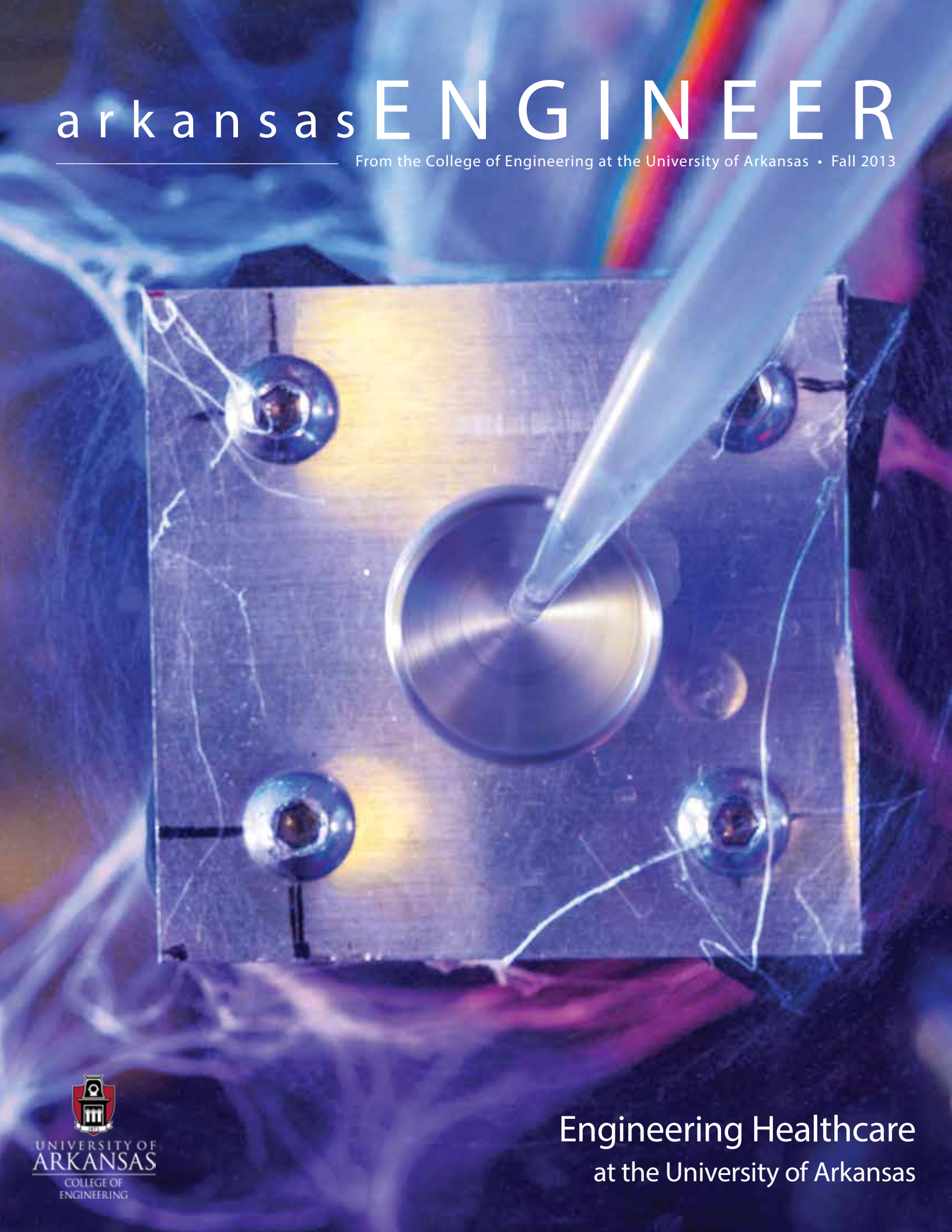
arkansas ENGINEER

From the College of Engineering at the University of Arkansas • Fall 2013



UNIVERSITY OF ARKANSAS
COLLEGE OF ENGINEERING

Engineering Healthcare
at the University of Arkansas


Trace element solutio
1000X

On the cover:
A device that makes nanofiber scaffolds. Researchers will grow cells on these scaffolds to create synthetic tissues that can be used to test drugs and diagnostic tools.

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John English
Dean of Engineering
Irma F. and Raymond F. Giffels
Endowed Chair in Engineering

Greetings from the dean's office! First of all, I'd like to tell you that it is truly a dream come true to return to the University of Arkansas as dean of engineering. And it's such an exciting time to be here.

Several years ago, when I served as head of the industrial engineering department, I got to witness the beginning of a transformational period at the University of Arkansas. At that time, the U of A was starting its journey to becoming one of the nation's leading public research universities. Now, I have returned to a university that earns more national recognition than ever, boasts top-notch facilities and has the ability to attract world-class faculty and students. I am impressed by the amazing work being done in the College of Engineering, and I am so grateful to be a part of it.

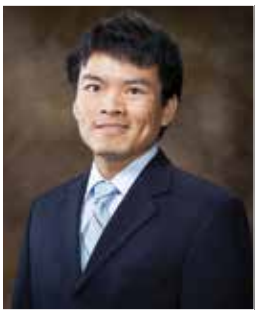
Part of my job is to make sure that we continue this momentum. Our students, faculty, and state benefit greatly as the University of Arkansas moves toward, and is recognized as, being one of the nation's most prestigious and engaged public research universities.

For this reason, I am establishing a research task force that will identify the areas where the College of Engineering has the most to contribute. By expanding and promoting our research strengths, we can attract the best students and faculty, as well as public and private investment. And these things benefit our region and state as well. Our graduates leave the university prepared to contribute their engineering expertise to businesses and organizations large and small, and, partly because of this, Northwest Arkansas has never been a better place for technology and business.

One of our emerging strengths is in the field of healthcare. Our first class of biomedical engineering students received bachelor's degrees in the spring, and this fall, construction is wrapping up on offices and labs for this department. The department is new, but healthcare research in this college is well-established. In this issue of the magazine, you can read about the broad range of this research. Our professors and students are finding new ways to detect and treat cancer, optimizing healthcare logistics to keep costs from rising, exploring cutting edge medical technology, creating more efficient ways to produce drugs and more.

I hope you enjoy this issue of the magazine, and I hope you're as excited as I am about what the future holds for the University of Arkansas College of Engineering!

MICHELLE BERNHARDT, civil engineering. Bernhardt uses laboratory validated discrete element computer models to study the multi-scale response of granular materials to different loading conditions.



QINGHUA LI, computer science and computer engineering. Li researches security and privacy in networking and computing systems, including mobile sensing, smart grid, healthcare systems and mobile cloud computing.

PAUL MILLETT, mechanical engineering. Millet researches topics related to energy materials, including materials for batteries and fuel cells, self-assembly of nanoparticles, and strategies for shape control in core-shell nanoparticles.

ARUN NAIR, mechanical engineering. Nair is building on his post-doctoral research in bio-inspired materials and his nanotechnology experience to develop new materials for biomedical applications and energy storage devices.

CLINTON WOOD, civil engineering. Wood has traveled to areas affected by devastating earthquakes to gather data that could help prevent future earthquake damage. Wood has also studied how topographic features can amplify earthquake ground motions.

Phillips 66 Presents $100,000 Gift to Business and Engineering Colleges

Representatives from Houston-based energy manufacturing and logistics company Phillips 66 visited the University of Arkansas recently to present a $100,000 check to support initiatives in the Sam M. Walton College of Business and the College of Engineering.

The College of Engineering received $30,000 in support of the Engineering Career Awareness Program (ECAP), a program that recruits students who are underrepresented in the field of engineering, and programs that support students and faculty in the department of computer science and computer engineering.

Robert Babcock (left), head of the Ralph E. Martin department of chemical engineering, and Dean Eli Jones (right), dean of Walton College, thank Doug Johnson for Phillips 66's donation.

U of A Plan Designed to Increase Graduates in Science, Engineering and Math

The College of Engineering, in partnership with the J. William Fulbright College of Arts and Sciences and the Global Campus, is spearheading an initiative to increase the number of students who successfully transfer to the U of A from the state's two-year colleges and earn bachelor's degrees in one of the science, technology, engineering and mathematics fields, known collectively as STEM.

Bryan Hill, assistant dean of student recruitment, honors and international programs at the College of Engineering, is leading the effort to build the program.

This project began with the development of four online courses in summer 2013 that will be offered to the state's two-year colleges in spring 2014. The goal is to provide online undergraduate STEM courses at the level of rigor that students at two-year colleges need to achieve academic success in STEM bachelor's degree programs at the U of A.

The university recently submitted a grant proposal to the National Science Foundation to seek funding for this program, which will create an academic partnership between two- and four-year institutions in Arkansas.

Chemical Engineering Student Honored by National Society

Hailey Dunsworth, an Honors College student majoring in chemical engineering, presented her research at the annual meeting of the North American Membrane Society in June. Dunsworth was one of 10 students awarded an Elias Klein Travel Grant to attend.

At the conference, Dunsworth presented a poster entitled "Reduction of Electrical Resistance as a Key to Improving Power Generation Through Reverse Electrodialysis," about her research on reverse electrodialysis. Reverse electrodialysis uses the ionic difference between salt water and fresh water to create electricity. Dunsworth's research focuses on finding ways to allow this process to produce energy at rates that would make it economically feasible to implement reverse electrodialysis on a larger scale. Dunsworth is working with Jamie Hestekin, holder of the Jim L. Turpin Endowed Professorship in Chemical and Biochemical Separations. She is taking part in a Research Experience for Undergraduates program. The program, called EcoREU, is administered by the department of biological and agricultural engineering and supported by a grant from the National Science Foundation and the United States Department of Agriculture.

Online Master of Science in Engineering Degree Ranked as No. 4 in Nation

The online master's degree in engineering offered by the U of A College of Engineering has been found to offer one of the best values in online graduate engineering education by GetEducated.com. This website ranks the program as No. 4, based on an independent review and a national survey.

This is the second time the MSE program has been recognized by a national organization. In January, U.S. News and World Report ranked the program 25th out of 66 online graduate engineering programs.

The MSE program is open to students with a bachelor's degree in any engineering field.

More than 35 faculty members and students from the department of industrial engineering attended the conference.

Industrial Engineering Department Collects Awards at National Conference

At the annual IIE conference, Russ Meller, holder of the James M. Hefley and Marie G. Hefley Endowed Professorship in Logistics and Entrepreneurship, received the Annual Award for Excellence in the Teaching of Logistics and Supply Chain. Meller's graduate student Lisa Thomas received the ISERC Best Track Paper Award in Facility Logistics. Chase Rainwater, assistant professor, was named an Outstanding Faculty Advisor. In addition, five IE students were recognized with awards.

NanoMech Makes R&D 100

NanoMech, a U of A-affiliated company, has received an R&D 100 award from R&D magazine.

The R&D 100 is a distinction given yearly to innovative products that are deemed to be technologically significant and the award is referred to within the industry as the "Oscar of Innovation," according to the magazine. The magazine based the award on Tufftek, a NanoMech innovation that reduces heat resistance and improves precision for cutting tools.

NanoMech's headquarters are at the Arkansas Research and Technology Park, which is managed by the University of Arkansas Technology Development Foundation. Ajay Malshe, Distinguished Professor and holder of the Twenty-First Century Endowed Chair in Materials, Manufacturing and Integrated Systems, founded NanoMech in 2002.

Malshe and his research team's breakthroughs in nano-materials and manufacturing include coating of nanoparticles, the first cubic boron nitride coating for machine tools, advanced nano-engineered lubricants and novel nano-electro-machining. As an internationally competitive nano-particle manufacturer, NanoMech's products have applications in machining and manufacturing, lubrication and energy, packaging for fresh produce, biomedical implant coatings and strategic military applications.

SunShot Initiative Shines on Silicon Solar Solutions

The U.S. Department of Energy has awarded one of its SunShot Incubator Awards to Silicon Solar Solutions LLC, a start-up company affiliated with the University of Arkansas. The award is the result of the company's patent-pending process to increase the efficiency of solar cells.

The award could ultimately lead to new high tech manufacturing jobs in Northwest Arkansas.

Silicon Solar Solutions received $500,000 for the award, which is targeted for early-stage assistance to help startup companies commercialize their inventions while encouraging private sector investment.

Douglas Hutchings (left), chief executive officer of Silicon Solar Solutions, is applauded by Chancellor Gearhart and Governor Beebe.

Arkansas Energy Consortium to Support Engineering Education

Alan Mantooth, Distinguished Professor of electrical engineering and holder of the Twenty-First Century Endowed Chair in Mixed-Signal IC Design and CAD, has received $10,000 from the Arkansas State Legislature and the Northwest Arkansas Economic Development District. These funds will support the Arkansas Energy Consortium, a group of academic and industry leaders who share a goal of addressing the shortage of engineers in the power electronics and energy fields.

Mike Norton, executive director of the Northwest Arkansas Economic Development District, Alan Mantooth and Representative Charlie Collins.

Researchers Tackle Concrete Cracking on I-540

Micah Hale, associate professor of civil engineering, and graduate student Richard Deschenes are working with the Arkansas State Highway and Transportation Department to find ways to repair cracking on the barrier wall on Interstate 540, just north of the Bobby Hopper tunnel.

This wall is affected by a process called an alkali silica reaction. Silica, an acidic material found in most types of rocks and sand used to make concrete, can react with the alkaline chemicals in cement to form a gel. This gel attracts water and then expands, causing cracks in the concrete. The cracks in the wall can be repaired with grout, but first this expansion must be stopped.

Under Hale's mentorship, Deschenes and other researchers are monitoring the degree of cracking on the wall, and testing several methods of reducing the amount of moisture inside the concrete. They are treating sections of the wall with different materials, including silane sealer, linseed oil or elastomeric paint. These treatments will prevent the concrete from absorbing water, but they will also allow the water already inside the concrete to escape.

Once researchers have found an effective way to reverse the damage on the barrier, they will apply the same treatment to the roadway, which is also beginning to expand due to the alkali silica reaction.

Researchers Focus on Dairy's Carbon Footprint

Researchers at the University of Arkansas are attempting to help the U.S. dairy industry decrease its carbon footprint as concentrations of carbon dioxide in the Earth's atmosphere reach record levels.

The dairy industry has set a goal of 25 percent reduction in greenhouse gas emissions by 2020.

Greg Thoma, holder of the Bates Teaching Professorship in Chemical Engineering, and an interdisciplinary team of U of A researchers looked at all facets and stages of milk production, from the fertilizer used to grow the animal's feed to waste disposal of packaging after consumer use. The researchers' "cradle-to-grave" life-cycle analysis of milk will provide guidance for producers, processors and others in the dairy supply chain and will help these stakeholders reduce their environmental impact while maintaining long-term viability.

The researchers found that for every kilogram of milk consumed in the United States per year, 2.05 kilograms of greenhouse gases, on average, are emitted over the entire supply chain to produce, process and distribute that milk. This is equivalent to approximately 17.4 pounds per gallon. The greenhouse gases were measured as carbon dioxide equivalents and included methane, refrigerants and other gases that trap radiation. The largest contributors were feed production, enteric methane – gas emitted by the animal itself – and manure management.

The researchers identified many areas where the industry can reduce impact within feed and milk production, processing and distribution, retail and the supply chain. They focused on farms, where processes for feed production, handling of enteric methane and manure management varied greatly and therefore represent the greatest opportunities for achieving significant reductions.

The U of A researchers – Rick Ulrich, professor of chemical engineering; Darin Nutter, professor of mechanical engineering; Jennie Popp, professor of agricultural economics and agribusiness; and Marty Matlock, professor of biological and agricultural engineering, in addition to Thoma – partnered with researchers at Michigan Technological University.

Study: Tornadoes Move Toward Higher Elevations, Cause Greater Damage Moving Uphill

Using 3-D computer models, U of A researchers have demonstrated the influence of hills on tornadoes. Their models revealed that the height of a hill and the size of a tornado's vortex have a significant effect on the tornado's destructive power. The findings could be used to identify safer areas for construction.

The researchers found that lower levels of a tornado's vortex are significantly disrupted if the height of a hill is equal to or greater than the radius of the vortex. The models also confirmed an important finding from a previous field study – that wind velocities are significantly reduced on the leeward side of hills.

Panneer Selvam, holder of the James T. Womble Endowed Professorship in Computational Mechanics and Nanotechnology Modeling, and civil engineering graduate student Piotr Gorecki used computational fluid dynamics to create 3-D computer models showing the interaction of hills and tornadoes. These simulations revealed that if a tornado's radius was equal to hill height, the lower levels of the tornado's vortex were significantly disrupted during the interaction. This contributed a low-velocity region on the leeward side of a rectangular hill. In this region, the researchers found, wind speeds were reduced by at least 41 percent compared to the maximum tornado velocity, the speed at which it was traveling when it hit the hill.

Selvam said the best sheltering abilities would be on the leeward side of bigger hills. This would require a further, historical investigation of the direction from which most tornadoes travel at a given location. For example, most tornadoes that hit southwest Missouri, including the massive EF5 tornado that struck Joplin, Mo., on May 22, 2011, travel from the west to the east.

For years Selvam has studied the effect of high winds on structures and developed detailed computer models of tornadoes. Selvam previously found that large structures can reduce the force of a tornado vortex.

Earlier this year Selvam and graduate student Nawfal Ahmed released findings of the first field investigations of the effect of terrain elevation changes on tornado path, vortex, strength and damage. They analyzed Google Earth images of the 2011 Tuscaloosa, Ala., and Joplin tornadoes.

In terms of magnitude of damage, the data clearly showed that tornadoes cause greater damage going uphill and huge damage on high ground or ridges. Damage decreased as the tornadoes moved beyond the crest of a hill and going downhill.

The researchers also found that when approaching a geographic intersection, tornadoes climb toward ridges rather than go downhill, which is counterintuitive when one thinks about wind or water seeking the path of least resistance. With both the Joplin and Tuscaloosa tornadoes, there were several locations where the paths changed direction. At each of these locations, or intersections, the tornadoes consistently sought higher ground.

Finally, Selvam and Ahmed discovered that when a region is surrounded by hills, tornadoes tend to maintain a consistent trajectory rather than follow topographical contours, jumping over valleys to hit hilltops and ridges. With both tornadoes, Selvam said, it was clear that all highland areas suffered the most damage.

Engineering and Healthcare

at the University of Arkansas

A concept sketch of the future biomedical engineering department suite (image courtesy of HBRA Architects and Wittenberg, Delony and Davidson Architects)

In the fall of 2012, U of A students gained additional degree options: the new department of biomedical engineering began granting bachelor's degrees and doctorates, in addition to the master's degree in biomedical engineering that was previously available through the department of biological and agricultural engineering.

The biomedical engineering program can prepare students for medical school, give them the skills they need to work with complicated medical devices or pave the way for a career in medical research. This program also creates new opportunities for the U of A to coordinate and collaborate with the rapidly growing local healthcare industry.

Over the past year, the college has hired three new biomedical faculty members and begun renovation work to create additional office, classroom and lab space in the John A. White Jr. Engineering Hall. While the new department is an important step for the college, the U of A has a long history of research and education in the healthcare field. In fact, in May of 2013, eight undergraduates received Bachelor of Science degrees in biomedical engineering, having completed most of their coursework as biological engineering majors.

This features section presents a look at the healthcare field in the College of Engineering, including an introduction to our biomedical engineering researchers, a summary of the research conducted at our Center for Innovation in Healthcare Logistics, an overview of the innovative and cross-disciplinary healthcare research across the college, and stories from our alumni who are working in the healthcare field.

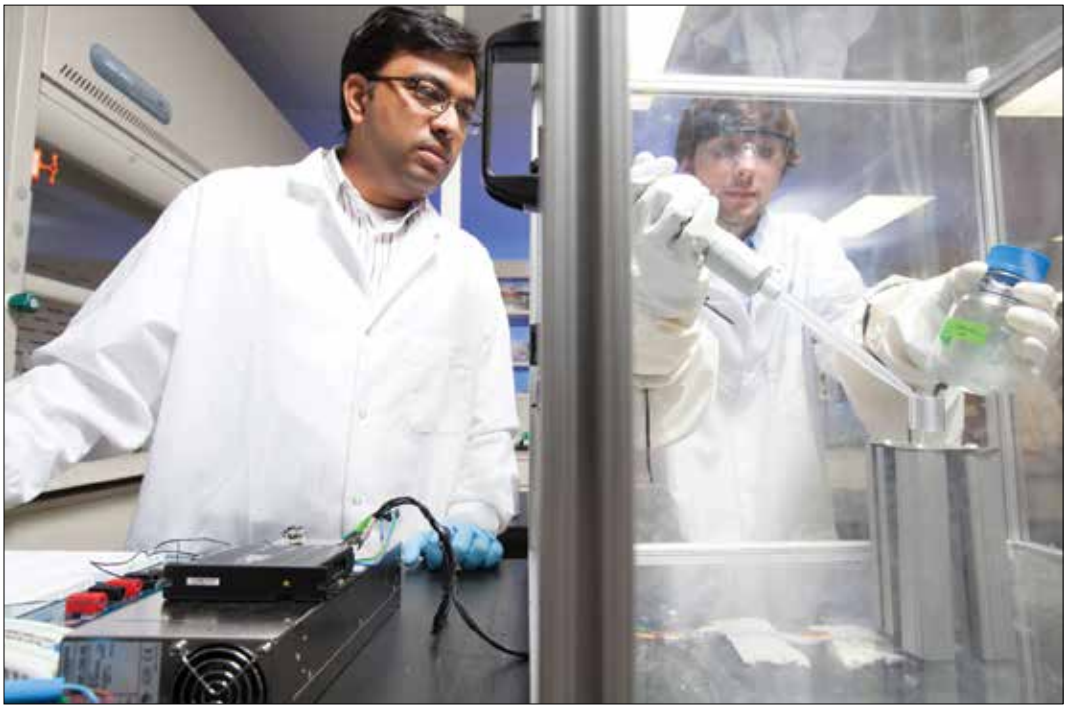
The U of A's first graduating class of students to receive the BSBmE degree: Back row: Jimmy Vo, Nathaniel Alexander, Peter Kleindl, William Ryan. Front row: Anh Vu, Katelin Cherry, Anna Heintz, Paul Goodchild

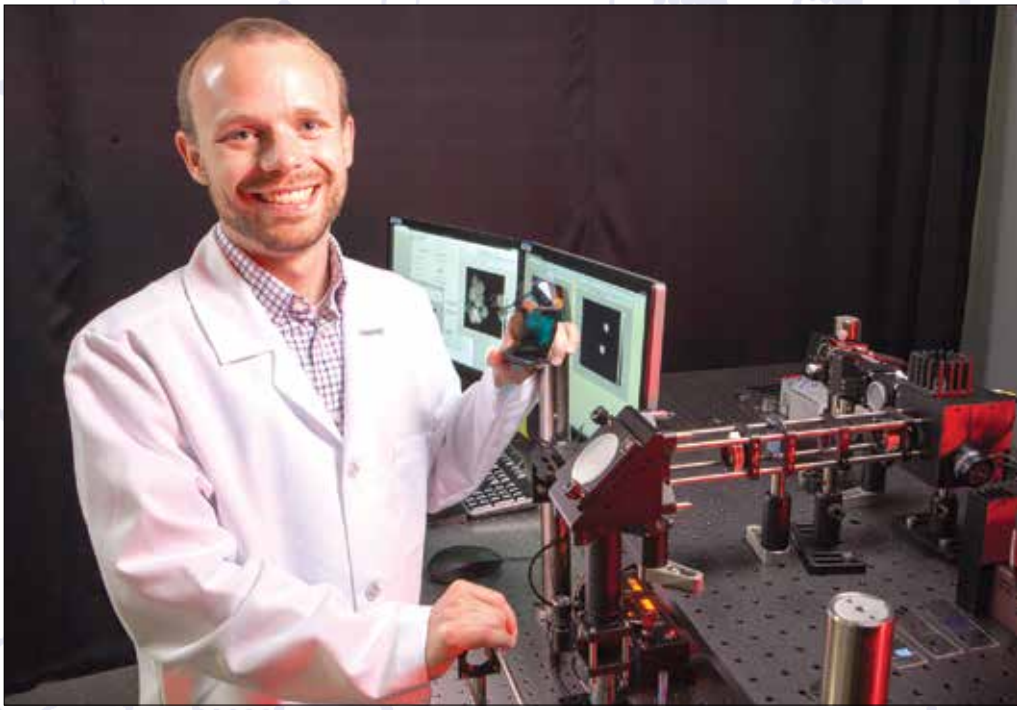
Biomedical Engineering Research at the U of A

SHA JIN (top left) studies stem cell differentiation and the interplay between cells and their environments. She examines how the interaction between cell-environment alters cell fate, including attachment, proliferation, differentiation, and cell death. Her research could lead to new cell-based therapeutics and to produce clinical relevant therapeutic cells. Other projects in Jin's lab include drug delivery systems for cancer treatment and the development of nanosensors to diagnose disease.

JEFF WOLCHOK (top middle) investigates the effects of traumatic brain injury on a type of brain cell called an astrocyte using a novel benchtop "crash tester". Dr. Wolchok also uses muscle cells to build biomaterials that mimic the properties of human tissue. Biomaterials like the ones Wolchok is creating in his lab would allow doctors to offer new and better treatments for patients with muscle injuries.

TIM MULDOON (top right) is working on a non-invasive

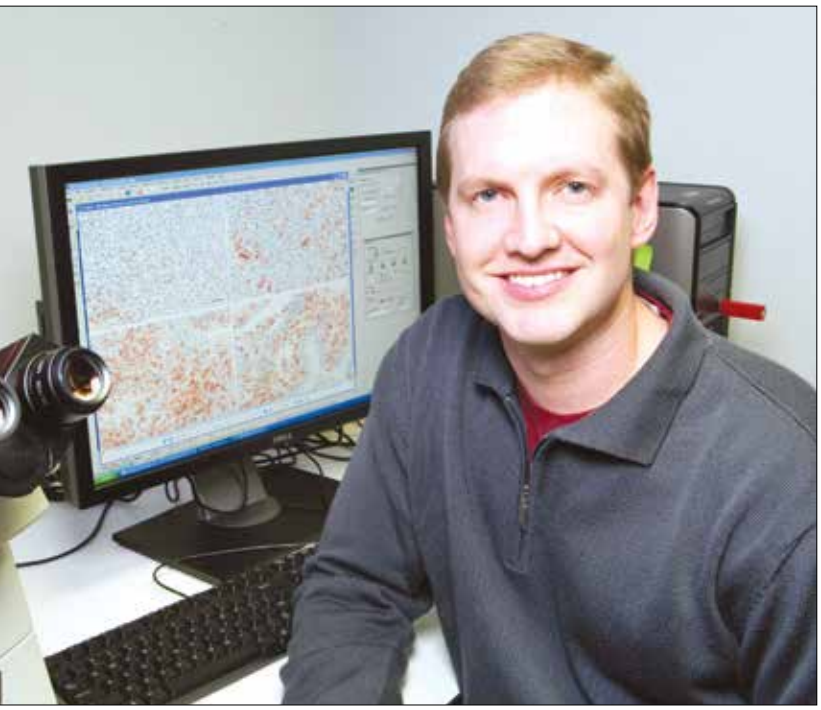




method of looking at cells in the body. Combined with contrast agents, substances that help medical professionals differentiate between types of tissues, this imaging technology could make it easier to diagnose, treat and monitor diseases like cancer. Muldoon plans to further develop these technologies with the goal of making them available to hospitals and medical clinics.

KARTIK BALACHANDRAN (bottom left) studies the way mechanical forces affect cells and organs. Using photolithography and nanoengineering techniques, Balachandran creates materials that mimic the properties of human tissues and tests the response of this material to different stresses and forces. Using these methods, he can examine the effects of everything from war injuries to high blood pressure.

DAVID ZAHAROFF (bottom right) focuses on delivery systems for cancer vaccines and immunotherapies. He is studying a biomaterial called chitosan. He has demonstrated that encapsulating protein antigens in chitosan enhances the body's immune response against that specific antigen. Separately, he has shown that chitosan-based delivery of a immune stimulating protein called interleukin-12 can eliminate aggressive primary tumors as well as inhibit metastatic progression.



A Tale of Two Supply Chains

Cutting-edge healthcare is a great thing, but the rising costs of healthcare in this country could make it difficult for Americans to take advantage of it. According to the World Health Organization, people in the United States spend more on healthcare than anyone else in the world. At the University of Arkansas, industrial engineering researchers are focusing on a way to reduce the cost of healthcare without compromising quality or availability—improving the supply chain system in hospitals and home health networks.

Most of us don't think much about the healthcare supply chain, but all hospitals need a reliable source of bandages, gauze, needles, surgical equipment, pharmaceuticals and other supplies. Just like a grocery store or other commercial retailer, hospitals must keep inventory, stay on top of demand and figure out when and how much to restock. Unlike the retail world, however, the healthcare industry has not traditionally focused on making their supply chain efficient and cost-effective. The Center for Innovation in Healthcare Logistics wants to change that.

In CIHL, researchers are targeting the gap between retail and healthcare logistics. By using the best practices from retail, CIHL's website points out, the healthcare industry can "recover significant costs and achieve new efficiencies, while enhancing safety, quality and equity of patient care."

Top to bottom: Ed Pohl, professor and director of CIHL, assistant professor Ashlea Bennett Milburn, Manuel Rossetti, professor and holder of the John L. Imhoff Endowed Chair in Industrial Engineering, professor Heather Nachtmann, professor Ronald Rardin (retired).

How to Improve the Hospital Supply Chain

60%

Approximately 60% of **retailers** state their supply expense is less than 10% of their total operating costs.

6%

Only 6% of **healthcare organizations** can say this.

Nearly 50% of **healthcare supply chain professionals** say that their organization has an immature supply chain.

50%

Fewer than

5%

describe their supply chain as **"customer-focused and collaborative".**

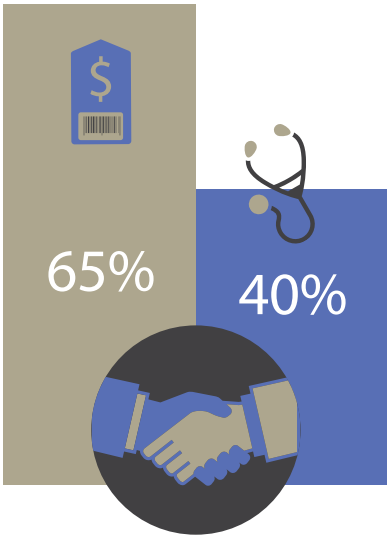
Number of **healthcare supply chain professionals** who say their organization is moving towards adoption of a data standards system.

35%

41%

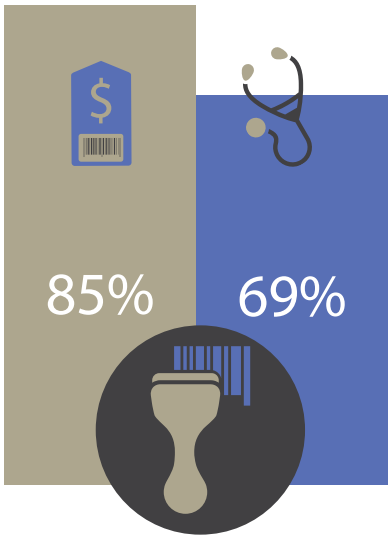
have **attempted to improve their supply** chain by adopting at least half the strategies suggested by the Efficient Healthcare Consumer Response report.

Best Practices from Retail—the healthcare industry needs to adopt or extend these practices.



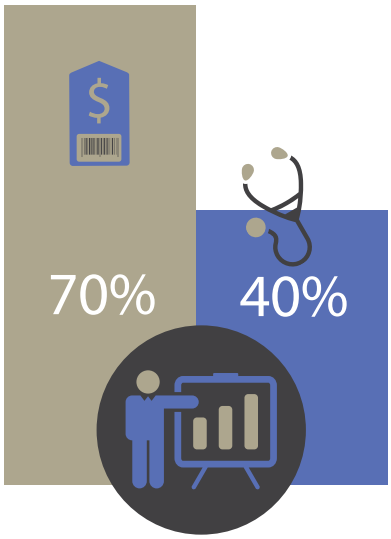
Collaborate

Collaborative Planning, Forecasting and Replenishment—enhance collaboration between suppliers and retailers/health care providers.



Scan

Use technology such as bar codes and RFID to improve supply chain visibility, which in turn will improve efficiency and patient safety.

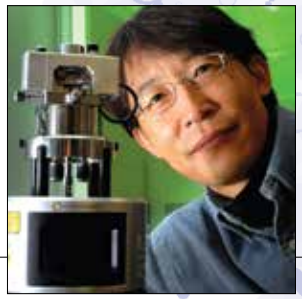


Train Employees

Enhanced Training for Materials Management Personnel and Formal Material Management Education—Additional education, credentials and certification for supply chain professionals.

Healthcare Research Across the College

Biological and Agricultural Engineering



PROFESSOR JIN-WOO KIM is working on a method to detect even small numbers of cancer cells in the blood—the first sign of metastasis. Kim arranges nanoparticles into structures, called plasmonics, which respond to specific wavelengths of light. He hopes to use these to create a non-invasive method to diagnose and treat cancer.

PROFESSOR YANBIN LI's research helps keep food safe from contamination. He develops different types of biosensors, which are used to detect foodborne pathogens. He also looks at ways to reduce the risk of microbial contamination in poultry products, including risk assessment models and antimicrobial technologies.

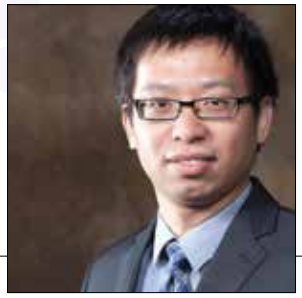
Chemical Engineering

PROFESSOR BOB BEITLE's research on drug-producing bacteria led to the establishment of Boston Mountain Biotech, LLC. He is currently researching algae based growth mediums for this process, and looking at ways to use skin-binding proteins to improve the performance of anti-fungal medications.

ASSOCIATE PROFESSOR CHRISTA HESTEKIN uses a technique called microchannel electrophoresis to analyze the amyloid beta proteins that are associated with Alzheimer's disease. By separating and studying the oligomeric forms of these proteins, she hopes to learn more about how they contribute to the disease.

ASSOCIATE PROFESSOR KEITH ROPER is studying the way different biomarkers, strands of DNA or amino acids that are particular to cancer cells, interact with light. His goal is to be able to make a tiny device that could be used externally to monitor the bloodstream for these biomarkers. Roper holds the Charles W. Oxford Endowed Professorship in Emerging Technologies.

ASSISTANT PROFESSOR SHANNON SERVOSS is studying the use of peptoids to treat Alzheimer's disease. Peptoids, synthesized molecules that mimic proteins, inhibit the formation of the amyloid beta plaques that are associated with Alzheimers and could reduce toxic species. Servoss holds the Ralph E. Martin Endowed Professorship in Chemical Process Engineering.

Computer Science and Computer Engineering

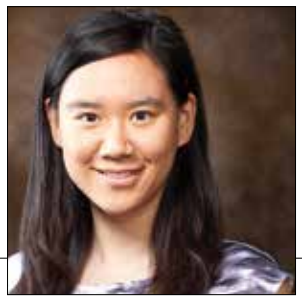
ASSOCIATE PROFESSOR PAT PARKERSON is collaborating with industry and medical professionals to develop devices to help people with disabilities communicate using small gestures or eye movements. He is looking for ways to make these devices as useful and efficient as possible.

ASSISTANT PROFESSOR TINGXIN YAN is developing mobile health systems—tools that help people maintain a healthy lifestyle. Yan is looking at ways to create devices that measure vital signs and communicate health information to patients' phones and healthcare providers. His research focuses on making these devices accurate, efficient and easy to wear and use.


Electrical Engineering

PROFESSOR MAGDA EL-SHENAWEE's lab features a unique combination of equipment to perform terahertz imaging. El-Shenawee is researching the use of this type of imaging to examine the margins of breast cancer tumors. This will help surgeons and pathologists make sure they have removed the entire tumor during surgery.

DISTINGUISHED PROFESSOR VIJAY VARADAN is developing wireless health monitoring systems. One of his projects is a vest that monitors and transmits heart rate, blood pressure and other vital signs. Varadan is also developing a system that can monitor brain and heart signals in the hospital, using nanosensors that are integrated into sheets and pillows. Varadan holds the Twenty-First Century Endowed Graduate Research Chair in Nano, Bio and Medical Technology.

Industrial Engineering

ASSISTANT PROFESSOR ASHLEA BENNETT MILBURN is applying operations research techniques to a broad range of topics in health and humanitarian logistics with the goal of making healthcare systems and disaster relief systems more efficient, effective and equitable. As part of the Center for Innovation in Healthcare Logistics, she is identifying best practices in home health supply chains. She is looking for ways to reduce the time home health nurses spend on supply chain duties and travel so they can spend more time with patients.

ASSISTANT PROFESSOR SHENGFAN ZHANG looks at medical decision making, especially in the area of breast cancer. She examines statistical data to find out what influences women's decisions to get screened for breast cancer, and she is using mathematical modeling to develop personalized screening and treatment recommendations.

I view engineers as problem solvers, and I think we need some serious problem solving

Neil Ingels

Alumni in Biomedical Engineering

Neil Ingels, BSEE'59

Neil Ingels spent most of his career at Stanford University and the Palo Alto Medical Foundation Research Institute in Palo Alto, California. With a Ph.D. in Electrical Engineering, Ingels had many different job opportunities, but he chose to be a medical researcher because he wanted to do something that provided a benefit to people. "I think engineers have to give serious thought to what problems they want to work on. I want to see them thinking about the application of technology to medical, economic, social and environmental problems. For example, a recent U of A team asked: 'How can I use my sophisticated engineering ability to help people who may not have a centrifuge for medical tests?' That's a terrific application of engineering. I would like see more of that."

Ingels' research has made an impact on the medical field. He headed a team that invented a technique to monitor heart motion, which has led to breakthrough discoveries about how the heart pumps blood and has influenced the treatment of heart disease, post-operative heart care and mitral valve repair.

Ingels retired in 2013 from the Research Institute, but continues as a consulting professor in the Stanford University School of Medicine and an adjunct professor in the U of A College of Engineering. He is currently working on a book about the mitral valve. Using computer modeling techniques, he is taking a very close look at the geometry of the beating heart. "The deeper I get into it, the more amazed I am at this machine, this mitral valve," he said. "I am working harder than ever, because I have so many new ideas now."

Dylan Carpenter, M.D.
BSBE '02, MSBAE '04

At the time Dylan Carpenter was a student, biological engineering students could follow a pre-med path, taking engineering courses plus courses to prepare for medical school. As a graduate student, he worked with professors Jin-Woo Kim and Russell Deaton on a project to use DNA to create self-assembling nanoparticles. Carpenter knew that an engineering degree would guarantee him a good career, whether or not he ended up as a doctor.

"The problem solving skills that engineering students learn, along with an understanding of the physical properties of both natural objects and machines make an excellent background for a doctor," Carpenter explained. His engineering education gives him a useful perspective on everything from how skeletons support weight to which type of screw he should use in a surgical procedure.

Carpenter graduated from the University of Arkansas for Medical Sciences recently and has joined a orthopedic surgery practice in Batesville, Ark. His favorite memories from college are of the projects he completed for his classes. "That's where you learn how to problem-solve, brainstorm, identify potential solutions," he said. "You find the optimum solution, design it, test it, put it to use. That whole process is synonymous with the process of medical care."

Kyle Rogers, BS'97

Kyle Rogers is the chief technical officer for SOAPware, a company that makes software for electronic health records. Rogers, who is a member of the CSCE Advisory Board, sees the relationship between the university and the local community from several different perspectives.

I can't state enough the benefits I see for northwest Arkansas from the university.

Kyle Rogers

Kyle Rogers poses with U of A graduates and current students who are working at SOAPware. Left to right: Phillip Cannon, Paul Martin, Sawyer Anderson, Adam Higgins, Matthew Burton, Ross Thian, Mason Hollis, Nathaniel Johnson and Kyle Rogers.

Millions of people across the globe are suffering from treatable diseases because manufacturers cannot afford to make the drugs they need…Our work addresses this problem.

Ellen Brune

As an alumnus and supporter of the university, Rogers is excited to see what he calls "true software companies" emerging in the region, because they can provide jobs for U of A graduates and contribute to the evolving culture of entrepreneurship and innovation in northwest Arkansas. "I want every U of A computer science and computer engineering graduate to have a job in the area," he said.

In his role as CTO, Rogers is very happy to be near the university, which he calls "more than a resource." Six of the 14 software developers working for SOAPware are U of A graduates, and Rogers reports that he is more than happy with their skills.

One of SOAPware's developers, Paul Martin, is currently working on his master's degree. He started applying for jobs before he graduated, planning to start working when he was finished with his degree. He received several job offers and agreed to start working at SOAPware immediately because he was so impressed with the company. "Northwest Arkansas is a great environment for computer engineering," he said.

Ellen Brune, BSChE '09, PhD '13

Ellen Brune became interested in chemical engineering when she visited her father at his job at the Anheuser-Busch brewery. There, she learned that the yeast used to make beer can also produce bad-tasting flavors, and she wondered why no one had created yeast that doesn't produce those unwanted by-products.

As a chemical engineering student at the U of A, Ellen applied this idea to the E. coli bacteria used to produce protein based drugs, such as insulin. On average, the products of these bacteria are 30 percent medicine and 70 percent unusable garbage. The drug industry must invest time and money to purify their products before they can be used. This amounts to an annual industry cost of approximately $8 billion.

Along with her faculty mentor, chemical engineering professor Robert Beitle, Brune has produced a cell line of genetically modified bacteria that produces more medicine and less garbage. She estimates her Lotus E. coli produce 60 percent medicine, which will make it easier and less expensive for drug companies to produce pharmaceuticals. Her company, Boston Mountain Biotech, LLC, has won several prestigious business plan competitions and is participating in the National Science Foundation's I-Corps program.

The 2013 Alumni Awards Banquet

The 2013 Alumni Awards Banquet was held at the Fayetteville Town Center on April 13.

Clockwise starting with above:

The Distinguished Alumni Awards, Outstanding Young Alumni Awards, Hall of Fame medal and Imhoff awards, waiting for their new homes.

Terry Martin (right) welcomes John English back to Razorback country.

Terry Martin,Teresa Martin, Ansel Condray, Virginia Condray, Bami Bastani, Elizabeth English, John English, Julian Stewart.

Outstanding Young Alumni: Dustin Beebe, Ben Hood, Gaven Smith and Bryan Billingsley.

Jin-Woo Kim, winner of the John Imhoff Outstanding Faculty Award for Research, Lalit Verma, biological and agricultural engineering department head and Scott Osborn, winner of the Imhoff Award for Teaching.

Hall of Fame inductee Jack King.

Middle: Distinguished Alumni Bill Brown, Chris Weiser, Dennis Gardisser, Larry Weir, Jeff Koenig and Kent Burnett.

Bottom right: Hall of Fame members Jack Buffington, Rodger Kline and Ansel Condray greet Jack King.

Stewarts Make $1 Million Gift Commitment to College of Engineering

Julian and Nana Stewart have made a $1 million gift commitment to the College of Engineering at the University of Arkansas. A portion of the gift will be used to establish the Julian C. and Nana B. Stewart AACE Access Arkansas Scholarships within the department of civil engineering and provide need-based support to at least 10 students annually. The remainder will be used to establish a charitable gift annuity with the university listed as the beneficiary.

"Once again the Stewarts are leading by example with this recent gift," said Chancellor G. David Gearhart. "They continue to embrace the priorities of the university and provide support in areas where it is needed most. We are incredibly grateful to them for the philanthropy and leadership they have displayed over the years and are fortunate to count them as our friends."

John English, dean of the College of Engineering, also applauded the Stewarts for their contribution.

"The Stewarts have carefully considered the needs of our engineering students and made a thoughtful decision to establish this scholarship," he said. "This shows true leadership to our entire college family and serves as an inspiration to others who are considering a similar impact."

This is not the first gift made by the Stewarts in support of student scholarships, or even Access Arkansas. In 2003, they established the Julian and Nana Bachtel Stewart Honors Fellowships, and in 2009, they created the Julian and Nana Stewart Access Arkansas Scholarship for the benefit of students university-wide.

Julian, who was heavily involved in the Campaign for the Twenty-First Century, realized several years ago that raising money for need-based scholarships appeared to be more difficult than for merit-based.

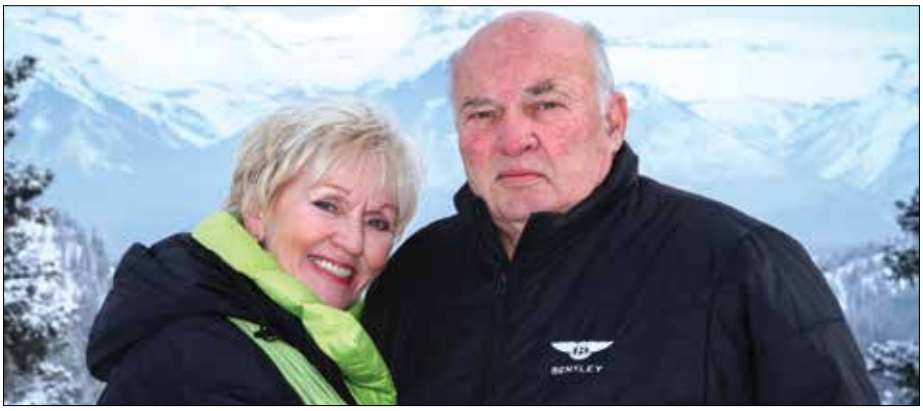
"I can appreciate the importance of financial assistance. As a student, I had to work each year to achieve my college education," he said. "Nana and I have greatly enjoyed the relationships we have built with our previous Access Arkansas recipients. At our age, these relationships have become incredibly rewarding, as we genuinely feel the appreciation shown by our student recipients."

Both Julian and Nana are graduates of the University of Arkansas. Julian earned a Bachelor of Science in Civil Engineering in 1957, and Nana holds a Bachelor of Science in Education from the College of Education and Health Professions. Julian was a member of the university's Campaign for the Twenty-First Century Steering Committee and the chancellor's Board of Advisors. He currently serves on the University of Arkansas Foundation's board and the Campaign Arkansas Steering Committee and chairs the College of Engineering's campaign committee. He was named the Volunteer of the Year by the university in 2003, received the Andrew Lucas Alumni Service Award in 2006 and was inducted into the Engineering Hall of Fame in 2010. Because of their philanthropy, both he and Nana were honored as the Outstanding Philanthropist award recipients for National Philanthropy Day in 2010 and are recognized by Towers of Old Main, a society for the university's most generous benefactors.

The Stewarts keep in touch with the of the recipients of their scholarship, meeting with them every semester and offering them support and guidance as they go through their college careers.

Access Arkansas, a university initiative committed to raising money for need-based scholarship support – particularly for undergraduates – was launched in 2007 with a goal of $15 million. In 2009, the Pat and Willard Walker Foundation created a $1 million Challenge Fund to match one-third of every dollar committed.

Gift from Mac and Sheila Hogan Supports Student Design



Mac and Sheila Hogan of North Little Rock have contributed $150,000 to the College of Engineering at the University of Arkansas. The funds will be used to support the Conceive, Design, Implement and Operate (CDIO) Initiative in the department of mechanical engineering through the purchase of equipment for a Virtual Machine Shop.

The department of mechanical engineering is now an official member of the Initiative, which is considered the state-of-the-art approach to educating engineers. The university joins the ranks of MIT, Harvard, Stanford, Purdue and the University of Michigan in this movement, as well as other universities worldwide.

Department head Jim Leylek is leading the effort, which helps students master the engineering fundamentals through design projects. When it is fully implemented, engineering students will be provided with design projects at the start of their curriculum and have the opportunity to accumulate design experience through many short, medium and long-term projects by the time they graduate. The Virtual Machine Shop will be an integral component of the initiative, as it provides students the opportunity to test the functionality of their designs by machining them in virtual space before actually making parts.

Hogan is a 1965 mechanical engineering graduate and received the Distinguished Alumnus award in 2012. He is chairman and president of Poloplaz Inc. and Air Tech Coatings Inc. and is also a member of the College of Engineering's Campaign Arkansas Steering Committee.

William and Margaret Harrison's Gift Creates High-Definition Video Conferencing

A laboratory in the Bell Engineering Center has been transformed into the Bill and Margaret Harrison Family Video Conferencing Facility thanks to a contribution from William and Margaret Harrison of Little Rock.

The gift allowed the department of industrial engineering to renovate and upgrade the space. The paramount feature in the facility is the state-of-the-art software and equipment, including the LifeSize 220 Express, described as the most full-featured video conferencing system available.

The system allows remote video and audio communication between up to eight parties concurrently, and users can share content, control cameras, change layouts and add participants with ease. It includes mobile and computer apps and can record and stream meetings. Thanks to this new technology, the department will be able to enhance students' learning experiences and expand research collaborations while reducing travel expenses.

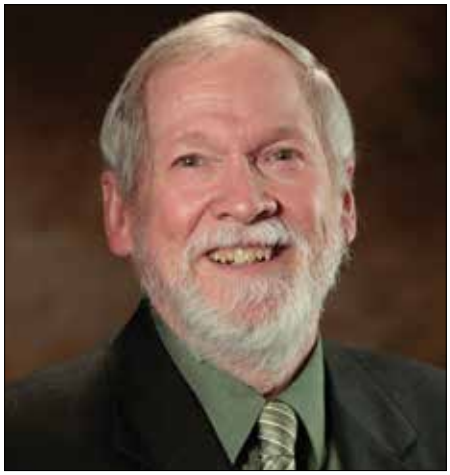
Bill Harrison, a 1966 IE graduate, is chairman and CEO of Harrison Energy Partners. He was elected to the Arkansas Academy of Industrial Engineering in 1991 and was named a Distinguished Alumnus of the College of Engineering in 2011. His wife, Margaret, is a 1966 U of A graduate and holds a Bachelor of Science in Education. The Harrisons are life members of the Arkansas Alumni Association and have been inducted into the Towers of Old Main, a recognition society for the university's most generous benefactors.

In Memoriam: Earnest Fant

Earnest W. Fant, associate professor of industrial engineering, died Thursday, Nov. 7 at his home in Fayetteville. Fant was 73 years old. He had taught in the industrial engineering department since 1988.

"Earnest Fant was a beloved teacher to many students, and he will be remembered in the College of Engineering for his endless energy and optimism," said John English, dean of engineering. "We are mourning a colleague and friend, and thinking of his family at this sad time."

Industrial engineering students honored Fant with the Mother Goose Award for exceptional storytelling in 2004, 2005, 2006 and 2011. He taught several popular electives within the industrial engineering department, which have had broad appeal across the college, including courses in renewable energy, robotics and machine vision.



Fant served as the principal investigator on several research projects sponsored by the Red River Army Depot for the Center for Excellence in Logistics and Distribution, an applied research and education consortium. A service project he initiated, the Photovoltaic Array Seminar, led students and community members through the process of setting up solar arrays and connecting them to the electrical grid.

Fant received a bachelor's degree in industrial engineering from the University of Arkansas in 1963, a master's degree from Southern Methodist University and a doctorate from Texas Tech. He served in the U.S. Army and the Texas National Guard.

He is survived by his wife, Georgie Fant; daughter Laura Hoisington and her husband Jeff of Stillwater, Okla.; son John M. Fant and his wife Phyllis of Hackett, Arkansas; sister Tanya Berkley of Fort Smith, Ark.; brother Jim Fant of Roland, Okla. (a 1965 industrial engineering alumnus); six grandchildren and seven great-grandchildren.

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Q & A with Brian Henderson, director of employer relations

Brian Henderson shares employment and networking opportunities with engineering students.

Q. How do you help connect employers with engineering students?
A. We host professional development and networking events throughout the year. We conduct events on campus that allow students and employers to meet one another and we also conduct company tours where we will bring students to local companies to tour their facility and meet their staff.
Q. What is the benefit of hiring an engineering student for a co-op or internship?
A. It's like test diving a car! The company can test a student's skills and abilities for a short term and then decide if that student is a good fit with the company before offering them a full-time position.
Q. What's your best "insider tip" for businesses looking for engineers?
A. Be visible and establish a brand on campus. Students become more interested in your company by the reputation you hold on campus. Some great first steps for employers to build their brand is by attending the STEM fair, speaking to clubs and organizations, and becoming active in the College of Engineering professional development activities.
Q. What is your favorite thing about your job?
A. Meeting new employers and connecting them with our students, which will hopefully lead to job opportunities. I love it when students thank me for helping them get an interview, co-op, internship, or full-time job. There is nothing more rewarding for me than receiving a high-five or handshake from a student who landed an interview or job.
Q. What is the best way to contact you?
A. By email: bwhender@uark.edu or phone: 479-575-6265.