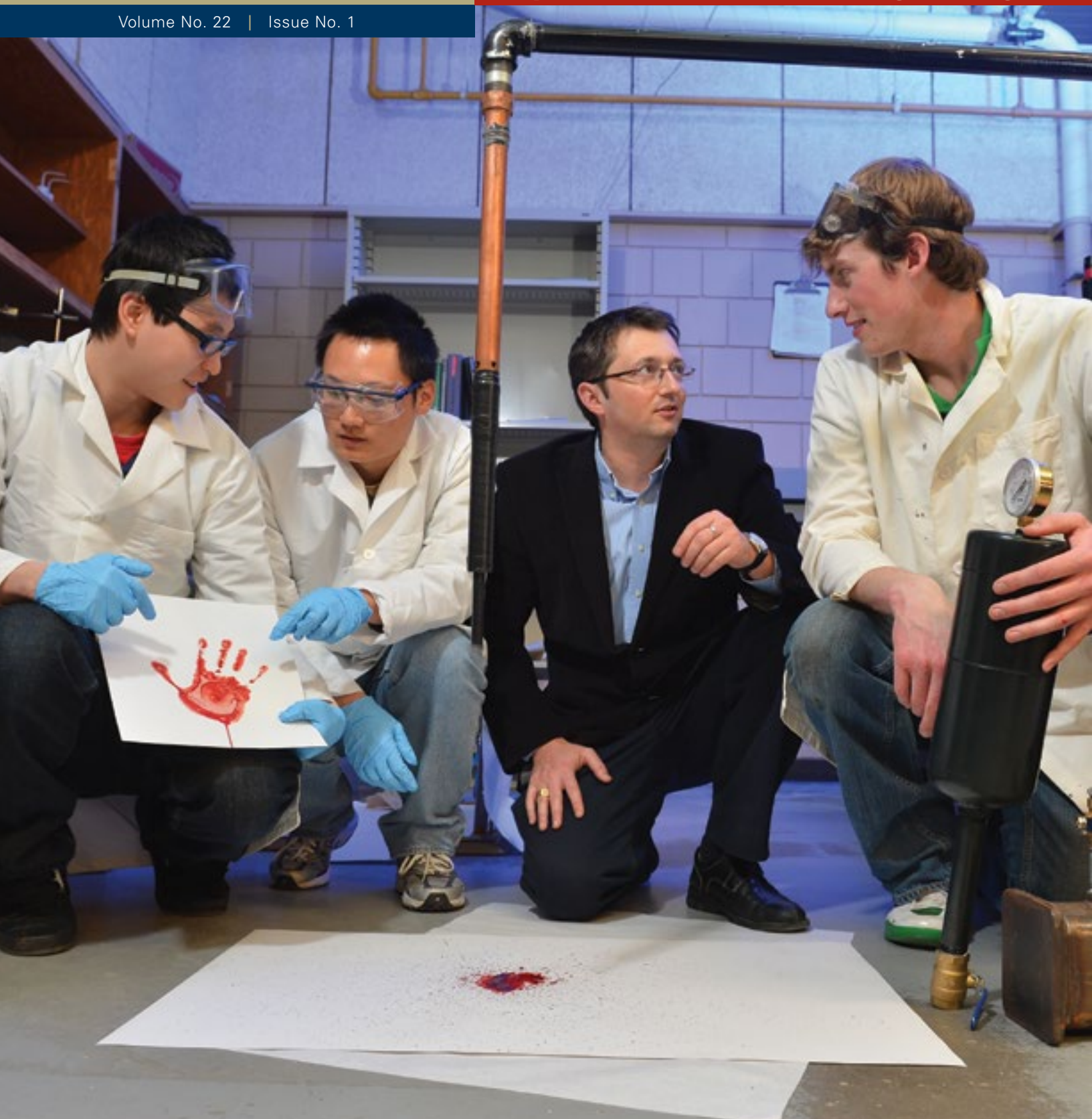
IOWA STATE UNIVERSITY
College of Engineering

DIMENSIONS

Department of Mechanical Engineering

Volume No. 22 | Issue No. 1

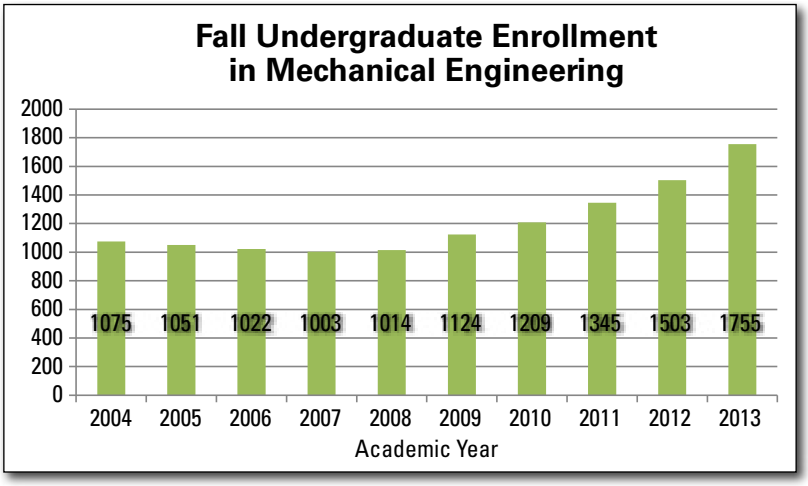


Message from the Chair

Dear alumni and friends:

We take pride in the accomplishments of our students, faculty, staff, and alumni. This newsletter highlights some of the things that demonstrate the continued strength and excellence of the Department of Mechanical Engineering at Iowa State University.

The undergraduate numbers have continued to swell, reaching 1755 in Fall 2013. Enrollment has grown more than 70% in five years, and shows no sign of stopping. We are thrilled to have so much interest in our program at Iowa State University. To accommodate the large number of students, we have increased our faculty and staff, and are searching for four additional faculty to start in Fall 2014. We welcomed three new faculty members: Assistant Professor Xianglan Bai, Assistant Professor Ming-Chen Hsu, and Assistant Professor Travis Sippel. We are proud to add their experience and talent to our already excellent faculty roster. You can read more about each of the new faculty members in the newsletter.



Our student design teams had a stellar year, with Team LunaCY winning the international lunar mining competition at NASA's Kennedy Space Center in Florida. The SAE Baja team received 10th out of 87 teams for their best finish in 20 years, and the solar car Team PrISUm raced to third in the Formula Sun Grand Prix.

Faculty and students within the department worked on solving problems in developing nations through undergraduate design courses (e.g. ME 270), faculty and graduate student research, and exploratory trips around the world. ME graduate students Bernardo Del Campo, Juan Proano Aviles, and Matt Kieffer traveled to Nicaragua to introduce farmers to the benefits of biochar, which converts abundant rice husks into a substance that both improves soil quality and sequesters carbon. You can read more about these efforts in this newsletter.

A few departmental honors that have been received include Joseph Miller, a recent ME Ph.D. graduate, who was awarded 2013 Zaffarano Prize, recognizing his superior performance in publishable research. Ted Heindel, Bergles Professor of Thermal Science, was appointed to Project Director of Iowa NSF EPSCoR, and Sriram Sundararajan, Associate Chair for Operations and associate professor, was appointed the College of Engineering's Equity Advisor.

The mechanical engineering field is stronger because of the achievements of our alumni and we are always interested in hearing from you. We encourage you to reach out and share your story and let us know how you are progressing in your careers. You can contact us at mealumni@iastate.edu.

Sincerely,

Caroline Hayes
Department Chair
Lynn Gleason Professor of Interdisciplinary Engineering

On the cover

*A research team led by **Daniel Attinger** of mechanical engineering is developing instruments that produce controlled bloodstain patterns. The team includes, left to right, Ying Xing, Jin Xu, Attinger and Miles Hayes.*

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Attinger working to put more science behind bloodstain pattern analysis

Daniel Attinger paused before handing over a photo of a crime scene.

"Are you bothered by the sight of blood?"

There was good reason for his question: The photo showed blood pooled and smeared on a floor. Blood drops ran down a nearby wall. A single shoe was left in the evidence of violence and pain.

"You can see some of the blood has started to dry," said Attinger, an Iowa State University associate professor of mechanical engineering. "There are elliptical stains, all pointing toward the pool. On the wall, the stains indicate the region of origin of the blood spatter."

The size and distribution of the bloodstains offers clues to whether a violent crime was caused by a gunshot, a stabbing or a beating, he said. The drying patterns also provide clues to the timing of the attack.

"A solid forensics expertise can help find the bad guy, or can help keep the good out of jail," Attinger said.

Bloodstain analysis, for example, has played a role in the murder investigation and charges against Oscar Pistorius, the double-amputee sprinter who raced in the Olympics for South Africa.

But current techniques in bloodstain pattern analysis need more science behind them. As evidence, Attinger cites a 2009 report published by the National Research Council, "Strengthening Forensic Science in the United States: A Path Forward."

"Scientific studies support some aspects of bloodstain pattern analysis," the report says. "One can tell, for example, if the blood spattered quickly or slowly, but some experts extrapolate far beyond what can be supported .... The uncertainties associated with bloodstain pattern analysis are enormous."

Attinger and a research team he's leading are using a three-year, $632,000 grant from the U.S. Department of Justice to take some of the uncertainty out of the analysis.

Uniquely qualified

Attinger's engineering career includes studies of the shape and deformation of ink-jetted drops, the evaporation of droplets on solid surfaces and even identification of wine stains with sophisticated pattern-recognition algorithms. His field is multiphase microfluidics, which includes precise studies of fluid dynamics, heat transfer and mass transfer.

"During these projects supported by the National Science Foundation, I developed a unique set of skills related to fluid dynamics, the generation of drops, their flight, impact and drying on a surface," Attinger said. "I look at these phenomena and try to explain how they happened."

And so Attinger was ready when he learned of the Justice Department's call for scientific studies of bloodstain pattern analysis and other forensic sciences.

Within one month, he assembled a research team that includes Shih-Fu Chang, the Richard Dicker Professor of electrical engineering and computer science at Columbia University in New York, a senior vice dean for Columbia's School of Engineering and Applied Science and director of the university's Digital Video and Multimedia Lab; Adam Donaldson, an assistant professor of chemical engineering who specializes in computational fluid dynamics at Dalhousie University in Halifax, Nova Scotia, Canada; and Craig Moore, detective constable with the Niagara Regional Police Service in Ontario, Canada, who's a bloodstain pattern analyst.

Other collaborators include Howard Stone, the Dixon Professor of mechanical and aerospace engineering at Princeton University in New Jersey and a member of the National Academy of Engineering.

Attinger's team is also working with the Midwest Forensics Resource Center, a collaboration of state crime labs, the U.S. Department of Energy's Ames Laboratory and Iowa State's Institute for Physical Research and Technology. Several Iowa Staters in the department of mechanical engineering are also part of the team: Jin Xu, a post-doctoral research associate; Miles Hayes, a senior student; and Ying Xing, another senior.

The team is working to understand the physics behind the impact and drying of blood drops. It is also working to develop portable tools that crime-scene investigators can use to analyze and interpret bloodstains.

"Our research goal is to make forensic science a bit more based on the principles of fluid dynamics," Attinger said.

Continued on page 8

Design courses introduce students to problems in developing nations

The goal of engineering is to improve lives by solving the world's problems, and Iowa State's College of Engineering believes it's never too early to start thinking globally.

Several courses in the college require students to identify and find solutions to major issues in poverty-stricken countries. Students use the semester to research, plan, design, and even produce prototypes of their products.

Kate Kennedy, a sophomore in mechanical engineering, is part of a group in ME 270 working to prevent soil erosion in Tanzania. Her group—which includes TC Ringgenberg, Emily Whitemarsh, Max Bramer, and Eric Johnson—began talking with people who had visited Tanzania to gain more information on the country.

The group noticed that the majority of Tanzanians are subsistence farmers, so the team chose to target farming for their project. First looking into building a hand planter, the group found several on the market and realized that wasn't the best direction to take. Erin MacDonald, assistant professor of mechanical engineering, encouraged the students to "dig deeper and find the real problem."

That problem turned out to be soil erosion. Farmers in the country often clear off roots that hold down the soil, which also washes away the topsoil, taking important nutrients with it.

Eric Johnson, junior in mechanical engineering, works on his group's project for the ME Design Expo in ME 270.

"In Tanzania, people live off what they grow," says Kennedy, "so if their soil gets depleted, it's a huge problem for them."

Kennedy described her group's project as a harvester that would be pushed around fields to spread mulch while leaving roots in the ground to compress the topsoil and contain its nutrients. "Ideally, the device would move through fields and cut and harvest the crop as well," she says.

Due to time, budget, and size constraints, the group is only sampling the mulching part of its machine. And while the students wanted to do more with the project, Kennedy said a restricted budget provided a more realistic experience.

Even with only a few semesters under their belts, these projects help students gain an understanding of working with global customers, focusing on real-world problems, and creating new designs on a budget.

And while this and other courses across engineering aren't necessarily developed for selling, they are always designed with actual uses in mind.

"The different technologies we are developing have the potential to get marketed because there are some good ideas," says Kennedy.

"It's important that we are confronted with problems in developing nations at some point in our college career. It's a good thing for young engineers to consider."

Contributed by Engineering College Relations

Leow honored with Barron Senior Award

Leow

Mechanical engineering senior **Szuyin Leow** received the Wallace E. Barron All-University Senior Award in recognition of her outstanding achievement in academics and university activities. Leow was crowned Iowa State's 2013 Homecoming queen. During her time at Iowa State, Leow has served as president of the nation's top Pi Beta Phi chapter and general co-director of Dance Marathon, in addition to her involvement with the Young Alumni Council, Cardinal Key, Alternative Breaks and the Catt Center for Women and Politics.

Baja Team

The Baja Team placed 10th out of 87 at the SAE International Baja Rochester Collegiate Design Series, making its best finish in the last 20 years. The team raced against 87 universities from all over the world in the endurance portion of the competition after passing the safety inspection and all dynamic events on the first day.

Team PrISUm

Team PrISUm fell just two laps short of a win at the 2013 Formula Sun Grand Prix, finishing third. Iowa State's team completed 191 laps of the 3.4-mile F1 race track in Austin, Texas.
Team PrISUm is wrapping up the design phase on their new car, called Phaeton. The team will travel to Texas next year for the 2014 American Solar Challenge.

Team LunaCY lands on top at NASA mining competition

Not only did Iowa State's Team LunaCY succeed in building a better robot and making a good showing at this year's NASA Lunabotics Mining Competition at the Kennedy Space Center in Florida, it also brought home three awards and the first place title.

The Lunabotics Club won the Joe Kosmo Award for Excellence, which is the overall top prize in the competition. ISU also won first place in on-site mining and third place in outreach, beating out 49 other teams from around the world.

Robots must collect at least 10 kilograms of simulated lunar soil in 10 minutes, but Iowa State's robot, HERMES, mined more than 115 kilograms during its last run. That was after the team put in hours of extra time attempting to make the robot run autonomously but ran into problems during competition.

The small improvements made by Team LunaCY each year resulted in a big victory for the team, which was a happy ending to the year. "It's nice that after all these years we've finally won the whole thing," Project Director Katie Goebel told the ISU News Service.

Top: (L-R) Brian Jend, Diana Jarrell, Ricardo Canahui Artola, Lauren Wickham-Kolstad, David Peiffer

Above: The team received multiple awards (clockwise from top): a $5,000 check for first place, first place in mining, the Joe Kosmo Award for Excellence, third place in outreach, and participation in the event.

Left: Team LunaCY poses for a picture with HERMES, the 2013 robot. (L-R) Front: Jim Heise-Faculty Adviser, Ricardo Canahui Artola (Sr-ME); 2nd Row: Katie Goebel (Sr-ME), Kyle White (Sr-AerE), David Peiffer (So-IE), Alex Kraft(Jr-ME), Joe Gettemy (Jr-ME), Lauren Wickham-Kolstad (Sr-ME), Diana Jarrell (Sr-ME), Quinn Murphy (So-ME); Back Row: Alex Haynes (Sr-CpE), Garrett Schieber (Jr-ME), Joe Niedergeses (Jr-Econ), Brandon Koepke (Jr-EE), Brian Jend (Sr-ME), Aren Hill (Sr-ME), Alex Grant (So-ME), Nathan Beougher (Sr-ME), Kurt Lundeen (Sr-ME)

Grad students introduce biochar to Nicaraguan farmers

Three students affiliated with BEI's Center for Sustainable Environmental Technologies (CSET) built two pyrolyzers in Nicaragua this summer to introduce farmers to the benefits of biochar. **Bernardo Del Campo**, **Juan Proano Aviles**, and **Matt Kieffer**, all graduate students in mechanical engineering at Iowa State University, spent two to three weeks near Matagalpa, Nicaragua, in June 2013.

The project was made possible by Emerging Opportunities for Sustainability (EOS) International, a nonprofit organization working in Nicaragua. Del Campo credited EOS members Wesley Meier, Bradley Barnhart, and Gregory McGrath for their help in obtaining a grant for this project. EOS International was started by a group of engineers from Iowa State in 2008 to promote appropriate technology in the developing world. The $5,000 grant was made by the Climate Food and Farming (CLIFF) Research Network, an initiative of the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS), in collaboration with the University of Copenhagen and Aarhus University.

Converting unwanted rice husks into better soil

A pyrolyzer is used to burn biomass in the absence of oxygen, generating a solid powdery substance known as biochar, as well as bio-oil and syngas. Incorporating biochar into soil both improves soil quality and sequesters carbon. For biomass, the Iowa State team used rice husks, which are readily available in the area. "The rice husks don't recompose quickly, so they're usually just burnt to get rid of it," del Campo said.

The project began with a hunt for materials to build the first pyrolyzer, which basically consisted of a 55-gallon drum, and a burner. "We had trouble finding materials," Kieffer said. "They don't have elaborate hardware stores." The team scrounged recycling centers and even begged a few spare parts from local farmers. "We took parts from old machines," Proano Aviles said.

Once they had the parts, it only took about two days to build the pyrolyzer, according to Kieffer. The team built the system in the backyard of EOS's facility, aided by EOS technicians. The pyrolyzer worked well, according to the students. "Rice husks are very homogeneous, very thin materials. In some ways, they are easier to pyrolyze and handle than corn stover," Proano Aviles said.

Bernardo Del Campo, Juan Proano Aviles, and Matt Kieffer, graduate students in mechanical engineering, spent time in Nicaragua to build two pyrolyzers to introduce farmers to the benefits of biochar.

Although the reaction required heat from a propane burner to get started, it sustained itself from the gases from the pyrolysis. "We think we can drastically improve on efficiency," del Campo said. "This was just our first reactor." Before leaving the country, the students began construction of a second pyrolyzer, which was to be finished by the EOS staff.

The resulting biochar was combined with manure, a common local fertilizer used by Nicaraguan farmers, and incorporated into test plots at four different area farms. "Their soil is really bad," del Campo said, noting much of it is very sandy and even rocky. The farmers grow potatoes, beans, tomatoes, and squash, among other crops.

The students theorize that biochar will help the soil retain moisture and nutrients. EOS employees are taking soil samples and will send some of those to Iowa State for analysis. "We'll also be looking at crop productivity," del Campo noted. The students are keeping in touch with EOS staff and farmers via the Skype video conferencing service.

Making sustainable connections

The project drew a lot of attention in the community. Kieffer and Proano-Aviles were interviewed by local radio and television media. Proano Aviles and Del Campo made a presentation at a local agricultural meeting. They also met with Funica, an organization that funds entrepreneurial projects in the agricultural community in Nicaragua. The hope is that the production of biochar can become a profitable endeavor to help farmers improve crop yields.

Another connection was made with Taking Root, a Canadian nonprofit organization that develops forest-based carbon projects in Nicaragua. Representatives from the organization discussed a partnership with the students to help create carbon offsets.

Each student stayed with a different host family in town. When they weren't working on the project, the students toured various part of Nicaragua. "We were submerged in the local culture," Proano-Aviles said.

The team agreed that this summer was just the beginning of the project and that they hope to return to Nicaragua to continue it. "We're hoping to do a one acre test," Del Campo said. The team is also raising funds to expand the project. Anyone interested in making a donation can contact del Campo via email at bernidc@iastate.edu.

Contributed by News Service

Graduate student honors

Todd Kingston, graduate student in mechanical engineering, received an American Society of Mechanical Engineers 2013 Fluids Engineering Division (FED) Graduate Student Scholarship Award.

The ISU Graduate college honors PhD students for research and teaching excellence, recognizing the "best of the best" graduating students who have submitted theses and dissertations and outstanding achievement in instruction.

Spring 2013 Research Excellence Awards:
Cheng Deng, PhD student for Pal Molian
Kaige Wang, PhD student for Robert Brown
Yanan Zhang, PhD student for Robert Brown

Spring 2013 Teaching Excellence Awards:
Hari Kodali, PhD student for Baskar Ganapathysubramanian
Haoyu Wang, PhD student for Michael Olsen

Summer 2013 Research Excellence Awards:
Jingchao Zhang, PhD student for Xinwei Wang
Dustin Dalluge, PhD student for Robert Brown
Yajun Wang, PhD student for Song Zhang

Fall 2013 Research Excellence Awards:
Jing Ren, PhD student for Sriram Sundararajan
Xiao Ma, PhD student for Pranav Shrotriya
Le Chen, PhD student for Erin MacDonald

Fall 2013 Teaching Excellence Awards:
Jinjuan She, PhD student for Erin MacDonald
Jordan Tiarks, PhD student for Song-Charng Kong

Nik Karpinsky, PhD student for Song Zhang, also received a Fall 2013 Research Excellence Award for Human Computer Interaction.

Creating new way to manipulate fluid stream flow

Two Iowa State researchers teamed up with researchers from UCLA and Princeton University to create an innovative way to engineer the flow of fluid streams, which is important in biological processing, controlling chemical reactions and creating structured materials.

Baskar Ganapathysubramanian, assistant professor of mechanical engineering, and **Yu Xie**, research graduate assistant in mechanical engineering, recently published an article called "Engineering Fluid Flow Using Sequenced Microstructures" in the journal Nature Communications.

The article detailed the importance of directing the shape of co-flowing fluid streams, a process that Ganapathysubramanian says can be applied across disciplines in a range of situations, from the very small to the macro-scale.

"There are literally infinite possibilities and applications of this discovery," Ganapathysubramanian added.

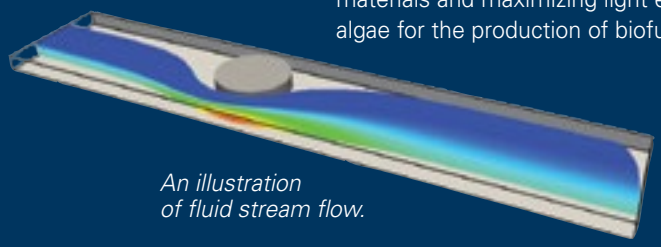
Before their research, limited strategies existed for manipulating the form and motion of fluid streams.

With this project, the team investigated a different method that included developing "a hierarchical approach to engineer fluid streams into a broad class of complex configurations." The researchers used sequences of fluid transformations to create order and control, unlike previous approaches that created chaotic flows.

The central operators for the flow scheme were cylinders positioned in various cross-stream locations to produce significant flow deformations. Using multiple pillars downstream of one another magnified the disrupted flow effect.

"This sequential placement of different types of pillars offers enormous flexibility to tailor the fluid stream for various critical applications," said Ganapathysubramanian. "Controlling the shape and location of co-flowing fluid streams provides a fundamental tool for creating structured materials, preparing biological samples and engineering heat and mass transport."

Other uses include tailoring tissue growth, cooling large data-center warehouses efficiently, fabricating interlocking fibers to improve the properties of composite materials and maximizing light exposure to algae for the production of biofuels.



An illustration of fluid stream flow.

Mechanical engineering grad student wins 2013 Zaffarano Prize

Joseph Miller, a recent Ph.D. graduate in mechanical engineering, was awarded the 2013 Zaffarano Prize, which recognizes superior performance in publishable research by a graduate student.

A check for $1,500 and a plaque was presented to Miller by the Iowa State University chapter of Sigma Xi, an international honor society for research scientists and engineers, at its banquet in April.

Miller says the Zaffarano Prize was a happy surprise, considering his initial dislike of writing when he was an undergraduate.

"I chose a discipline somewhat based on 'where can I be and not have to do a lot of writing,' which turned out to be mistaken thinking," said Miller. "Writing is half of what you do as an engineer, and if you're not able to communicate your ideas to the scientific community as well as a broader general audience, you're not going to go anywhere. So I had to get better."

Miller is also the first graduate student in mechanical engineering to be honored with the Zaffarano Prize in its 24-year history. He credits the interdisciplinary approach of his major professor, Associate Professor of Mechanical Engineering Terry Meyer, for that first-time nod.

Miller's research at Iowa State focused on developing a high-energy, high-repetition-rate pulsed laser and ultrafast nonlinear spectroscopy techniques for optical sensing of turbulent combustion. These tools allow scientists to track key components and properties of combustion, in order to acquire a more thorough understanding of combustion reactions. Being able to accurately and precisely describe combustion processes has potential applications to industrial and utility power generation, residential heating, the aerospace industry, and the automotive industry.

Miller

Contributed by Engineering College Relations

ME welcomes three new assistant professors

Xianglan Bai

Postdoc, Mech. Engr., Michigan State University
Ph.D., Mech. Engr., University of Tokyo, Japan
B.S. and M.S., Aerospace Engr., Beijing University of Aeronautics and Astronautics, China

Xianglan Bai is a new assistant professor of mechanical engineering, but before that, she was an adjunct assistant professor at the ISU Center for Sustainable Environmental Technology.

Bai's research focus is thermochemical conversion of biomass and other waste materials for biofuels and chemicals.

"This mainly focuses on thermal conversion technologies called fast pyrolysis and solvolysis," says Bai.

Fast pyrolysis is the process of rapidly heating organic materials to 450 to 600 degrees Celsius in the absence of air. Solvolysis is a chemical reaction in the presence of a solvent at elevated pressures and temperatures. Both the technologies are able to provide liquid products that contain many useful chemicals.

Since she joined ISU in 2011, Bai has collaborated with several ISU faculty members through joint projects and has received funding from several sources already.

She recently received funding for two projects from the Iowa Energy Center: "Conversion of Biomass into Fuels and Chemicals Using Solvolysis," as a PI with co-PIs Robert C. Brown, Anson Marston Distinguished Professor in Engineering, and Mark Wright, assistant professor of mechanical engineering, and "Municipal and Hydrocarbon Waste Streams—An Alternative Source for Fuels," as a co-PI with Atul Kelkar, professor of mechanical engineering.

Ming-Chen Hsu

Ph.D., University of California, San Diego
M.S., University of Texas at Austin
B.S. and M.S., National Taiwan University

Ming-Chen Hsu joined the mechanical engineering department as an assistant professor and is looking ahead to the future possibilities offered by his position.

Hsu worked on numerical analysis and computational fluid dynamics while finishing on his Ph.D., and he started to focus on structural analysis and computational fluid-structure interaction.

"Fluid-structure interaction is an emerging field, and many engineering applications involve the coupling of these two problems," says Hsu. "Having experience in both fields really helped me to better understand this linked system."

He has research experience in various areas, including the study of cerebral aneurisms and bioprosthetic heart valves—but the majority of his work has involved wind turbines, which he'll continue at Iowa State.

"I want to do turbine work here because it's a promising research direction, not just in the U.S., but in the world. I believe Iowa State is one of the places with a strong foundation for my research. People in this state are really fascinated with wind energy."

In addition to his research, Hsu will be teaching ME 160—an introductory class combined with computational skills—this fall.

He says he was impressed with the college from the time he first interviewed. "It was like a family here: everybody was so nice and people appreciate my work."

Travis Sippel

Ph.D. and M.S., Mech. Engr., Purdue University
B.S., Mech. Engr., University of Kansas

As **Travis Sippel** settles in to the Department of Mechanical Engineering, he's bringing his work with energetic materials—a line of research he believes will complement the work already being done in the mechanical and aerospace engineering departments—along with him.

"Something that really excited me about Iowa State is the potential for collaboration," says Sippel, who was impressed by the large amount of collaborative research being done by faculty and students on campus.

Sippel's work in energetic materials includes propellants, explosives and pyrotechnics. One of his current projects involves trying to make rocket propellants burn more efficiently. Specifically, Sippel was looking for a way to make aluminum a more efficient fuel in propellants.

He realized the problem was a bit more complicated than he thought. The answer, he found, is to use nanostructured particles that burst into much smaller particles during combustion.

"So far, we have only developed temperature-sensitive particles," Sippel says. "It is possible to incorporate other materials into metal particles, possibly making them sensitive to electromagnetic, piezoelectric or other stimuli."

As an assistant professor of mechanical engineering, Sippel plans to start new research similar to his current work, with hopes to study the use of hierarchical nanostructured energetic materials in new applications.

Attinger working to put more science behind bloodstain pattern analysis

Continued from page 3

Inside the lab

A tiny drop of horse blood appeared at the end of a slim tube. And with a push of a button, the drop was atomized into a spray that sent droplets flying across the lab and onto a long sheet of white paper. A high-speed camera takes up to 100,000 images per second to monitor the process.

Xing and Xu track the bloodstains across the paper to analyze and ultimately understand the trajectory of blood droplets through the air.

"The challenge is to reconstruct the curved trajectory of the blood," Attinger said. "It is a problem that was described 75 years ago. It's very complicated. Nobody has found the way yet."

His team is also building a larger instrument that will slam a piston into a pool of blood, sending blood splashing and spattering. Data from the instrument will help the team understand bloodstains from beatings.

The research team is also working to develop a 3-D measurement device to quickly and easily measure the thickness of bloodstains at a crime scene. Attinger said that would help investigators more accurately locate the blood's point of origin by estimating the impact velocity.

It's not all high technology in the lab. Attinger said some of the studies involve blood sprayed by the hammer of a mouse trap. Researchers are also making painstaking counts of the tiny spikes that radiate from drops of blood thrown to a floor or wall.

Attinger said this forensics project is interesting for him and for his lab.

"I always want to show people how important engineering is to help people with their lives and with society," he said. "I always try to find projects that are useful to society. I think engineers can do a lot to make the world a better place."

Contributed by News Service

Faculty honors and awards

Daniel Attinger, associate professor
ISU Presidential Initiative for Interdisciplinary Research Award
Co-chair of the American Society of Mechanical Engineers (ASME) 2013 11th International Conference on Nano-, Micro- and Minichannels

Ganesh Balasubramanian, assistant professor
Miller Faculty Fellowship, ISU President's Office and the Center for Excellence in Learning and Teaching

Robert Brown, Anson Marston Distinguished Professor in Engineering
Ranked #47 in the Top 100 People in Bioenergy by Biofuels Digest

Mark Bryden, associate professor
2013 ASME Melville Medal

Caroline Hayes, Department Chair and Lynn Gleason Professor of Interdisciplinary Engineering
2013 ASME Fellow
Selected for the ISU Emerging Leaders Academy

Ted Heindel, Bergles Professor of Thermal Science and **Baskar Ganapathysubramanian**, assistant professor
Innovative Research Grants Program Award, ISU Plant Sciences Institute

Xinwei Wang, professor
Viskanta Fellow, Purdue University

Promotions and appointments

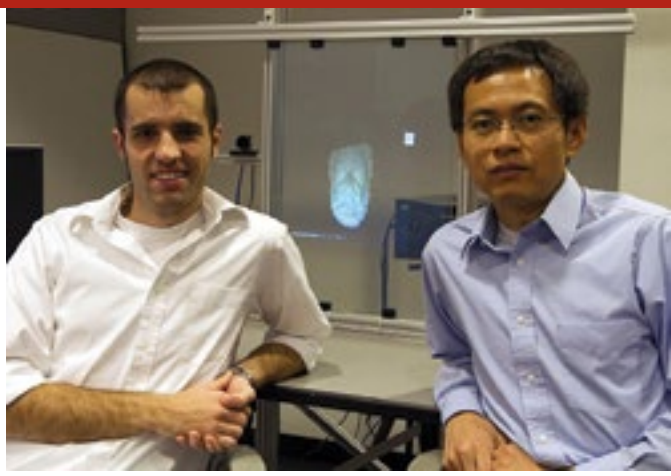
Ted Heindel, Bergles Professor of Thermal Science
Project Director of Iowa NSF EPSCoR

Sriram Sundararajan, Associate Chair for Operations, associate professor
College of Engineering Equity Advisor

Gap-Yong Kim, promoted to Associate Professor with Tenure

Song Zhang, William and Virginia Binger Assistant Professor of Mechanical Engineering
Courtesy Appointment, Department of Electrical and Computer Engineering

Nik Karpinsky, left, and Song Zhang show off their 3-D teleconferencing technology by displaying an image of Zeus. Photo courtesy of Nik Karpinsky.



Engineers develop real-time, 3-D teleconferencing technology

Nik Karpinsky quickly tapped out a few computer commands until Zeus, in all his bearded and statuesque glory, appeared in the middle of a holographic glass panel mounted to an office desk.

The white statue stared back at Karpinsky. Then a hand appeared and turned the full-size head to the right and to the left. Yes, it was quite clear, Zeus really was pictured in 3-D.

And there it was from one computer work station on the second floor of Iowa State University's Howe Hall to another down on the first floor: 3-D teleconferencing that's live, real-time and streaming at 30 frames per second.

"Four years ago, this would not have been possible," said Karpinsky, an Iowa State doctoral student in human computer interaction who's been working day and night to make the technology a reality.

Part of the problem is the complexity of the technology, said **Song Zhang**, Iowa State's William and Virginia Binger Assistant Professor of Mechanical Engineering, an associate of the U.S. Department of Energy's Ames Laboratory and the leader of the 3-D imaging project.

"There are a lot of skills involved," he said. "You have to do programming, optical engineering, hardware, software and networking."

To make it all work, Karpinsky and Zhang had to solve three big technical problems: capturing the 3-D images, transmitting the images and displaying the images.

"I was originally worried about transmission," Karpinsky said. "But we had to focus on all three."

The result of successfully combining those technologies is a proof-of-concept prototype that Karpinsky and Zhang call "Portal-s."

It all starts with a projector that shines a light straight at a teleconferencer, in this case, that bust of Zeus. There's a camera to the right of the projector and one to the left, both angled toward the subject. The cameras record two images of the light as it's distorted by the subject. The images are combined to create a single 3-D image.

That optical hardware is networked and connected to a standard computer with a graphics card. The computer combines, processes and compresses the images. (And it really compresses them – from 700 megabits per second to less than 14 megabits per second.)

The compression allows transmission of 3-D images to another computer, even over wireless networks.

The idea, Karpinsky said, is for the projectors to become the eyes of the teleconferencing system: "What the projector sees is what you see."

Karpinsky and Zhang see a bright future for the technology they've developed with the help of support from the National Science Foundation and Iowa State's Virtual Reality Applications Center.

Zhang said the next steps include developing and testing applications for smart phones. He thinks the technology is only a few years away.

"In the future, we can do all of this 3-D video conferencing on the phone," he said. "These phones are powerful enough to do all the computation."

Zhang also wants to develop the 3-D teleconferencing technology for use in powerful virtual reality environments such as Iowa State's C6, a six-sided room that surrounds users with 100 million pixels of 3-D images.

Contributed by News Service

Suresh named president of Carnegie Mellon

Subra Suresh (MSME'79) has been named Carnegie Mellon University's new president, succeeding Jared L. Cohon, who is stepping down from the position after 16 years. Suresh will assume the post of CMU president on July 1.

Cline named STATEment Maker

Each year, the Iowa State University Alumni Association names STATEment Makers to recognize the early personal and professional accomplishments and contributions to society of young alumni (graduates 32 years of age and under).

This year's STATEment Makers includes 2004 mechanical engineering alumnus **Jacob Cline** from Eldridge, Iowa. Cline postponed a professional career in engineering to provide the ultimate service to his country. Following graduation, he enlisted in the U.S. Army as a combat engineer and served two tours of duty – one in Iraq, and one in Afghanistan. He was injured by a fractured bullet during a firefight in Baghdad and was awarded the Purple Heart for his injuries. Today, he is an engineer with Deere & Co. in the Quad Cities. "I've always wanted to work as an engineer for either the department of defense or in agriculture," Jacob says. "I lucked out when I landed a job at John Deere. Now I get to help make a difference for the farmer."

Dick Stanley retires from Stanley Consultants

After 58 years of service to Stanley Consultants, Chair Emeritus **Dick Stanley** retired from the company on June 30. Stanley is a professional engineer, businessman, and world citizen. Stanley was first introduced to Stanley Consultants and the engineering profession in the mid-'40s by his father, the late C. Maxwell Stanley.

Stanley earned bachelor's degrees in mechanical and electrical engineering from Iowa State University and later received his master's in sanitary engineering from the University of Iowa.

After graduating from ISU in 1955, Stanley joined Stanley Consultants as an engineer-in-training and devoted his entire professional career to the company. Over the years he gathered broad professional experience in general management, project management, quality management, design, studies and reports.

Ben Nimmergut's ISU adventure comes full circle in his career

A 2001 mechanical engineering graduate, **Ben Nimmergut** was always fascinated with airplanes, getting to know them while his father worked as a pilot for United Airlines. But it wasn't until he devoted his last two years at Iowa State to the solar car team that he took an interest in Boeing.


Nimmergut

Nimmergut—originally from the suburbs of Chicago—had attended a summer camp in Seattle, Wash., for several years as a kid and developed an appreciation for the environment there.

When he began looking for jobs at the College of Engineering career fairs, he put his focus on the Boeing branch in Seattle. Once he knew exactly what he wanted, he took charge.

"All my effort was to get a job at Boeing in Seattle," says Nimmergut. "There are many different paths to do that and, ultimately, I was successful literally by cold-emailing the recruiting manager and saying, 'I'm coming to Seattle, and I would love to have an interview.'"

The recruiting manager, Kim Pastega, was an Iowa State alumna herself and scheduled an interview for Nimmergut at 4 p.m. on a Friday with another manager. Aside from a two-year leave of absence to get his MBA, he's been working there ever since.

Nimmergut began as a design engineer and has taken on many different roles leading up to his current position as the 747 Interiors Chief Engineer, "which means I'm responsible for the design, manufacturing and certification of the interiors of a 747."

The new 747-8 was developed about five years ago, says Nimmergut, and he helped his boss lead the airplane's design, including a brand-new interior. Once the basic foundation for the interior is designed, he works with airlines to customize it for them.

He's also responsible for the technical safety of the product, so he is still involved with the hands-on engineering even though he's now an executive.

Becoming a manager was something Nimmergut decided to pursue because he loves working with people and likes being challenged.

"I've grown at quite the rapid rate and, in some cases, that has definitely taken me out of my comfort zone," he says. "But those experiences are where I look back and really appreciate how much I have grown and learned."

Since he earned his MBA in 2007, Nimmergut has held different management roles at the company. "I get to inspire and lead the team on trying to drive change, and that's what I really enjoy about my job," he says.

Being responsible now for all the 747 interiors, he oversees the work of about 380 people who also contribute to other models and projects. As an executive, he's learning the importance of focusing on the vision of the organization.

"It's important to keep priorities and focus clear because any day of the week I could be consumed with details from any one of those teams and what they're working on."

Working at the world's leading aerospace company means Nimmergut invests a lot of time in his job. The time he does spend out of the office is devoted to his wife Julie—a 2000 business graduate of Iowa State—and their two young daughters, with soccer on Saturdays, swimming on Wednesdays and camping on the weekends.

He also spends some of his time traveling for work, although he says that's only about four to six times a year. Often, that includes visiting Ames to recruit at career fairs, which he's been doing for the last four years.

Being heavily involved with the solar car team as a student at Iowa State, Nimmergut likes to check in with the team when he comes back and says he tries to be the Boeing contact for them.

"That was my biggest involvement on campus, and that's definitely where I learned that I love leading technical groups," says Nimmergut. "Boeing continues to sponsor the solar car team, either with money or, in years past, I've been successful to give material donations."

Brad Matt shares international experience, love for Iowa State

Even though he's a mechanical engineer, **Brad Matt**, a 2002 alumnus, prefers to spend his time working hands-on at a construction site rather than in his office. Lucky for Brad, his jobs have provided him with a steady mix of both environments.

Never living in the same city for more than two consecutive years, he has spent the last 10 years working on international projects, commuting across the country and visiting Iowa and Jack Trice Stadium as much as possible.

During Brad's first job at Burns & McDonnell in Kansas City, he spent the majority of his time designing, working on aviation fuelling facilities at airports and military bases. Since taking his recent job at Shaw Group—which was acquired by CB&I in February—his job has consisted of more applied work in the field.

Brad estimates about 75 percent of CB&I's work is international and says he jumps at the chance to leave his office for a while because it mixes things up and keeps the job fresh.

In his three years at CB&I, Brad has worked on projects in Spain, Korea and Guam. Travelling to different countries sometimes every 6-7 weeks—like he's done this past year while working on a project in Guam—has taken its toll, but Brad says it is also one of the best parts of his job.

"It's a great experience just being able to see how other people live and work, and learning about their culture," he says. Brad gets to experience the work environment in other countries, but he often tries to make time for fun, too.

"My coworkers and I call some of them 'work-ations' because usually on long trips you can go and see some of the sites. I guess that's kind of the benefit we get back from sacrificing and being away from home," he adds.

Growing up in Cedar Rapids, Iowa, Brad became accustomed to the easily accessed green spaces of the rural Midwest, something he often misses now that he lives in Dallas. Since all of his family lives in Iowa and he still enjoys watching Cyclone football, Brad says he tries to make the two-hour direct flight back to Iowa four or five times a year.

He used to buy season tickets to ISU football, but his job made it harder for him to get back to watch many games. As a different way to stay connected with the university, he started the Harold L. Matt Memorial Scholarship in Engineering, named for his grandfather.

He chose to give the scholarship to an active member of the Greek system because his time in Farmhouse Fraternity and working on the Homecoming committees were some of his favorite experiences in college.

"I like that personal effect and hearing about other people's success," Brad adds. "I'm able to meet the scholarship recipients and, with scholarships like this, I know where my money is going."

Brad says he put the scholarship in his grandfather's name because he provided some of his inspiration to become an engineer. He enjoyed visiting his grandfather's farm in northeast Iowa and helping fix farm equipment.

Brad Matt, BSME'02

Even though he's always been a little more interested in the construction and application aspects of engineering, Brad says that looking back he probably wouldn't change his decision to pursue a career in mechanical engineering, which he chose because of its versatility.

Brad explains that his biggest struggles when he first began in the fueling industry came from starting out on paper, saying that he learns faster doing hands-on work. "If I had to do that part of it again, I would probably start in the field," he says, "so I would understand the projects sooner."

Still acknowledging that coursework is extremely important, Brad says it was actually his leadership experience during college that was most beneficial to him. "Getting involved on campus and learning to work with people made the transition to the professional world easier," he says.

Leadership and constant involvement helped prepare him for life after college, but his biggest lesson—and advice to current students—is to never turn down opportunities.

"If a project opportunity comes up, jump on it," he says. "Because every opportunity you get is going to help you in the future. It's going to open your eyes to different things."

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