursework or who isn't satisfied with some of the careers they see out there to pursue an independent study because you'll be surprised with what you can find," Saunders said.

Ryan Saunders, an ISU mechanical engineering graduate, poses with Proterra founder Dale Hill.

Photo courtesy of Ryan Saunders



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