IOWA STATE UNIVERSITY
College of Engineering

DIMENSIONS

Volume No. 23 | Issue No. 1

Department of Mechanical Engineering

IN THIS ISSUE

Message from the Chair

Dear alumni and friends,

We are proud to share this newsletter with you as a testament to the exceptional work done in the mechanical engineering department over the past year. It has been another exciting year, filled with significant achievements by students, faculty and alumni. For yet another year, we have the largest student enrollment that we have ever had in the history of the department. It is great to know that so many recognize the value of an Iowa State mechanical engineering degree.

To serve our growing student body, we have added six new tenure-track faculty members in Fall 2014, and profiles of these assistant professors, Jonathan Claussen, Shan Hu, Adarsh Krishnamurthy, Sonal Padalkar, Rafael Radkowski and Soumik Sarkar, are included in the newsletter. Three senior lecturers joined the department during the year: Scott Merkle, Owen Kolstad, and Barbara Lograsso. Additionally, we are undertaking major renovations and equipment updates in many of our teaching laboratories.

Our student design teams have risen to meet the challenges of competition, producing great results and supplementing their classroom lessons with real-world experience. The Clean Snowmobile Challenge team took part in their first competition, completing every event and taking home the rookie of the year award and 8th place overall. Our summer experience in Nicaragua program is now in its second year. Gloria Starns led a team of students to Nicaragua to work with rural farmers on projects ranging from clean drinking water to irrigation systems.

Among our faculty accomplishments highlighted in this newsletter, Robert Brown, Anson Marston Distinguished Professor in Engineering, was honored with an Impact Award from the Iowa Energy Center for his work on thermochemical processing of biomass and fossil fuels, transforming them into energy, fuels and chemicals. Associate Professor Baskar Ganapathysubramanian was named a Faculty Scholar by the Plant Sciences Institute as part of his research on utilizing computing to improve agronomic output. Assistant Professor Sourabh Bhattacharya organized the first "Rise of Machines" robotic competition, where graduate and undergraduate students had the chance to put their autonomous and semi-autonomous robots to the test.

Our illustrious alumni have also achieved much during the year. Alumnus Dale Johnson received the Iowa State University Alumni Association's Alumni Merit Award for his work developing an engineering program at a high school in his hometown of St. Paul, Minnesota. This story and other alumni stories can be found in this newsletter.

Our alumni are vital to the growth and success of the mechanical engineering field, and we enjoy hearing about your accomplishments. Please feel free to reach out and share your story. You can contact us at *mealumni@iastate.edu*.

Sincerely,

Caroline Hayes
Department Chair
Lynn Gleason Professor of Interdisciplinary Engineering

On the cover

Students traveled to Nicaragua in Summer 2014 as part of a design course to learn how to implement design projects to improve lives.

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Students work on design projects during class visit in Nicaragua

Nine mechanical engineering students as well as a biology student from Luther College, traveled to and lived in San Isidro, Nicaragua from June 7 to July 3, 2014 as a partial requirement for completion of M E 402, Human Centered Design. **Gloria Starns**, mechanical engineering senior lecturer, and **Wes Meier**, one of the founders of the non-profit, Emerging Opportunities for Sustainability (EOS), had discussed the possibility of forming such a course shortly after Meier, **Chris Deal** and **Greg McGrath**, all alumni of ISU's mechanical engineering program, founded the non-profit organization in 2006. EOS is dedicated to providing sustainable technology to help generate income and improve the health and welfare of Nicaraguan families. Both Starns and **Mark Wright**, mechanical engineering assistant professor, taught the course in Nicaragua last summer. Wright's fluency in Spanish, as well as his expertise in thermal systems engineering and sustainability, made him a natural fit for Human Centered Design.

The central tenet of the Human Centered Design (HCD) experience is that engineering teams work directly with the end-user of the product or process being developed. Students immerse themselves in the lives of Nicaraguan end-users to better understand what is wanted, what is feasible, and what is financially sustainable. The outcomes of the course are the ability of the students to lead other teams of engineers through the HCD process, leave the host country with a functioning, possibly marketable technology, and to experience the empowerment that an engineering education brings toward the solution of world-wide problems.

"The approach gives you a step-by-step process to develop something that users need, not something you think they need," said **Lindsey Coons**, senior in mechanical engineering.

Many people working in developing countries have been using human-centered design, as they realize the important information users provide in creating a product that will add value to their lives.

Three products for rural Nicaragua

Three student groups created three different products – a rainwater catch system, coffee roaster system and a biochar reactor. Before going to Nicaragua, the nine students started their studies with Starns and researched their future projects.

Coons explained why a rainwater catch system was so important, "Six months out of the year, they don't get any rain, so we wanted to make something to collect rain during the rainy season that the community could use to shower, wash dishes, cook, etc. during the dry season."

Ann McLoughlin, junior in mechanical engineering, was part of the coffee roaster group. "Our assignment was improve their roasting method without using electricity because the farmers don't have power," she said. Prior to going on the trip, her group researched coffee and interviewed a Burgie's worker. At the conclusion of the trip, the coffee farmer was able to roast 25 pounds in a few hours, compared to less than five pounds prior to receiving the ISU-designed roaster.

The final project was a biochar reactor; biochar is used to improve soil quality and bury carbon underneath the ground. The group worked to continue building a reactor that had been started the year before by two mechanical engineering graduate students. Eventually, EOS would like to have a reactor that produces enough biochar to sell to farmers.

All three groups completed their projects, and the technologies were implemented in Nicaragua before they left.

Nicaragua group at the EOS headquarters (bottom left, moving counterclockwise): Bob Bjorklund, Alicia Maher, Gloria Starns, Michelle Bruns, Lindsey Coons, Eric Mootz, Marcus Graefenhain, Thomas Howlett, Ann McLoughlin, Mark Mba Wright, and Elizabeth Shroyer

More lessons learned

Another unique aspect to the course was that the students had to understand the way business is conducted in a third world country. Because people do not always have money to pay with, bartering and exchanging services is common and needed to be incorporated into the class's projects.

The students also had to write a final report about their projects in Spanish after returning to the United States. In these reports, the groups discussed their math model and the identification process; the "fast prototype" they developed to determine an ideal product; and the changes they had to make to their design after talking with the customer.

Although Spanish-speaking skills were not required, Starns believes everyone's speaking skills improved as a result of the trip. "By the time the students left, they were all approaching fluency in terms of everyday language."

Making an impact and looking forward

Nicaragua proved to be an ideal location for the course and application of the concepts that form the core of HCD principles. Starns was impressed with the Nicaraguan people, "They took care of us, gave us everything that they had, embraced us into their families, trusted us with their children, and they were just really awesome."

And Wright said applying his knowledge as an engineer to somewhere that was not as privileged was a powerful experience, as the students got to see how their work could impact the second poorest country in the northern hemisphere.

Both felt partnering with EOS made the trip even better. "Their organization [EOS] really made that trip what it was. It was so well prepared and well thought out," Starns said.

The same class will be offered again in Summer 2015. Wright is also writing a National Science Foundation proposal to design a graduate-level class to expand the reach of the course.

Contributed by ECR

Student design team updates

Baja Team

The Baja team's hard work on their off-road vehicle resulted in the most successful season in the history of the program. After endurance wins at University of Texas at El Paso and Kansas, and two top-ten overall finishes last season, the team is looking to build on their success. The schedule for their next season includes competitions at Auburn, Oregon and Maryland.

Clean Snowmobile Challenge Team

In their first year, the CSC team took their modified snowmobile to Houghton, Michigan for the 2015 SAE International Clean Snowmobile Challenge Competition. The team surpassed their goals, finishing every event, taking 8th place in the internal combustion spark-ignited class, and receiving the Rookie of the Year Award. They are already developing ideas for their next machine, and hope to compete in more events over the coming year.

Team PrISUm

Iowa State's solar car team enjoyed another great season, the highlight of which was participating in the American Solar Challenge. Team PrISUm's solar car, Phaeton, raced from Austin, Texas to Minneapolis, Minnesota, stopping at home in Ames along the way. The team received the best mechanical design award and placed third overall. Team PrISUm is in the process of building their next car and regularly participates in outreach events to educate people about solar energy.

Cyclone Space Mining

The Cyclone Space Mining team once again took part in the NASA Robotic Mining Competition in 2014, becoming the first team in contest history to run a fully autonomous mining robot. This achievement helped the team qualify for the "World Cup" of robotic space mining in Hilo, Hawaii. The team took their robot all the way to the slopes of Mauna Kea volcano, where they earned first place in Best Design and Innovation and second in Mining. The team looks forward to another competitive season in 2015 and continued growth.

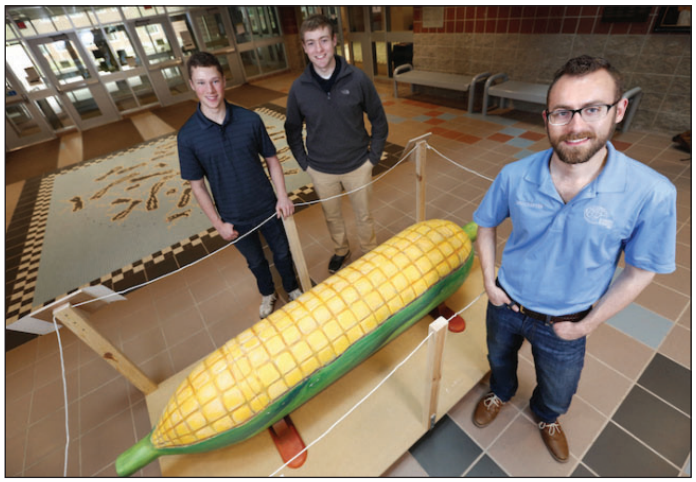
Undergraduate student honors

Adam Lawrence was named Outstanding Senior for Fall 2014 commencement.

Nathan Brace, senior, was awarded a $2,000 scholarship by the Fluid Power Educational Foundation.

Senior **Emmett Konrad** was awarded a $10,000 Willis H. Carrier scholarship by the American Society of Heating, Refrigerating and Air-Conditioning Engineers.

Lisa Garrett, senior, was given Tau Beta Pi Laureate award.



Engineers Without Borders-ISU sold the folk art coffin by Eric Adjetey Anang to help fund an earthen dam in Ghana. From left, engineering students Kevin Strohm, Jason Schmitt and Joe Gettemy. (Photo by Christopher Gannon)

Engineering students auctioned Ghanaian folk art coffin to help fund village dam

Iowa State University engineering students auctioned a rare work of folk art to help fund construction of an earthen dam for an African village that lacked a water distribution system. The final bid came in at $2,850.

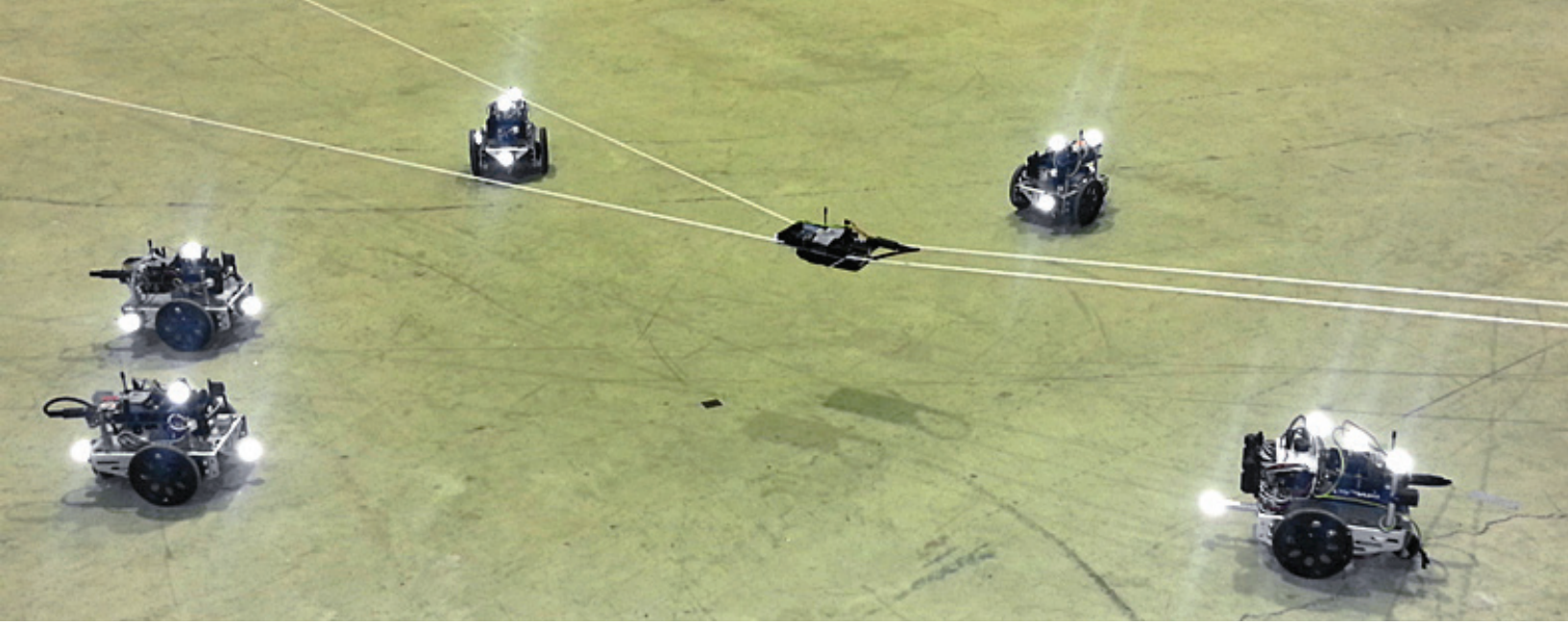
The artwork is a painted coffin in the form of an ear of corn. It was sculpted by Ghana's leading fantasy coffin artist, Eric Adjetey Anang, when he was artist-in-residence in ISU's art and visual culture department in September 2014.

A traditional folk art unique to the Ga people of southern Ghana, fantasy coffins are functional, customized coffins sculpted and painted to be figures or objects that represent the deceased. For example, a fisherman might have a coffin in the shape of a fish.

The fantasy coffin was auctioned by the ISU student chapter of Engineers Without Borders (EWB-ISU) through eBay's "Giving Fund," an easily accessible auction site for nonprofit fundraising. All proceeds will help fund the EWB-ISU's project to engineer an earthen dam in Ullo, Ghana.

Three engineering student members of EWB-ISU participated, including two from mechanical engineering: **Joe Gettemy**, senior in mechanical engineering, **Kevin Strohm**, junior in mechanical engineering, and Jason Schmitt, junior in aerospace engineering.

Contributed by News Service



Rise of Machines competition: Engaging students in robotics

In December, a group of ISU graduate and undergraduate students gathered at the Applied Science Complex to demonstrate their passion for making robots smarter and more autonomous. The event was the first "Rise of Machines" robotics competition, organized by **Sourabh Bhattacharya**, assistant professor of mechanical engineering, who has been developing a cutting-edge research program in the area of multi-robot systems.

"This marks the beginning of a new effort in the Department of Mechanical Engineering in the area of autonomy. This competition provides a great opportunity for the students to become engaged in robotics," said **Caroline Hayes**, department chair of mechanical engineering and Lynn Gleason Professor of Interdisciplinary Engineering. Hayes, who earned a PhD in robotics from Carnegie Mellon University, has been extremely supportive of this competition, as well as similar efforts in the department to foster student interest in robotics.

"These students have really worked hard to compete in this event," said Bhattacharya, who organized this event as a final project presentation for the automatic controls course offered in the department. "In addition to the assignments, exams and labs in the course, the students had to learn hardware programming, interfacing and algorithm design to compete in the event. This requires a steep learning curve on their part given the fact that they have no prior background in these areas," Bhattacharya added.

"It is invaluable to witness them progressing in the project. What they have achieved in a semester is impressive, and it is the result of their hard work," said **Rui Zou**, graduate student in mechanical engineering, who was actively engaged in organizing this event.

Participants comprised student teams from various departments in the College of Engineering, at the graduate and undergraduate levels. In the semi-autonomous category, the winner of the competition was "Bo the Bot," a robot designed and programmed by **Andrew Patience** and **Steven Lindner**, both ME undergraduates. Their robot finished the maze in less than a minute. "We just lost the first position by 2 seconds," said Keith Lansing, a graduate student in ABE, whose robot Optimus Prime finished a close second. "We were having better finishing times during the practice runs," said Lansing's teammate **Nick Orlowsky**, an undergraduate student in mechanical engineering.

One of the autonomous robots from the competition, left, is called a quadcopter.

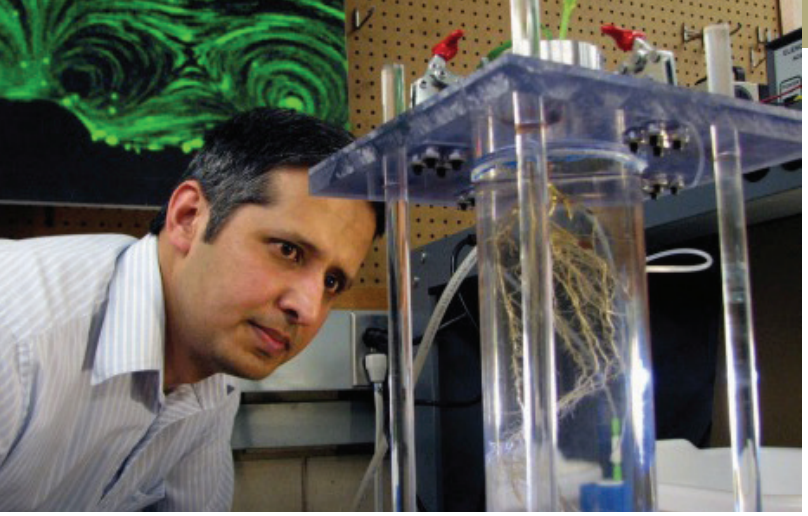
In the autonomous category, the winner was MOLI, a robot programmed by Katherine Hinkle (Grad, ABE) and Dillon Worth (Undergrad, ME). John Deutsch (Grad, ABE) and Dustin Monat (Undergrad, ME) secured the second position in the autonomous category with their robot hoiBORG.

Several faculty members attended the competition, and engaged in thought-provoking discussions with each team regarding the control and navigation algorithms designed by the students for the robots.

"The Rise of Machines robotics competition, being the first of its kind at ISU, truly presented an excellent opportunity to students to apply their classroom learning of automation and control theory to practice. The motivated performances of student teams clearly showed how much they enjoyed this holistic learning process. I really hope that the platform thrives and grows in future so that many more students can have this unique experience," said **Soumik Sarkar**, assistant professor in mechanical engineering.

In addition to staff and faculty members, the event also generated some curiosity among local school children. Stevn Schroeder, a sixth-grade student from Boone, was present to cheer for his favorite team. "I am interested in seeing the type of robots built by the college students. I hope to do the robotic section for one of my robotic modules in the Industrial Arts class," Schroeder said.

Bhattacharya hopes the competition will become an annual event in the future as a part of Iowa State's outreach efforts. "By having various categories and levels in the competition, we can attract K-12 participants from the neighboring counties," Bhattacharya said. "This will serve as a great platform to raise awareness and enthusiasm among the local kids regarding STEM fields."



Zaki Jubery, a postdoctoral research associate in mechanical engineering, examines corn roots in a pressure chamber that measures the root system's water and nutrient flow. Photo by Mike Krapfl.

Presidential initiative creates team of engineers, plant scientists to develop smart plants

Iowa State University engineers and plant scientists are joining forces to design better crops that tolerate climate change, produce bigger yields and feed more people.

The collaborative effort to develop computationally engineered plants could have the same kind of impact on agriculture as biomedical engineering has had on medicine, said **Daniel Attinger**, the leader of the project and an associate professor of mechanical engineering. Plant engineering could produce better crops or new ways to grow crops, just as biomedical engineering has saved lives by developing artificial hearts, robotic surgery and more effective drugs.

"There is so much potential for engineering in living systems," Attinger said. "Engineers and plant biologists can learn a lot from each other."

Engineers, for example, are fluent in measuring flows of water and nutrients, running high performance computer simulations and visualizing huge amounts of complex data. If engineers don't have an instrument to collect or analyze data, they'll build one.

Plant scientists bring their own tools and techniques to the collaboration. They have a long history of breeding and improving plants, identifying plant traits, understanding genomics and studying soil and environmental impacts on plants.

In the 1970s and '80s, plant scientists took steps toward the primary goal of the Iowa State collaborators: identifying the necessary traits for ideal crops and then breeding toward that goal. Such "ideotype breeding" wasn't a great success at the time, said Patrick Schnable, Charles F. Curtiss Distinguished Professor in Agriculture and Life Sciences, the director of Iowa State's Plant Sciences Institute and part of the plant engineering collaboration.

But Schnable sees promise in this new attempt to use the principles of engineering and physics in plant breeding. He calls the new Iowa State effort "a bold experiment at bringing new techniques and approaches to an idea plant scientists have looked at. This new collaboration is developing new science at the interface of plant sciences and engineering."

Iowa State engineers and plant scientists launched their effort last summer with a one-year, $100,000 grant from Iowa State's Presidential Initiative for Interdisciplinary Research. Iowa State President Steven Leath announced the initiative in the fall of 2012 with the goal of promoting interdisciplinary research, securing large research grants and building Iowa State's reputation for innovation.

The plant engineering collaboration has already gone public with its ideas and findings. The research team sponsored and organized an International Workshop on Engineered Crops in April 2014 in the Hotel Fort Des Moines in downtown Des Moines. The workshop welcomed more than 100 participants, including some of the world's best engineers and plant scientists, as well as representatives from agribusiness companies and government agencies. Workshop topics included genotypes and environmental interactions, plant physiology and nutrient transport, numerical modeling, imaging of plant traits and education needs.

One thing engineers can do for plant scientists is help identify the best combinations of genes and traits for better crops. **Baskar Ganapathysubramanian**, an associate professor of mechanical engineering, is working to develop computer models of how the environment affects a plant's nutrient transport, water uptake, photosynthesis and root architecture.

"Instead of going out in the field and doing a lot of experiments that are resource intensive and time intensive, we're coming up with a computational paradigm and throwing that into high performance computing resources," he said. "This way you can go through millions and millions of combinations and figure out which ones might work."

Plant scientists and engineers are also working to develop other research techniques. One project, for example, is using engineering tools – including X-ray computed tomography – to study root systems in the soil.

"With these new technologies we're developing, we should be able to look at real root development in the soil, over time," said Larry Halverson, an associate professor of plant pathology and microbiology who studies root biology. "And from that, we should be able to model nutrient and water transport in ways that have never been done before."

This idea of plant scientists and engineers working together to engineer "smart plants" is all very promising, Halverson said.

"What we intend to do is integrate two disciplines that have really not been integrated very well," he said. "They have different approaches, different philosophies as well as different perspectives on how to answer questions."

Combining the different strengths of both disciplines is the point of this new collaboration, Attinger said.

"The engineers will use quantitative methods to identify the characteristics of ideal crops," he said. "And the plant scientists will breed crops having the desired characteristics."

He also said Iowa State, with established research programs in the plant sciences and engineering, is very suitable for an effort to develop engineered plants.

"This can be a game-changer for Iowa," Attinger said. "We have high-tech agriculture industries and extremely good soil and farms for large-scale testing. There might be no place better than Iowa's Cultivation Corridor to engineer plants."

Contributed by News Service

Graduate student honors and awards

Jeremy Caplin was selected for the National Science Foundation's East Asia and Pacific Summer Institute fellowship.

Ph.D. student **Tannon Daugaard** won the poster competition "Sustainability and Sustainable Biorefineries" at the 2014 Annual Meeting of the American Institute of Chemical Engineers.

Graduate students **Bernardo del Campo**, **Matt Kieffer** and **Juan Proana Aviles** were awarded a $150,000 grant by the Small Business Innovation Research and Small Business Technology Transfer Programs Office within the U.S. Department of Energy to develop their biochar business, Advanced Renewable Technology International, Inc.

Mahdi Javanbakht, postdoctoral research associate, was awarded the 2014 Karas Award for Outstanding Dissertation.

Graduate student **Qing He** was awarded a 2014 Leading the Bioeconomy Graduate Fellowship.

Spring 2014 Research Excellence Awards
Sujith Sukumaran
Punit Tulpule

Fall 2014 Research Excellence Awards
Ammar Melaibari
Shen Xu

Spring 2015 Research Excellence Award
Yu Xie

Spring 2014 Teaching Excellence Awards
Wangyujue Hong
Ruchir Goswami

Fall 2014 Teaching Excellence Awards
Pavan Poosarla
Joshua Mineroff
Ping Du

Spring 2015 Teaching Excellence Awards
Yuanfen Chen
Sougata Roy
Farrokh Sharifi

New and improved steel fanning mill prototype built in 2014. Photo by Anastacia MacAllister.

Student visits Uganda to improve rural livelihoods

In July 2014, **Anastacia "Stacy" MacAllister**, who is a graduate student in mechanical engineering, traveled to the Kamuli District in Uganda to assess a fanning mill project that has been ongoing since 2011.

This project originally began when sophomore engineers, in collaboration with ISU-based Value Added Agriculture Program (VAAP), built a wooden, hand-powered fanning mill to help African farmers clean their seeds of chafe and dirt.

"Previously, farmers could only clean 100kg, or about four bushels of soybeans, in two days, spending around 16 hours on the process, which comes out to about ¼ bushel per hour. With the fanning mill, farmers could process 6.6 bushels each hour," an earlier College of Engineering story said.

VAAP sent the sophomore engineer-designed machine over to Uganda where it was introduced to farmers in Kamuli. It worked really well, MacAllister said, but there was just one problem – it was made of wood and vulnerable to rot and insects.

In response, a team of mechanical engineering seniors, including MacAllister, picked up the project in the spring of 2013 for ME 415 and started to redesign the seed cleaner using steel parts.

By the end of the semester, she says her team had essentially designed the core components of the new machine.

"It wasn't quite ready for primetime," she said, but enough progress had been made to send a steel prototype to Tonnet Agro Engineering, a manufacturing company in Kampala, Uganda, and begin locally sourcing the machine.

In August 2013, MacAllister and Margaret Smith, who is a co-director of VAAP, flew over to help Tonnet finish the designs. Tonnet manufactured eight fanning mills that ISU purchased and issued to 16 farmer groups in the Kamuli District for testing.

Eight more machines were later built in January 2014 and distributed to VEDCO (Volunteer Efforts for Development Concerns), St. Joseph Vocational Training Center and six women's farm groups.

MacAllister, accompanied by former ISU employee Jennifer Steffen, embarked on a second trip in July to check on the machine and interview the farmer groups who have been testing it. Overall, the trip was successful.

"The design is holding up well and meets the majority of their needs while coming in at a low cost," she said.

It's also saving the farmers time, which has especially benefited women farmers. They use this extra time to expand their gardens to grow more food or focus on other activities, such as hand weaving baskets to sell in the market, MacAllister said.

However, low income and limited access to banking resources make the machine a large investment. It costs roughly 831,000 Ugandan shillings ($300) to manufacture, and many of the interviewed farmers were willing to pay up to 275,000 shillings ($90).

"In this situation, the right resources and intervention, like microfinance, could help to put the machine within their reach, cost wise," she said.

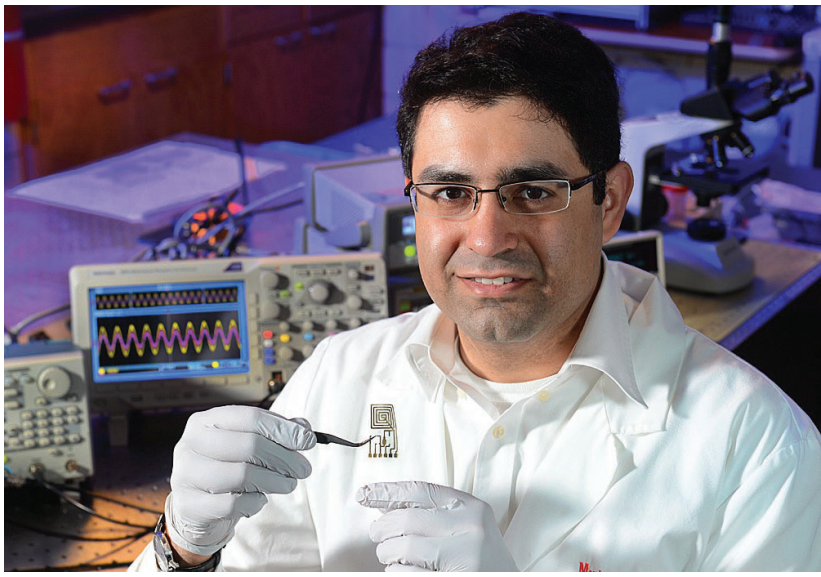
Contributed by Engineering College Relations

Montazami developing materials and electronics that dissolve when triggered

A medical device, once its job is done, could harmlessly melt away inside a person's body. Or, a military device could collect and send its data and then dissolve away, leaving no trace of an intelligence mission. Or, an environmental sensor could collect climate information, then wash away in the rain.

It's a new way of looking at electronics: "You don't expect your cell phone to dissolve someday, right?" said **Reza Montazami**, an Iowa State University assistant professor of mechanical engineering. "The resistors, capacitors and electronics, you don't expect everything to dissolve in such a manner that there's no trace of it."

But Montazami thinks it can happen and is developing the necessary materials.



Reza Montazami examines a degradable antenna capable of data transmission. Photo by Bob Elbert.

He calls the technology "transient materials" or "transient electronics." The materials are special polymers designed to quickly and completely melt away when a trigger is activated. It's a fairly new field of study and Montazami says he's making progress.

The research team he's leading, for example, is developing degradable polymer composite materials that are suitable platforms for electronic components. The team has also built and tested a degradable antenna capable of data transmission.

The team presented some of its research results at a meeting of the American Chemical Society in Dallas.

And, a paper describing some of the team's work, "Study of Physically Transient Insulating Materials as a Potential Platform for Transient Electronics and Bioelectronics," was published online by the journal Advanced Functional Materials.

The paper focuses on the precise control of the degradation rate of polymer composite materials developed for transient electronics.

Montazami is the lead senior author of the paper. Iowa State coauthors are Nastaran Hashemi, an assistant professor of mechanical engineering; Handan Acar and Simge Cinar, postdoctoral research associates in mechanical engineering; and Mahendra Thunga, a postdoctoral research associate in materials science and engineering and an associate of the U.S. Department of Energy's Ames Laboratory. Michael Kessler, formerly of Iowa State and now professor and director of Washington State University's School of Mechanical and Materials Engineering in Pullman, is also a coauthor.

The research has been supported by Montazami's startup funds from Iowa State. He's pursuing grants to support additional projects.

"Investigation of electronic devices based on transient materials (transient electronics) is a new and rarely addressed technology with paramount potentials in both medical and military applications," the researchers wrote in the paper.

To demonstrate that potential, Montazami played a video showing a blue light-emitting diode mounted on a clear polymer composite base with the electrical leads embedded inside. Add a drop of water and the base and wiring begin to melt away. Before long the light goes out and a second drop of water degrades what little is left.

The researchers have developed and tested transient resistors and capacitors. They're working on transient LED and transistor technology, said Montazami, who started the research as a way to connect his background in solid-state physics and materials science with applied work in mechanical engineering.

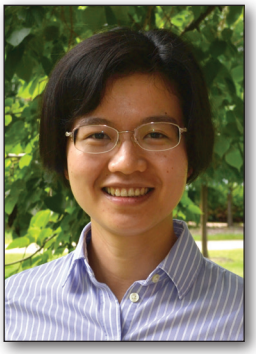
As the technology develops, Montazami sees more and more potential for the commercial application of transient materials.

Just think, he said, if you lose your credit card, you could send out a signal that causes the card to self-destruct. Or, sensors programmed to degrade over certain times and temperatures could be stored with food. When the sensors degrade and stop sending a signal, that food is no longer fresh. Or, when soldiers are wounded, their electronic devices could be remotely triggered to melt away, securing sensitive military information.

Contributed by News Service

Pursuit of higher education leads Shan Hu to Iowa State

Shan Hu left her home country and flew across the world in pursuit of higher education. Her journey has landed her in Iowa where she hopes to share her expertise and experiences with students at Iowa State University.



Hu

Hu grew up watching her father, a carpenter, make furniture and other products that were sold in her hometown in Longsheng, Guangxi, China. She says his work later inspired her to pursue a career in engineering.

"When I was little, I liked to make, break and fix stuff. I too wanted to be able to make things just like my father," she said.

Hu enrolled at Harbin Institute of Technology for a Bachelor of Engineering in measurement and control technology. This degree contains elements from electrical engineering, mechanical engineering, optical engineering and controls engineering.

"Higher education gives me access to advanced knowledge that shapes me personally and professionally in a good way," she said.

Hu received her bachelor's in 2007 and immediately started looking into graduate programs for a master's degree. She had heard about the education system in the U.S. and decided to move abroad for her studies.

"Students in the U.S. generally have more flexibility and freedom in deciding how they want to pursue their graduate degree," she said. "So I said, 'Why not? Let me get a flavor of a different educational system outside of China.' "

She moved to the states in 2007 and joined a project that used non-invasive methods to study heart rate variability in individuals driving vehicles to determine fatigue levels. If a driver reached a certain fatigue level, an automated computer program would caution them to pull over and rest before continuing.

"This would be especially useful for truck drivers who travel long distances across the country," she says.

After receiving her master's in engineering management in 2009, Shan Hu began considering a Ph.D. And her adviser knew the perfect place for her to go next – the University of Minnesota.

For her Ph.D. project, she helped design a standalone system that could be used to play music and negate outside noise sources at the same time.

She says it's like placing a transparent speaker on your window. "If you don't like the music that's being played outside or if you live in a loud neighborhood, you can play your own music and/or reduce the noise."

Now at ISU, Hu is settling into her position as assistant professor of mechanical engineering. She's setting up her lab space and preparing curriculum for ME 370 Instrumentation, a class she'll teach in the spring of 2015.

"Overall, higher education is very rewarding for me and I want my students at Iowa State to have the same, if not better, experience. That is one of my goals as an assistant professor."

Contributed by ECR

Designing disease detection and prevention technologies

After watching individuals, families and communities slowly succumb to debilitating diseases – like Alzheimer's, cancer and type-2 diabetes – throughout his life, **Jonathan Claussen** is determined to find a way to relieve the effects of these illnesses.

Claussen

"I've seen how devastating these diseases can be," said Claussen, assistant professor in mechanical engineering. "I want to help detect and monitor them at an early stage to increase the odds of a promising prognosis."

He received a bachelor's degree in mechanical engineering, Spanish and Portuguese studies from the University of Minnesota. He then took a one-year sabbatical to perform service work in southern Brazil that helped to solidify his interest in health-related engineering.

While studying for his master's from Purdue University, Claussen became interested in nanostructured biosensors that were capable of detecting biomarkers associated with diseases such as diabetes and cancer.

"Noninvasive glucose biosensors, for example, monitor glucose in saliva or interstitial fluids and can be used for disease diagnostics and treatment," he explained.

For his doctorate degree, he developed electrochemical biosensors – sensors that can monitor electrical changes in solutions due to biological events – comprised of carbon nanotubes and graphene deposited onto silicon chips through chemical vapor deposition for disease diagnostics.

Biosensors, he says, can attach to skin or surface material and continually measure compounds associated with diseases or other biological processes, called biomarkers, in sweat or interstitial fluid, pathogens in a farmer's field or food quality in a supermarket.

Claussen moved to the University of California San Diego, after receiving his Ph.D. in 2011, where he spent a year as a postdoc working on micro/nano rockets and micro needles arrays for drug delivery. He later studied optical-based biosensors comprised of semiconductor nanocrystals, called quantum dots, as a research scientist at the US Naval Research Laboratory in Washington D.C.

Now at Iowa State, Claussen brings his background in nanotechnology and microfabrication and a goal to help others learn to ISU's classrooms. And his research seems to be a perfect fit in the biological and nanoscale sciences research thrust in the mechanical engineering department, where he looks forward to creating strong and lasting collaborations with his colleagues.

He started a lab group with two major focus areas: researching ink jet printed biosensors and developing new fabrication methods for "growing" carbon nanotubes and graphene for a variety of applications including biosensing.

In addition to research, Claussen taught ME 160 – Problem Solving with Computer Applications – in Fall 2014, and he hopes to develop a new course on biosensors and nanotechnology for students.

"It's exciting to see new students come in and give them a taste of what engineering really is," he said. "They also bring an energy and excitement to the classroom and laboratory that is quite contagious and rewarding."

Contributed by ECR

Studying materials systems with microscopy and engineering

Sonal Padalkar grew up looking through the lens of a microscope, seeing new worlds of changing colors and patterns. The experience, she says, gave her a unique perspective on life and sparked her interest in material systems.

Padalkar

Padalkar, who joined the mechanical engineering department in Fall 2014 as an assistant professor, spent many weekends as a child in the National Chemical Laboratory in India. She would visit her father, who was a microscopist, or a scientist who uses microscopes to study material systems.

His lab was equipped with several types of microscopes, such as scanning and transmission electron microscopes. And since her father was a scientist, he often asked her questions to correlate what she was seeing in his lab to stimulate her critical thinking skills.

"I began to wonder what was really happening when different materials were placed under the microscope," she said. "These observations made me curious about materials and their behavior."

Intent on learning more about materials systems, Padalkar enrolled at Government College of Engineering in India to study metallurgical engineering for her bachelor's degree. She later pursued a master's in physical metallurgy at Pune University.

Padalkar continued her studies in materials engineering for her Ph.D. At Purdue, Padalkar studied bottom-up synthesis techniques to synthesize nanowires, which were studied using a variety of microscopes, including scanning electron microscopes, transmission electron microscopes and cryo transmission electron microscopes.

After receiving her Ph.D. in 2010, Padalkar studied atom-probe tomography at Northwestern University as a postdoc under Lincoln Lauhon. She says this technique goes one step ahead of conventional microscopy in terms of resolution and sensitivity, to let researchers "see" materials on the atomic level.

Now at Iowa State, Padalkar says she joined the mechanical engineering department because of its interdisciplinary research culture and strong collaborative environment, which provide emerging scientists like her with opportunities to thrive in their respective research areas and help them forge new paths.

She will now be using various characterization techniques to solve complex problems in research, like studying hybrid structures for solar energy applications – mainly solar cells.

"I am curious about the composition and performance relationship of these hybrid structures," she said. "I want to design, synthesize and characterize them to maximize light absorption in solar cells."

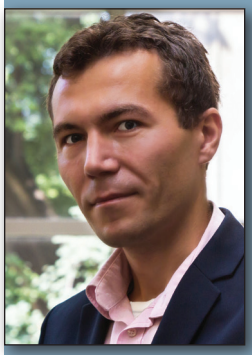
Padalkar is also teaching ME 231 Engineering Thermodynamics for the first time.

"Teaching thermodynamics is very exciting as I, along with my students, am learning a lot while preparing for lectures," she said.

Contributed by ECR

Bringing virtual reality into the real world

Is the table in front of you a real or digital copy? Right now, you might be looking at a four-legged, rectangular figure made of wood and metal. You probably feel a cool, smooth sensation as you run your fingers across its surface.



Radkowski

In the future, however, **Rafael Radkowski** says you might not be able to distinguish – at least visually – real-world objects from 3-D models, thanks to a technology called augmented reality.

"Unlike virtual reality, which connects the user to the digital world, augmented reality projects the digital world into the real world using 3-D models," said Radkowski, who joined the ME Department as an assistant professor.

Radkowski received a Diploma in Engineering (2003), which is the equivalent to both a bachelor's and a master's degree, and his Ph.D. (2006) in mechanical engineering from Universität Paderborn in Germany.

His main research subject is augmented reality and object tracking in particular. He's been working in the field since starting his research career in Paderborn as well as during previous visits to Iowa State.

In 2011, Radkowski came to ISU as a visiting researcher where he studied computer vision and natural feature tracking for about five months. In 2012, he returned as a postdoc and worked on several research projects, with a focus on visual natural perception.

Standard displays only permit a fixed view – you have the same view no matter where you move your head. Whereas natural visual perception simulates depth cues and motion parallax, allowing us to see in 3-D.

"The view within the screen itself shifts to your perspective in real time," Radkowski says. "When everything adapts to your view, you can better perceive 3-D objects on a screen – sort of like looking through a window."

In the engineering field, this research could help engineers whose visual perception relies on depth cues to better estimate distances, sizes and spatial dimensions of objects.

Radkowski will continue studying natural visual perception at Iowa State, continuing a grant he received at Paderborn. He is also designing software programs that can visualize 3-D models – using projectors and displays – for assembly assistance in the manufacturing process.

This technology is still developing and his current research is focusing on a proof-of-concept prototype to show the positive effects of simulated depth cues. In addition to his research, Radkowski taught ME 325 Mechanical Component Design and HCI 571X Augmented Reality in Fall 2014.

Right now, Radkowski is doing studies to prove we can turn 3-D models into more lifelike copies. It may not be long before we're using holograms to communicate.

Contributed by ECR

Faculty and staff honors

Daniel Attinger, Associate Professor
ME Professor of the Year, voted by ME senior class

Robert Brown, Anson Marston Distinguished Professor in Engineering
Ranked #23 in the Top 100 People in the Bioeconomy by Biofuels Digest
2014 Impact Award, Iowa Energy Center

Baskar Ganapathysubramanian, Associate Professor
ISU Award for Early Achievement in Research
Plant Sciences Institute Faculty Scholar

Ted Heindel, Bergles Professor of Thermal Science
Exemplary Faculty Mentor Award

Jim Heise, Senior Lecturer
Engineering Student Council "Faculty Member of the Year"

Shan Hu, Assistant Professor
Black and Veatch Building a World of Difference Faculty Fellow in Engineering

Soumik Sarkar, Assistant Professor
Black and Veatch Building a World of Difference Faculty Fellow in Engineering

Gloria Starns
College of Engineering Superior Teaching Award
ME Professor of the Year, voted by ME senior class

Jessica Van Winkle, Academic Adviser
2013-2014 Exemplary Peer Mentor Supervisor

Judy Vance, Joseph C. and Elizabeth A. Anderlik Professor of Engineering
Exemplary Faculty Mentor Award

Xinwei Wang, Professor
2014 ASME Fellow
ISU Award for Mid-Career Achievement in Research

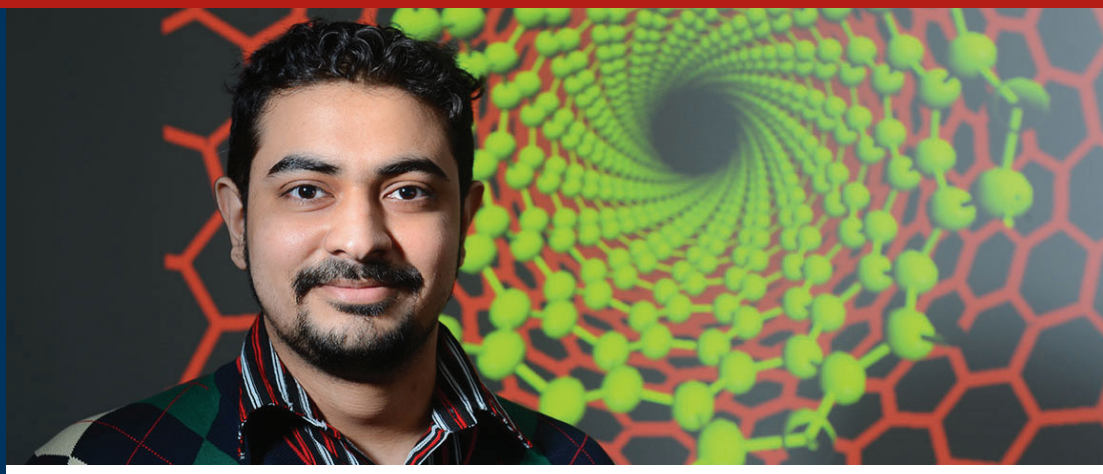
Promotions

Baskar Ganapathysubramanian, promoted to Associate Professor with Tenure

Timothy Bigelow, promoted to Associate Professor with Tenure

Shankar Subramaniam, promoted to Professor

Sriram Sundararajan, promoted to Professor



Ganesh Balasubramanian

HPC at the Molecular Level

The work that **Ganesh Balasubramanian**, assistant professor of mechanical engineering, and his students are doing with High Performance Computing (HPC) at Iowa State could eventually save lives. Their research could contribute to new ways of treating tumors, using chemical injections rather than radiation.

"We are investigating stimulus-responsive materials," Balasubramanian explained. "We look at temperature and light and photoresponsive molecules that change color with light," he said. "Using this technology, a surgeon can use remote control to laser beam the chemical into the tumor."

Balasubramanian uses HPC technology to look at molecular systems, nanomaterials if you will. "We can compute millions and millions of atoms with HPC," he said. "A regular computer can't handle that volume. You need volume and speed. Problems like this would take ages. HPC expedites all these systems in a reasonable amount of time. If you cut a piece of paper as small as it will go, the very smallest piece you can hold in your hand still has millions of atoms. It's those things we are looking at."

Their research is being used to create new materials or adapt existing ones. For example, his group is studying hydrophilic properties, trying to understand, in one problem, the remarkable elasticity of certain insect proteins. "We are gaining a fundamental understanding of molecular properties that can contribute at the bulk level, to help create new materials," he said. His group also examines heat transfer through low dimensional materials that provide new insights for molecular engineering of next generation thermoelectrics and nanoelectronics.

"HPC helps us do the necessary computations," he said. "This happens at the nanosecond and we need HPC in order to be accurate."

Balasubramanian's team includes three PhD students, one master's level student, and an undergrad. They connect to the ISU HPC system through their desktop workstations. Balasubramanian is an HPC enthusiast. "Dr. Somani was kind to include our group in the purchase of the CyEnce machine," he said. Dr. Arun Somani is chair of the HPC steering committee at ISU. "Before CyEnce there was no unified model for everyone to access HPC," he said. "CyEnce gave us that platform."

From the Office of the CIO

Wang elected ASME Fellow

Wang

Xinwei Wang, professor of mechanical engineering, was elected a fellow of the American Society of Mechanical Engineers (ASME) for his contributions in the fields of micro/nanoscale thermal probing and characterization, and laser-material interaction.

Members of ASME are eligible for fellowship after 10 years of practice in the field of mechanical engineering and 10 years of corporate membership in the society.

ASME has more than 130,000 members in 150 countries and holds more than 30 technical conferences annually.

Wang has been a member of ASME for 15 years. He has given invited talks at conferences and helped organize conferences in the areas of thermal science and heat transfer.

One of Wang's newest areas of research is thermal/electrical transport in metallic films. His work has focused on films as thin as the width of three atoms.

"It's a very exciting area," Wang said.

Incorporating video game technology into pacemaker therapy

Growing up, **Adarsh Krishnamurthy** had a fascination for cars that later inspired him to pursue engineering. He also had an affinity for computer science, thanks in part to his older brother, who earned degrees in the field.

Krishnamurthy

Krishnamurthy found a way to combine these interests during his undergraduate studies at the Indian Institute of Technology (IIT) in Madras, majoring in mechanical engineering with an emphasis on non-destructive testing and computational modeling.

He received his bachelor's and master's in product design at IIT in 2005. While studying for his master's, Krishnamurthy developed simulation methods for a nondestructive testing technique called ultrasonic testing. The technique involved sending sound waves through a material that reflected back and indicated whether it had any defects. In the process of developing techniques for modeling the objects to be tested, Krishnamurthy says he became interested in solid modeling, specifically using computer-aided design (CAD).

He then decided to pursue a Ph.D. in mechanical engineering with an emphasis in CAD at the University of California in Berkeley. Krishnamurthy used graphic process units (GPU) to speed up simulations under his Ph.D. adviser, Sara McMains, who pioneered the use of GPUs for mechanical engineering applications.

After receiving his Ph.D., Krishnamurthy moved to San Diego to perform postdoc research in bioengineering at the University of California, San Diego, focusing on using CAD for biological cardiac modeling with a technique called finite element analysis (FEA). FEA uses geometry to simulate objects that deform, such as a beating heart.

The biological cardiac modeling research studied heart patients with a left bundle branch block. The patients' hearts did not contract synchronously, causing it to pump less blood.

Traditionally, pacemakers are installed to send a stimulating electric current to synchronize the contractions. Unfortunately, the technique only works in 60% of patients.

Using computational modeling, Krishnamurthy's postdoc research focused on discovering why patients have positive or negative reactions to pacemakers. Part of his research developed new metrics that can be used to classify responders of the therapy using baseline data from simulations. The simulations took some time to develop, as a single beat of the simulations took about 8 hours to simulate on a supercomputer. He had to do at least 10 beats, taking about 3-4 days to finish one simulation.

Krishnamurthy and his mentor were one of few researchers to use higher order of finite element. Now at Iowa State, Krishnamurthy is continuing to study the use of GPUs in FEA simulations.

"If I could speed up the process by 40-50 times using GPUs, I could generate one beat in about 10 minutes," he said.

Currently, the process takes about two weeks, but Krishnamurthy hopes GPUs will allow medical physicians to generate simulations of their patients' hearts within a day. This will help doctors to determine the best place to insert a pacemaker in the heart. Krishnamurthy believes his research will one day enable medical physicians to design pacemakers that work for 100% of patients.

Contributed by ECR

Sarkar studies interdisciplinary area of data science and system science after career in industry

As **Soumik Sarkar** settles into the mechanical engineering department as an assistant professor, he'll continue to pursue complex systems and data in as many ways as he can.

Sarkar

Sarkar initially received his undergraduate degree in mechanical engineering from Jadavpur University in 2006. With an interest in physics, mathematics and research, he went to Penn State, where he earned a master's degree in mathematics.

Sarkar also began to learn more about modeling complex systems. He studied several human-engineered systems and used data analytics and machine learning to predict how the systems will behave. He says the growing size and heterogeneity of system interactions add extra complexities to the study.

"It becomes very difficult to know the behavior of a complex system with basic first principle based models. Emergent behavior can occur, causing one small change to set off a chain of events that affects the whole system." Because of this, Sarkar used smart data analytics to study complex systems to make them safer and more efficient.

After receiving his Ph.D. at Penn State in mechanical engineering, Sarkar began his career in industry as a senior scientist at the United Technologies Research Center in East Hartford, Connecticut. Sarkar focused his research on analyzing data from complex systems to create more efficiently performing machines that the United Technologies Corporation develops and manufactures, such as gas turbine engines, helicopters and HVAC equipment.

Although Sarkar enjoyed applying his research, he wanted to perform more cutting-edge research, which brought him to Iowa State's mechanical engineering department. "I love basic and exploratory research. That's why I moved back to academia."

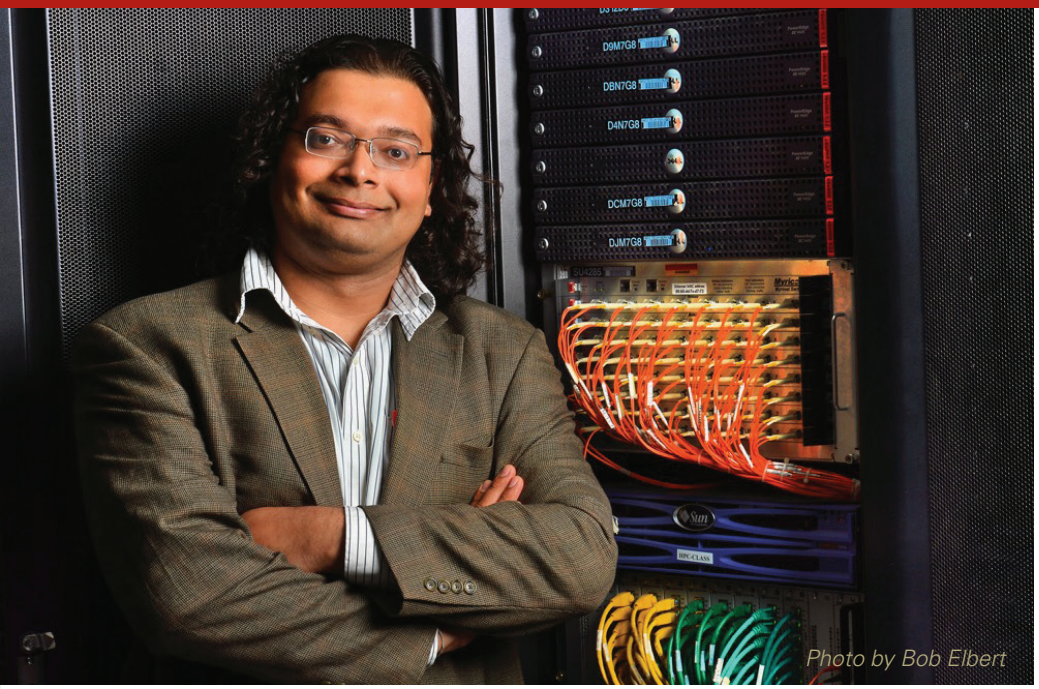
Since joining Iowa State, Sarkar has taught a senior-level course on system dynamics and controls.

He has also begun two projects focusing on data and system science. The first project is with the Iowa Energy Center to develop smart analytics and control strategies to decrease the amount of energy usage in large commercial buildings. He is collecting data from buildings and using this information to design more energy-efficient building controls.

Sarkar is also working with Rockwell Collins to design image processing systems that can help cameras capture better images and videos in difficult environments. "For example, landing an unmanned aircraft in a foggy, nighttime environment is a difficult job because the camera is giving off a noisy, cluttered image."

In the future, he looks forward to creating interdisciplinary programs between different departments and universities in order to train students in the critical area of data and system science.

Contributed by ECR



Change Agent: Baskar Ganapathysubramanian

Baskar Ganapathysubramanian spelled out a major goal of his work on the title page of a conference presentation: "Revolutionizing Science through Simulation."

Baskar, an associate professor of mechanical engineering, and the researchers in his group are serious about that.

They're confident they have developed the tools and the methods to mathematically and computationally simulate problems across disciplines, literally exploring millions and millions of variables, before settling on the most promising answers for further study.

"This is better science at a faster rate," Baskar said during a recent conversation on the third floor of Iowa State University's Lab of Mechanics, home to his Computational Physics and Mechanics Laboratory. "This enables us to quickly explore so many different scenarios."

It doesn't matter if the scenarios relate to solar cells, heating and cooling systems, wind energy or plant growth. Baskar says there are high performance computing tools that can model these scenarios and find answers.

"We're a curiosity-driven research group," he said. "We find science problems and use our methods to attack the problem."

In one study, for example, Baskar's research team helped agronomists convert series of images of corn seedling roots into precise measurements of root length, center of mass, width/depth ratio, surface area and 23 other traits.

"We could have done this," said Thomas Lubberstedt, an Iowa State professor and the K. J. Frey Chair in Agronomy. "But we would have recorded fewer traits and students would have had to spend much more time measuring rather than analyzing.

"Automatization of this phenotyping enabled evaluation of hundreds or even thousands of lines, as needed for genome-wide association analyses."

Questions and curiosity

Baskar, who's 32 and from Hyderabad in south-central India, remembers being a "why kid" – "Why does this work? Why does this happen?"

There were answers all over the house: His father has a doctorate in mechanical engineering. His mother taught literature at a high school. His only sibling – a brother three years older – also earned a doctorate in mechanical engineering.

And there were books.

"I had access to a lot of books," Baskar said. "I was a voracious reader."

His questions and his reading led him to the Indian Institute of Technology Madras where he studied mechanical engineering. Then he followed his brother to Cornell University in Ithaca, N.Y., to study mechanical and aerospace engineering, earning a master's degree in 2006 and a doctorate in 2008.

At Cornell, he joined a computational mathematics research group. His projects included studying how molten silicon solidifies in space (zero gravity produces defect-free silicon) and how to account for uncertainty in complex systems. A major tool for those studies was high performance computing.

"The computer gets numbers and we get insights out of the numbers," Baskar said. "It can be so easy to explore nature from a computer."

Even though he talks a lot about working with math and computers, Baskar said mechanical engineering is the right field for him.

"I thought I'd go into electrical engineering," he said. "But my father, knowing that I was very curious, convinced me that mechanical engineering is a very broad field. I now work with folks in electrical engineering on a variety of very fascinating problems."

Setting up shop at ISU

Baskar began his Iowa State career in 2008. He had talked to other universities, but is glad he picked Iowa State.

A startup package goes a lot farther here. He can build and teach a sizable research group. It's easy to meet faculty across the university. And he appreciates the chance to collaborate.

"I was fortunate to come here," Baskar said. "There's a wonderful group of experimental colleagues and mentors. They're willing to test out a lot of my crazy hypotheses."

One of those colleagues is Ulrike Passe, an Iowa State associate professor of architecture, who is working to make the heating and cooling systems of buildings more efficient and sustainable.

Baskar and his group have developed simulations of various duct configurations, have studied the best locations for temperature sensors and controls within a room and have even looked at the physics of the natural climate control within the beehive-shaped mud houses of Harran, Turkey.

Think about it, Baskar said: "One-third of all the energy we use is to heat and cool buildings. If we can improve the efficiency of that by 1 percent, we can save $1 billion or more every year."

Passe says architects have a basic understanding of the physics of heating and cooling, but they're not the ones to break heat transfer into math calculations and computer algorithms.

"We can use that science knowledge and work to turn it into design tools for architects," she said.

And then she described what it's like to work with Baskar and his group: He's good at explaining what he does. He can listen to collaborators and develop or apply the simulation tools they need. He can help collaborators visualize complex sets of data. And he's not afraid to cross disciplines.

"Baskar is very creative," she said. "He's a fantastic collaborator. I've learned a lot from him."

Contributed by News Service

Three new senior lecturers join ME Department

Owen Kolstad

Owen Kolstad joins the ME faculty after a career in product design at Caterpillar, AT&T Bell Labs, Donaldson, and John Deere. He holds master's degrees in both mechanical engineering and agricultural engineering from the University of Minnesota.

Barbara Lograsso

Barbara Lograsso comes to the department after working at the Ames Lab as a Metallurgical Engineer/Scientist developing smart artificial skin. She also served as president of 8VA, a thermal management accessories company, and on the ME faculty at Michigan Tech. She earned her Ph.D. in Metallurgical & Materials Engineering from Michigan Tech.

Scott Merkle

Scott Merkle has had a career in product development with Whirlpool and Maytag. He holds a MBA from the University of Iowa and a B.S. in mechanical engineering from Iowa State University.

ME Ph.D. graduate awarded for paper on spray research

Benjamin Halls was recently recognized by the Institute for Liquid Atomization and Spray Systems for research he conducted during his graduate program at Iowa State.

Halls, a 2014 mechanical engineering Ph.D. graduate, received the Simmons Award for Best Student Presenter for his paper "X-ray Fluorescence Measurement of Mixing in Impinging Jets." The research for the paper was done in collaboration with Argonne National Laboratory as part of his thesis and was originally presented in May 2014.

Halls is currently a National Research Council Postdoctoral Fellow at the Air Force Research Laboratory in Dayton, Ohio, where he continues his work on spray research.

The Harold C. Simmons Award is presented by ILASS and was named after the first chairperson of ILASS-Americas. The award provides a $1,000 prize to the student who made the best presentation—with and emphasis on clarity, delivery and visual aids; but also considers technical content and knowledge of the subject.

Contributed by Engineering College Relations

Alumni career updates

Greg Roche (BSNucE'82) was selected to be the new Vice President of Sales and Marketing of Applied LNG. He will be responsible for the company's commercial activities in the regions surrounding the Topock, Arizona and Midlothian, Texas production platforms and work with customers and strategic partners to expand the role of LNG in the North American fuel market.

Al Kapoor (MSME'92) was named chairman of TiE (The Indus Entrepreneurs) Global. The company fosters entrepreneurship across the world by nurturing future entrepreneurs.

Second Lt. **Derrick Hill** (BSME'14) will go on to a leadership role as an engineer officer with the United States Army, after he completed his journey with the Reserve Officers' Training Corps (ROTC) at Iowa State.

Maohong Fan (PhDME'00) was appointed to serve as a member of the National Coal Council – a federal advisory group that provides recommendations and guidance on policy issues pertaining to coal. Fan leads the University of Wyoming's research cluster on energy conversion technologies, including conversion of coal to value-added fuels and chemicals such as diesel, gasoline and ethylene glycol. Most recently, he received a grant from the U.S. Department of Energy for a project aimed at converting Wyoming's Powder River Basin coal into synthesis gas that can be used in chemical production.

NucE alumnus specializes in alternative energy wastewater treatment

Most students have a moment where they are sitting in a class thinking they will never use the information once they leave campus. For **Mike Locascio**, it was a fluid dynamics lab he had to take prior to graduating with a nuclear engineering degree in 1989. With his career now focused on water treatment, Locascio says he uses fluid dynamics everyday. And he's quick to add how grateful he is that Iowa State taught him how to be an engineer in any discipline.

After graduating, Locascio spent five years in the Marine Corps and then pursued an interest in rural water treatment. He now owns his own consulting business, Yield and Capacity Group, LLC, where he finds solutions to clean and dispose of wastewater for many types of industries. He says the hands-on experience of problem solving and working in a lab environment from Iowa State has come in handy since that's what he spends a majority of his time doing.

Locascio

Locascio specializes in fuel ethanol and potable alcohol wastewater treatment where he figures out how much water plants need. He also determines how the plant discharges this water into the environment. When he began working with the industry following the ethanol boom in the 2000s, he initially helped the state of Iowa create water discharge permit limits for the plants. Since then, Locascio has changed focus to help the plants use less water and recycle the water that is used, which he has coined the LESS process.

LESS stands for low energy solids separation and uses a combination of chemical and mechanical process to separate liquids and solids in a low-energy process. The Boeing Corporation, distilleries, ethanol plants and Honda have either implemented Locascio's processes or done extensive trials.

He says creating the technology was not an easy process because he had to make sure his method did not violate other patents. After trying four technologies – centrifuges, screw presses, dissolved air floatation and clarifiers – he began studying low-energy processes. This led Locascio to his greatest accomplishment – a patented technology of a gravity table and micro-screen to separate water and solids. His discovery is the most energy-efficient process available and displaces very energy traditional processes.

Locascio's process also created a new feedstock utilizing the solids filtered from the wastewater. The solids are paired with enzymes and produce a high-quality feedstock that can be fed to cattle, pigs and chickens.

Improving the environment is another result of his processes. He recently traveled to the Caribbean to implement technologies in a rum distillery. Molasses is used in the production process, which creates a thick and viscous wastewater. After the wastewater is discharged into a ditch or the ocean, the sunlight is blocked from entering the discharge area, effectively destroying the ecosystem. To reduce the damage to the environment all while improving plant economics, Locascio created a process using a chemical reaction and his patented LESS technology to remove the organics and turn them into a precursor to fertilizer as well as remove the color.

No matter what part of the world Locascio travels to, he is grateful for the opportunity to become an Iowa State engineer. "I've traveled all over the world and worked with a lot of great people, but the best engineers I run across all come from ISU."

Contributed by Engineering College Relations

Agba works with CIRAS to inform companies about automation possibilities

A new presentation from the Center for Industrial Research and Service (CIRAS), coauthored by ISU mechanical engineering senior lecturer **Emmanuel Agba**, seeks to educate company owners about the place automation could have in their business.

According to Agba, the presentation was created because of a "gap in communication and understanding of what is needed by manufacturers and what should be provided by system integrators."

The presentation outlines four different types of automation: fixed, programmable, flexible and integrated. It is designed to teach company owners about all possible levels of automation and help them use that knowledge to decide what path to pursue and how to properly shop for automation equipment.

Agba says automation decisions can lead to "costly and disastrous" failures if they're not made with a clear understanding of how the changes will impact the entire business.

Agba

Before joining Iowa State University in 2010, Agba held a career at Ford Motor Company where he specialized in metal processes and techniques. He currently works with students in the mechanical engineering capstone design course to pair them with real problems they can solve for Iowa's industries. CIRAS has allowed him to connect students to specific needs of area businesses.

Johnson works to support next generation of engineers

Dale Johnson (BSME'60, MSME'62) received the 2014 Iowa State Alumni Association's Alumni Merit Award. Created in 1932, the award recognizes alumni for outstanding contributions to human welfare that go beyond purely professional accomplishments and bring honor to the university.

Unbeknownst to Johnson, a group of friends and colleagues had been working on his nomination, and received news that their efforts were successful. The award was presented to Johnson at a ceremony during Homecoming weekend in Fall 2014.

One of Johnson's nominators was Ron Baukol, chemical engineering graduate and Johnson's friend since they first met at Iowa State in 1956. Baukol was unsuccessful in recruiting Johnson to his fraternity, Sigma Phi Epsilon (Johnson pledged Sigma Alpha Epsilon), but that didn't stop the two from becoming friends, as well as teammates on the ISU men's basketball team.

Baukol and Johnson went their separate ways after graduating, but after earning their Master's degrees the two ran into each other in the cafeteria at 3M, where they had both found jobs. They became teammates once again, this time on the 3M commercial basketball team, and both settled in White Bear Lake, Minnesota. Johnson stayed at 3M for 35 years, ending his career as Director of Plant Engineering for 3M plants in 56 countries. While with the company, he helped establish programs to revitalize St. Paul's east side, providing summer jobs for students, supplies to area schools, and support to the East Side Area Business Association.

After retiring from 3M, Johnson was in a meeting with the superintendent of schools and the two discussed finding a new focus for the school district. They saw the potential for an engineering program, but needed an administrator to help start the process. In 2007 Kathe Nickleby, an assistant principal at the time, was chosen to direct the engineering program and began working with Dale to develop curriculum.

Their efforts materialized in the Engineering Leadership Program, a school district project that introduces students at all grade levels to engineering. Students at Mahtomedi High School have the chance to take engineering courses and work in the school's state-of-the-art digital fabrication lab.

"We really wanted to develop young adults that understood what an engineer does, understand the engineering thought process and were really prepared so that when they walk into that freshman engineering class they would be successful and they would stay on the engineering path," said Nickleby, now principal of Mahtomedi High School.

"It's project-based learning, they get a chance to take what they get in the classroom and put it to work. And that's what engineers do," Johnson said. Programs in the middle school, elementary school and preschool all aim to get kids excited about engineering and educate them about the roles engineers play.

The program has already yielded impressive results. Mahtomedi's math and science scores on the Minnesota graduation exam are first in the state, and eleven Mahtomedi alumni are currently studying engineering at Iowa State.

Bowman named LEED Fellow

After **Scott Bowman** (BSME'82) was introduced to the United States Green Building Council (USGBC) and the Leadership in Energy and Environmental Design (LEED) standard, his career took a different direction.

"The organization and the standard aligned with my personal beliefs and engineering practice to increase energy efficiency in buildings. I have embraced and encouraged sustainability ever since," he said.

And now, Bowman is getting well-deserved recognition for his life's work. He was recently selected as a 2014 LEED Fellow by the USGBC for his extensive experience in green building.

LEED Fellows are recognized for the achievements as LEED Professionals and the green learning community. Bowman is the first LEED Fellow from Iowa and was recognized at the Greenbuild International Conference and Expo on October 22-24, 2014 in New Orleans.

He is the head of his own sustainability consulting business, Integrated Design + Energy Advisors, and serves as Sustainability Circle coach with True Market Solutions. Bowman also worked with KJWW Engineering Consultants for 25 years, which is considered a Top 100 Greenest Design Firm by ENR. He recently retired from the company as principal and corporate sustainability leader after guiding the firm to more than 100 LEED certified projects.

"Being named a LEED Fellow was a dream of mine since they announced this designation. Energy efficiency has always been a core value of mine, ever since my time at Iowa State," Bowman said. "You cannot underestimate the value of the foundation that Iowa State and the mechanical engineering department gave me."

Bowman has served as a member of the ME industry advisory council in the past and is an advisory board member for Iowa State's program for women in science and engineering. He also serves as subject matter expert for Iowa NSF ESPCoR energy utilization platform and was awarded a Professional Award Citation in Engineering (PACE) in 2011.

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These students are the recipients of scholarship endowments from Dale and his wife Jan, which build on the legacy created by Johnson's mother Kathryn Engel, a longtime supporter of Iowa State and the College of Engineering in particular.

Ted Heindel, Bergles Professor of Thermal Science, worked with Dale while serving as interim department chair and saw the impact he made through these grants.

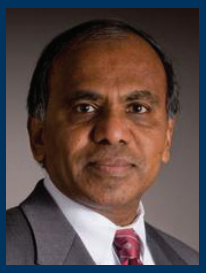
"Without his help, our students would be graduating with more debt or not graduating at all because they could not afford college. Our college, department and profession are extremely grateful to Dale's impact on undergraduate education at ISU," Heindel said.

Baukol realized that his friend's impact through the Mahtomedi engineering program deserved recognition. "That's what really caught my attention. I said 'Boy, this is an amazing thing,'" Baukol said. He worked with John Glover in the Engineering Development Office to determine an appropriate award for Dale. "Between us, we decided the Alumni Merit Award would be the right one because it's for things outside of the normal workplace, to enhance and advance human welfare."

Johnson's primary motivator remains his ability to make a difference. "I don't do this for recognition, and the purpose of the recognition for me is, if it motivates somebody else somewhere to do something in their community or wherever they have an opportunity, then it's worthwhile," Johnson said.

Mechanical engineering alum Subra Suresh honoured

Subra Suresh (MSME'79) was inducted into the Institute of Medicine (IOM) in recognition of his research into cell mechanics related to malaria, blood diseases and certain types of cancer. Suresh is one of the only 16 living Americans to be elected to all three national academies — IOM, National Academy of Sciences and National Academy of Engineering.



Suresh

President of the prestigious Carnegie Mellon University (CMU), Suresh is the first CMU faculty member to hold membership in all three academies.

Before becoming president of CMU, he served as director of the National Science Foundation (NSF), a $7-billion independent government science agency charged with advancing all fields of fundamental science, engineering research and education. He has also been elected a fellow or honorary member of all the major materials research societies in the United States and India.

Flying high: ME alum brings engineering and business skills to ICON Aircraft

Lei Huang earned his concurrent mechanical engineering and MBA degree in the fall of 2012 from Iowa State University. Today's successful engineers often need strong business management skills to complement their degree in engineering.

Huang is currently a manufacturing engineer at ICON Aircraft in California. It is here that he makes innovative impact in Light Sport Aircraft (LSA) history, by designing a production line that can output 37 aircrafts per month and create manufacturing processes for mechanical installations. Huang works on projects of integrating MES with ERP and PLM and purchasing capital equipment, but most importantly he is having fun around aircraft!

ICON Aircraft designs, manufactures, and sells full carbon composite amphibious aircrafts called A.5. ICON also provides training and services for A5 customers. The company is focusing on customer's experience and is committed to delivery innovation and excitement! ICON was founded in 2006 and is currently headquartered in Los Angeles, California.

Huang's favorite part of his job is that it has different challenges every day and he continues learning. ICON is a start-up, so there are many challenges. "The job provides me opportunities to explore different areas, not necessarily just in mechanical engineering. For example, I have chances to work with vendors for purchasing equipment and provide leadership to the shop floor."

For a LSA, the maximum taking of weight is 1,320 pounds. The top speed should not exceed 139 mph in the air. There is only one engine and a maximum of two seats are allowed. They are fairly affordable. A LSA only needs 20 hours of training, compared to a private pilot license which requires 40 hours of training, but with that said, no night flying is allowed in a LSA.

Gallagher

Teaching engineers the value of communication and "soft" skills

Don Gallagher, BSME'82, says the skills he learned at Iowa State and in the co-op program have been invaluable for his career.

"Learning a clear problem-solving methodology in the classroom gave me a solid foundation. Then it all came to life in the real world during my intern sessions." Gallagher adds that the engineering education he received here has been a "great springboard to do all sorts of different things."

Satisfying his interest in building and fixing was Gallagher's goal when pursuing a mechanical engineering degree. He believes he was able to fulfill this goal through his education at Iowa State and the opportunity to intern with John Deere for five summers.

After graduation, Gallagher transitioned from intern to full-time engineer in Waterloo, Iowa, at John Deere's diesel engine factory. He later moved into marketing and ultimately worked in a variety of roles during his 25-year career with Deere.

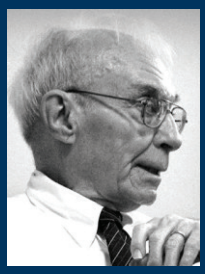
It was Gallagher's entrepreneurial drive that pushed him to leave the corporate world in 2010. Many years earlier, a seed had been planted when he attended a training workshop on personal development and productivity. During the workshop, he says he had an epiphany. "There was an engineer teaching the class that had a big impact on me. I thought: I'd really like to teach and develop employees like he's doing."

So today, Gallagher runs his own training and consulting business, where he focuses on two priorities. The first is to help organizations by teaching personal effectiveness and productivity to their employees. The second is by teaching soft skills to engineers of all ages, as well as engineering students. He believes this is important because, as a senior engineering manager told him years ago, "Engineering is roughly 20 percent technical and about 80 percent communications. You can't do great work if you can't interact effectively with other people." Gallagher focuses on engineers through a website, blog and podcast, as well as serving as a live speaker and trainer.

After 35 years of education and experience, Gallagher is excited to be channeling his passions for engineering and people development into a brand new venture that's centered on helping others. He says, "I believe an engineering degree is the perfect foundation around which you can build a great career, but by developing strong soft skills you can position yourself to become what I like to call a remarkable engineer."

Contributed by Engineering College Relations

In memoriam



Serovy

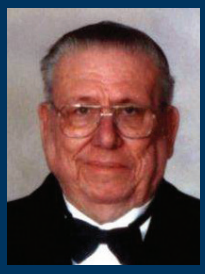
George Serovy, mechanical engineering alumnus and previous Anson Marston Distinguished Professor in Engineering, passed away November 14, 2014 at Mary Greeley Hospital in Ames. George Kaspar Serovy was born in 1926 to George and Helen (Kaspar) Serovy.

He enrolled at Iowa State College in 1943, and earned his bachelor's degree in mechanical engineering after enlisting in the Navy and serving in St. Louis. Afterwards, he worked with the National Advisory Committee for Aeronautics, the predecessor of NASA, in Cleveland from 1947 to 1948, where he explored his interest in turbomachinery.

George returned to Iowa State in 1958 to complete his Ph.D., then taught as the Anson Marston Distinguished Professor in Engineering until his retirement in 1991. He taught in both Lausanne, Switzerland and Paris as an exchange professor on two separate sabbaticals.

George was active in the American Society of Mechanical Engineers and the International Gas Turbine Institute, and also consulted for NATO and many leaders in the aeronautics and turbomachinery industries.

George is survived by his wife, Joy, five children, five granddaughters and one great-granddaughter. He is remembered for his loyalty, integrity and wit, and as an avid walker, jazz lover, saxophonist and world traveler.



Peters

Mechanical engineering professor emeritus, **Leo Peters** (82) passed away July 20, 2014.

Dr. Leo Charles Peters was a presence in the mechanical engineering department for thirty-five years who preferred spending time mentoring students to doing research.

Peters served as an academic adviser in addition to being a professor and researcher, and he enjoyed helping foreign and minority students achieve their goals.

Graduate school brought Peters to Ames in 1961. He received his master's degree in mechanical engineering and began teaching. After finishing his doctorate, he became a full professor in 1978.

Peters also worked as an engineering consultant in his private consulting practice, handling cases all over the world. He served as a consultant and expert witness in patent infringement and products liability litigation.

Peters married Suzanne Gordon in 1957. They raised nine children together.

Almeida

Eric Almeida: A pilot's dream

Eric Almeida, BSME'09, knew he wanted to be a pilot from the age of 10. After graduating from Iowa State, he was selected for Euro NATO Joint Jet Pilot Training (ENJJPT) but was later medically disqualified due to poor eyesight. Never giving up on his dream, Almeida completed ENJJPT in August 2014.

"This is something I set out to do since I was a little kid, and there were plenty of obstacles in the way of me getting here, "he said.

Almeida's first stop on the way to becoming a pilot was at Iowa State, where he planned to major in mechanical engineering, which was the closest to his dream major, nuclear engineering. He was convinced Iowa State was right for him after taking a tour designed for high school juniors, especially since the College of Engineering and marching band were superb.

He says both these two groups gave him a sense of community within the university. "You would see the same faces from class to class, even in technical electives, so it was pretty cool and gave you someone familiar to connect with."

In fact, Almeida made lifelong friends, including Brian Leber. The duo graduated with mechanical engineering degrees and was selected for ENJJPT at the same time. Leber continued with the training after Almeida was disqualified in 2009, but later became Almeida's initial instructor pilot for the T-38C phase this last spring.

They also traveled together during Almeida's T-38C cross country trip, where they flew over Des Moines and Ames, reminiscing about their times together at Iowa State.

As Leber was getting certified to be a pilot, Almeida was reclassified to be an operations research analyst, where he worked on statistics, modeling and simulation, and problem solving.

However, he still wanted to achieve his pilot's dream and decided to receive photorefractive keratectomy (PRK) eye surgery in 2010. After surgery, he reapplied to Air Force pilot training and entered in ENJJPT class 14-07, which he recently completed.

As part of the ENJJPT graduation ceremony, every class makes a video documenting their experiences. Almeida's class was selected to get raw footage of flying, so the team captured 55 weeks of training using GoPro cameras. Almeida then compiled the video (check it out!) that was shown during the graduation ceremony.

Excited to have achieved his dream, Almeida realizes now, more than ever, it was worth whatever obstacles he may have faced along the way. Upon completing additional training, Almeida will report to Davis Monthan AFB in Tucson, Arizona, where he will begin training to fly the A-10C Thunderbolt II, affectionately called the "Warthog."

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