ARKANSAS INGENUITY

FROM THE COLLEGE OF ENGINEERING AT THE UNIVERSITY OF ARKANSAS • SUMMER 2010

UNIVERSITY OF ARKANSAS

College in the Forefront of Health Care Breakthroughs

IMAGINATION • INNOVATION • INSPIRATION

I probably don't need to remind you of the extraordinary historical times this country faces right now. Daily, we're bombarded with messages from the media about the dire economic, social and technical challenges America must overcome to meet its citizens' needs and maintain its leadership in the global economy.

Let me just offer this simple thought in response to these challenges: now, more than ever, America NEEDS our engineers.

Innovation in translating laboratory success to commercial success is the key to the country's future. Engineers, as the nation's problem-solvers, have an important role to play in each of these challenges.

So it's profoundly encouraging to see that the number of Arkansas students choosing to study engineering is on the upswing.

In the fall of 2008, the college welcomed our largest-ever freshman class of 450 students. This bumper crop of would-be engineers was in part the result of our recruiting efforts, which have sought to spread information about the world of opportunities available to engineering graduates. The college also scored significant success in attracting greater numbers of diverse students. Representation of African American, Latino, Native American and female students all have increased dramatically over the past five years. In the last year alone, the college witnessed a 165% increase in the number of African American students in the college – largely the positive outcome of our Engineering Career Awareness Program.

These strong trends continued in the Fall of 2009 and the Fall of 2010 promises to break all previous records in engineering enrollment at the University of Arkansas.

Equally important, our focused efforts to retain greater numbers of these incoming freshman engineers are also bearing fruit. In the two years since the design and implementation of our Freshman Engineering Program, we have seen the fall-to-spring retention rate for the freshman class rise. For those who find that engineering is not the right fit, we have retained 91% of those students at the University of Arkansas Fayetteville.

These are more than just statistics. They are more than just successes for the College of Engineering. These numbers represent students who – with the support of our faculty and administration – are succeeding in becoming the next generation of Arkansas engineers.

Today, with better opportunities available in Arkansas, these students will have excellent career options right here at home. The college has partnered closely with the Governor's Office and the Arkansas Economic Development Commission to ensure these opportunities continue to grow.

We believe that when our students succeed, our state succeeds.

All the Best,
Ashok Saxena
Dean

Ashok Saxena

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

College of Engineering

UA Professor Helps Haiti as Member of NSF Team

University of Arkansas Civil Engineering Professor Brady Cox traveled to Haiti as a member of Geo-engineering Extreme Events Reconnaissance, or GEER, an organization sponsored by the National Science Foundation to conduct reconnaissance efforts of extreme events such as earthquakes, tsunamis and hurricanes. The small, Caribbean-island nation was hit by a magnitude 7 earthquake that killed more than 200,000 people and destroyed buildings, bridges and other infrastructure in January.

Cox and seven other GEER members gathered data and examined the earthquake's impact on buildings, bridges, utilities and ports. Their work will deepen an understanding of earthquakes and contribute to the design of structures that can respond to the violent effects of earthquakes without failing.

Arkansas Ingenuity is published by the College of Engineering at the University of Arkansas. Questions or comments should be sent to Editor, 4180 Bell Engineering Center, University of Arkansas, Fayetteville, AR, 72701.

College of Engineering Department and Faculty Awarded Gold

The Ralph E. Martin Department of Chemical Engineering received the 2009 Department Gold Medal from the University of Arkansas. The medal is awarded to one department that demonstrates a well-rounded investment in student success, usually demonstrated by excellent mentorship on the part of several faculty members.

The success of chemical engineering students is proof of faculty leadership and support. This year alone, students won diverse national and state honors, including:

- National Science Foundation Graduate Research Fellowships
- a best conference paper
- a spot as the U.S. delegate to a major youth camp
- an honorable mention for the Goldwater Scholarship, which ranks among the nation's top undergraduate science scholarships
- four NSF Research Experiences for Undergraduates
- two State Undergraduate Research Fellowships awarded by the state of Arkansas

Departmental representatives also co-wrote the proposal to establish RISE internships on the UA campus through the German Academic Exchange and mentored successful student teams in the People, Prosperity and Planet Student Design Competition, which is sponsored by the U.S. Environmental Protection Agency.

"These achievements demonstrate the collaborative learning environment present in the department and the far-reaching impact we can have on the lives of students," said Tom Spicer, chemical engineering department head.

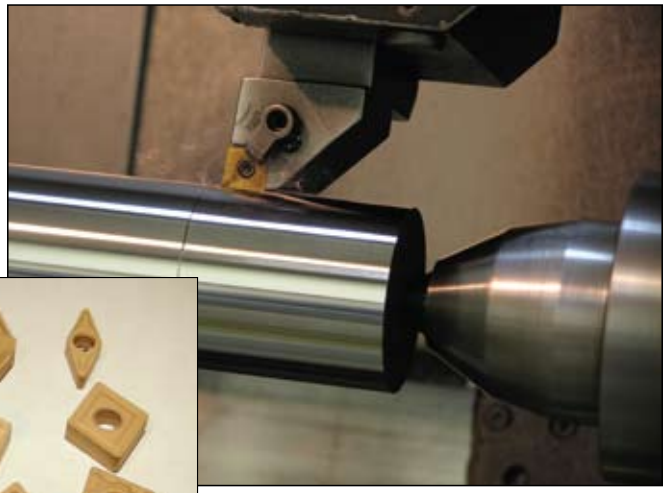
In addition to the department, College of Engineering faculty members were awarded University of Arkansas Faculty Gold Medals. Jamie Hestekin, of chemical engineering and Scott Mason, of industrial engineering, received the University-wide honors.

"We're so very proud of the tremendous accomplishments of our chemical engineering department and our faculty who have earned these awards," said Ashok Saxena, dean of the College of Engineering.

Nanotech Company Creates Products and Jobs

Ajay Malshe, professor in mechanical engineering, has big dreams about tiny particles. Those dreams led him to create NanoMech, which offers highly-skilled jobs for Arkansans. It's also the only nanomanufacturing facility in the state.

The company recently opened a production and R&D site in the Springdale Technology Park. NanoMech produces high-performance coatings and coating processes for cutting tools and machine-wear parts. The company manufactures cubic boron nitride (cBN) coatings for cutting-tool applications currently in use with a global automotive manufacturer and in the heavy-machinery industry under the product name TuffTek®. Diamonds are the only cutting surface harder than cBN, but are unsuitable for hardened steel machining.



NanoMech is the only nanomanufacturing facility in the state.

"NanoMech is a prime examples of our state's capacity for translating university-based fundamental science into high-value products and employment," said Jerry Adams, CEO of the Arkansas Research Alliance. A recent study commissioned by the Alliance found Arkansas gaining ground against the national average in university research and development investment.

During the next five years, NanoMech representatives say they could potentially employ more than 300 employees.

"For our economy to thrive, we must have a strong high technology manufacturing base and knowledge based jobs to complement the large service economy," said Keith Blakely, CEO of NanoMech. "Our products strengthen that base by providing Arkansas with high-paying engineering and technology-related jobs, as well as 21st century manufacturing processes."

Grant Benefits Computer Studies

The "Star of Arkansas" is the 339th fastest computer in the world.

Arkansas scientists, students and information-technology employees will benefit from a new $3.3 million grant from the National Science Foundation. The award, made possible by the American Recovery and Reinvestment Act of 2009, will enable researchers at the University of Arkansas and other colleges and universities in the state to build and support cyberinfrastructure and to train students and workers in information-technology systems, tools and services.

The grant, named CI-TRAIN (Cyberinfrastructure for Transformational Scientific Discovery in Arkansas and West Virginia), is part of a broader award to create a research consortium between the two states, which will have researchers specializing in high-performance computing, visualization and modeling.

At the University of Arkansas, the federal funding will enhance supercomputing resources at the Arkansas High Performance Computing Center. The Center supports research in computational science, nano- and ferroelectric materials, multiscale visualization and many other research projects that require massive data storage.

"Beyond the critically important goal of helping scientists discover, understand and solve complex problems that affect our lives, this award will enhance undergraduate education, provide training for information-technology workers and support statewide initiatives such as the Arkansas Research and Education Optical Network," said Amy Apon, professor of computer science and computer engineering, director of the computing center and principal investigator for the project.

In addition to Apon, other UA researchers involved in the project include Fred Limp, University Professor, anthropology; Laurent Bellaiche, physics professor; and Douglas Spearot, assistant professor of mechanical engineering. Srinivasan Ramaswamy, professor and chair of the computer science department at the University of Arkansas at Little Rock is also a co-principal investigator.

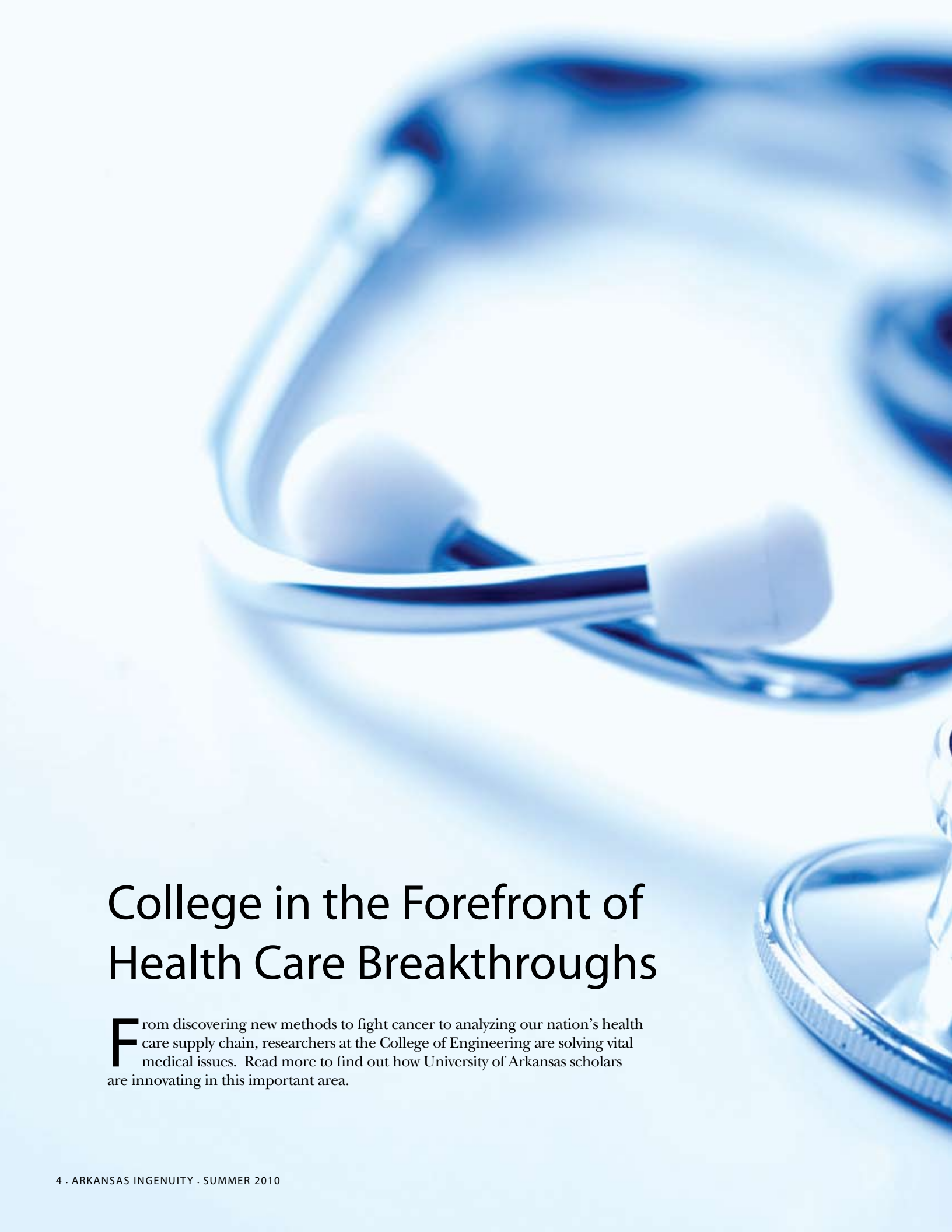
University Center Receives R&D 100 Award

R&D Magazine announced that Arkansas Power Electronics International, Inc. (APEI) and the National Center for Reliable Electric Power Transmission at the University of Arkansas received the 2009 R&D 100 Award for their high-temperature silicon carbide power module.

A joint development between APEI, the University of Arkansas, Rohm Company and Sandia National Laboratory, the APEI power module is the world's first commercial high-temperature silicon carbide-based power electronics module. With application in hybrid and electric vehicles, renewable energy interfaces and electric aircraft, the APEI power module reduces the size and volume of power electronic systems by an order of magnitude over present state-of-the-art silicon-based solutions. At the same time, it reduces energy loss by greater than 50 percent, which translates to significant potential energy savings.

"The performance increases developed from our power module are not incremental, they are revolutionary," said Alex Lostetter, president and CEO of APEI.

Power electronic modules are the core components of all power electronic systems. They're required to drive electric motors – particularly those used in all electric or hybrid vehicles – but they're also necessary to convert energy from renewable sources such as solar arrays or wind generators. Power electronic systems convert electrical energy from one form, provided by a source, to another form, consumed by a load. These systems can produce heat, which can harm some silicon-based electronics. Because the APEI module uses silicon carbide, it can operate at much higher energy efficiencies and at temperatures up to 250 degrees Celsius. Both abilities are considered major breakthroughs in power electronics.



College in the Forefront of Health Care Breakthroughs

From discovering new methods to fight cancer to analyzing our nation's health care supply chain, researchers at the College of Engineering are solving vital medical issues. Read more to find out how University of Arkansas scholars are innovating in this important area.

Researcher Discovers Better Method for Treating Cancer


David Zaharoff

A biomedical researcher at the University of Arkansas and his colleagues at the National Cancer Institute recently discovered a superior way to treat superficial bladder cancer. This type of cancer leads to muscle invasive and then metastatic bladder cancer, which is the fifth most common form of cancer in America. David Zaharoff, assistant professor in the department of biological and agricultural engineering, combined Interleukin-12 (IL-12), a powerful cytokine (a type of protein) with chitosan, a biocompatible and adhesive polysaccharide, to successfully cure mice with bladder tumors.

"Intravesical chitosan/IL-12 is a well-tolerated, effective immunotherapy that deserves further consideration for testing in humans," said Zaharoff. "We're very excited about this therapy as an alternative or complementary strategy for the management of superficial bladder cancer."

Human clinical trials at the National Cancer Institute began this spring. The results were published in the August issue of Cancer Research, which you can view at http://cancerres.aacrjournals.org/.

Last year, nearly 71,000 Americans were diagnosed with bladder cancer and slightly more than 14,000 of them will die. Globally, more than 1 million people will have the disease. That number is steadily increasing.

For more than 30 years, a drug known as BCG (bacillus of calmette-guerin, a type of bacteria) has been given intravesically – within the urinary bladder – as the immunotherapeutic standard-of-care treatment for superficial bladder cancer. But 20 to 30 percent of patients fail initial intravesical BCG therapy. And 30 to 50 percent of patients will develop recurrent tumors within five years. For the past several years, medical researchers have worked with Interleukin-12 as a potential alternative to standard cancer treatments because it has shown an ability to eliminate tumors. But a recent clinical study using Interleukin-12 on patients with recurrent superficial bladder cancer did not demonstrate anti-tumor efficacy.

Aware of Interleukin-12's potency, Zaharoff wondered why the therapy was unsuccessful. He hypothesized that the agent wasn't effectively delivered to the bladder tumor and underlying tissue. At the same time, he had been reading about chitosan, a natural, biodegradable polysaccharide derived primarily from the shells of shrimp and crab. Zaharoff knew that chitosan displayed adhesive properties, so he decided to combine it with Interleukin-12 and investigate whether the new formulation would adhere to the mucosal wall of mouse bladders and kill tumors.

Chitosan, he found, improved delivery and bio-adhesion of Interleukin-12. In their studies, 88 to 100 percent of mice with bladder tumors were cured after four intravesical treatments. In contrast, only 38 to 60 percent of mice treated with Interleukin-12 alone were cured. None of the mice treated with BCG alone were cured.

"Antitumor responses following chitosan/IL-12 treatments were durable and provided complete protection from intravesical tumor re-challenge," Zaharoff said.

Urinary analysis showed that chitosan/Interleukin-12 induced multiple cytokines – that is, proteins that allow communication between cells and help regulate immunity – at levels significantly higher than either Interleukin-12 alone or BCG.

Immunohistochemistry tests following chitosan/Interleukin-12 treatments revealed moderate to intense tumor infiltration by T cells, a group of white blood cells that are critical to the immune system, and macrophages, also a type of white blood cell. Bladder mucosa from cured mice contained residual populations of immune cells that returned to baseline levels after several months.

Zaharoff's future work will focus on uncovering the specific immune responses that cause the tumors to die. His colleagues at the National Cancer Institute are planning human clinical trials. He hopes that in five to 10 years chitosan/Interleukin-12 will be the standard-of-care therapy for patients with superficial bladder cancer.

Zaharoff holds the Twenty-First Century Professorship in Biomedical Engineering. He's also director of the Laboratory of Vaccine and Immunotherapy Delivery.

Sensor Detects Onset of Acute Myocardial Ischemia


Taeksoo Ji

Engineering researchers at the University of Arkansas have fabricated and tested a unique biosensor that measures concentrations of potassium and hydrogen ions in the human heart with high specificity. Simply put, the research could lead to a better way to monitor indicators of acute myocardial ischemia, or AMI, one of the leading causes of cardiovascular failure.

"Insufficient blood supply to the heart muscles triggers AMI," said Taeksoo Ji, assistant professor of electrical engineering. "This lack of blood supply results in excess anaerobic metabolism – or a lack of oxygen – which we know is accompanied by an increase of potassium and hydrogen ions released from cardiovascular cells. The goal is to develop a robust yet inexpensive sensor that rapidly detects those chemicals that signal the onset of AMI."

Due in part to the National Heart Lung and Blood Institute's emphasis on promoting research on rapid detection of the symptoms acute myocardial ischemia, various types of biosensor designs including ion-selective optical fibers, wave guides, nanoparticle fluorescence sensors and ion-selective electrodes, have been used to detect potassium and hydrogen in the blood stream.

Working in the Organic Electronics and Devices Laboratory, Ji, research assistant Soyoun Jung and student Pratyush Rai developed an ion-sensitive field effect transistor, yet another type of sensor used to detect potassium and hydrogen in blood.

Most ion-sensitive field effect transistors are silicon-based. Instead of silicon, Ji's team worked with a low-cost organic semiconductor known as poly 3-hexylthiophene, which they fabricated on a flexible substrate. The design and fabrication process was based on special devices used to deposit organic semiconductors on substrates. Organic semiconductor films don't require high vacuum and temperature cycles for a deposition and curing, which reduces the cost of production.

The researchers also developed a smoothing technique to assess the effect of external electric fields on the devices. The human heart creates a great amount of electrical charge from the organ's network of neurons that help it relay electrical impulses for pace-making activity. The myocardium, or the middle section of the heart wall, has intense electrical activity. Diagnostic tools such as electrocardiograms detect electric fields emanating from the heart. To operate properly, implantable biosensor devices must be immune to these electric fields, or background noise.

The smoothing technique and noise calculation demonstrated a high signal-to-noise ratio. Overall, the testing and validation process for the device displayed stable calibration characteristics, which proved its independence from surrounding electrical fields.

In other words, the sensor was immune to external voltages.

Ji collaborates with Vijay Varadan, distinguished professor of electrical engineering and director of the Center for Wireless Nano-, Bio- and Info-Tech Sensors and Systems, which is supported by the National Science Foundation. Led by Ji, the Organic Electronics and Devices Laboratory is one of the center's four laboratories.

Varadan holds the College of Engineering's Twenty-First Century Endowed Chair in Nano- and Bio-Technologies and Medicine as well as the college's Chair in Microelectronics and High Density Electronics. In addition to his position as director of the above center, he directs the university's High Density Electronics Center. Varadan is also professor of neurosurgery in the College of Medicine at the University of Arkansas for Medical Sciences in Little Rock, Ark.

The researchers' findings were published in Applied Physics Letters, a journal of the American Institute of Physics Publishing. An electronic copy of the article can be provided upon request.

Researcher Part of Team that Discovers How to Capture Tumor Cells in Bloodstream


Jin-Woo Kim

Jin-Woo Kim, a biomedical engineering researcher at the University of Arkansas, is part of a cutting-edge nanotechnology research group that has discovered a way to capture tumor cells in the bloodstream. The work could dramatically improve early cancer diagnosis and prevent deadly metastasis.

The discovery was published in Nature Nanotechnology, a monthly print and online journal that provides a forum for leading research papers in all areas of nanoscience and nanotechnology.

A team led by Vladimir Zharov, director of the Phillips Classic Laser and Nanomedicine Laboratory at the University of Arkansas for Medical Sciences, injected a cocktail of golden carbon nanotubes and magnetic nanoparticles with a special biological coating into the bloodstream to target circulating tumor cells. A magnet attached to the skin above peripheral blood vessels can then capture the cells, especially the so-called rolling cells.

By magnetically collecting most of the tumor cells from blood circulating in vessels throughout the body, this new method can potentially increase specificity and sensitivity up to 1,000 times compared to existing technology, researchers said. Once the tumor cells are targeted and captured by the magnet, they can either be microsurgically removed from vessels for further genetic analysis or can be noninvasively eradicated directly in blood vessels by laser irradiation through the skin, which is safe for normal blood cells.

Kim contributed to the project by applying thin deposits of gold on carbon nanotubes and their biological coatings. The gold layer enhances absorption of laser radiation and reduces toxicity. The golden nanotubes required extremely low laser-energy levels for detection.

Publication of the finding marks the second time Kim has been featured in Nature Nanotechnology in the past few months. The journal also announced that Kim and Zharov had developed a special contrast-imaging agent capable of molecular mapping of lymphatic endothelial cells and detecting cancer metastasis in sentinel lymph nodes. That material, made of carbon nanotubes and gold, could be used in the non-invasive and targeted molecular detection of normal, immune-related cells and abnormal cells, such as cancer cells and bacteria.

In yet another previous study, Kim and Zharov demonstrated that carbon nanotubes hold great promise as contrast agents for photoacoustic detection and photothermal killing of individual bacteria in the blood system.

Kim is an associate professor in the College of Engineering and the Dale Bumpers College of Agricultural, Food & Life Sciences. He works in the Institute for Nanoscale Materials Science and Engineering at the University of Arkansas and directs the Bio/Nano Technology Laboratory. In addition to him and Zharov, researchers on the project include Ekaterina Galanzha, research assistant professor at UAMS; Evgeny Shashkov, visiting scholar and laser physicist at UAMS; Thomas Kelly, associate professor in the department of pathology at UAMS; and Lily Yang, biologist at Emory University.

UA Study Shows Health Care Supply Chain Immature and Expensive

University of Arkansas researchers conducted a comprehensive survey that revealed the American healthcare supply chain is an immature and expensive system with significant barriers to efficiency. Specifically, stakeholders – manufacturers, distributors, group purchasing organizations and providers like hospitals, surgical centers and long-term care facilities – lack good and accurate information because they haven't implemented universal standards for data, despite recent movements in this direction.

"Right now, all manufacturers, distributors and providers don't use the same system to identify items, whether they're surgical scissors, heart monitors or cafeteria trays," said Heather Nachtmann, associate professor of industrial engineering. "In short, the healthcare supply chain is starved for accurate and accessible data, which are the primary barriers to efficiency, collaboration and standardization. This is an extremely expensive problem. In our survey, the average healthcare provider spends more than $72 million a year on supply-chain functions, nearly one-third of their annual operating budget."

Nachtmann and Edward Pohl, also an industrial engineering associate professor, conducted the industrywide study for the university's Center for Innovation in Healthcare Logistics and for the Association for Healthcare Resource and Materials Management, a national association for healthcare supply chain and materials-management professionals. The goal of the survey was to assess and describe the current state of the healthcare supply chain, identify inefficiencies and investigate opportunities for improvement.

"Everyone knows healthcare costs are rising at alarming rates," said Nachtmann. "A significant cost driver is the universal complexity of the healthcare supply chain. We believe that healthcare logistics is an area in which costs can be significantly reduced and efficiencies gained to provide better and safer healthcare delivery at a reasonable cost."

The healthcare supply chain is a network of information and logistics within the broad spectrum of U.S. healthcare. In addition to direct healthcare providers such as acute-care hospitals and long-term facilities, surgical and diagnostic centers, physicians' clinics, pharmacies and other facilities, the healthcare supply chain includes laboratories, equipment manufacturers, suppliers and distributors. Group-purchasing organizations, which are businesses within the healthcare supply chain formed to increase purchasing or bargaining power for bulk supplies, also play an integral role in the healthcare supply chain.

The researchers surveyed 1,381 professionals from all major sectors of the healthcare supply chain. Most – more than three out of four – of the respondents worked for a healthcare provider. The remaining participants worked for manufacturers, distributors, group-purchasing organizations and other healthcare supply-chain organizations. The respondents generally had significant experiences in the industry; two out of three had worked in the healthcare supply chain for more than 10 years. Almost half of the respondents had more than 20 years of experience in the field.

Nearly half the respondents indicated that their organization's supply chain was immature – with unstructured and loosely defined supply-chain management practices and no process measures in place – or "defined," where basic supply-chain management processes were defined and documented, and procurement and other processes went through a formal procedure. Fewer than one in 20 respondents reported that their organization operated at the "extended" level, the highest of five levels on the maturity spectrum. "Extended" means that the supply-chain management and processes are routine and so well established that the transfer of responsibility among all entities within an organization is smooth and seamless. At the extended level, there is a high level of trust, collaboration and mutual dependency among all entities.

As mentioned, lack of data standardization was the main obstacle to a mature or extended supply chain. Data standards refer to universally agreed upon and accepted representations, formats and definitions for common data ascribed to equipment, supplies and records. Data standards increase compatibility, reduce redundancy and improve exchange and efficiency. Nearly three out of four survey participants indicated that a lack of data standards is a barrier for their organization reaching an acceptable level of collaboration among healthcare supply-chain organizations.

Thirty-five percent of the respondents stated that their

organization was moving toward the adoption of a data standards system. Importantly, the overwhelming majority of these organizations will use the same tool, the GS1 system, which includes location- and product-identification standards and a registry. The respondents reported that most of the organizations are at least marginally ready to adopt data standards. Of those manufacturers, distributors, health care providers and group-purchasing organizations moving toward adopting product identification standards, most will do so within three years.

There were other encouraging findings. The researchers found that despite the lack of standards for data, there was a high level of collaboration among the various health care supply-chain players. The respondents also reported significant existence of and active participation in strategic supply-chain improvement initiatives within their organizations.

Two out of five survey participants indicated that their organizations had attempted at least half of the initiatives suggested by the Efficient Healthcare Consumer Response report, the 1996 benchmark study that assessed the role of the supply chain in healthcare expenditures. Initiatives most frequently attempted improved supply-chain performance, Nachtmann said. These initiatives included inventory-management and reduction programs, an increase in electronic-commerce transactions and automation for common supply chain practices.

"It's our hope that 10 years from now people will look back at this study and attribute many of the new and innovative changes made in the healthcare supply chain to the opportunities identified in this report," Nachtmann said.

The Center for Innovation in Healthcare Logistics is an industry-university partnership that leads a nationwide effort to identify and foster systemwide adoption of ground-breaking innovations in healthcare supply chain and logistics. The center facilitates collaboration among researchers at the University of Arkansas, healthcare provider organizations and industrial sponsors. Participants include Walmart Stores, IBM, Procter and Gamble, regional Blue Cross Blue Shield companies, VHA Inc. and the Association for Healthcare ºResources & Materials Management. The center, which began operations in May 2007, is housed at the University of Arkansas and has sustaining funding of more than $3 million for five years.

College of Engineering Receives Three-Year Grant to Boost Teachers' Knowledge of Physical Science

Teachers in Northwest Arkansas will receive the resources and knowledge they need to develop hands-on activities in physical science due to a $488,000 grant from the U.S. Department of Education. The College of Engineering, as well as nine public school districts throughout Northwest Arkansas, will design a two-week summer program to assist 40 middle school science teachers.

These resources can be used by the teachers to engage their students in the physical sciences when they return to their classrooms in the fall. The grant will fund this summer program for three years.

A $488,000 grant from the U.S. Department of Education helps middle school teachers educate their students in physical science.

"The shortage of engineers in the U.S. requires a hard look at the preparation of students before they reach the collegiate level," said Bryan Hill, assistant dean, Student Recruitment and International Programs. "For students to succeed in engineering, they need a strong foundation in physical science. Research shows 6th and 7th grade students in Northwest Arkansas only answer 38 percent of physical science questions correctly. The grant will specifically address this critical area."

Hill serves as the primary investigator. Co-primary investigators include Christa Hestekin, assistant professor of chemical engineering; Carol Gattis, associate dean of Honors College and associate professor of industrial engineering; Ed Clausen, professor of chemical engineering; George Denny, professor of educational statistics and research methods.

Operations Management Graduate Program Celebrates 35 Years

The College of Engineering's operations management graduate program is celebrating its 35th year of educating students in Arkansas and around the world.

The program serves adults living in all areas of Arkansas, as well as in many locations around the United States. Military personnel serving abroad can work toward a master's degree even while stationed in countries such as Iraq and Afghanistan. Program coordinators work with students to make sure that textbooks and class sessions are available via the Internet or DVD. The curriculum emphasizes practical knowledge in areas like project planning, quality management, operations research, supply chain management, human behavior analysis, economic decision-making and many other subjects for managers and professionals.

Founded in 1974, the program was developed by John Imhoff, who served as head of the industrial engineering department at the time. Originally offered on three military bases in Arkansas and Tennessee, program sites are now supported at the Fayetteville campus; Blytheville and Camden Arkansas; Little Rock Air Force Base in Jacksonville, Arkansas; Naval Support Activity/Mid-South in Millington, Tennessee; and Hurlburt Field, Florida.

This graduate program has grown to be the largest offered by the University of Arkansas.

"The removal of geographic barriers has proven to be an advantage for our students, but also for the state of Arkansas," said Alex Lasareff-Mironoff, assistant director of the program. "Our program provides access to an advanced degree for Arkansans who live in rural areas with limited opportunities for graduate study."

The operations management program is truly a visionary inspiration. Even in 1974, the program was geared toward working and remote students – something that didn't become a popular trend in higher education until the 1990s.

Morris Gift of $500,000 Helps Arkansas Students

Ron (B.S.I.E., 1958) and Betty (B.A., 1959) Morris of Dallas believe in education and want to help deserving young people who rely on financial assistance to get a college degree. Their recent gifts totaling $500,000 will help many students at University of Arkansas for years to come.


Ron and Betty Morris

Although the couple has funded many honors scholarships within the university, one of the new endowments carries special meaning. The Ben Gray Scholarship was created in memory of the father of the couple's daughter-in-law, Debbie Morris. Funds will be awarded to graduates of high schools in Marion or Baxter counties in Arkansas.

"Ben grew up in a family with 10 children and experienced the harsh reality of poverty," said Ron Morris. "He was also limited by a very serious heart defect. The combination of these circumstances made it impossible for him to earn a high school education, much less attend college. When he became a parent, Ben insisted that his five children focus on education, and they all did exactly that."

Two of his children, David Gray and Debbie Gray Morris, graduated from the University of Arkansas.

Gray passed away in 1991. "The scholarship will allow Ben's legacy to continue, giving the opportunity to other young people to achieve a dream and to live a life he was unable to live," said Ron. "We hope he would have been very proud to see his name on this scholarship.

The remaining portion of the Morris' generous gift will fund the Ron and Betty Morris Scholarships, designated for students from Arkansas.

"I, too, understand the importance of financial assistance for college," said Ron. "I was born on a small farm near DeQueen, Ark., at the height of the Great Depression. My family didn't have running water or electricity. I realized I would need an education to make a different life for myself, and I began working after school and during summers to save for college. I have enjoyed a successful career thanks to my time at the University of Arkansas and my sheer hard work and dedication. I want to instill that drive in students by supporting them through scholarships. I truly believe if there is a will, there is a way."

Ron and Betty Morris are very special to the college and to the university," said Ashok Saxena, dean of the College of Engineering. "The Morris Scholarships make dreams come true for our students every year, and this most recent gift showcases not only the Morris' passion for education, which we know to be strong, but also memorializes a very special friend and family member. I am proud to call Ron Morris one of our most treasured alumni, and I greatly appreciate his and Betty's passion for helping others. We cannot thank them enough for their kindness, generosity and loyalty to the mission of our college and the university as a whole."

In addition to the two new funds, the Morris Scholarships include the Jack and Jessie Morris Scholarship, the Lee and Wilma Douglas Scholarship, the Ron and Betty Morris AAIE Endowed Scholarship and the Guie Morris Honors Scholarship.

Ron Morris began his career with General Electric, and later became a vice president at Thorsen Tool Co. Morris recently retired as the president and chief executive officer of his own company, Lyons Manufacturing Inc. He holds a master's degree from Southern Methodist University. Betty Morris earned a master's degree from Syracuse University. The couple has two children, Ron and Robert, and six grandchildren.

Kellie Knight Named Director of Development and External Relations

Kellie Knight of Springdale, Ark., is the new director of development and external relations for the College of Engineering at the University of Arkansas. Knight returns to the college — where she once served as the assistant director of development and previously the scholarship and endowment officer — after spending three years as the development director in the Dale Bumpers College of Agricultural, Food and Life Sciences.

"I am thrilled to welcome Kellie Knight back to the College of Engineering family," said Ashok Saxena, dean of the Engineering College. "Her historical knowledge of our faculty, our accomplishments and our needs will undoubtedly be an asset to our future. Kellie is an expert fundraiser who builds genuine, meaningful relationships, helping our alumni and friends to focus their philanthropic efforts in a way that is fulfilling to the benefactors as well as to the college. We have chosen the very best person for this vital position."

Banquet Celebrates Alumni, Professors


2010 Hall of Fame Inductee, Julian Stewart.

The College of Engineering recently hosted the sixth annual Engineering Alumni Awards Banquet. The event brought together alumni from across the country to recognize and celebrate the achievements of our 2010 Hall of Fame awardee, our three Distinguished Alumni awardees, four Outstanding Young Alumni awardees and three Outstanding Faculty Awardees.

The 2010 Hall of Fame award was presented to Julian Stewart, BSCE '57. The award was presented by Chancellor Gearhart.

L. Lee Johns Lane, BS Chemistry '62, MSOR '74, PhD '76, Kelly C. Overman, BSEE '69, MS '75, and G. Lowrance Hodge, BSIE, '61, MS '64 were each presented with the 2010 Distinguished Alumni Award.

Denese Jackson, BSChE '90, Marcelo Schupbach, BSEE '97, MS '00, PhD '04, Bradley Gentry BSEE '98, MS '00 MBA '10 and Natalie Becknell BSCE '03, MS '05, were all presented with 2010 Outstanding Young Alumni Award.

And Edgar C. Clausen Professor, Ray C. Adam Endowed Chair in Chemical Engineering, Russell D. Meller Professor, James M. Hefley and Marie G. Hefley Endowed Professorship in Logistics and Entrepreneurship, and Vijay K. Varadan Distinguished Professor, The Twenty-First Century Endowed Graduate Research Chair in Nano, Bio and Medical Technology each received the 2010 John Imhoff Outstanding Faculty Award.

The College of Engineering hosts its Alumni Awards Banquet each year in Northwest Arkansas.


IE Department Head, Kim Needy, and Distinguished Alumni, G. Lowrance Hodge.


Dean Ashok Saxena and Fred Clark present Lee Lane with Distinguished Alumni Award.


Outstanding Young Alumni Awardee, Brad Gentry and Distinguished Alumni Awardee, Kelly Overman.

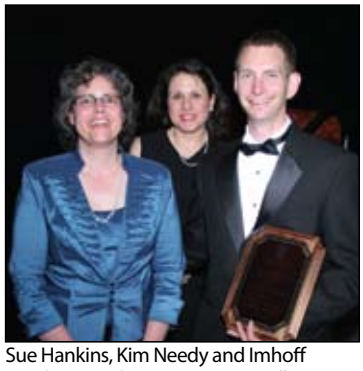

Lindsay and Marcelo Schupbach, Outstanding Young Alumni recipient.


Tom Spicer and Outstanding Young Alumni Honoree, Denese Jackson.


Dean Ashok Saxena and Jairo De Jesus present Natalie Becknell with an Outstanding Young Alumni Award.


Vijay Varadan accepts an Imhoff Faculty Award from Rodger Kline.


Ed Clausen accepts an Imhoff Faculty Award from Rodger Kline.


Sue Hankins, Kim Needy and Imhoff Faculty Award recipient, Russ Meller.

8 of Top 10: top paying positions for new graduates that were engineering majors

petroleum engineering: top paying position for all new graduates
$86,220: average starting salary for a new graduate with a degree in petroleum engineering
3 years: number of years this degree has been at the top of the list

chemical engineering: second top-paying position for all new graduates
$65,142: average starting salary for a new graduate with a degree in chemical engineering

mining & mineral engineering: third top-paying position for new graduates
$64,552: average starting salary for a new graduate with a degree in mining and mineral engineering

computer engineering: fifth top-paying position for all new graduates
$60,879: average starting salary for a new graduate with a degree in computer engineering

electrical engineering: sixth top-paying position for all new graduates
$59,074: average starting salary for a new graduate with a degree in electrical engineering

mechanical engineering: seventh top-paying position for all new graduates
$58,392: average starting salary for a new graduate with a degree in mechanical engineering

industrial engineering: eighth top-paying position for all new graduates
$57,734: average starting salary for a new graduate with a degree in industrial engineering

aerospace engineering: ninth top-paying position for all new graduates
$57,231: average starting salary for a new graduate with a degree in aerospace engineering

72% increase: projected increase from 2008 to 2018 in **biomedical engineers**

16,000: number of biomedical engineers in 2008
27,600: projected number of biomedical engineers in 2018

Source: The National Association of Colleges and Employers

UNIVERSITY OF ARKANSAS
4180 Bell Engineering Center
College of Engineering
Fayetteville, Arkansas
72701

Distance Education Master's Degree Now Offered for Students with an ABET Engineering Degree

Students who are employed can choose to take a lighter course load to maintain a balance between work, school and family.

In the Fall of 2009, the College of Engineering introduced the new distance learning Master of Science in Engineering program. This program now serves students who enter the program with ABET accredited engineering degrees.

Because classes are held in eight-week terms, the program can be completed in as little as one year with only two classes taken each term. Students who are employed can choose to take a lighter course load to maintain a balance between work, school and family.

The quality of the MSE educational program is substantial. The program is accredited with courses that are taught by the same faculty who teach traditional on-campus graduate students.

Although the program is only open to U.S. citizens, it can be completed from around the world as long as the student has access to high-speed Internet. This opens the door for members of the military to advance their education while serving abroad.

If you need a high-quality education that offers convenience and affordability, then this program is just what you're looking for.

Please visit www.mse.uark.edu for additional information.