

IOWA ENGINEER



THE UNIVERSITY OF IOWA COLLEGE OF ENGINEERING

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the Emerging
Internet of Things

Inspiring the Future through Engineering Research and Education

The faculty and staff of the University of Iowa College of Engineering know that we have a unique opportunity to positively impact the future through our teaching and research programs. Teaching involves much more than simply presenting material to the students - the best



teachers inspire their students to imagine the impact they could have in their career, and provide them with the knowledge, skills, and perspectives that enable them to begin their successful career journey. Our research is focused on identifying and solving the most important problems in society through a collaborative approach that cuts across many disciplines. This issue of *Iowa Engineer* provides great examples of how our faculty and staff are inspiring the future in these ways. The article on the new degree

program in Computer Science and Engineering illustrates how our faculty are constantly improving the curriculum and creating new educational opportunities based upon how the world is changing. Clearly there is a major shift in computer technology toward small, interconnected devices in which the hardware and software are inextricably linked. To prepare students for this new world of “the internet of things” it was necessary to combine computer science with computer engineering, and the faculty at the University of Iowa were up to this task even though it required a joint effort from two departments across two different colleges. You will also find two articles describing how our faculty and students are making an impact in the area of electronic medical records. This is also an area in which engineering faculty can inspire and enable a better future by developing solutions which optimize a complex array of medical, legal, security, and usability requirements. I hope that you enjoy these great stories about how we are helping to create a better future.

A handwritten signature in blue ink that reads "Alec".

Alec Scranton
Dean of Engineering

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NEW DEGREE

PREPARES STUDENTS

FOR THE EMERGING

“Internet of Things”

Smart phones, smart cars, smart homes — and even smart appliances — are leading to an increasingly interconnected world on the Internet.

For that reason and more, the University of Iowa College of Engineering is introducing a new degree. It’s a Bachelor of Science degree in Engineering with a major in Computer Science and Engineering.

Approved by the Iowa Board of Regents in June and available to students beginning in August 2016, the degree is a joint effort of the Department of Electrical and Computer Engineering in the College of Engineering and the Department of Computer Science in the College of Liberal Arts and Sciences (CLAS).

The new degree is in addition to the the very popular electrical engineering major with a computer track — which has about 300 enrollees — and the CLAS computer science department, with more than 600 enrollees.

Jon Kuhl, professor of electrical and computer engineering, interim associate dean of academic programs, and a co-developer of the new degree, says it will help provide engineers with essential skills for designing systems in our increasingly interconnected world.

“The technical revolution fueled by the advent of the so-called smart technology is fundamentally transforming society,” Kuhl says. “As the world becomes increasingly connected via the Internet, smart technologies are revolutionizing everything from health care delivery to transportation systems.

TEXT BY
GARY GALLUZZO

“Over the next several decades, this area is expected to be the single most important driver of technological and economic development across a broad spectrum of areas.

“This on-going technical revolution requires engineers who are competent in both computer software and hardware and who possess the engineering skills to design and implement complex, intelligent systems. We have designed this new program in close consultation with our industrial advisory boards to produce graduates best-suited to meet the current and future needs of business and industry,” Kuhl says.

Alec Scranton, dean of the UI College of Engineering agrees.

“The world is becoming ever more dependent upon computer and information technologies. The major will provide the simultaneous benefits of a fundamental grounding in computer science with the problem-solving and critical thinking skills associated with an engineering education,” Scranton says.

He says the new degree will prepare Iowa students to participate in current and future Iowa industries including information technology, manufacturing, the various power industries, insurance, and financial services.

The UI College of Engineering isn’t alone in introducing the new degree.

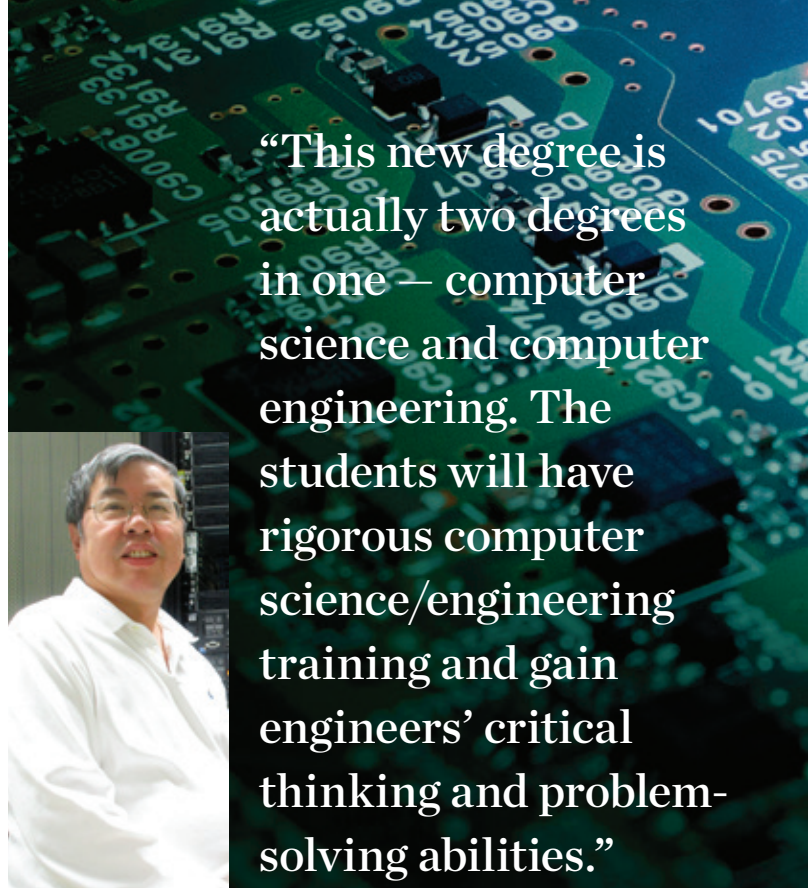
Similar degrees currently are offered by some 11 other universities, notably MIT, University of California—Berkeley, and The Ohio State University.

Together, universities offering degrees focused on computer software and hardware — as well as strong engineering design and problem-solving skills and the ability to work on multidisciplinary teams — are preparing students for something Kuhl calls the “Internet of Things.”

“The term ‘Internet of Things’ refers to the movement toward a fully connected world in which almost everything — not just computers and phones — will share Internet connectivity,” Kuhl says. “This will allow the creation of smart systems to enhance efficiency and quality-of-life such as smart homes, smart cities, smart transportation systems, smart healthcare, etc.

“Today, it is estimated that several billion devices worldwide are connected to the Internet. Within the next decade, this is expected to grow to as many as 100 billion, and many of these new devices will not be computers or smart phones but things like household appliances, sensors of various types, etc.,” he says.

“The Internet of Things is expected to be the single largest driver of technology-related economic growth,” Kuhl says.



“This new degree is actually two degrees in one — computer science and computer engineering. The students will have rigorous computer science/engineering training and gain engineers’ critical thinking and problem-solving abilities.”

*ER-WEI BAI, PROFESSOR AND DEO,
ELECTRICAL AND COMPUTER ENGINEERING*

Er-Wei Bai, professor and departmental executive officer in the Department of Electrical and Computer Engineering, says that the new major will prepare students for new careers in industry, such as those related to The Internet of Things, as well as advanced study in fields requiring engineering and computational skills.

“This new degree is actually two degrees in one — computer science and computer engineering. The students will have rigorous computer science/engineering training and gain engineers’ critical thinking and problem-solving abilities,” Bai says.

Although all three Regent universities in the state of Iowa offer a liberal arts-based computer science degree, the new UI degree is unique in that it combines the full technical content of a computer science degree and a computer engineering degree.

Gary Christensen, professor in the Department of Electrical and Computer Engineering and — together with Kuhl and Bai — a College of Engineering architect of the new program, says that the new degree offers the best of both worlds. It provides the foundational knowledge of a computer science education and the critical thinking, problem-solving and system design skills of a computer engineering education.



Harrison Freund and Tengku Amatullah Alya Binti T Mohd are enrolled in the new degree program.



Vincent Lopez and Sarah Graham work as a team on a class project.

In particular, the new UI degree will require that students complete:

- A capstone project course sequence.
- Extensive laboratory components.
- A General Education component from the Humanities and Social Sciences.
- Leadership-team-building experiences beginning in the first semester.

One of the CLAS planners of the new degree is Alberto Segre, Gerard P. Weeg Faculty Scholar in Informatics and professor and chair of the Department of Computer Science. Segre says, “We’re delighted to partner with our colleagues in Engineering to provide Iowa students with new pathways to computing careers.”

He says that computer science is one of the fastest-growing CLAS majors, currently making it one of the 10 largest CLAS undergraduate programs with 535 computer science majors and 110 informatics majors for a total of 645 majors. Computer science and informatics each offer the B.A. and B.S. degrees; thus, the new degree will be the fifth undergraduate degree program in the department.

In addition to the College of Engineering and CLAS planners, who have worked together to set up the logistics for the new program, establish the program curriculum, and prepare documentation for the Regents’ approval process, UI administrators have added their support. “The College of Engineering and CLAS deans’ offices and President Bruce Harreld have also provided invaluable support,” Kuhl says.

Kuhl says that the new Bachelor of Science degree in Engineering with a major in Computer Science and Engineering ultimately will help engineers to better see that our society has rapidly moved through a series of “information ages.”

“Over the past several decades we have moved from the age of computers — enabled by the advent of personal computing technologies — to the mobile age — enabled by smart cell phones and other mobile devices. We are now entering into a new age that will be characterized by ubiquitous Internet connectivity,” he says. ■

Electronic medi

BALANCING HUMAN TOUCH WITH HIGH-TECH

Picture a group of doctors and nurses who've gathered in front of a white board to discuss the care of a particular patient.

Each person brings something unique to the discussion. By sharing their knowledge and perspectives about the patient's condition, weighing treatment options, and taking notes everyone can see, the group arrives at a consensus about next steps in the patient's care. They leave the meeting with a common purpose and understanding.

As a Ph.D. student in industrial and systems engineering at the State University of New York at Buffalo, Priya Pennathur worked with an advisor interested in human factors in the health care environment. When Priya observed these white-board gatherings, she wondered: How will this process change when these same health care providers are relying on electronic systems for patient information, instead of face-to-face consultation with one another?

Those questions have guided much of Pennathur's career. Now an assistant professor of mechanical and industrial engineering at the University of Iowa, she credits her Ph.D. advisor for her introduction to the field of cognitive engineering. "We look at how people make decisions, and how they use technology and tools," Pennathur explains, "and then we explore how engineers can design tools so they will better support what people want to do with them."

INFORMATION EBB AND FLOW

When Pennathur began her doctoral program a decade ago, the use of electronic medical records (EMRs) was becoming much more widespread in hospitals and other health care facilities across the country. But the transition wasn't always a smooth one.

"Usability problems with EMRs were more common back then, and I continued to think about the people using that white board," Pennathur says. "There seemed to be a seamless way in which they organized and used the information they shared."

Based on interdisciplinary theories from complexity science and self-organizing behavior, Pennathur's dissertation presented a model for examining a trail of information – who creates it, who shares it, and for what purpose. That work led to a post-doctoral research fellowship at Johns Hopkins University and her first in-depth exposure to the use and importance of EMRs in a hospital setting.

"I learned so much there about what hospitals were facing in their use of EMRs," she says. "The fellowship combined cognitive engineering principles, information science, and patient safety, which were all central to my research."

That combination of interests also made Pennathur an ideal fit for the UI College of Engineering. She was drawn by the college's interdisciplinary collaborations with

cal records

TEXT BY
SUSAN SHULLAW

TOOLS



“HOW DO WE DEVISE A SYSTEM THAT HELPS DOCTORS AND NURSES DOCUMENT PATIENT CARE, BUT DOESN'T LEAVE THEM FEELING THAT THEY COULD BE SPENDING MORE TIME WITH THE PATIENTS THEMSELVES?”

Priya Pennathur

University of Iowa Hospitals and Clinics and the UI's health colleges: Dentistry, Nursing, Pharmacy, Public Health and the UI Carver College of Medicine.

“When I came to the UI in 2012 I had just received a grant from the National Library of Medicine,” Pennathur says. “That funding enabled me to start a research program here to study how health care providers – nurses, physicians, nurse practitioners, others – actually use and organize the information they receive every day, including EMRs.”

As part of her larger research effort, Pennathur presented a paper at the Human Factors and Ergonomic Society 59th Annual Meeting in Los Angeles describing a study she and her students had conducted at UI Hospitals and Clinics. The team shadowed a group of nurses, clerks, physicians and residents to determine the amount of time devoted to electronic systems.

Although times varied by job function, the study revealed that providers spent on average about four hours of each eight-hour shift on electronic health records, compared to other activities throughout the day.

“Our findings highlight the need to be even more cognizant of the potential of computerized systems in transforming the health care system and patient care as a whole, as well as introducing new challenges in managing them,” the paper concluded. “The next set of design challenges is to ensure the reliability, accuracy and relevance of information in electronic health record systems without compromising direct patient care.”

In 2014, the use of electronic records was mandated by the American Recovery and Reinvestment Act for health care providers wishing to maintain existing Medicaid and Medicare reimbursements. But concerns persisted about the use of EMRs, including cost and efficiency issues, ease of use, records accuracy, data security and, above all, patient safety. Priya Pennathur's research became more relevant than ever before.

EMR INNOVATIONS

As early as the 1970s, UI Hospitals and Clinics began exploring the use of information technology to assist physicians, nurses and other staff in their daily tasks, from ordering tests to reporting lab results.

Lee Carmen, Associate Vice President for UI Health Care Information Services, explains that after developing several internal computer systems, the hospital began to transition in the early 2000s to commercial patient billing and scheduling systems.

“After that successful conversion, we began looking for vendors that had developed large enterprise systems capable of handling in-patient and out-patient records in an institution like ours,” says Carmen. “We wanted a single product with a common database that would offer a unified experience to staff, regardless of where they were working within the organization.”

In 2006, UI Health Care selected Epic software as the solution, and began rolling out various Epic tools over the ensuing decade. They include the “MyChart” portal that most UI patients use today to access lab results, billing information,



Members of Dr. Pennathur's research group

upcoming appointments, provider messages and more.

Although concerns persist about the use of EMRs, Carmen says the UI's experience with electronic records has been one of continuous improvement and innovation. One example is the integration of Epic with biomedical devices, such as infusion pumps.

"These pumps usually come with an order from the provider with the rate and dose of medication, and that information is stored in the patient's EMR," Carmen explains. "When staff have to transcribe dosage information from the EMR into the infusion pump by hand, there's always a chance for error."

"We were the first in the country to automate that process, so now Epic tells the infusion pump the rate and dose information, the pump infuses the medication, and then tells Epic how much medication was delivered. It's an improvement that represents great strides in both patient safety and staff efficiency."

INTERDISCIPLINARY INDICATORS

Another UI innovation emerged from an engineering graduate course on health care human factors taught by Priya Pennathur in 2013.

"A couple of my students were interested in the quality indicators that nurses use to make decisions about patient care," she says. "They wanted to know how nurses access pertinent information about a patient's immediate condition."

Working with Laura Cullen, DNP, RN, FAAN, an evidence-based practice researcher at the UI College of Nursing, Pennathur's students developed a prototype

application that would provide nurses with an at-a-glance view of key health indicators, such as a patient's fall risk or length of hospital stay. Cullen then brought in Keith Burrell, a UI Health Care Information Systems applications developer and reporting specialist.

"Laura first came to me with an Excel spreadsheet that Priya's students had developed for how they wanted the application to work," Burrell says. "We were able to incorporate a lot of that functionality within our electronic records system, and our initial application worked pretty well. Then we contacted Epic, and they were able to provide software that made it even better."

That application – called the Interdisciplinary Dashboard – went through several rounds of usability testing and refinements, and now is in use in units throughout the hospital.

"Each patient record contains tons of information, but providers often have to drill down into the record to find what they're looking for, and that takes time," Burrell explains. "The dashboard gives them that information at a glance, so they can spend more time tending to the patient's immediate needs. It's a great tool."

Burrell explains that the application's interdisciplinary name reflects the fact that it is meant to start a conversation among doctors, nurses, social workers and others involved in a patient's care.

"It allows everyone to come together and understand what's going on with a particular patient," he says. "Then they can talk about what can be done, whether it's to alleviate pain, or minimize the risk of falling, or take other steps that might lead to an earlier release date."

All of this sounds very much like Priya Pennathur's white board experience, and she admits she had that example in mind as the key-indicators application evolved. She's pleased with the progress and proud of her students' role in bringing a very useful idea to fruition.

"My team has submitted a paper about the project and it's currently under review," she adds. Meanwhile, Burrell and his colleagues continue to work with Epic on improvements that may make the UI's Interdisciplinary Dashboard available to health care providers nationwide.

Pennathur is happy to see ongoing improvements in staff efficiency, accuracy and patient safety. But she and her colleagues will continue to study ways to find what she describes as the ideal middle ground for the use of EMRs. Or, as she puts it: "How do we devise a system that helps doctors and nurses document patient care, but doesn't leave them feeling that they could be spending more time with the patients themselves?"

It's a puzzle that undoubtedly will have an interdisciplinary solution. And a cognitive engineer like Priya Pennathur is likely to be among those gathered around a white board when the next stage of problem-solving begins. ■





An EPIC Start

TEXT BY JEAN FLORMAN

It's not unusual for a young woman on the threshold of adulthood to seize the opportunity to take a different path than her parents. But bucking a legacy established by two parents, five cousins, five uncles, and two grandparents is another story. Yet that is precisely what Liz Risius (BSE 2013 in electrical engineering) did when she decided to attend the University of Iowa College of Engineering.

"All those relatives attended Iowa State," Risius says. "But when I was in high school, my parents encouraged me to go into engineering and said I might as well apply to both Iowa schools. When I opened the Presidential Scholar award letter from the UI, they both rolled their eyes and said, 'Well, of course, it would be from Iowa!'"

Clearly, the College chose well—only three years after graduating with a degree in electrical engineering and double minors in computer science and math, Risius is now an Integration Engineer and Technical Project Manager with healthcare software giant, Epic. Headquartered in Verona, WI, the 36-year-old company provides tools for the creation and maintenance of electronic health records for more than 160 million users, including patients at the University of Iowa Hospital and Clinics. Risius's role bridges all three of Epic's primary missions to provide code, support healthcare provider customers, and effectively implement the company's software tools in new sites.

"That's actually why they hire engineers," she says, "because we can develop code, support customers, and communicate well. We understand difficult concepts but also can translate between the technical developers and the healthcare providers."

The goal of Epic is also translational. The Electronic Health Records software provides apps that enable users to schedule clinic visits, admit patients to hospitals, organize, track, and communicate billing, facilitate doctor-patient communication, and create and maintain patient healthcare records.

"We provide integration across all these needs," Risius says. But keeping in mind that Epic doesn't start from scratch in many settings, "we also design systems so our software can 'talk' to non-Epic information systems that may already be in place."

For example, when a patient who suffers an injury to his leg is admitted into the emergency room, the admission is recorded in his hospital records that were previously created in Epic. After examining him, the ER physician orders an X-ray—an order that also is conveyed through the software system. Epic then interfaces the information across the imaging system to the actual X-ray machine—a hardware device whose own software gathers data about the patient's injuries. Once the machine captures and stores the image, the X-ray technician sends the information about the image back to the ER physician—communication accomplished through the Epic interface which translates the data from the X-ray machine into the patient's Epic-based hospital records.

"So everything the doctors, nurses, and technicians do is in the patient's electronic healthcare records," says Risius, whose role at the company focuses on data exchange communication—sending and receiving information. "It's all automated, which is more efficient than handwritten records, and even more important, safer for the patient."

It's a testament to Risius's expertise and resolve that only three years after leaving Iowa, she has earned such respect of her colleagues and supervisors that she now manages a team that collaborates with physicians, public health workers, and other healthcare providers who help shape and implement the company's products.

"I really enjoy the variety of people and institutions I work with, and I work hard to ensure that everyone on the team has a voice," she says. "I get to do a variety of things every day, sometimes in the context of cutting-edge work."

Working with complex, multifaceted organizations comprised of individuals with a wide array of specializations is a challenge Risius welcomes. Part of her role is to examine all systems used by an institution and determine which aspects are unique and which are redundant with the affordances Epic already provides. But the scope of problems isn't always at the organizational level, and Risius also has had to untangle knots created by individuals that can stall institutional processes. For instance, she recently had to figure out how to track down individual patients who have no home addresses—a problem much narrower in scope, but no less important than collecting, processing, and protecting massive amounts of data for multiple institutions.

As a young professional, Risius is looking toward an exciting future in her field.

"Ten years ago, healthcare records were all on paper," she says, "but now most organizations have electronic systems already up-and-running well. We now have more opportunities to input data before going live, and with time, our systems will provide even more elegant solutions to collecting, storing, processing, and protecting data."

Whatever the challenge, working at Epic has provided Risius with the opportunity to hone her leadership and communication skills—something she says began during her Iowa years.

"Participating in many different student organizations was a real plus at Iowa," says Risius, who during her undergraduate experience served as a Student Ambassador, a Student Advisor, a teaching assistant for Professor of Electrical Engineering Gary Christensen, and an intern at State Farm Insurance Co., Rockwell Collins, and AMD. Risius continues to serve the College today as a member of the Young Alumni Advisory Board.

"I left college a lot more of an extrovert than when I arrived," she laughs.

Risius's interests extended beyond academics. As a horseback rider, she claims to have been "disappointed to learn of the 'no-pets' rule in the UI dorms" which meant she couldn't bring her trusty steed with her from Illinois. Nevertheless, she says it only took a week on campus for her to know she had made the right choice of schools.



"I left college much more of an extrovert than when I arrived."

LIZ RISIUS, BSE 2013 EE

"Like most freshmen, I was pretty nervous," the Normal, IL native says. "But I made friends through campus ministry the first week and we've remained friends ever since. And Jane Dorman's freshman seminar was a wonderful introduction to engineering college life. The College presents a consistent message starting with recruitment, during the seminar and throughout the four years at Iowa. It's not just 'You can succeed here,' but, 'We have resources and we're here to help you succeed.' That message sets Iowa apart."

Risius adds that the message was underscored during her academic experience, which although challenging, was bolstered by faculty and staff members who willingly mentor students. Among a number of excellent role models, Risius singles out Professor Christensen as an excellent teacher who also was fun to work with when she served as an undergraduate TA for Circuits.

"He also was really interested in supporting a new group of women who were in the department," she adds. "And as part of the college diversity committee, Professor Christensen helped to successfully recruit more women into Electrical Engineering the year I began."

Risius adds that choosing Iowa for her education was a good decision that has prepared her well for the future. And her parents managed to maintain their sense of equanimity even after their daughter chose Iowa over Iowa State. Sometime after she started school, they informed her that her great-great uncle, John Risius, actually was a fellow Iowa engineering alumnus back in the 1920s.

"Finally," Risius says, "someone fessed up." ■

Eight new faculty members for fall 2016 semester



IBRAHIM DEMIR, assistant professor of civil and environmental engineering, earned a B.S. in chemistry from Bogazici (Posporus) University (2000); M.S. in environmental engineering from Gebze Institute of Technology (2004) and a Ph.D. in environmental informatics and control program from the University of Georgia (2010). Although newly appointed to a tenure track position, he is no stranger to the University of Iowa with previous appointments in the Iowa Flood Center, IIHR—Hydroscience & Engineering, Center for Global and Regional Environmental Research, Center for Teaching and the Graduate Program in Informatics.



ZHEN KAN has joined the department of mechanical and industrial engineering as an assistant professor. He earned his B. Engineering (2005) and M.S. (2007) from the Hefei University of Technology. He earned his Ph.D. from the University of Florida in 2011. After graduation he served as a postdoctoral research associate at the University of Florida—REEF/AFRL. His present research interests include networked robotic systems; graph theory; Lyapunov-based nonlinear control; vision-based estimation and control; and human-in-the-loop systems.



XUAN SONG is an assistant professor in the department of mechanical and industrial engineering. He earned a B.S. in mechanical engineering from Wuhan University (2008); M.S. from Zhejiang University (2011); M.S. and Ph.D. (2016) from the University of Southern California. His special fields of knowledge include process development and optimization for additive manufacturing, mechatronics, and digital geometry processing.



DANIEL MCGEHEE was appointed director of the National Advanced Driving Simulator and associate professor of mechanical and industrial engineering. He holds associate professor appointments in Occupational and Environmental Health and Emergency Medicine. He earned a B.A. in Psychology (1987) from Central Washington University, M.S. (1995) from the University of Idaho and a Ph.D. (2009) from University of Leeds, England. No stranger to the UI community, McGehee previously served as director of the transportation and vehicle safety research program at the UI Public Policy Center



JUN WANG is professor of chemical and biochemical engineering. He earned a B.S. degree (1996) from Nanjing Institute of Meteorology; M.S. (1999) from the Chinese Academy of Sciences, Institute of Atmospheric Physics, and a Ph.D. (2005) from the University of Alabama-Huntsville. His special fields of knowledge include interaction between atmospheric composition and climate change and the impacts of aerosols on air quality, weather and climate.



COLLEEN MCHENRY, lecturer in biomedical engineering, earned all of her degrees (BSE 2008, M.S. 2010, and Ph.D. 2015) at the University of Iowa. McHenry will oversee the new Carver Medical Device Design Lab that will help engineering students and faculty to design and produce industry-standard medical device prototypes.



MATIAS PERRET, lecturer in mechanical and industrial engineering, earned his degrees at the University of Iowa (BSE 2009; M.S. 2013; Ph.D. 2016). Perret has served in many roles at the University of Iowa including research assistant at IIHR—Hydroscience & Engineering (2009 – present) and lab instructor/teaching assistant for the Design for Manufacturing course. One of his responsibilities includes oversight of the Program for Enhanced Design Experience (PEDE).



JING ZENG is a lecturer in the department of chemical and biochemical engineering. She earned a B.S. degree (1997) in meteorology, Nanjing Institute of Meteorology; MS (2000) from the Chinese Academy of Meteorological Sciences; M.S. (2004) and Ph.D. (2006) from the University of Alabama Huntsville. Previously she was employed as a research scientist, hydrological sciences branch at the Goddard Space Flight Center and lecturer, research assistant professor at the University of Nebraska-Lincoln.

Engineers Continue Corn Monument Tradition

What does it take to maintain the annual tradition of constructing the University of Iowa American Society of Civil Engineers (ASCE) Corn Monument?

According to planners of the fall 2016 monument, at least five elements:

- Willingness to continue the tradition.
- A vision of what the monument should look like.
- Planning.
- Hard work.
- The generous support of others.

Initiated about 100 years ago, the tradition of building a structure that incorporates thousands of ears of corn into a display on the west lawn of Old Capitol continued largely unbroken into the 1960s. Following a pause, the Iowa Homecoming tradition of the monument was sporadically revived in the 1980s. The current revival of the corn monument began in 2014.

The fall 2016 version consisted of some 3,000 ears of corn sliced in half and nailed to a wooden pyramid capped by a football. It stood more than 26 feet high and weighed more than 3,000 pounds.

Civil engineering seniors Brendan Durkin of Glen Ellyn, Ill., chair, and Travis Thornburgh of New Virginia, Iowa, vice chair of the team that built the 2016 corn monument, say the tradition was its own inspiration.

“I saw how the corn monument brought the UI campus together the last two years,” Thornburgh says “and I wanted to be a part of it.

“It’s ‘Iowa-esque.’ I think it’s a very Iowa thing to do. I saw so many people stop and take pictures of themselves and their friends in front of the corn monument. It’s unique, and people will remember it,” he says.

Thornburgh and Durkin credit Civil Engineering Professor and ASCE advisor Bill Eichinger with stimulating interest in the project and inspiring students to envision what shape the monument should take. Each fall, students in Eichinger’s Civil and Environmental Engineering Practice class participate in a competition to determine

the design for the following year. The 2016 monument, for example, was based upon a winning design submitted by Taryn Gholson and Marri Van Dyke in the fall 2015 class.

“The winning design was similar in concept to the NFL’s Super Bowl trophy,” says Thornburgh.

Although the design was set a full 12 months in advance of the 2016 Homecoming, construction planning began in earnest when classes resumed during August 2016. Thornburgh says there were four organized build days, but that the total number of days devoted to construction probably was closer to 16 or 17.

Durkin says the College of Engineering was very supportive of the project, as Dean Alec Scranton sat down to meet with him and subsequently helped with fund-raising.

Durkin points out that there was no shortage of workers. An estimated 25 to 40 volunteers contributed 800 man hours of work. Students from the Campus Activities Board helped one day, while engineering students from throughout the college pitched in other days.

Also, students from The Nexus of Engineering and the Arts helped. “They found a drawing of the original Herky from the 1940s, and they painted a 12-foot-tall and 16-foot-wide picture of Herky standing over a flattened Northwestern Wildcat, our 2016 Homecoming opponent,” says Durkin.

Regarding the importance of support, Thornburgh says the corn monument wouldn’t be possible without generous financial and in-kind support from the College, departments, research centers, alumni, friends and local sponsors.

What is left for the future?

“We look forward to making the corn monument a full college-wide activity. It will become even more fun as we attract more people and get all the disciplines involved,” says Durkin.

According to Professor Bill Eichinger, the corn monument is a way for students to have fun while using design and construction skills similar to those they will use after graduation and throughout their professional engineering careers. ■



Lin Appointed Mielnik, Harding Professor of Mechanical and Industrial Engineering

Ching-Long Lin, professor and departmental executive officer of mechanical and industrial engineering, has been appointed the Edward M. Mielnik and Samuel R. Harding Professor of Mechanical and Industrial Engineering, effective July 1, 2016.



“Dr. Lin is an internationally recognized research leader who has made seminal contributions to fields ranging from oceanic and atmospheric flows to modeling of the human lung,” Alec Scranton, College of Engineering dean, said. “Moreover, his contributions extend well beyond research as he excels as a teacher and a mentor.”

Lin also serves as professor of the graduate program in applied mathematical & computational sciences, and is a faculty research engineer at IIHR—Hydroscience & Engineering and a researcher at the Iowa Institute for Biomedical Imaging, Environmental Health Sciences Research Center, and Nanoscience and Nanotechnology Institute. He earned a B.S. degree in mechanical engineering in 1986 from National Taiwan University. He earned an M.S. degree in 1989 in mechanical engineering and a Ph.D. degree in 1994 in mechanical engineering, both from Stanford University.

The Edward M. Mielnik and Samuel R. Harding Professorship in Mechanical and Industrial Engineering was established through a gift to the University of Iowa Foundation from C. Allan Poots and Dr. Jennifer Niebyl of Coralville, IA. A former engineering student in the late 1950’s, Mr. Poots went on to become a successful residential developer, building more than 650 homes in the Iowa City area as well as Coralville’s Brown Deer Golf Course. Dr. Niebyl is Professor of Obstetrics and Gynecology at the University of Iowa.

Their gift honors two Engineering faculty members who mentored Mr. Poots as a student, and establishes the first permanent professorship in the Department of Mechanical and Industrial Engineering. Mr. Poots’s academic mentors and life-long friends were Edward M. Mielnik and Samuel R. Harding.

Professor Mielnik was a 1943 graduate of the College of Engineering and received his Master’s Degree in Mechanical Engineering from the Massachusetts Institute of Technology. He taught undergraduate and graduate courses in materials science and materials processing at the college. He retired in 1983 and died in 2002.

Harding joined the Engineering faculty in 1944. He was superintendent of the Machine Tool Laboratory and instructor in manufacturing processes. He retired in 1960 and died in 1969. ■

Grosland Appointed Head of Biomedical Engineering

Nicole M. Grosland, professor of biomedical engineering, was appointed departmental executive officer for biomedical engineering, effective July 1, 2016.

Grosland joined the College of Engineering as a member of the faculty in 2001, having earned both her B.S.E. and Ph.D. degrees from the department in 1994 and 1998, respectively. She directs the Musculoskeletal Imaging, Modeling, and EXperimentation (MIMX) program at the University of Iowa Center for Computer-Aided Design. MIMX is a collaborative effort directed at computational modeling of anatomic structures. A primary objective of MIMX



is to automate the development of patient-/subject- specific models using a combination of imaging and modeling techniques, with particular emphasis on finite element modeling. Her present research interests include spinal biomechanics, total joint arthroplasty, patient/subject-specific model development, and finite element meshing techniques.

In addition to her research and teaching, Grosland co-founded Clubfoot Solutions, a non-profit organization that strives to rid the world of untreated clubfoot.

Grosland is a member of the Orthopaedic Research Society, American Society of Biomechanics, American Society for Engineering Education, and Biomedical Engineering Society. ■

Engineering Introduces New Recruiting Viewbook

The College of Engineering has published a new recruiting viewbook designed to inform prospective students to consider the college for their engineering education.

In addition to being published in hard copy, the viewbook also is available on line in an interactive format that resembles magazine style and incorporates convenient web links and video clips.

The new viewbook features the college’s six undergraduate programs, resources for students to become successful, information on careers, and admission requirements.

To read the new viewbook, go to <http://www.pageturnpro.com/University-of-Iowa-College-of-Engineering/74929-College-of-Engineering-Recruiting-Viewbook/index.html#1>. ■

Engineering Library Opens New Creative Space

University of Iowa engineering students have a new resource to explore the latest in virtual reality, 3-D scanning and modeling, and wearable technology.

In collaboration with the UI College of Engineering, the Lichtenberger Engineering Library has opened a Creative



Space on the second floor of the Seamans Center. The newly renovated room in the library includes tinkering stations featuring different technologies and tools, as well as collaborative work areas with white boards and computer monitors that can split into as many as four independent screens.

Engineering Librarian Kari Kozak says the new space was designed to spark the imaginations of students, faculty, and staff and to help them turn their ideas into reality.

“It’s great that we now have a dedicated Creative Space where people will be able to imagine, tinker, design, and—ultimately—create new and innovative projects,” Kozak says. “I can’t wait to see what they’ll do with all of the new tools.”

The Creative Space’s virtual reality station is equipped with a powerful computer and video card that allow for hours of virtual reality creation and display. Students can check out 360-degree 3-D cameras; Leap Motion controllers, which sense the movement of your hands and display them in 3-D; and a headset called an Oculus Rift, which students can use to experience virtual reality environments.

The Creative Space also features four types of 3-D scanners, including the Xbox Kinect, which has a scanning range starting at 48 inches. After objects are scanned, they can be sent to the Engineering Electronics Shop or the Engineering Machine Shop to be printed in 3-D.

Kozak also designed a variety of “creative boxes” tailored to different interests, such as e-textiles, programming and hardware, and motorized robotics. One box includes the MaKey MaKey, a tool with which you can turn anything into a keyboard by connecting alligator clips to your desired touchpoints. For example, you could turn bananas into the keys of a piano. ■

*An engineering student uses the Oculus Rift headset to look around a virtual Minecraft world.
Photo by Tim Schoon.*



Student Recognition

Six College of Engineering student-athletes are among 42 from the University of Iowa who have been honored by the Big Ten Conference with Distinguished Scholar Awards.

They are **Anthony Gregorio**, a senior from Palatine, IL, majoring in mechanical engineering, for men's cross country; **Maverick Hovey**, a senior from Eden Prairie, MN, majoring in mechanical engineering, for men's swimming and diving; **Aubree Larson**, a sophomore from Ankeny, IA, majoring in industrial engineering; **Sarah Mazur**, a senior from La Grange, IL, majoring in electrical engineering, for women's soccer; **Patrick Rhoads**, a senior in civil engineering from Kansas City, MO, for wrestling; and **Samantha Wagner**, a senior from Marion, IA, majoring in biomedical engineering, for women's swimming and diving.

Among the Iowa honorees, Gregorio, Mazur, and Hovey maintained a perfect 4.0 grade point average during the 2015-16 academic term.

Big Ten faculty representatives established the Distinguished Scholar Award in 2008 to supplement the Academic All-Big Ten program. The recipients must be letterwinners in at least their second academic year at their institution and have a minimum GPA of 3.7 or higher for the previous academic year, excluding summer school.

For a complete list of all Big 10 Distinguished scholars go to

<http://www.hawkeyesports.com/news/2016/7/16/general-42-hawkeyes-named-big-distinguished-scholars.aspx>.

Yashila Permeswaran, a senior from LeMars, IA, majoring in electrical engineering, was selected 2016 University of Iowa Homecoming Royalty. Honoring her achievement, the UI Office of Student Life profiled Permeswaran on line at <http://studentlife.uiowa.edu/news/yashila-permeswaran-ui-homecoming-court-2016/>.

Appointments

Karim Abdel-Malek, professor of biomedical engineering and director of the UI Center for Computer-Aided Design, has joined the University of Iowa Office of the Provost leadership team to help work on initiatives associated with interdisciplinary team research development across campus.

As senior associate to the executive vice president and provost, Abdel-Malek will work with directors of the UI Cluster initiatives, the Office of the VP for Research and Economic Development, and other academic leaders to identify areas for collaboration and potential focus areas for future faculty hiring initiatives. He will provide leadership for efforts related to development of large-scale proposals and projects, attainment of extramural support for those projects, and establishment of partnerships with various external organizations. The appointment is for one year with the option to renew.

An internationally recognized leader in the field of digital human modeling and simulation, Abdel-Malek founded and directs the Virtual Soldier Research (VSR) program, which produced the digital human model SANTOS, now being used by all branches of the U.S. military and by many industry partners. The VSR team has received international attention and continues to expand into applications in sports, medicine, and manufacturing.

David Cwiertny, associate professor of civil and environmental engineering and director of the Public Policy Center's Environmental Policy Research Program, has been selected to serve as minority staff for the U.S. House Committee on Energy and Commerce. His appointment is a part of his role as a 2016-17 Congressional Fellow of the American Association for the Advancement of Science (AAAS).

Jon Kuhl, professor of electrical engineering and researcher at the UI Public Policy Center and the Iowa Institute for Biomedical Imaging, has been appointed interim associate dean for academic programs in the College of Engineering, effective January 1, 2017.

Promotions

The following faculty were promoted effective July 1, 2016:

To the rank of Professor:

Yong Chen, Industrial Engineering

Todd Scheetz, Ophthalmology & Visual Sciences in the Carver College of Medicine and Biomedical Engineering in the College of Engineering

Thomas Schnell, Industrial Engineering, Electrical and Computer Engineering, Occupational & Environmental Health in the College of Public Health, and Neurology in the Carver College of Medicine

Xiaodong Wu, Electrical and Computer Engineering and Radiation Oncology in the Carver College of Medicine

To the rank of Adjunct Professor:

Louis Licht, Civil and Environmental Engineering

To the rank of Associate Professor with Tenure:

Eric Nuxoll, Chemical and Biochemical Engineering

Gabriele Villarini, Civil and Environmental Engineering

P. Barry Butler, Executive Vice President and Provost of the University of Iowa, and former Dean of the College of Engineering, has been selected as the next President of Embry-Riddle Aeronautical University, Daytona Beach, FL.

Publications

Dan McGehee, associate professor of mechanical and industrial engineering and director of the National Advanced Driving Simulator, co-authored an op-ed piece with Deborah Hersman, president and CEO of the National Safety Council and former chairwoman of the National Transportation Safety Board, on "With advanced technology, drivers still control safety," in the Sacramento, CA, Bee McGehee and Hersman attended the Automated Vehicles Symposium in San Francisco, CA.

Recognitions

Karl Lonngren, UI professor emeritus of electrical and computer engineering, has been honored by his alma mater, the University of Wisconsin-Madison Department of Electrical and Computer Engineering, as one of 125 People of Impact.

Jerry Schnoor, Allen S. Henry Chair in Engineering, professor of civil and environmental engineering, co-director of the Center for Global and Regional Environmental Research, and faculty research engineer at IIHR-Hydrosience & Engineering, was the 2016 recipient of the Dixy Lee Ray Award from the American Society of Mechanical Engineers.

Hiroyuki Sugiyama, associate professor of mechanical and industrial engineering, received a SAE Excellence in Oral Presentation Award for his presentation "Tire dynamics simulation for transient braking and cornering" at the SAE 2016 World Congress.

Gabriele Villarini, associate professor of civil and environmental engineering and associate faculty research engineer at IIHR—Hydrosience & Engineering, received the American Geophysical Union's James B. Macelwane Medal.

Athletes

Faculty and staff that participated in RAGBRAI, the grueling bike trip across the state, in part or all the way, were **Keri Hornbuckle, David Andersen, Michael Schnieders, Terry Braun** (with the Cancer Center Team), **Chelle Lehman**, and **Tom Casavant**.

On August 19, **Tom Casavant**, professor of electrical and computer engineering and biomedical engineering and director of the Center for Bioinformatics and Computational Biology, swam 21.5 miles from Catalina Island to Los Angeles. Eight family members provided support during the 12 hours, 59 minutes and 19 seconds it took to complete the challenge.



Grants and Contracts

Pablo Carrica, professor of mechanical and industrial engineering and faculty research engineer at IIHR—Hydroscience & Engineering, received a \$151,884 grant from the US Department of Defense, Department of the Navy, Office of Naval Research for “Effects of ship motions and atmospheric boundary layer on ship aerodynamics.”

K.K. Choi, Carver Professor of Mechanical Engineering, professor of mechanical and industrial engineering, and researcher at the Center for Computer-Aided Design, received a \$175,137 subgrant for “SBIR: Development of advanced reliability-based design optimization software.”

David Cwiertny, professor of civil and environmental engineering and faculty research engineer at IIHR—Hydroscience & Engineering, has received a \$200,000 grant from the National Science Foundation for “Collaborative research: integrated in silico and non-target analytical framework for high

throughput prioritization of bioactive transformation products.”

Mona Garvin, assistant professor of electrical and computer engineering, received a \$107,000 grant from the US Department of Veterans Affairs for “Optic disc swelling.”

Dawn Marshall, staff research assistant, National Advanced Driving Simulator, received a contract in the amount of \$85,544 for “Distracted driving task acceptance testing III.”

Sharif Rahman, professor of mechanical and industrial engineering, was awarded a \$399,912 grant from the National Science Foundation to investigate “CDS&E: Stochastic isogeometric analysis by hierarchical B-spline sparse grids.”

Tom Schnell, professor of mechanical and industrial engineering, and director of the Operator Performance Laboratory, received a \$300,000 contract for “Degraded visual environmental/brown-out rotorcraft research;” a \$496,644 grant from the US National Aeronautics and Space Administration (NASA) for “Technologies for indicating system status and dependencies during complex non-normal situations;” and a subcontract in the amount of \$99,981 for “LVC wireless network evaluation.”

Fatima Toor, assistant professor of electrical and computer engineering, received two grants from the National Science Foundation—a \$374,920 grant to study “OP: Towards high performance nanowire photonic devices: Novel testing techniques and device structures” and a \$50,000 grant to investigate “I-Corps: Customer discovery for silicon nanowire biosensor.” She also received a \$99,877 grant from the Iowa Energy Center for “Quantum efficiency measurement and analysis of tandem junction solar cells.”

Andrew Veit, program manager at the National Advanced Driving Simulator, received a \$206,927 grant from Yale University to develop a miniSim research driving simulator.

Jun Wang, professor of chemical and biochemical engineering, received a \$105,511 grant from NASA for an “Amplified study of the interactions and feedbacks between biomass burning and water cycle dynamics across the Northern Sub-Saharan African region” and a \$162,841 NASA grant for “Sensitivities of biomass burning and land use change on the number of precipitation days in the maritime continent.”

Alumni, Where Are They Now?

1960's

Engineering alumnus Dr. **Richard Konzen** (BSCE 1961) visited the College of Engineering July 20, to meet with Dean Alec Scranton. Konzen is professor emeritus of nuclear engineering at Texas A&M University.

1970's

Distinguished Engineering Alumni Academy member **Roger Koch** (BSChE 1977) received the College of Engineering Dean's Award for Entrepreneurial Leadership October 13. Koch has successfully combined a keen business sense with the engineering skills he learned at the University of Iowa to build a remarkable career in innovative aerospace interior products.

1980's

Gregory Kirsch (BSE 1987), partner and head of Smith, Gambrell & Russell, LLP, was named Georgia's Patent Law “Lawyer of the Year” for 2017 by The Best Lawyers in America. In addition to this recognition, Mr. Kirsch has previously been selected for inclusion in The Best Lawyers in America for Patent Law since 2007. He has also been recognized by Chambers USA: America's Leading Lawyers for Business for Intellectual Property Law 2007-2016, Georgia Super Lawyers and Georgia Trend's Legal Elite. Recently, Mr. Kirsch was selected to Intellectual Asset

Management's (IAM's) 2016 IAM Patent 1000 list of the world's leading patent professionals.

Gregg Machetta (BSE 1988) of Deere & Co. has been appointed to the mechanical and industrial engineering advisory board.

James Seaba (BSE 1984, MS 1986, PhD 1990) was named senior director, technology development, at the Gas Technology Institute.

Rebecca Svatos, P.E. (BSCE 1982) was promoted to Environmental and Urban Design Market Leader and elected vice president of Stanley Consultants. Her responsibilities include creating and implementing a comprehensive market strategy inclusive of business development and program/project execution for the company's environmental and urban planning services. A licensed professional engineer in seven states, Svatos joined the company in 2002 and has 31 years of professional experience.

2000's

Anne Buchele Campbell (BSE 2009) is an associate project manager at Walt Disney World.

Beth Westlake Blanco, P.E. (BSE 2007, MS 2009, MS 2010) recently moved to Washington, D.C.

Jingzhou (James) Yang (PhD 2003), associate professor, associate chairman and director of undergraduate studies in the Department of Mechanical Engineering at Texas Tech University has been named a Fellow by the Society of Automotive Engineers International.

2010'S

Gerald Beranek (BSE 2010), founder of BeraTek Industries, was featured in a July 5, 2016, Corridor Business Journal article about local manufacturers bringing jobs back to Iowa. For the complete story, go to <http://www.corridorbusiness.com/news/bringing-jobs-back/>.

IN MEMORIAM

David Blanco (BSE 2010) is employed with SK&A, Washington, D.C. as a structural engineer.

Rachel (Crome) Hahn (BSE 2011), employed with General Mills, Cedar Rapids since 2011 has accepted the position of Start Up Manager. She is orchestrating the refurbishment and startup of a 10 MW co-generation power and steam plant.

Kayla (Kamber) Hill (BSE 2012) is an industrial engineering manager with Mars Chocolate North America.

Anthony Melchiorri (BSE 2011) has authored eight science fiction novels. His novels blend biomedical technology with thrillers and science fiction. (www.anthonymelchiorri.com)

Mackenzie Myhre (BSE 2011), senior OEM account manager for CIVCO Medical Solutions, has relocated to New York City.

Sailahari Ponnaluri (BSE 2016) is a graduate student at Penn State University.

Adam Smith (BSE 2010) joined HDR, Des Moines, in July as a water/wastewater engineer.

Amanda Smith (BSE 2016) is an R&D Engineer with Boston Scientific, Boston, MA.

Narayan C. Barman (PhD 1949) of Pittsburgh PA, August 8, 2016.

Duane Barnhart (BSChE 1949) of Cedar Rapids, IA, August 8, 2016.

Steven M. Blair (BSE 1984) of Marion, IA, April 25, 2016.

Ronald C. Brechler (BSCE 1958) of Peoria, AZ, March 26, 2016.

Marvin A. Brown (BSME 1957) of Sewickley, PA, July 1, 2016.

Ivan L. Burmeister (MS 1965) of Iowa City, IA, October 6, 2016

Kathryn J. Cartwright (MS 1980) of Albia, IA, August 12, 2016.

Irvin. L. Cirks (BSEE 1951) of Panama City, FL, April 28, 2016.

Kara Clark (BSE 2004) of Lisbon, IA, June 11, 2016.

George A. Dixon (BSME 1959) of Cincinnati, OH, July 11, 2016.

Ron Eden (BSME 1962) of Crawfordsville, IN, May 28, 2016.

Fred Eggert (BSEE 1959) of Guttenberg, IA, June 1, 2016.

Charles D. Favreau (BSCE 1950) of Anaheim, CA, May 17, 2016.

Melvin Fisk (BA 1941, BSE 1941) of Redondo Beach, CA, August 5, 2005.

Elmer L. Floyd (BSME 1959) of La Crescenta, CA, August 3, 2016.

Richard D. Fretwell (BSEE 1965, MS 1967) of San Francisco, CA, October 16, 2015.

Frank H. Gardner (MS 1972) of Touchet, WA, March 25, 2016.

James A. Haack (BSE 1987, MS 1988) of Tipton, IA, June 26, 2016.

Salim Hussain (BSIE 1979) of Anaheim, CA, November 26, 2008.

Lyle M. Howard (BSEE 1967) of Portland, OR, May 31, 2016.

Walter B. Ingram (BSME 1955) of Oklahoma City, OK, September 5, 2016.

David R. Kendall (BSEE 1960) of Albuquerque, NM, May 29, 2016.

Richard J. Koftan (MS 1970) of Cedar Rapids, IA, August 4, 2016.

Gerald L. Kopischke (MS 1972) of East Dubuque, IL, September 12, 2016

Donald G. Kuntz (BSChE 1957) of The Colony, TX, October 18, 2014.

Donald E. Laughlin (MS 1961) of Iowa City IA, August 19, 2016.

Robert H. Lind (BSChE 1951, MBA 1971) of Dayton, OH, March 30, 2013.

Joseph M. Lord (BSCE 1962) of Buffalo Creek, CO, June 28, 2016.

William T. Metz (BSEE 1950, JD 1953) of Burlington, IA, June 5, 2016.

Larry J. Montgomery (BSME 1962, MS 1968) of Muscatine, IA, July 9, 2016.

Tatsuaki Nakato (PhD 1974) of Coralville, IA, September 3, 2016.

Jesse I. Nelson (BSME 1949) of Mesa, AZ, May 25, 2016.

V. Richard Peiffer (BSME 1949) of Grand Rapids, MI, October 14, 2009.

Franz L. Putzrath (BSEE 1943, BA 1943) of Washington, D.C., November 16, 2012

John L. Richards (BSME 1969) of Georgetown, TX, August 9, 2016.

Robert W. Richey (BSChE 1950, MA 1952) of Downingtown, PA, June 11, 2016.

Richard R. Roseberry (BSME 1952) of Cape Coral FL, September 11, 2016.

James M. Sielman (BSE 1986) of Urbandale, IA, August 11, 2016.

William D. Upmeyer (BSME 1949) of Maquoketa, IA, June 15, 2016.

Robert Walljasper (BSEE 1959, MS 1960, PhD 1970) of Ankeny, IA, April 19, 2016.

Wang-Mo Wong (MS 1949, PhD 1954) of Hazel Crest, IL, March 4, 2013.

FUTURE DATES

- April 6** Learn about current research in the College at our Research Open House, 2nd Floor, University Capitol Centre
- April 11** Engineering Alumni Reception in Minneapolis, McNamara Alumni Center, Heritage Room
- April 20** Engineering Professional Development Banquet and Award Ceremony, Feller Club Room, Carver Hawkeye Arena
Featuring our student organizations and their accomplishments
- October 6** Party after the Parade – in the new Seamans Center Annex
- October 7** Homecoming Tailgate Open House
- October 28** Family Weekend Tailgate Open House

IOWA ENGINEER

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Shaping an Annex to Educate the Engineer...and Something More



The new Annex to the Seamans Center for the Engineering Arts and Sciences is now only months away from welcoming students to their classrooms and labs of the future. The \$37 million, 65,000-square-foot addition answers a pressing need for more space and state-of-the-art facilities as the College of Engineering experiences significant growth in enrollment and research.

Stay up to date as the new Annex approaches an exciting completion. Stop by regularly at <https://www.engineering.uiowa.edu/college/new-annex>.

