

FACE TO FACE WITH THE
COLLEGE OF ENGINEERING

Mary Gomez



Hometown: Cartagena, Colombia

Undergraduate education: Universidad Pontifica Bolivariana, Medellin, Colombia. I graduated with a degree in chemical engineering.

Field of study: I'm pursuing a doctorate in chemical engineering.

Thesis topic: "Regeneration of Spent Dialysate Using a Membrane Bioreactor." I want to help people receiving dialysis.

Expected graduation date: May 2006

Career goal: I want to work for the Environmental Protection Agency and focus on industrial wastewater treatment. My degree is in chemical engineering, but I work a lot with environmental engineering.

Why engineering: I attended a very competitive high school in Colombia and chemical engineering was the most challenging field. I'm the first in my family to go to college.

Why the UA: I found the membrane expertise I wanted along with environmental engineering. The professors were friendly, returning my calls and e-mails. People really help you to succeed here.

Most memorable moment: There are so many! I was president of the Society of Hispanic Professional Engineers last year and we received the UA Outstanding Professional Registered Student Organization (RSO) Award, while I received the Outstanding Professional RSO Student Member Award.

We're hosting a regional conference of the Society of Hispanic Professional Engineers next spring, which is exciting. I've also gone to a lot of conferences and presentations.

And I just became a U.S. citizen, which is so exciting for me!

*To contact Mary Gomez,
e-mail mgomez@uark.edu
or call her at 479-236-1758.*

From the College of Engineering
at the University of Arkansas • Fall 2005

INGENUITY
IMAGINATION • INNOVATION • INSPIRATION



4180 Bell Engineering Center
College of Engineering
Fayetteville, Arkansas
72701

The Little Grain That Could

Nanocrystalline copper, with grain sizes in the range of 50 nanometers, is five to seven times stronger and significantly more resistant to fatigue damage than its microcrystalline counterpart. It's also able to retain its other attractive properties such as high-fracture toughness, and electrical and thermal conductivity, which make it an attractive choice for interconnects in the next generation of electronic products.

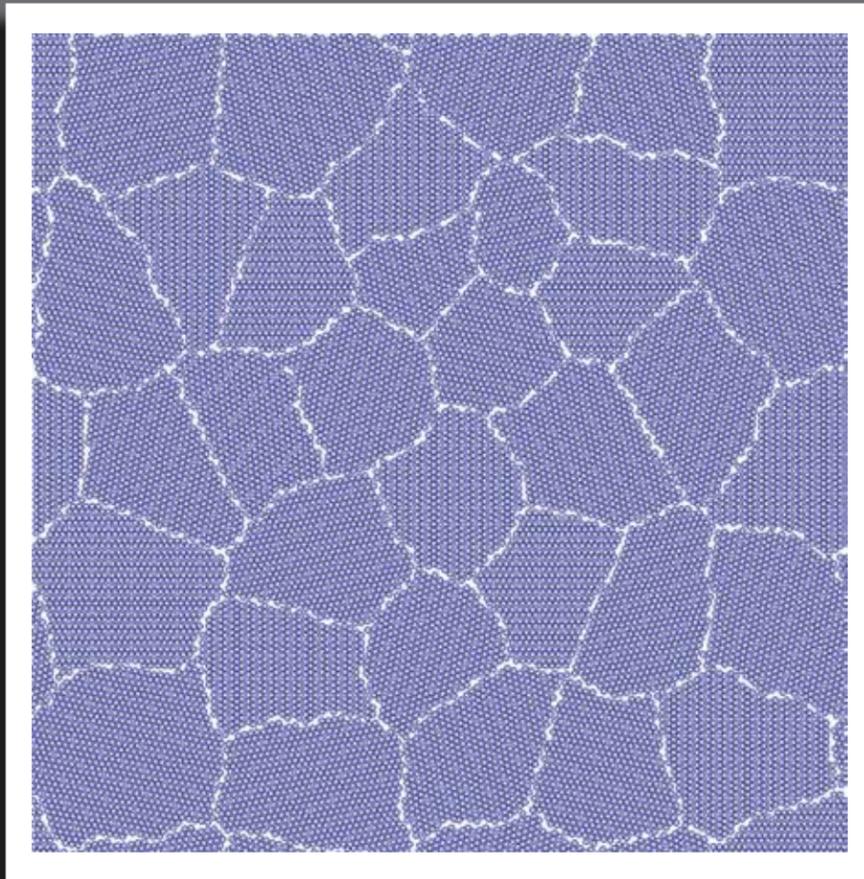
When the temperature increases to about 100 C, however, the grain size begins to increase and the advantages begin to disappear.

Researchers **Paul Millett, R. Panneer Selvam** and **Ashok Saxena** in the Computational Mechanics Laboratory in the College of Engineering applied the principles of molecular dynamics and computer simulations to demonstrate that adding very low amounts of "dopants" (or impurities that consist of other elements) around the grain boundary controlled the grain growth and retained the advantages of the nanostructure. ❄

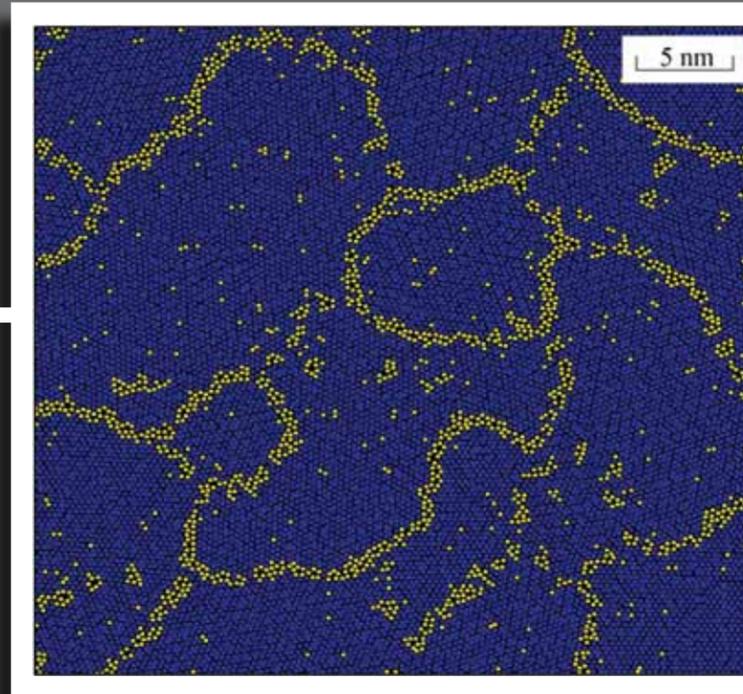
To contact Paul Millett, a graduate student in civil engineering, e-mail pmillet@uark.edu or call 479-575-2229

To contact R. Panneer Selvam, a professor in civil engineering, e-mail rps@engr.uark.edu or call 479-575-5356.

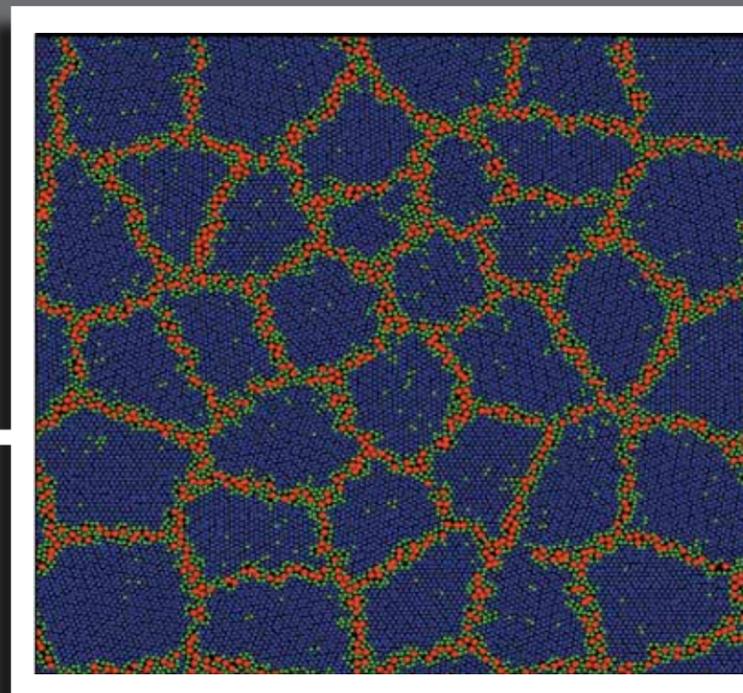
To contact Ashok Saxena, distinguished professor of materials science and engineering, e-mail asaxena@engr.uark.edu or call 479-575-3054.



The initial configuration of the nanocrystals of pure copper before increasing the temperature.



The change in grain size due to the increase in temperature.



The phenomena of grain size control due to the addition of dopants, or trace amounts of impurities.

INGENUITY
IMAGINATION • INNOVATION • INSPIRATION

Fall 2005

FEATURES

8 COVER

Turning the Tide

UA Ecological Engineering Group pursues groundbreaking research and innovative collaborations to change the course of ecological matters.

12

Lighting the Way

College of Engineering researchers establish new national center designed to make the nation's power grid more efficient and reliable.

15

Campaign for the Twenty-First Century

University of Arkansas joins the ranks of only 13 public institutions to have raised \$1 billion.

IN EVERY ISSUE

4 In the Lead

18 On the Move

20 Alumni in Action

22 The Last Word

23 Engineering Matters

24 Face to Face

Ingenuity is published twice a year 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 or sent by e-mail to cecilia@uark.edu.

Dean of the College of Engineering: Ashok Saxena
Editor: Cecilia Vigliaturo
Writers: Melissa Blouin, Matt McGowan
Editorial Consultant: Charlie Alison
Art Director: Leigh Caruthers Prassel
Photographer: Russell Cothren

IE Student Gains Hands On Experience in National Security

Lauren Chambers, a senior in industrial engineering, received one of only 105 fellowships from the U.S. Department of Homeland Security awarded through a national competition in all academic fields relevant to homeland security. This is the first and only such fellowship awarded to an industrial engineering student in the country.

The undergraduate fellowship includes full tuition and fees, a \$1,000 monthly stipend for nine months and \$500 weekly for a summer internship at Sandia National Laboratory, Albuquerque, N.M., a Department of Homeland Security-designated facility. Other facilities include the Coast Guard, Secret Service, Department of Energy labs and the Federal Emergency Management Agency.

"I was so excited that I called my parents the minute I found out," said Chambers. "Homeland security is such an important issue to me. We won't ever stop building and making improvements to protect our country."

Nearly 900 applications were reviewed by 65 science and technology experts. The scholarship program is designed to support, stimulate and tap into the intellectual capital in academia to address current and future homeland security challenges, while at the same time educating and inspiring the next generation of scientists and engineers dedicated to improving homeland security.

"Industrial engineering as a discipline – and our department specifically – is ideally positioned to support the challenges of integrating the complex systems presented by homeland security issues," said John English, head of the department. ❁

Pfeiffer Balances Books, Basketball

Sarah Pfeiffer, a junior in industrial engineering, was voted the Southeastern Conference's Women's Basketball Scholar-Athlete of the Year by the league's 12 head coaches.

The leading scorer for the Arkansas Lady Razorbacks, Pfeiffer carries a 3.94 grade point average. Averaging 11.4 points per game, Pfeiffer ranks in the top 20 among scorers in the SEC and led the Lady Backs to a 15-12 regular season record.

In addition, Pfeiffer was voted to the ESPN Academic All-District Team by the region's sports information directors and was the university's selection for the SEC Good Works Team for outstanding community service.

"Sarah has to miss practice for certain classes, but we support that," said UA women's basketball coach Susie Gardner. "We help her work around the demands she faces



Sarah Pfeiffer stays above the competition.

in the College of Engineering, and at the same time, we're thankful that she has understanding professors for times when she might have to miss class for competition." ❁

Graduate Receives Exceptional Fellowships

Adam Eckenseair, who graduated in May with a bachelor of science degree in chemical engineering, received two highly prestigious fellowships.

First, Eckenseair was awarded a National Defense Science and Engineering Graduate Fellowship, sponsored by the Department of Defense. He was one of only five students nationally in the chemical engineering discipline to receive the fellowship, which includes full tuition, fees and an average stipend of \$30,000 per year for three years. From 2001 through 2004, only 6 percent of the applicants for the fellowship in chemical engineering have received the

award – 423 students have applied, with 25 recipients.

Eckenseair also received a Graduate Research Fellowship from the National Science Foundation, one of only 1,000 students nationwide selected for the honor. This three-year grant provides \$10,500 toward tuition as well as a \$30,000 annual stipend.

"I'm planning to use the Department of Defense fellowship to pursue my graduate studies at the University of Texas-Austin," said Eckenseair. "The NSF fellowship is deferrable, which will allow me to use it to eventually pursue a doctoral degree." ❁

UA College of Engineering Teams Excel Nationally

Two University of Arkansas student chapters of the Institute of Electrical and Electronics Engineers (IEEE) recently received national acclaim.

The first award recognized the University of Arkansas IEEE Components, Packaging and Manufacturing Technology student branch chapter as the 2005 Student Chapter of the Year. The award is based on activities of the past year, including social and technical operations.

At the IEEE Region 5 Conference, the University of Arkansas IEEE student chapter received the "Outstanding Small Student Branch of 2004" award based on skill and knowledge displayed by the students in two tournaments.

Two teams from the Ralph E. Martin Department of Chemical Engineering won three awards at the WERC competition at New Mexico State University in Las Cruces, N.M. A team competing in the sprouts competition, known as the "Sprouts Team," received the USDA Award of Excellence and presented their experiment to representatives of the USDA in Washington, D.C.

In addition, the Semiconductor Team finished first in a task that focused on developing and demonstrating a cost-effective, energy-efficient treatment technology for semiconductor wastewater.

The Industrial Engineering Senior Design Team won the Best Project Award in the Statistical Analysis and Stochastic Processes track at the 2005 United States Military Academy Capstone Design Conference in West Point, N.Y. The project, which topped teams from the United States Military Academy, the Air Force Academy and George Mason University, focused on forecasting egg hatchability for Cobb, Inc., the leading provider of broiler breeding stock in the world. The team developed a cost function to estimate the consequences of making an inaccurate forecast, as well as several linear regression models to forecast the hatch rate of Cobb eggs. ❁



UA Solar Boat Team Makes Waves, Slaloms into Second

A rough start almost sank the Solar Boat Team from the College of Engineering at the University of Arkansas, but they resurfaced to capture a second-place finish in the Solar Splash Competition, the world championship of solar and electric boating held in Buffalo, N.Y.

Racing the "Boss H2og," the team received a total of five trophies, including first in the solar slalom race, and second place in both the solar sprint and the solar endurance races. They also received third place in the technical report category.

"I'm really proud of our team," said **Roy McCann**, associate professor and faculty sponsor from electrical engineering. "It shows something special when you can persevere and come back like they did."

Next year, the Solar Splash Competition glides into home territory for the UA team at Lake Fayetteville. "I know we're going all the way in 2006," said **Bill Springer**, associate professor and faculty sponsor from mechanical engineering. ❁

Professors Produce Success

Ajay Malshe, a professor of mechanical engineering, was elected a fellow of the Institute of Physics (IOP). The worldwide organization claims more than 35,000 members and supports physics and physicists in various fundamental and applied areas. He was recognized for his work in advanced materials and manufacturing research, which have aided the areas nanomaterials and manufacturing processes, surface engineering and microsystems packaging.

Panneer Selvam, a professor of civil engineering, was elected a fellow of the American Society of Civil Engineering (ASCE). The association represents more than 130,000 members of the civil engineering profession around the world, with only 6,748 ever elevated to the grade of "fellow."

Jerry Yeargan, head of the computer science and computer engineering department, received the IEEE Haraden Pratt Award for Outstanding Contributions to the Engineering Accreditation Activities of the Institute for Electrical and Electronics Engineers (IEEE).

Steve Tung, an associate professor of mechanical engineering, has received the Ferdinand P. Beer and E. Russell Johnston, Jr., Outstanding New Mechanics Educator Award from the American Society of Engineering Education.

Bill Brown, associate dean for research, was named a fellow of the IEEE. He was honored specifically for his contributions to education, particularly in the area of packaging.

Lalit Verma, head of the biological and agricultural engineering department, was named to a three-year term as a member of the ABET board of directors.

Jerry Havens, a distinguished professor of chemical engineering, has testified several times in front of Congress and the 9/11 Commission about the nation's efforts to transport and safeguard shipments of liquefied natural gas.

Joe Rencis, head of the mechanical engineering department, was elected vice chair of the Region X Mechanical Engineering Department Heads group at the American Society of Mechanical Engineers International Mechanical Engineering Education Conference.

William Myers, assistant department head in the Ralph E. Martin Department of Chemical Engineering, was featured in "Japan's Atomic Bomb," a documentary that was broadcast on the History Channel. 🌸

Tooley Elected to National Leadership Position; First Woman to Serve



Melissa Tooley

Melissa Tooley, director of the Mack Blackwell Center for Rural Transportation, has been elected president of the Council of University Transportation Centers. Tooley is the first woman to hold this position.

The council represents more than 60 of the nation's leading university-based transportation research and education programs. The council, established in 1979, is dedicated to facilitating the flow of transportation research and information among its members.

The Mack Blackwell Rural Transportation Center, which is housed in the College of Engineering, is the only council member geared specifically to researching rural transportation. The center, established in 1992, has conducted research in the fields of engineering, social science, agriculture, business and logistics as well as other disciplines. Researchers in the center have collaborated with Wal-Mart Stores Inc., Tyson Foods, the Arkansas Highway and Transportation Department and other universities around the country. 🌸

Welcome New College of Engineering Faculty Members

Biological and Agricultural Engineering

Kaiming Ye, assistant professor
Zunzhong Ye, assistant professor

Chemical Engineering

Jerry King, professor

Electrical Engineering

Jose Abraham, associate professor
Taeksoo Ji, assistant professor
Ruyen Lo, professor
Robert Saunders, instructor
Vasu Varadan, distinguished professor
Vijay Varadan, distinguished professor
Jining Xie, assistant professor
Hargsoon Yoon, assistant professor

Industrial Engineering

Russell D. Meller, professor

Mechanical Engineering

Douglas Spearot, assistant professor
Sulin Zhang, assistant professor

College Expands Study Abroad to India



Next summer, six students in the College of Engineering will study engineering in India.

The university, Shanmugha Arts, Science, Technology and Research Academy (SASTRA) in Tamilnadu, India, will host the students and a professor for a six-week summer pilot program. The students will take two engineering courses along with students from India. The UA College of Engineering professor will be the lead instructor for these courses.

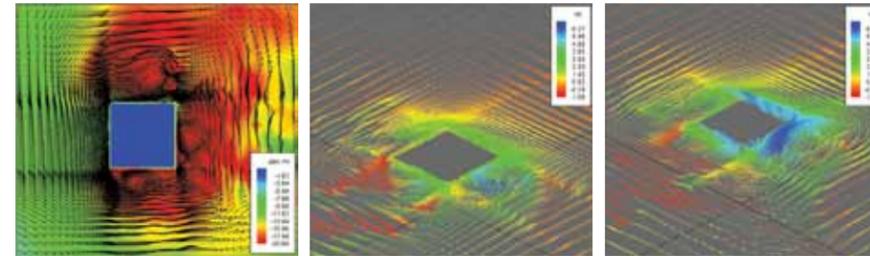
"Once considered a luxury, studying abroad is quickly becoming a necessity for

students interested in careers with large multinational corporations," said Carol Gattis, director of recruitment, retention and minority affairs.

The group will also spend a week touring the country. A full program might then be started the following summer.

"This is an opportunity for students to gain a completely different perspective and to begin to understand what globalism is all about," said Ashok Saxena, dean of the College of Engineering. "We are excited to enter this partnership with such a prestigious institution in India." 🌸

Researchers Apply Supercomputer to Solve Global Problems



Panneer Selvam, a professor in civil engineering, uses Red Diamond to develop simulations that can result in safer buildings. These images illustrate the wind velocity distribution around a building due to a tornado. The images are from a three-dimensional simulation that uses computational fluid dynamics principles. The colors represent air pressure.

Left: The aerial view of wind velocity pattern looking down from the roof as the eye of the tornado coincides with the center of the building.

Center and right: The vertical velocity at the mid-height and top plane of the building.

Predicting the behavior of tornadoes and volcanoes. Calculating molecular formulas for new drugs. Modeling global climate change.

Researchers have big plans for Red Diamond, the state's first supercomputer. "Red Diamond will help solve some of the most challenging science and engineering problems in the world today," said Amy Apon, an associate professor of computer science and engineering and the leader of the effort

to bring the machine to the university. "UA researchers have already used Red Diamond to calculate the molecular structure of new nanomaterials."

By connecting to other supercomputers on a global computing grid, Red Diamond will also allow the university to participate in collaborative research projects with other institutions. In addition, it was also named to a list of the most powerful computers in the world. Twice a year, TOP 500 provides an



updated list of the world's most powerful computers at corporations, universities and government laboratories. Red Diamond made the most recent list at No. 379.

The supercomputer is named for the university's school color and the symbol and dominant color on the state's flag. 🌸



BREAKING GROUND, BUILDING BRIDGES



Whether it's joining with The Nature Conservancy to rebuild damaged streams or working with Habitat for Humanity to develop its first-ever ecologically friendly subdivision, pursuing innovative collaborations to address complex ecological problems is simply in **Marty Matlock's** nature.

"We really have the opportunity to make the world a better place," said Matlock, associate professor of biological and agricultural engineering with the University of Arkansas Division of Agriculture. "If we're going to live on the landscape in a way that allows future generations to continue to use it, we need to actively engage citizens, government leaders, developers and nonprofit organizations."

Matlock's inclusive philosophy flows into his coordination of the UA Ecological Engineering Group (EEG), a concentration of researchers who combine the science of ecology with the process of engineering.

"We're dedicated to building the field of ecological engineering," said Matlock. Indeed, the UA EEG hosted the fourth annual meeting of the Ecological Engineering Society of America in 2004.

The program, one of only 20 in the nation, consists of faculty members from biological and agricultural engineering, who team with faculty members from civil

and chemical engineering. The group makes the most of its size by forming partnerships with UA faculty from geosciences, agricultural economics, the School of Architecture and the Sam M. Walton College of Business as well as collaborations with the Audubon Society, the U.S. Department of Agriculture, the U.S. Army Corps of Engineers, the U.S. Geological Survey and municipal, state and federal governments.

"We're a small program, but put us all together and we're very powerful," said Matlock.

Small but powerful also defines the booming economy of Northwest Arkansas, which is the sixth fastest-growing region in America. Matlock believes the area is a near-perfect laboratory to study a variety of ecological engineering issues with national – and international – implications. Those issues include urban vs. rural needs; rapid population growth; depleting resources; commercial vs. common property usage; urban vs. suburban sprawl; and interstate property rights.

"Few areas are facing all of these issues at once," he said. "We have a great opportunity to lead the way in addressing these pressing problems."

One groundbreaking project that's drawing national attention involves sculpting a stream to create specific ecological services. The project requires research

"THE UA PROGRAM IS FLEXIBLE, DYNAMIC AND IT'S REALLY HEADING IN THE RIGHT DIRECTION."

*MIKE HANLEY
THE NATURE CONSERVANCY*



that Matlock and co-leader Mike Hanley of the Nature Conservancy believe can be applied to other stream ecosystems nationwide. Together, they applied these principles in an innovative graduate class.

"It's about taking these ecosystems and trying to restore them to meet human needs and desires," said Matlock. "Desires like having clean water, preserving animal habitat, restoring wetlands and creating spaces for natural beauty and recreation."

Students received a unique, real-world opportunity. "The students really learned a lot from this collaborative effort," said Hanley, senior riverine ecosystem restoration engineer. "Especially because the UA Ecological Engineering Group includes such a diverse cross-section of engineers from different disciplines."

By studying the historic and current patterns of water flow and asking questions about desirable outcomes, Matlock and the students in this graduate-level class can redesign a stream to meet human needs – as unique as each stream – in a sustainable way.

"There's no one right answer," he said. "A stream can be a thousand things and still be a stream."

The students worked with a landowner along a mile-long stretch of Wharton Creek, a tributary of War Eagle Creek. They've taken measurements, determined the

dimensions of the stream and the size of the particles in the stream bed. By examining the bedrock and sediment, the erosion and flood plains, they created a history of what the channel has done.

"We've changed the way waters flow over the land," said Matlock.

Streams have always changed within certain boundaries – flood, droughts and other natural processes have shaped those boundaries for millions of years. But people have stretched those boundaries past their natural limits with logging, grazing, planting non-native crops, urbanization and other land-use changes. And these changes have brought about undesirable results.

"Streams that are affected have more erosion power, which causes land loss," said Matlock. "Important species, like smallmouth bass, have disappeared from native habitats and more frequent flooding has led to more sediment movement, which adds fine sediment and other pollutants to our water supply."

Once the students determined the past and present dynamics of the stream ecosystem, they designed the restoration process based on the desired outcome for the stream.

"You have to answer the question 'what do you want the system to do?'" he said. "You can never restore streams to

THE UA ECOLOGICAL ENGINEERING GROUP IS ONE OF ONLY 20 SUCH PROGRAMS IN THE NATION.



what they once were. But some of the things that were, we want back."

In this case, the desired outcomes included restoring the smallmouth bass habitat, minimizing land loss and keeping sediment and gravel transported downstream in balance with the landscape. Accomplishing this requires many ecological engineering design phases, including restoring sinuosity to the stream, creating riffles and pools, planting native trees and grasses along the riverbanks and restoring the channel to its natural water energy level.

Historically, most stream-restoration projects have been done from the perspective of landscape architecture or restoration ecology. As a licensed engineer and registered ecologist, Matlock is one of the few academic researchers nationwide who is qualified to design stream-restoration projects from an ecological engineering perspective.

"As ecological engineers, we can predict outcomes with a relatively high level of confidence," he said. "These predictions, which are based on quantifiable data, satisfy the concerns of community leaders, regulatory agencies, property holders and citizens. We're moving this from a pure science to an engineering practice that uses and respects science." ❁

*"WE'RE A SMALL PROGRAM,
BUT PUT US ALL TOGETHER
AND WE'RE VERY POWERFUL,"*

*MARTY MATLOCK
ASSOCIATE PROFESSOR*



To contact Marty Matlock,
e-mail mmatlock@uark.edu
or call him at 479-575-2849.

Modernizing the Power Grid

UA Gets Green Light to Form National Research Center

Researchers at the College of Engineering at the University of Arkansas are working to ensure that the 2003 blackout in the Northeast United States – the largest and most catastrophic failure in the history of the country – never happens again.

The newly formed National Center for Reliable Electric Power Transmission is dedicated to developing advanced power electronic systems to make the nation's power grid more reliable and efficient. With a \$1 million congressional appropriation managed by the Department of Energy's Gridworks Initiative, faculty members and graduate students will design, test and package electronic systems for future commercial use in the nation's power grid.

"Because we live in the 'digital economy,' we must develop the capability to limit potentially catastrophic events so that people don't get hurt and equipment doesn't get destroyed," said **Alan Mantooth**, professor of electrical engineering and director of the newly formed center. "These events can also severely damage our nation's economy as well as jeopardize our national security." Mantooth will operate the center with **Aicha Elshabini**, head of the electrical engineering department, **Juan Balda**, professor, and **Fred Barlow**, associate professor.

The University of Arkansas is one of five universities in the nation to receive such support. The others include Georgia Tech, Virginia Tech, the University of Tennessee and the University of Wisconsin-Madison.

According to Mantooth, the researchers' collective expertise in advanced power electronics design, modeling and packaging, together with their previous investigations of silicon carbide, made the UA a compelling choice for this research center.

For the past decade, UA electrical engineers have developed and packaged silicon-carbide systems for the National

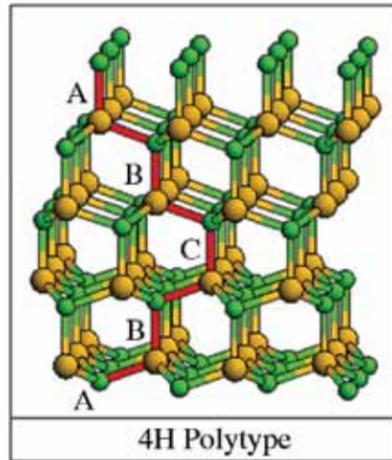
Aeronautics and Space Administration and the defense industry. In addition to its strength and ability to respond quickly to power interruptions, silicon carbide is a superior material than what is currently used in the power grid for many reasons.

"It's a good thermal conductor, which means that it can operate at very high temperatures without requiring extra equipment to remove heat," said Mantooth. "This can result in a reduction in the overall mass and volume of advanced controllers for a power grid. The properties of silicon carbide also allow an extremely high

voltage capability, which can simplify power electronic design solutions compared to other materials such as silicon."

For the national power transmission center, UA researchers will create mathematical models of silicon-carbide devices to simulate the design of large systems. These devices will then be rigorously tested and packaged. Packaging involves creating protective coatings and enclosures to prevent the material from breaking down when it's subjected to high voltages and currents or when it's interacting with air and water. These packaged devices will then be used to develop advanced technology

For the past decade, UA electrical engineers have developed and packaged silicon-carbide systems for the National Aeronautics and Space Administration and the defense industry.



The structure of the SiC crystal is highly dependent on its orientation. The different types of SiC crystals are known as polytypes. This figure shows the structure of the 4H-SiC polytype, the one most commonly used for making electronic devices. The molecular structure has a hexagonal frame and the distance between the Si and C atom is invariably 3.8 Å.

demonstrators for the power grid.

Funding for the new national center is part of the federal government's focus on research and development to improve technology on the nation's power grid. In response to the massive blackout of the Northeast United States in 2003, Congress passed the Energy Policy Act of 2003 and created the Gridworks Initiative.

"The 2003 blackout was triggered by sagging power lines touching tree branches," said Mantooth. "The damage should have been limited to a local area. But the sagging lines caused huge surges of current, which had a cascading effect that left the entire Northeast grid in complete disarray. None of the built-in protection devices reacted quickly enough or properly to limit the problem to a local level."

Existing protection equipment didn't function quickly enough and this resulted in a chain reaction of blackouts, which caused billions of dollars in lost revenues. The protection devices currently deployed in the power grid operate too slowly

– even when the electro-mechanical switches work well, the system is too slow – according to Mantooth.

New power electronics devices known as FACTS controllers could have limited those surges of electrical current, which then could have prevented the domino effect of successive systems overloading.

"It happens in the blink of an eye, but the electrical system of our country responds at mechanical speeds," said Mantooth. "We want to get the system to react like a computer can react – at electrical speeds. None of the built-in protection devices reacted quickly enough to limit the problem."

The solid-state fault current limiter based on advanced power electronics has the potential to avoid expensive upgrades of circuit breakers due to

increased fault current levels in those areas with very high power densities such as New York City.

"We need faster acting, more reliable, purely electrical systems – what we refer to as solid-state solutions," he said. "And we're developing them here." ❁

With a \$1 million congressional appropriation... faculty members and graduate students will design, test and package electronic systems for future commercial use in the nation's power grid.



To contact Alan Mantooth, e-mail mantooth@uark.edu or call him at 479-575-3848.

UA Exceeds \$1 Billion Goal

College Tops Goal by Nearly 30 Percent

The University of Arkansas not only reached its goal of raising \$1 billion during its Campaign for the Twenty-First Century, it surpassed it by \$46 million, raising a total of \$1.046 billion.

The campaign, which began July 1, 1998, officially concluded June 30, 2005, with a campus-wide "Thanks a Billion" celebration. The University of Arkansas now joins the ranks of only 13 public institutions to have raised \$1 billion.

The size of the university's endowment has increased from \$119 million in fiscal year 1997 to \$626 million in fiscal year 2004. A total of 81 chairs and 51 professorships have been created through the Campaign for the Twenty-First Century, with 2,212 endowed and non-endowed scholarships and fellowship funds created as well.

"We are extremely grateful to everyone who shares the desire to move the University of Arkansas into the upper ranks of the nation's public universities," said **UA Chancellor John A. White**. "The outpouring of private gift support from our family of donors affirms and enhances our standing as a nationally competitive, student-centered research university serving Arkansas and the world."

The College of Engineering raised a record \$70.9 million during the campaign. More than 11,200 gifts have focused on funding four main categories: students, faculty, capital improvements and program support. The size of the college's endowment is now \$27 million, while the college raised \$17.2 million in fiscal year 2005 alone.

The campaign resulted in three new chairs with an endowment of \$3 million each, six new chairs with an endowment of \$1.5 million each and eight endowed professorships in various departments throughout the College of Engineering. In addition, donors funded 19 doctoral fellowships, five Honors College academy fellowships and 10 Honors College academy scholarships.

"There were two main factors in our ability to meet and to exceed our campaign goals; the support of our alumni was outstanding and lure of the Matching Gift Program made them stretch to their fullest," said **Ashok Saxena**, dean. "We will forever be grateful to these wonderful and generous people!"

"The gifts have already made a huge difference in the College of Engineering in attracting and retaining outstanding senior faculty and providing them the resources necessary to continue to be the best in their fields," he continued. "We are also seeing considerable more interest in younger applicants for starting academic careers at the University of Arkansas. The number of applications for faculty positions has increased by almost ten times over the past couple of years. I am very excited as we move into this year's recruiting season knowing fully well that we will be able to attract applicants from the pool of the nation's brightest." ❁



Long-time Donor Endows Department

The College of Engineering recently celebrated its first endowed department.

Ralph E. Martin, an alumnus of the college, made a gift of \$5 million to endow the Ralph E. Martin Department of Chemical Engineering. The gift was matched by \$4.25 million from the Matching Gift Program, creating a total endowment of \$9.25 million.

The gift is being used to create an endowment for faculty and student positions with the department.



Kathy and Ralph Martin

“To say that we’re thrilled by the magnitude and potential impact of this gift is an understatement,” said Ashok Saxena, dean of the College of Engineering. “Ralph Martin’s longtime support and his latest gift will have a profound impact on all chemical engineering students and professors for decades to come.”

With this endowment, the department is positioned to attract nationally recognized professors and researchers from around the world, in areas such as biomedical engineering and homeland security. An additional concentration is green engineering, which focuses on developing environmentally benign methods of industrial production.

The endowment is also being used to create doctoral fellowships, designed to increase the number of Ph.D. graduates from the department. Martin previously established an academic enrichment fund in 1994 that will continue to enhance the department’s teaching and research programs.

“I’m so grateful for the education I received at the University of Arkansas and it means a lot to me to be able to give back to the institution that gave me so much,” he said.

Martin, a native of Eureka Springs, Ark., graduated with a bachelor’s degree in chemical engineering in 1958 and a master’s degree in chemical engineering in 1960. He founded PetroFac Inc., of Tyler, Texas, a single-source supplier for the hydrocarbon-processing industry that

grew into an international corporation. Currently retired, he continues to serve as chairman of the board. He holds patents for the treatment of emulsions, the desalinization of brackish waters and the desalinization of crude oil. Martin also founded Eagles Bluff, a country club and residential community on Lake Palestine in Bullard, Texas.

He is a member of the College of Engineering Hall of Fame and has provided leadership as a member of the College of Engineering Advisory Council and the College of Engineering Campaign for the Twenty-First Century Committee.

“Ralph Martin has been such a great influence on chemical engineering students at the University of Arkansas,” said Tom Spicer, head of the department. “His distinguished career demonstrates that UA chemical engineering graduates can take their place among America’s leaders in business and industry.” ❁

UA Chancellor, Wife Endow Chair in Engineering

UA Chancellor John and Mary Lib White have made a gift of an annuity that ultimately guarantees \$1.5 million to the University of Arkansas to establish an endowed chair in the College of Engineering.

The John and Mary Lib White Systems Integration Chair will be used to attract an internationally renowned scholar to the department of industrial engineering. The Matching Gift Program has already provided \$1.5 million to support the chair, which will ultimately be supported by an endowment of \$3 million. A national search is currently being conducted to fill the position.

In addition to this most recent gift, the Whites have made previous gift commitments to the Campaign for the Twenty-First Century that total more than \$400,000 in support of a broad range of campus-wide initiatives, including academic and athletic programs and projects.

“John and Mary Lib have always invested in ideas they are passionate about,” said Ashok Saxena, dean of the College of Engineering. “This chair will provide an important legacy for two of our college’s greatest champions.”

Chancellor White, who received a bachelor’s degree in industrial engineering from the UA in 1962, is in his eighth year as chancellor of the university and distinguished professor of Industrial Engineering. ❁

College of Engineering Adds Chairs, Professorships, Fellowships and Scholarships Through Matching Gift Program

Graduate Research Chairs

College of Engineering

Graduate Research Chair in Materials Science and Engineering

Computer Science and Computer Engineering Department

Charles D. Morgan/Acxiom Graduate Research Chair in Database

Electrical Engineering Department

Graduate Research Faculty Endowed Chair in Microelectronics and High Density Electronics

Endowed Chairs

College of Engineering

George M. and Boyce W. Billingsley Chair in Engineering

Ralph E. Martin Department of Chemical Engineering

Ross E. Martin Chair in Biomedical Engineering

Ralph E. Martin Leadership Chair in Chemical Engineering

Maurice E. Barker Chair in Chemical Process Safety and Environmental Fate of Chemicals

Computer Science and Computer Engineering Department

Rodger S. Kline Chair in Computer Science and Computer Engineering

Industrial Engineering Department

John and Mary Lib White Systems Integration Chair in Industrial Engineering

Endowed Professorships

Ralph E. Martin Department of Chemical Engineering

Ralph E. Martin Professorship in Chemical Engineering

Jim L. Turpin Professorship in Chemical and Biochemical Separations

Charles W. Oxford Professorship in Emerging Technologies

Robert E. Babcock, Sr. Professorship in Chemical Process Safety and Environmental Fate of Chemicals

Louis Owen Professorship in Green Chemical Process Design and Development

Ansel and Virginia Condray Endowed Professorship in Biochemical and Chemical Separations

Civil Engineering Department

James T. Womble Professorship in Computational Mechanics and Nanotechnology Modeling

Industrial Engineering Department

James M. Hefley and Marie G. Hefley Professorship in Logistics and Entrepreneurship

Doctoral Fellowships

College of Engineering

Hearst Foundations Doctoral Academy Fellowships in Engineering

Ralph E. Martin Department of Chemical Engineering

Martin Doctoral Academy Fellowships in Chemical Engineering

Barrett and Peggy S. Duff Doctoral Fellowships in Chemical Engineering

Civil Engineering Department

Citizens Fidelity Insurance Company Doctoral Fellowships in Civil Engineering

Schueck Family Foundation Doctoral Fellowships in Civil Engineering

Industrial Engineering Department

ABF Freight System Doctoral Fellowships in Industrial Engineering

Dr. Wray Wilkes Doctoral Fellowships

Mechanical Engineering Department

Cecil O. Cogburn Doctoral Fellowships in Mechanical Engineering

Honors College Academy Fellowships

Civil Engineering Department

Julian and Nana Bachtel Stewart Honors Fellowships

Honors College Academy Scholarships

College of Engineering

George D. and Shirley Combs Honors Academy Scholarship

Ashok and Madhu Saxena Honors Academy Scholarship

Gadberry Family Honors Academy Scholarship

Matthew J. Siebenmorgen Honors College Academy Scholarship in Engineering

Civil Engineering Department

Irene and Gus Vratsinas Honors Academy Scholarships

Matthew J. Siebenmorgen Honors College Academy Scholarship in Civil Engineering

Industrial Engineering Department

Guie Morris Honors Academy Scholarships

Mechanical Engineering Department

David O. and Carolyn D. Watts Honors Academy Scholarship in Mechanical Engineering

College Welcomes World Renowned Researchers

With the addition of **Vijay and Vasundara “Vasu” Varadan**, the University of Arkansas is positioned to become a world leader in the field of sensor technology. Both are internationally renowned and their pioneering research has profoundly influenced the quality of human life.

Vijay holds the Graduate Research Faculty Endowed Chair in Microelectronics and High Density Electronics, a \$3 million graduate research chair. Vijay is also a professor of neurosurgery



at University of Arkansas for Medical Sciences, distinguished professor of electrical engineering and director of the High Density Electronics Center.

Vasu holds the George M. and Boyce W. Billingsley Chair in Engineering, a \$1.5 million chair. She is also a distinguished professor of electrical engineering.

“This is a defining moment for the College of Engineering,” said **Chancellor John White**.

“The Varadans are two of the best in the world in their fields. Their appointment immediately establishes the UA College of Engineering as a

major R&D player nationally. All Arkansans will be beneficiaries of the Varadans’ decision to join the University of Arkansas and, thereby, accelerate the university’s rise to international prominence.

Vijay has developed biosensors to treat neurological disorders, such as Parkinson’s disease. His research also focuses on potential applications to control blood glucose levels and to treat Alzheimer’s disease and epilepsy.

Vasu’s research concentrates on ambulatory medical sensors as well as wireless microsensors for monitoring patients at home and in hospitals, thus providing better data to doctors and reducing health care costs.

“The Varadan team is really more than the sum of its parts,” said **Ashok Saxena**, dean. “They demonstrate the capability of engineering to translate technology into real solutions that will improve human life.”

The Varadans, married for 31 years, are a complementary team, both equally accomplished in their respective fields. Vijay is a systems integrator and design specialist; Vasu’s expertise is in creating new materials with novel properties, then studying and modeling their characteristics.

“As a professor, it is my privilege to impact many eager minds about the excitement of research and engineering,” said Vasu. “We are both excited about our new labs, new collaborations and the environment here in Northwest Arkansas. We’re committed to building up the University of Arkansas and taking it to a new level.” ❁

Internationally Esteemed Professor Joins College Faculty

Jerry King has been named the holder of the Ansel and Virginia Condray Endowed Professorship in Biochemical and Chemical Separations at the University of Arkansas. He will also serve as an adjunct professor in the Food Science Department.

King most recently was program manager and research scientist in the Supercritical Fluid Facility at the Los Alamos National Laboratory in Los Alamos, N.M. Before joining Los Alamos, King was lead scientist of the Critical Fluid Technology Group at the National Center for Agricultural Utilization Research (NCAUR) in Peoria, Ill., for more than 16 years.

After more than 37 years of experience in supercritical fluid technology, chemical separations, chromatography and applied chemical engineering and chemistry, King is excited to return to academia at the University of Arkansas.

“It’s like building the field of dreams,” he said. “We’re creating world-class capabilities – all the way up to pilot plant scale – to demonstrate better processes for industrial uses in Arkansas and throughout the nation.”

King specializes in sustainable development and processing, also known as “green engineering.” His research interests include developing critical fluid technology for food and agro-material processing, materials science and analytical applications. He holds three patents, has written more than 207 publications and has lectured extensively at national and international conferences.

In 2004, the European Union selected him to hold a Marie Curie Chair. In 1997, he received the Harvey Wiley Award from the Association of Official Analytical Chemists, the organization’s most prestigious honor, in addition to many other accolades from various professional and international societies. Harvey Wiley was the founder of the Food and Drug Administration.

“The faculty and staff here really impressed me,” he said. “I’m looking forward to teaching and to attracting international scholars to the College of Engineering – I’m excited by the future here.” ❁



Kevin Hall, a professor in civil engineering, has been named the head of the department. He succeeds Bob Elliott, who held the position for 14 years and who will resume teaching duties.

After receiving an undergraduate degree from the UA, Hall was employed by the U.S. Army Corps of Engineers. He came back to the UA to earn a master’s degree in civil engineering, then

earned a doctoral degree from the University of Illinois at Urbana-Champaign in 1993. He returned to the College of Engineering as assistant professor that year, receiving promotions to associate professor in 1998 and professor in 2003.

He received the Distinguished Faculty Achievement Award for Research and Teaching from the Arkansas Alumni Association in 2004.

Hall’s research focuses on the design, production and rehabilitation of pavements and construction materials, and he plays a vital role in highway transportation both throughout the U.S. and within Arkansas. As part of the Transportation Research Board’s National Cooperative Highway Research Program 1-40 project panel, Hall is a part of the national effort to determine how to implement an entirely new system of pavement standards to update the nation’s highways. He is one of only two members of the project panel from academia.

Hall is also co-chair of the College of Engineering’s Strategic Planning Committee, a member of the Service Learning Committee and has served as a member of the Faculty Senate since 1998.

Joe Rencis has been named head of the mechanical engineering department. Rencis, formerly professor and director of engineering mechanics at the Worcester Polytechnic Institute, succeeds William Schmidt, who stepped down as head of the department after 19 years. Schmidt will resume classroom duties as a professor.

Rencis received his doctorate in engineering mechanics from Case Western Reserve University, Cleveland, Ohio,



and had been at Worcester Polytechnic Institute since 1985. He is a Fellow of the Wessex Institute of Great Britain, which recognizes leaders in the fields of computational engineering and boundary element research. He has also been a Fellow of the American Society of Mechanical Engineers since 2001.

Much of Rencis’ research focuses on the formulation and

development of boundary and finite element methods for analyzing solid, heat transfer and fluid mechanics problems. He is internationally known for pioneering work in the area of error estimation and adaptive refinement for the boundary element method.



Peggy Maher Gabriel has joined the College of Engineering as the director of development, succeeding Susan Vanneman who retired after 17 years of service to the college and 21 years to the University of Arkansas.

Most recently, Gabriel was director of major gifts at the Columbia University Graduate School of Business in New York, N.Y. In that position, she was

responsible for creating and managing a team with an annual fundraising target of \$20 to \$30 million. Prior to that, she was major gifts officer at New York Weill Cornell Medical Center in New York and corporate relations manager at The Asia Society and Museum, also in New York.

Gabriel holds a master’s degree in public administration from Columbia University and a bachelor’s degree in Asian studies from Williams College in Williamstown, Mass. Gabriel spent five years in Hong Kong, teaching English at Chinese University and coordinating research and marketing for the China-based practice of Freshfields, Bruckhaus, Deringer, a leading international law firm.

IN MEMORIAM

John L. Imhoff

John L. Imhoff, a University Professor Emeritus in industrial engineering, died on March 16, 2005. Imhoff established the Industrial Engineering Department at the College of Engineering, serving the department as professor and head from 1952 to 1990. After retiring in 1990, he continued to teach part time.

Charles W. Oxford

Charles W. Oxford, who served as instructor, assistant professor, associate professor, professor, assistant dean, associate dean and department head in the College of Engineering beginning in 1943, died on Aug. 16, 2005.

Inaugural Dinner Honors College of Engineering Alumni, Professors

The College of Engineering held its first Alumni Awards Dinner in the spring, welcoming three new members into its Hall of Fame and inducting the inaugural class of two new awards: the Distinguished Alumni Award and the Young Alumni Award. More than 250 alumni and friends attended the black-tie affair, held at the Fayetteville Town Center.

In addition to the alumni awards, the first John Imhoff Faculty Awards were presented. Designed to recognize excellence in teaching and research, the awards were generously established by John Imhoff, founder of the Department of Industrial Engineering, just before he passed away on March 16.

The 2005 Imhoff Outstanding Researcher Award went to Jin-Woo Kim, an assistant professor of biological and agricultural engineering. Kim has established an interdisciplinary research program that focuses on four areas: bio-catalysis technology, environmental biotechnology, nucleic acid technology and nano-biotechnology.

The 2005 Imhoff Outstanding Teacher Award went to Richard Cassady, an associate professor of industrial engineering. Currently serving as the advisor to 30 undergraduate students, three master's students and three doctoral students, Cassady's

teaching philosophy is guided by five words: knowledge, preparation, enthusiasm, availability and fairness.

The goal of the dinner is to honor, preserve and perpetuate the names and accomplishments of the people who have provided extraordinary service to the engineering profession, the college and the University of Arkansas. The 2006 College of Engineering Alumni Awards Dinner will be held Saturday, April 8, at the Fayetteville Town Center. ❁



James T. Womble, Charles D. Morgan and Edward M. Harvey are the newest members of the College of Engineering Hall of Fame.

2005 Hall of Fame

Edward M. Harvey, BSME '54

Founder, Chairman and CEO
Harvey Industries, Inc.
Little Rock, Arkansas

Charles D. Morgan, BSME '66

Company Leader
Acxiom Corporation
Little Rock, Arkansas

James T. Womble, BSCE '66

Global Development Leader
Acxiom Corporation
Little Rock, Arkansas

2005 Distinguished Alumni Award

Wesley F. Buchele, MSAGE '51

Professor Emeritus, Agricultural Engineering
Iowa State University
Ames, Iowa

Fredric H. Clark, BSEE '67

President and Co-Owner
CAS, Inc.
Huntsville, Alabama

Dan Flowers, BSCE '69

Director
Arkansas State Highway and Transportation Dept.
Little Rock, Arkansas

David D. Foust, BSIE '64

President and CEO (retired)
Seneca Wire and Manufacturing Company
Rogers, Arkansas

Grady E. Harvell, BSCE '72

President
AFCO Steel
Little Rock, Arkansas

Ron Morris, BSIE '58

CEO
Lyons Manufacturing, Inc.
Dallas, Texas

Stanley E. Reed, BSAGE '73

Owner and operator
Reed Farms
Marianna, Arkansas

Larry G. Stephens, BSIE '58

CEO
Mid-South Engineering Co.
Hot Springs, Arkansas

Kay Watson Tait, BSChE '83

Supply Chain Planning Manager, Basic Chemicals
Celanese Chemicals
Dallas, Texas

R. Terral Whetstone, BSME '59

Director of Production (retired)
Southwestern Electric Power Company
Shreveport, Louisiana

Lang Zimmerman, BSCSEG '85

Vice President
Yelcot Telephone Company
Mountain Home, Arkansas

2005 Young Alumni Award

Scott E. Bennett, BSCE '89, MSCE '94

Assistant Chief Engineer, Planning
Arkansas State Highway and Transportation Dept.
Little Rock, Arkansas

Shannon D. Harrop, BSME '92

National Account Director
Heil Environmental Industries, Ltd.
Chattanooga, Tennessee

Bruce D. Lilly, BSChE '92

Manufacturing Support Manager
Exxon Mobil Chemical
Baton Rouge, Louisiana

Marji McNeill, BSChE '91

Director, Audit and Assurance
Koch Industries, Inc.
Wichita, Kansas

Jerry Lynn Moore, Jr., BSCSE '94, MSCSE '96

Chief Executive Officer
Focus Technologies, LLC
Plano, Texas

Brett A. Peters, BSIE '87

Professor and Head, Industrial Engineering
Texas A&M University
College Station, Texas

Bruce Westerman, BSBAE '90

Engineer and Forester
Mid-South Engineering Company
Hot Springs, Arkansas

Alum Constructs Well-Rounded Life , Garners National Acclaim



Photo by Scogin Mayo

Rachel Stender, BSCE 97, was featured on the cover of the December 2004/January 2005 issue of Working Mother magazine. The accompanying story highlighted her balancing act while fulfilling many roles: engineer, mother, faculty member and community volunteer.

Last year, Stender was one of 12 engineers nationwide nominated as a "New Face of Engineering" as part of National Engineers Week, sponsored by the National Society of Professional Engineers. As part of the honor, she was featured in an issue of USA Today.

As a project engineer for the Port of Corpus Christi, she is responsible for the design, construction and management of

capital and maintenance projects throughout the Port. Her recent licensure made her the first female registered engineer in the 77-year history of the Port.

"I am extremely proud to be a graduate of the College of Engineering at the University of Arkansas," said Stender. "I've always felt the UA is the best-kept college secret in the U.S., with great professors, a beautiful campus, state-of-the-art research facilities and excellent faculty-to-student ratios. My coursework and classes gave me the tools I needed as I began my professional experience. After graduating, I was prepared to be a valuable engineering asset early in my career."

In addition to her duties at the Port, Stender recently completed reserve duty in the U.S. Air Force as a civil engineering officer with the 307th RED HORSE Unit, a mobile, rapid-response construction unit. In 2003, she completed a master's degree in business administration from Texas A&M University-Corpus Christi, and now serves as an adjunct professor at the local community college. She is also a student mentor in the FUSE program at Texas A&M-CC, which is designed to further minority interest in science and engineering fields. ❁



Fill Us In

Tell us about your latest accomplishments, honors and awards.

By mail:

INGENUITY
4180 Bell Engineering Center
College of Engineering
University of Arkansas
Fayetteville, AR 72701

By e-mail:

cecilia@uark.edu

Stop by the College of Engineering Homecoming Open House

3 hours before game time

Saturday, November 5

John Imhoff Study Center

Fourth Floor

Bell Engineering Center



Imagination. Innovation. Inspiration.

These words represent, as well as any words are able, the ongoing accomplishments of the faculty, students, staff and alumni of the College of Engineering at the University of Arkansas.

Engineers share a passion for solving problems, for improving the quality of human life and for asking “Why not?” instead of “Why?”



*Ashok Saxena
Dean of Engineering
Distinguished Professor
of Materials Science
College of Engineering*

During the two years of my tenure as dean here, I’ve noticed that very passion reflected throughout our campus community.

Some amazing examples that you’ll read about in this issue of “Ingenuity” include:

Imagination in action

The successful conclusion of the \$1 billion Campaign for the Twenty-First Century. Through the incredible support and teamwork of our alumni, volunteers and donors, a dream has become a reality. The university

and our college are now poised to become even better.

Innovation in action

Our researchers continue to explore solutions that address global issues such as discovering alternative forms of energy and developing better ways for society to lessen its toll upon our environment.

And finally, an inspiration to us all

Ralph E. Martin has exemplified a successful engineer and a generous donor. His record-setting gift to the chemical engineering department, which was renamed in his honor, will have a lasting impact on the lives of students and faculty that simply cannot be overstated.

We continue to welcome internationally renowned senior faculty to our community and we’re looking forward to recruiting more leaders committed to teaching, research and service. Any newcomer to the college will be – as I have been – inspired by the quality faculty, staff, students and alumni of this institution. ✨

ENGINEERING MATTERS

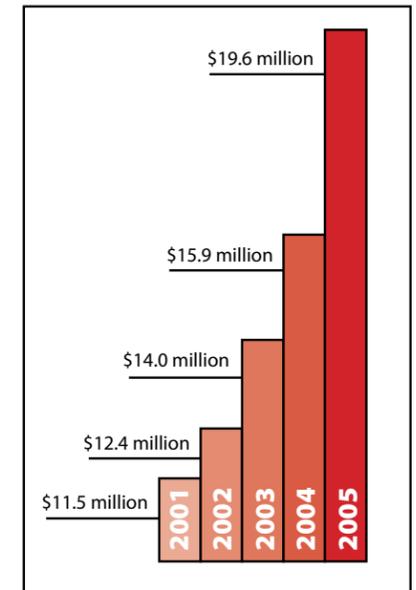
FAST FACTS FROM THE COLLEGE OF ENGINEERING AT THE UNIVERSITY OF ARKANSAS.

- 2,102** Total number of students*
- 1,559** Number of undergraduate students*
- 416** Number of master’s students*
- 127** Number of doctoral students*
- 236** College of Engineering bachelor’s degrees granted†
- 210** College of Engineering master’s degrees granted†
- 20** College of Engineering doctoral degrees granted†
- 102** Number of tenured or tenure tracked faculty
- 16 to 1** student to faculty ratio
- 90** Number of schools, including the College of Engineering, that are certified by GEM, the National Consortium for Graduate Degrees for Minorities in Engineering and Science

- \$1 billion** Amount raised by the University of Arkansas during the Campaign for the Twenty-First Century
- \$70.9 million** Amount raised by the College of Engineering during the Campaign for the Twenty-First Century
- \$17.2 million** Amount raised by the College of Engineering during fiscal year 2005
- \$626 million** Amount of the University of Arkansas endowment
- \$27 million** Amount of the College of Engineering endowment

* Based on initial 2005 enrollment figures
† Graduates of academic year 2004–2005

- OFFERING UNDERGRADUATE, GRADUATE AND DOCTORAL DEGREES IN:
- Biological engineering
 - Chemical engineering
 - Civil engineering
 - Computer science and computer engineering
 - Electrical engineering
 - Industrial engineering
 - Mechanical engineering



Research Expenditures since 2001

- ALSO OFFERING INTERDISCIPLINARY PROGRAMS OR GRADUATE DEGREES IN:
- Biomedical engineering
 - Environmental engineering
 - Homeland security
 - Microelectronics-photonics
 - Nanotechnology

*“To the optimist, the glass is half full.
To the pessimist, the glass is half empty.
To the engineer, the glass is twice as big as it needs to be.”
Anonymous*