CONNECTIONS

Racing to the Future

Iowa State's student organization SAE International, including the club Supermileage, shown here, continues to grow, as students design and produce vehicles for a variety of purposes, hoping to improve on the original concepts.

IOWA STATE UNIVERSITY
Department of Electrical and Computer Engineering

Winter 2017

Greetings from Iowa State.

Our students and faculty have returned to campus to start the spring semester with renewed 2017 vigor. We are excited to welcome them!

In this issue, we highlight the achievements of our faculty, students and alumni. The National Science Foundation (NSF) awarded ECpE faculty $4 million to increase enrollment and retention of academically talented students from economically disadvantaged families using innovative curriculum and mentoring activities. The NSF award will fund scholarships for students and employ innovative curriculum components and mentoring activities to achieve the intended goals. This is a highly competitive award, and only a handful of schools in the nation get this size of award each year; Joe Zambreno serves as the principal investigator leading this project. Manimaran Govindarasu, Ruth Shinar, Joe Shinar and Rana Biswas have received a research award from the United States Department of Energy (DOE), focusing on cybersecurity and energy efficiency. Zhaoyu Wang, our rising start in the power systems area, joined ECpE at ISU a year and a half ago and has attracted over $3 million in research grants from the NSF, DOE and industry affiliates.

Our students also are doing great work, and in this issue we focus on SAE International, a student organization comprising five teams of students who design and build vehicles and compete against other colleges from around the world. The group's mission is to expand upon Iowa State's curriculum through participation, leadership, outreach, design and fabrication, which aligns with our department's goals for our students when they leave our classrooms.

And to our alumni, who have already left, we recognize you in this issue. Last fall, we asked alums to update us on what they are doing now, and we received many interesting responses of where your Iowa State educations have taken you. Toward the back of this publication, you will find spotlights on several graduates of our department who have continued their ISU legacies across the globe, as well as right here in the Midwest.

Finally, I would like to introduce myself as the new Palmer Department Chair of ECpE, as I joined on Jan. 3, 2017. I come to ISU from the Chicagoland area, where I have spent last 16 years, most recently as Chair of the Electrical and Computer Engineering Department at Illinois Institute of Technology. I am honored to assume this leadership role, and I am thrilled to join my distinguished and accomplished colleagues, dedicated staff, enthusiastic and talented student body and proud alumni base. The opportunities ahead of us are tremendous, and our excitements and resolve are equally matching. ECpE at ISU is making lasting contributions to educating future generations of leaders and innovating technologies that make this world a better place!

I look forward to serving as chair. Please enjoy this winter issue of Connections.

Ashfaq Khokhar
Palmer Department Chair in Electrical and Computer Engineering
Iowa State University

IN THIS ISSUE

Winter 2017

Editors: Kristin Clague and Emily Benda
Contributors: Kristin Clague, Emily Benda, Christina Creel, Caitlyn McCreight, Mitchell Kerr, Christopher Gannon

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Leading in STEM Education

COURTESY OF ISU NEWS SERVICE

Iowa State University has received nearly $10 million in funding from the National Science Foundation (NSF) to improve diversity in both the professional STEM workforce and academia.

The grants represent a significant win for Iowa State's faculty researchers. The National Science Foundation typically funds only 10-20 percent of the proposals it receives. The science, technology, engineering and math programs listed below represent numerous grassroots collaborations among faculty, as well as significant outreach to educational partners, including Iowa's community colleges.

Principal Investigator **Joe Zambreno** received $4 million of the near $10 million from the NSF to fund scholarships for students in STEM. The S-STEM program provides financial support to help low-income, academically talented students obtain STEM degrees and enter the workforce or graduate study. The program also aims to improve the education of future scientists with a focus on low-income students and develop strategies to improve retention and graduation rates.

Iowa State's S-STEM initiative, ECSEL: Electrical, Computer, and Software Engineers as Leaders, is a partnership between the Department of Electrical and Computer Engineering, Program for Women in Science and Engineering, Des Moines Area Community College and Kirkwood Community College. The initiative will fund 582 scholarships over the next five years for students majoring (or preparing to transfer) in electrical engineering, computer engineering and software engineering, as well as implement a student experience model to help participants thrive and succeed in their degree programs.

"One area where we will be particularly focused is on creating opportunities for women, to address their underrepresentation in the electrical engineering and information technology workforce," said Zambreno, associate professor of electrical and computer engineering.

"We also look forward to working with DMACC and Kirkwood on cybersecurity education, a significant strength of Iowa State and a high-demand field for both working professionals and graduate students."

Diane Rover also received $5 million from the NSF for her work with the Iowa-Illinois-Nebraska (IINSPIRE) LSAMP, an alliance of 16 institutions focused on increasing the quality and quantity of students successfully completing undergraduate STEM programs and increasing the number of underrepresented students who pursue graduate degrees. Strategies to achieve these goals include supporting students' academic, social and professional development; expanding undergraduate research opportunities for underrepresented students; and enhancing STEM transfer partnerships between two- and four-year institutions.

LSAMP partners include universities, colleges and community colleges all over Iowa, Illinois and Nebraska.

"The ultimate goal of LSAMP is to increase the number of students who earn doctorates in STEM fields, particularly those from underrepresented populations," said Rover, University Professor of Electrical and Computer Engineering. "We will be focused on expanding inclusive mentoring and teaching practices, providing high-impact educational experiences and helping students gain confidence through undergraduate research and professional development activities."

The STEM education programs implemented by Zambreno and Rover will provide opportunities for students of all backgrounds.

ASHFAQ KHOKHAR NAMED CHAIR OF DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

BY KRISTIN CLAGUE

Ashfaq Khokhar has been named the Palmer Department Chair in Electrical and Computer Engineering (ECpE) at Iowa State University. His appointment officially began Jan. 1, 2017.

Khokhar was previously chair of the Department of Electrical and Computer Engineering at Illinois Institute of Technology, where he held the position since 2013. Before that, he was a professor and director of graduate studies in the Department of Electrical and Computer Engineering at the University of Illinois at Chicago. He was named an Institute of Electrical and Electronics Engineers (IEEE) Fellow in 2009.

"Khokhar is passionate about providing students the highest quality education, and we look forward to his contributions in this leadership role," said Sarah Rajala, dean of the College of Engineering. "He will continue the positive and collaborative atmosphere in the department and has strong support from the faculty and staff."

Khokhar says he is excited about this new opportunity and is already thinking ahead. "One of the main goals I have is to help move electrical and computer engineering to the next tier in terms of academic stature and to increase overall visibility for the department and our core strengths," Khokhar said. "The ECpE department is doing great things, and we want to build on this and develop an aggressive outreach to further strengthen its connection with constituents, including students, parents, alumni and peers."

Impressive ongoing projects spotlighting ECpE at Iowa State include two recent NSF research awards received by ECpE faculty: Reinventing the Instructional and Departmental Enterprise (RIDE) and Scholarships in Science, Technology, Engineering and Mathematics (S-STEM) Program. Both awards, totaling $6 million from the National Science Foundation, are aimed at course design and curriculum planning with an emphasis on diversity in the student body.

"These two programs will serve as key enablers in the coming years toward enhancing uniqueness in ECpE curricula offered at Iowa State and attracting outstanding students to the program," Khokhar said.

The department as a whole is strong.

"The existing strengths of ECpE at Iowa State are something that I'm very excited about. The faculty are highly accomplished and well respected by their peers. It is heartening to witness their dedication to research and educating the next generation of engineering leaders," he said.

Khokhar also has his own research interests, which he will continue to pursue at Iowa State.

"My passion is the role of engineering in improving healthcare, and my focus is particularly on big data analytics in that field," Khokhar said. He envisions a system where tiny smart devices and implants capable of monitoring vitals and other phenomenon of interest can be utilized to improve quality of care by enabling them to automatically connect with each other based on common characteristics, thus creating smart connected communities of like-minded healthcare objects and people associated with these objects. He said, "Doing so in an anonymous and secure manner is a great challenge."

Khokhar earned his bachelor's degree in electrical engineering from the University of Engineering and Technology in Lahore, Pakistan; his master's degree in computer engineering from Syracuse University; and his Ph.D. in computer engineering from the University of Southern California.

There are currently more than 2,200 undergraduate and graduate students studying electrical and computer engineering at Iowa State. The College of Engineering at ISU offers 12 majors and is the largest college on campus with more than 9,300 students enrolled.

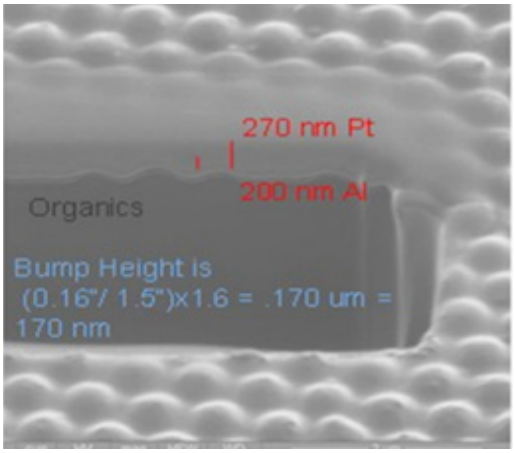
"My passion is the role of engineering in improving healthcare, and my focus is particularly on big data analytics in that field."

ECpE RECEIVES DEPARTMENT OF ENERGY GRANT FOR $1.3 MILLION

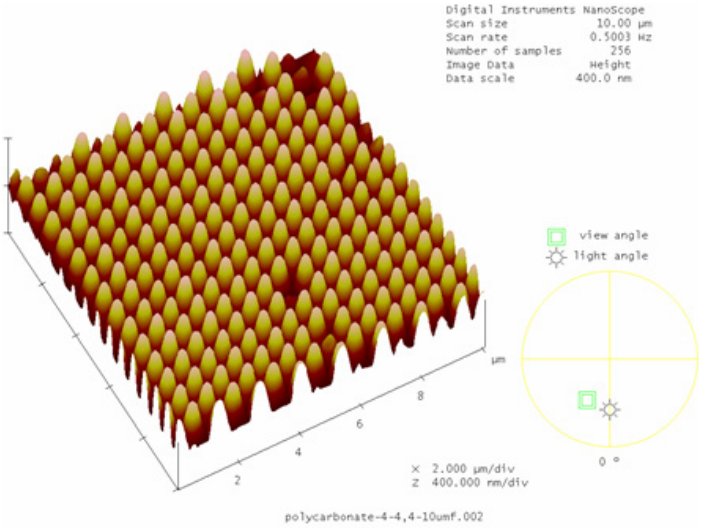
BY KRISTIN CLAGUE

Three faculty members of Iowa State University's Department of Electrical and Computer Engineering (ECpE) have been awarded a grant from the United States Department of Energy (DOE)'s Office of Energy Efficiency and Renewable Energy (EERE). The award of $1.3 million comes from the program "Solid-State Lighting Advanced Technology R&D-2016."

Ruth Shinar, senior scientist at the Microelectronics Research Center (MRC) and adjunct professor of ECpE, is the principal investigator for the project. Co-principal investigators are Joe Shinar, professor of physics and astronomy (P&A) and courtesy professor of ECpE, and Rana Biswas, senior scientist at the MRC and adjunct professor of P&A and ECpE. The title of their winning project is "Enhanced Light Extraction from Low Cost White OLEDs Fabricated on Novel Patterned Substrates."



Focused Ion beam image of an OLED fabricated on the corrugated substrate.



Atomic Force Microscopy image of the nano-patterned substrate with 320 nm high features.

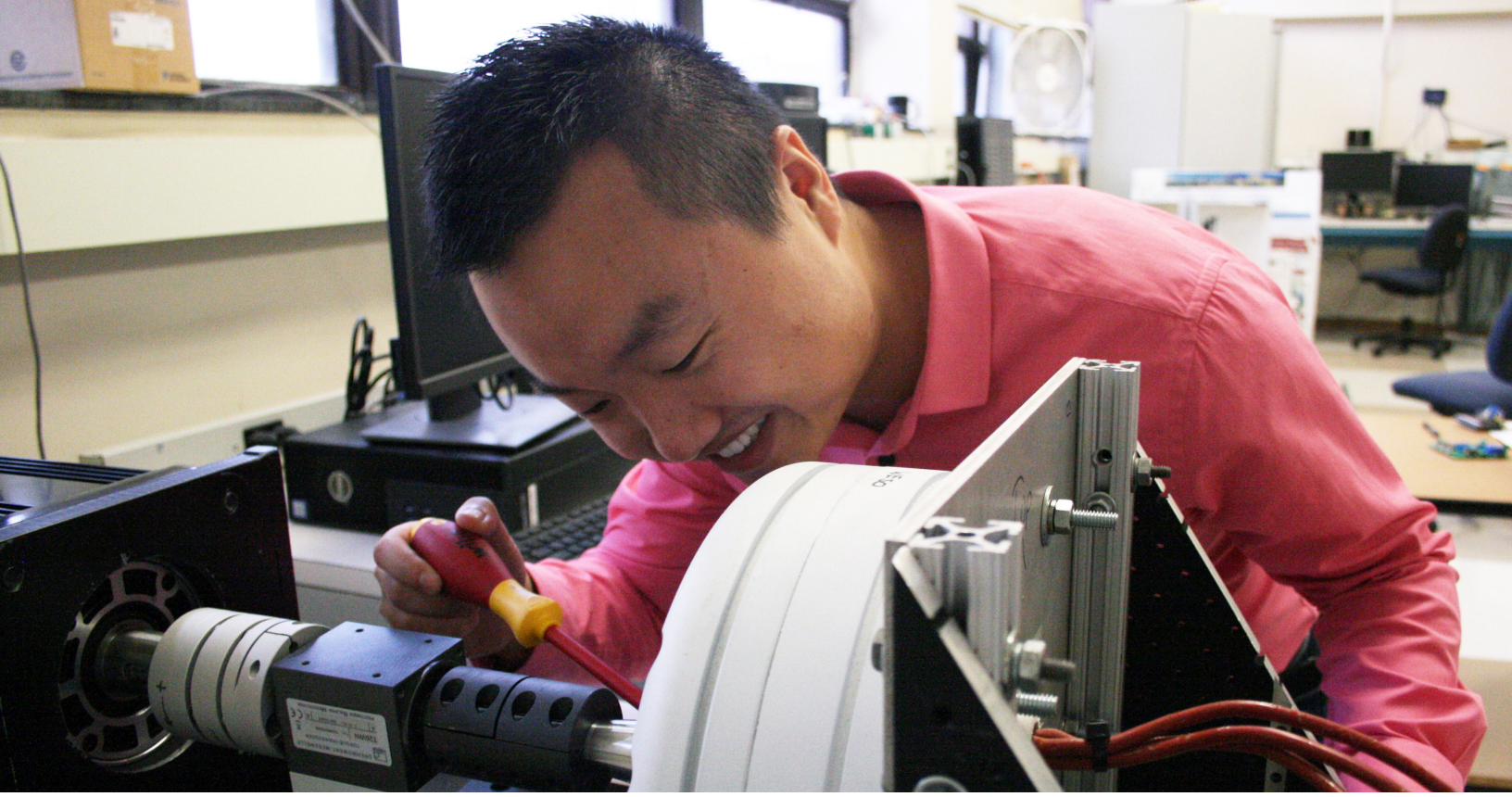
The DOE aims to increase organic light emitting diodes (OLED) extraction to 70-percent by the year 2020, and this project will work toward meeting that objective by producing simple, inexpensive phosphorescent white OLEDs (WOLEDs) with significantly enhanced light extraction. The grant money will go toward fabricating these WOLEDs on a patterned flexible substrate, while maintaining a high color rendering index and maximizing the stability of the WOLEDs. This will enable extraction of the approximately 50-percent light trapped by total internal reflection at the high-index organic/electrode and plasmon-related losses at the metal electrode.

"The DOE funding is necessary to achieve the objectives," R. Shinar said, "as our preliminary results, though indicating that our approach is very promising, point to challenges that will be mitigated in the proposed project via simulations, fabrication of new patterned substrates with optimized designs and fabrication of optimized phosphorescent WOLEDs, including with improved electrodes."

The success of the project will help create a clean, energy-efficient solid-state lighting (SSL) future and will benefit U.S. manufacturing. Because the materials and device designs will be simple and low cost, the project will help make OLED-based SSL more competitive, and the university-industry collaboration will advance SSL-related business, leading to national job creation. MicroContinuum, Inc., of Cambridge, Mass., a sub-recipient of the grant, will fabricate the substrates by a roll-to-roll process based on design and feedback provided by ISU. Trovato Manufacturing LLC, from Victor, N.Y., will assist in developing the product with the university and MicroContinuum, Inc.

"We are very excited about the project," R. Shinar said. "It will be very helpful in addressing one of the main issues facing OLED SSL applications. It will also involve graduate students, who will be trained in the area or organic electronics and will then assist in solving energy-related problems, and will help to develop U.S. manufacturing, as well."

Preliminary results of WOLEDs developed by ISU, Trovato Mfg. LLC and MicroContinuum Inc.



NEW FACULTY GARNERS MILLIONS IN GRANTS

Zhaoyu Wang joined ECpE in August 2015 and has already brought in millions of dollars from national organizations to fund his innovative research.

BY CHRISTINA CREEL and ISU NEWS SERVICE

In August of 2015, Iowa State Electrical and Computer Engineering added **Zhaoyu Wang** as an assistant professor. In the short time Wang has called Iowa State home, he has acquired over $3 million in research grants from groups like the National Science Foundation, Department of Energy and industry leaders.

"I really enjoy working with Zhaoyu," noted Executive Director of the Electrical Power Research Center Anne Kimber. "He is so enthusiastic about working with the utility members of the Electric Power Research Center. This is great for our utilities because they can work with a top-notch research engineer genuinely interested in helping them solve problems."

Wang's research interests include power distribution systems, networked microgrids and data-driven analytics in smart grid. These technologies allow for better power infrastructure in case of natural disasters or other emergencies. Currently, Wang is now working on four projects that could help build a better smart grid:

1. Developing a tool that will help utility companies recover from natural disasters, supported as part of a three-year, $1.95 million grant from the U.S. Department of Energy's Grid Modernization Laboratory Consortium. The project is led by Jianhui Wang of Argonne National Laboratory near Chicago. Iowa State's Wang is working to produce a software tool that will help utilities quickly locate outages and efficiently dispatch crews to make repairs.

2. Developing a practical model for planning and predicting power demand down to the level of homes and businesses, supported as part of a three-year, $2.7 million grant from the energy department's Grid Modernization Laboratory Consortium. The project is also led by Argonne's Jianhui Wang.

> "We're always trying our best to do one thing – enhance the power grid. We want to make it more secure, reliable and resilient."

"The objective of this project is to build local models," said Iowa State's Wang. "Each customer is part of the local grid. Each computer, for example, is a component of the local grid. And local is hard to model. It's highly stochastic – it's affected by many factors, including the weather."

3. Developing models to monitor and mitigate cascading power outages, supported by a three-year, $348,000 grant from the National Science Foundation. The project is led by Iowa State's Wang. The project will use big-data techniques to mine existing utility data to look for patterns in cascading outages, identify high-risk conditions for them and target mitigation efforts to those conditions.

4. Developing an advanced business model that manages

the risks and uncertainties of the power system, supported by a three-year, $345,000 grant from the energy department's Office of Electricity Delivery and Energy Reliability. The project is led by Iowa State's Wang. Wang said he'll investigate how new ideas for service contracts can provide more flexibility and less risk to power-system operations – all without relying on conservative plans for worst-case scenarios.

While it is very common for faculty within ECpE to receive large-sum grants, it is not as common to receive large-sum grants so early in one's career. Iowa State is Wang's first full-time position following graduation from Georgia Institute of Technology. Prior to applying for grants totaling $3 million, Wang had never even written a proposal.

He attributes much of his recent success to his colleagues, especially Distinguished Professor Jim McCalley, Sandbulte Professor Ian Dobson, Nicholas Professor Venkataramana Ajjarapu and Kimber. McCalley and Kimber taught Wang how to write proposals from their past experiences. In addition to the support of his colleagues, Wang mentions how the Iowa State College of Engineering and the department have urged him to pursue research areas.

Looking forward, these grants are a stepping stone for future research areas for Wang.

"Our future research will build upon the existing topics and grants," Wang said. "I think we will focus on data-driven analytics and its application to power grids, design and operation of resilient power systems, networked microgrids, power distribution system operation and control with a high penetration level of renewable energy."

By building on his research, Wang can contribute to America's energy future.

PROJECT ADVANCES TOPOLOGICAL PHASES OF MATTER

BY EMILY BENDA

Iowa State's Magnetic Research Group is investigating topological electromagnetic sensors, a subject related to the recent Nobel Prize for physics for theoretical discoveries of topological phase transitions and topological phases of matter.

The Nobel Prize was awarded half to David J. Thouless at the University of Washington, Seattle, and half to F. Duncan M. Haldane of Princeton University and J. Michael Kosterlitz of Brown University.

The ISU team consists of Electrical and Computer Engineering graduate student Yan Ni and two undergraduate research assistants under the direction of Principal Investigator David C. Jiles, funded by the National Science Foundation.

Ni said the difference between Iowa State's research and the Nobel Prize-winning project was an engineering application versus theory. The group is doing an engineering component of topological insulators, which is beyond the science and the next advancement toward the application of topological phases.

The objective of the group's research is to build ultra-sensitive magnetic field sensors based on the newly discovered material, topological insulators. Based on the discoveries of the Nobel Prize winners, under Jiles' supervision, Ni's research systemically investigated several approaches toward demonstrating the proof-of-concept axion-electromagnetic effect (AEM), as well as device fabrication. Four critical challenges were met, including opening the surface band gap, reducing the bulk conductivity, tuning the Fermi level and increasing device working temperature by quantum capacitance. They also applied topological insulators into a special kind of Hall sensor to increase the sensitivity magnitude.

Jiles said ISU's Magnetic Research Group's work is significant because they are furthering the discoveries made by the Nobel Prize winners.

"We place emphasis on engineering applications, building devices — particularly sensors — out of this novel quantum material," Jiles said. "This goes beyond the basic science that won the Nobel Prize and takes a further step toward applications that can be used in daily life."

The Magnetic Research Group's discoveries have brought worldwide interest. They have 10 publications, including journals, invited book chapters and a thesis, as well as conference presentations. In the future, Jiles said the group will continue their research work on topological insulators-based sensors.

DEPARTMENT HEADLINES

RATNESH KUMAR WINS IEEE BEST PAPER AWARD

Each year, the Institute of Electrical and Electronics Engineers (IEEE) recognizes the best paper on IEEE Transactions on Automation Science and Engineering. This year Iowa State University's Electrical and Computer Engineering Professor Ratnesh Kumar was honored with receiving this award.

Kumar was recognized for his paper "Fault Detection of Discrete-Time Stochastic Systems Subject to Temporal Logic Correctness Requirements." This was an extension of research done by former student Jun Chen. Kumar's research in cyber physical systems (CPS) drove his knowledge on the topic of fault detection.

"In contrast to the cyber (software) part, the physical part is subject to constant noise," Kumar said, "which makes the overall model stochastic and the task of prediction more intricate."

KAMAL WINS IEEE AWARD

The IEEE Communications Society Optical Networking Technical Committee recognized the significance of the contributions made by ECpE Professor Ahmed Kamal through his publications in the area of traffic grooming and multipoint communication in optical networks.

"Multipoint communication includes modes like broadcast, multicast and many-to-one, among several modes. To groom traffic from multipoint communication effectively involves several issues in the planning, design, implementation and operation of optical networks," Kamal said.

Kamal describes optical networks as communication networks that use optical fibers as the physical medium to carry information in the form of light. These optical fibers and supporting devices are used for transmission and reception.

Although he has spent years working with optical networks, he has started looking at the next generation (fifth generation, or 5G) of wireless networks. But at this stage in his career, he finds it most important to groom the next generation of engineers.

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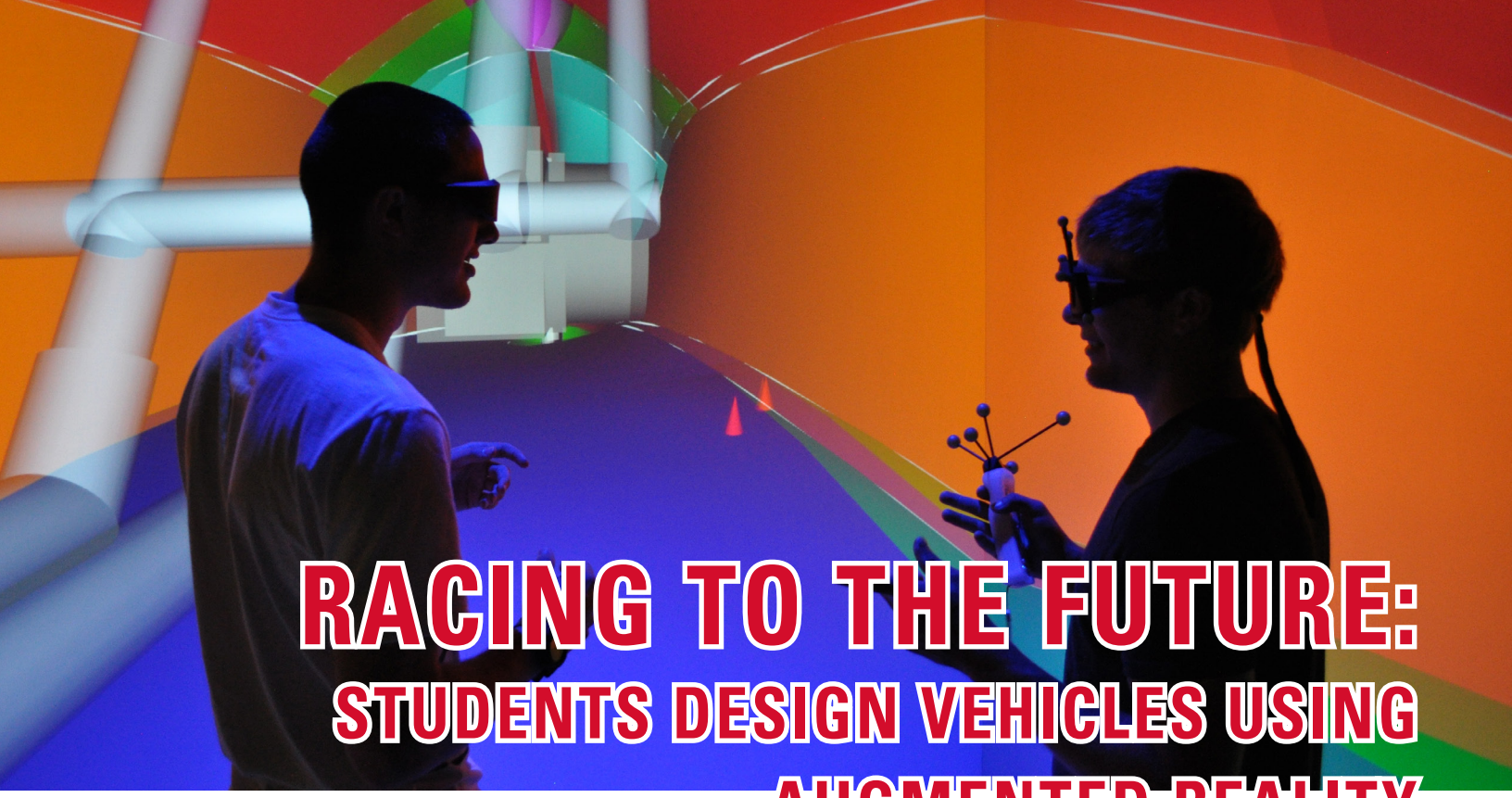


RACING TO THE FUTURE:
STUDENTS DESIGN VEHICLES USING AUGMENTED REALITY

BY KRISTIN CLAGUE

When most of us drive our cars, we're thinking about what's on the radio, what we're making for dinner and, hopefully, the other drivers and pedestrians around us. Most likely, we aren't thinking about the elaborate computer systems keeping our vehicles running. But some students at Iowa State University take great interest in what's happening behind the scenes.

SAE International, or the Society of Automobile Engineers, was started in 1905 in New York City in response to a growing demand: Automobile manufacturing was on the rise, and engineers needed a resource for communicating knowledge and expertise, as well as sharing solutions to technical issues. As technology progressed, electronics and computers became increasingly important to the industry, and SAE changed with the times.

Flash forward 112 years later to Ames, Iowa, where SAE International is a thriving student organization on Iowa State's campus, with 418 total collegiate branches around the world. At ISU, SAE International is comprised of five teams of approximately 320 students designing and building vehicles. Their mission is "to expand upon the ISU classroom education through participation, leadership, outreach, design and fabrication," and club members spend many nights and weekends together to achieve this goal.

Within these teams, Formula, Baja, Supermileage, Clean Snowmobile and Aero, students use electronics and computers to improve the speed, safety and efficiency of the vehicles. SAE puts no requirements on academic majors, though many come from the College of Engineering; some are future electrical, computer and software engineers.

One of those students, Mitchell Kerr, a junior software engineering major, is Project Director for Supermileage, whose members design and build a fuel-efficient vehicle and make it as aerodynamic and lightweight as possible with a goal of achieving 200 miles per gallon.

"Unlike many other clubs, we have built our car completely on our own with almost no outsourcing [help from another company]," Kerr said. "I enjoy problem solving, and with a ground-up build process, there is a lot of that."

The challenge of building an extremely fuel-efficient vehicle is what led senior mechanical engineering major Ian Baumgartner to start ISU's Supermileage chapter two years ago when he and a few friends, who later became club members, were just sophomores. Because SAE allows students from any major to join, Baumgartner knew he would need students with different skills. Just like the original founders of SAE in 1905, he wanted to build a place for students to communicate expertise and new ideas.

"The greatest part is the shared collective knowledge," he said. "I've taught people

Right: ISU Supermileage founder Ian Baumgartner views the club's car in 3D on his phone, using an app and augmented reality. Above: Supermileage members check out their car in METal, a multimodal lab.

SOLIDWORKS as my expertise, and there are people who are really good with mechanics, and they've taught me a lot. There are people who are good with engines, with carbon fiber, and it's all this collective learning about different areas."

They use carbon fiber to make their vehicle lightweight and fuel efficient.

"Every ounce you can shave off could get you another five miles per gallon. Our car is 10 feet long, 40 inches wide and close to three feet tall. But for a car of that size, it probably only weighs 50 pounds at most," Baumgartner said. With a driver in the car, the total weight will not pass 200 pounds.

Originally, members worked with pre-impregnated carbon fiber, which uses a hardener and resin to bond and create a hard surface. But to achieve that hardness, students had to lay the fiber in multiple directions and then apply heat to the vehicle's shell. The problem? Baking a ten-foot-long car in one shot.

"We actually had to build our own oven," Baumgartner said. "It was four feet by 12 feet to fit the whole car in. We used foam installation plywood. I know it's crazy to make an oven out of wood, but the combustion temperature of wood is 460 degrees, and we didn't need it to get that high. So we tore up a microwave oven and used the heating element for that and an old computer fan with some ducting to blow the air around. We were able to get the oven up to 150 degrees and get the car into there and bake it."

Besides having the ability to work with carbon fiber and build an oven from scratch, other technical knowledge required to build Supermileage's vehicle includes working with an EFI kit, or Electronic Fuel Injection kit, as well as the team's use of augmented reality.

"We use an EFI kit, which uses a computer that has software to determine the best air-to-fuel ratio for the engine," Kerr said. "It has sensors for temperature, pressure, O2 and so on."

Baumgartner echoed Kerr's thoughts.

"The EFI kit will help us get a lot better fuel mileage because we're able to actually control the fuel in and out more precisely. We're able to tune the engine now a lot quicker with a laptop, versus having to adjust the throttle body," he said.

Baumgartner also thought to use augmented reality to design the vehicle after taking a course with Mechanical Engineering Professor Judy Vance.

"The problem with designing in CAD [computer-aided design] is that you can't tell the scale of the car in real life. You're just stuck with this 3D image transformed onto a 2D plane. And you have these set lengths and distances that you're dealing with, but you don't get a good idea about depth perception, and the size perception is really skewed," Baumgartner said.

Vance allowed students to look at their own 3D CAD models in the Multimodal Experience Testbed and Laboratory (METal) in the Black Engineering building, which houses the Department of Mechanical Engineering. METal is a three projection screen immersive room, which supports development of products and processes through computer-based simulation. Baumgartner programmed their car into augmented reality.

Members of Supermileage test their car with a driver inside.

"We were able to see it in that one-to-one scale, and it was immensely helpful," he said. "We had our driver sort of virtual-reality-like sit in the car to see if the window we had originally designed [on the vehicle] was enough for him to see through it, and we discovered that it actually wasn't. So that was a huge thing."

Baumgartner uses an application on his phone to view a 3D model of the car, which is uploaded to the program. When he points the phone's camera at a cylinder, recognized by the app, an image of the car appears on the phone's screen.

"Anyone can do it that has a smartphone," he said. "Now we don't have to reserve a time [to work] at a spot. We can have it on our phone and see the car there. It's more applicable and easy to use for everyone."

This ingenuity makes Supermileage successful, which in turn will help these students in their futures.

"My dream job is to work in the automobile industry as a software engineer, helping to progress the industry toward more automation, higher safety ratings and cleaner energy consumption," Kerr said. "Supermileage will help me because I've learned how to tackle problems that I have little to no background in. I do this by reaching out to people more knowledgeable than me, conducting my own research, brainstorming with team members and testing ideas."

This is where being not just club members but teammates comes in.

"We're almost like a family by the time the year's done," said Jason Whited, president of SAE International and mechanical engineering senior. "All the core members that stick around through the year learn a lot about each other and how to work together, so it's a more personal experience. You have strong feelings about building this car. You become attached to it, because you're involved in a whole group of people building it together."

HOLLAND TAKES ON CYBERSECURITY CHALLENGES

BY EMILY BENDA

Current Iowa State University Computer Engineering Ph.D. student Ben Holland is always willing to take on a cybersecurity challenge.

Holland has participated in Automated Program Analysis for Cybersecurity (APAC) and Space/Time Analysis for Cybersecurity (STAC), the two largest grants Iowa State's Electrical and Computer Engineering Department has received in the last several years. He was a valuable asset to ISU's success as the top-performing team on the Defense Advanced Research Projects Agency (APAC) project. The team's success was evaluated based on their ability to detect malware in DARPA challenge apps and the malware detection technology.

Holland participated in every challenge engagement for APAC and personally audited over 65 DARPA challenge applications for novel and sophisticated malware. Currently, Holland works on DARPA's Space/Time Analysis for Cybersecurity (STAC) project. His team has been very successful and has made many new contacts with industry and other universities.

Holland said networking with others in the cybersecurity field has opened his eyes to new ways of thinking and encouraged him to seek answers from others.

"I have been humbled many times in my life," Holland said. "The more I learn, the more I realize that I don't know. I have also learned to be humble and to be skeptical of those who are not."

After receiving his master's degree, Holland worked at Iowa State University as a full-time research associate and then an assistant scientist for three years, before deciding to pursue a Ph.D. in 2015.

He also recently helped teach a short course with Richardson Professor Suraj Kothari in India under a new Government of India program titled Global Initiative of Academic Networks (GIAN). The one-week graduate course about program analysis and cybersecurity was held at Malaviya National Institute of Technology in Jaipur, India.

Kothari, Holland's mentor, said Holland's teaching style was greatly appreciated by the students at the GIAN workshop, and the organizers hope he teaches another course in the future.

"Ben is a gifted hands-on teacher, a superb team player, a leader and an effective communicator, always ready to help his teammates," Kothari said. "He has prepared valuable lab material that we use at ISU and at invited tutorials at international conferences."

Holland said working with Kothari has taught him to think in a different way, and he thinks Kothari will continue to rewire his brain as Holland keeps working with him.

"Dr. Kothari is a great match for me," Holland said. "He is a patient, hands-off adviser who gives me space to be creative and approach problems in a way that fits my personal strengths. At the same time, he has always been available to mentor me and develop my critical thinking, communication and general life skills."

GRACE HOPPER CONTINUES TO INSPIRE IOWA STATE WOMEN IN ENGINEERING

BY CHRISTINA CREEL

Grace Hopper carries many titles: Navy admiral, computer engineer, co-creator of the term "computer bug" and, most recently, the posthumous recipient of the Presidential Medal of Freedom. Her biggest claim to fame might be her work on Mark I, a naval computer that ran mathematical equations, which aided in the creation of the atomic bombs used in WWII. It is rumored that during Hopper's time on this project, a moth flew into one of the circuits, causing an error in the program, hence the term "computer bug." The legend lives on at Iowa State University in the moth statue outside of Coover Hall, home to the Electrical and Computer Engineering department on campus.

It is in the spirit of Hopper that the Grace Hopper Celebration of Women in Computing conference was founded. Each year, the best minds in the engineering world come together to celebrate the accomplishments of women in computing. This past year, that included 10 women in STEM — Science, Technology, Engineering and Math — fields at Iowa State.

Iowa State Digital Women members pose at the Grace Hopper Celebration of Women in Computing.

The conference gave these students the opportunity to hear from industry speakers, connect with other women in computing and attend a career fair with over 200 employers. Ashley Dvorsky, a senior at Iowa State majoring in software engineering, was one of those in attendance. She used what she learned at the conference as a springboard to share the Hopper legacy further.

"After the conference, I had done a presentation on her leadership for the Dean's Leadership Class," Dvorsky said. "I think that having more people hearing about the great legacy that Grace Hopper has left and fully understanding her contributions to computing will make the point that women have always been on the forefront of computing and that women in STEM isn't some new concept."

While Hopper's legacy inspired all the women who attended the conference, it also provided an important opportunity to network. Especially in a field where women are a minority, it is powerful to attend a conference surrounded by people with similar interests.

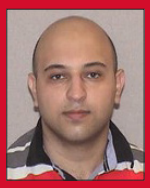
Assistant Professor and Digital Women Faculty Adviser Phillip Jones said, "It is a great opportunity for a core of the Digital Women members to have a shared experience for bonding. Not only does this bonding occur during the trip, but opportunities arise during the fundraising process for members to step into leadership roles and to bond with the rest of the group in an organic way. Often there are roles that involve members reaching out to industry, making and strengthening industry relationships."

Hopper passed away in 1992, two years prior to the founding of the Grace Hopper Celebration of Women in Computing. She never had the opportunity to witness the giant celebration held in her name. But her legacy lives on in the connections made between thousands of intelligent women in computing from across the globe.

RESEARCH AND TEACHING EXCELLENCE AWARD WINNERS

Awards are given to graduate students who are near graduation and go above and beyond within their research area or teaching undergraduate students.

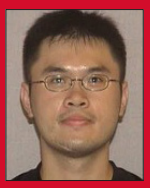

Wenji Chen


Ahmad Mustafa Alsharoa


Yung-Yu Chung


Yixiao Ding


Akshit Peer


Chi-Fu Yen


Ben Holland


S.M. Istiaque Hossain


Mohamed Youssef Selim

ECpE ALUMNI: LEAVING THEIR LEGACIES

Last fall, we asked our alums to submit stories celebrating Iowa State's Homecoming theme, "Leave Your Legacy." We received so many inspiring entries -- here are a few.

Cristina Simón

I was born in Chihuahua, Mexico. I graduated ISU almost 10 years ago. I am now working as a systems engineer at Rockwell Collins. My husband, Paul Simon, also attended ISU. Our son Roman was born while we both attended ISU, so he is a lifetime Cyclone!

Robi Polikar

I received my M.S. and Ph. D. from ECpE, and I am Professor and Department Head of Electrical and Computer Engineering at Rowan University in New Jersey. My brother also graduated from Iowa State's industrial engineering program and is now a technical manager at Kiddie in the Boston area. I have a baby girl, Chloe Nese Polikar, and I think she shows Iowa State pride well.

Barbara Culton

I was born and raised as an Iowa State fan, so there was really no doubt where I wanted to go when I decided to go into electrical engineering (BSEE in '98). My uncle graduated in electrical engineering (he worked on the stealth bomber), and my dad graduated in civil engineering.

My mom, sister and brother-in-law have also all graduated from Iowa State. My parents have had season basketball and football tickets since I can remember, and I continue to come up for a least one or two games.

The picture above is my dad and me at a football game. I'm currently in the Kansas City area and work for a consulting firm designing electrical substations for various utilities and industrial clients, and I continue to cheer for the ISU Cyclones at Hilton South!

Luis Colon

Since leaving ISU, I've also earned a Masters of Science in Data Analytics from Southern New Hampshire University.

I have been serving as Software Engineering Manager for DevOps and Chief Architect at TeamQuest Corporation, a software company with offices in Clear Lake, Iowa, and Minneapolis, Minn. I was in the performance management business, offering monitoring tools for servers; prediction tools for server health, risk and efficiency; and business value dashboards for tracking key performance indicators.

This December, I also started a new position in Seattle as Development Manager for Amazon.

Jaiyong Lee

I'm a '84 M.S. and '87 Ph. D. computer engineering graduate. Coover Hall reminds me of professors I learned from, such as Terry A. Smay, Arthur Pohm and Doug Jacobson.

Now I'm working as a professor of electrical engineering of Yonsei University, Seoul, Korea. I will also be working as a Provost. Yonsei is the oldest and top private university in Korea.

As an alum of the ECpE department, I always appreciate all the things I learned from the best environment of education and research of Iowa State University. I'm always proud of being a graduate of the ECpE department.

Brittany and Jack Tuohy

My husband Jack and I graduated from Iowa State University as computer engineers in 2013. Our adventure began as lab partners in college, and later, we both interned at Microsoft at the same time.

Now, we continue to work together as software engineers at Self Esteem Brands, the parent company of Anytime Fitness, which was ranked the number-one global franchise two years in a row by Entrepreneur magazine. The part we love best is helping people get to a healthier place.

Last spring, we went on an adventure to Japan and loved it! Our next adventure begins when we will have our first baby in February!

Iowa State University - Department of Electrical and Computer Engineering

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Iowa State University ECpE Department

Have a story to share? Connect with us on social media or contact our Communications Specialist, Kristin Clague, at kclague@iastate.edu.

REMEMBERING FACULTY AND ALUM PAUL BOND

BY EMILY BENDA

Pictured
Paul R. Bond
Courtesy: University Archives

Paul R. Bond, associate professor emeritus for the Iowa State University Department of Electrical and Computer Engineering (ECpE), passed away Oct. 31, 2016, after a 13-year battle with Parkinson's disease. He was 88.

After graduating from John Brown University in 1952, Bond enlisted in the U.S. Air Force and served four years at a radio relay station in Germany. Bond then enrolled at Iowa State where he earned his master's degree ('58) and Ph.D. ('63) in electrical engineering. In the early 1960s, Bond joined Iowa State's ECpE faculty.

Nationally, Bond was known for his textbook on electronics, Principles of Electronic Circuits, which he co-authored with Stanley Burns. The book features a new learning pedagogy with careful and complete integration of SPICE, a circuit simulation software program widely used in electrical engineering departments, and realistic examples incorporated into the text.

Locally, Bond was known for teaching senior and graduate-level courses in communication theory. He originated and taught a short course, Data Communication, primarily for engineers working in the telephone industry.

Associate Professor Emeritus Thomas Scott said Bond's Data Communication course was always sold out and sometimes ran twice a year.

> "Bond was among the most popular and most admired teachers of his time."

Bond's students said he was invested in teaching and preparing his mentees for the real world. One of Bond's former Ph.D. students, Frederick Raab, said he felt each of his courses with Bond was useful.

"Paul didn't just teach a bunch of math," Raab said. "His courses were practical, with the application tied to math."

Bond also developed connections with the students he taught. For four years, Raab worked with Bond and narrowed his research into high-efficiency power amplifiers. Raab currently is Chief Engineering and Owner of GMRR, a consulting firm, which he founded himself in 1980. Although Raab graduated years ago, he said he will not forget how Bond was personally invested in his students.

"After defending my Ph.D. dissertation, the Bonds invited me to their house for dinner," Raab said. "This was quite an honor for a mere graduate student."

Bond was a member of ECpE's faculty for over 30 years before retiring in 1996. After retirement, he continued to have a strong presence and interest in the technical community.

"At a time when no one else was worrying about energy consumption, Paul designed a house that was very energy efficient," Raab said. "He told me his heating bill was half that of his neighbor. Two years later, during the Arab oil embargo, I imagine a lot of other people were interested in how he did it, or at least envious."

Bond's textbook, Principles of Electronic Circuits, continues to be a strong resource in the basic concepts of electronics.

Through his teaching and contributions to the field of electrical engineering, Bond's legacy at Iowa State and in communication theory will continue to be recognized for years to come. Faculty and former students will remember him for his real-life teaching applications and dedication to his students.

"Bond was among the most popular and most admired teachers of his time," Scott said.

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Pictured
The Marston Water Tower nestled between Durham and Marston Halls.