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College of Engineering and Mines

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Ed Stiles

Alix Deymier, *a senior in Materials Science and Engineering, works on a fresco painting using traditional, raw-egg-based paints during a heritage conservation science lab class. The class introduces students to traditional technologies that have been used from the Stone Age to present.*

UA engineers help to save and reconstruct the past

Each time an ancient vase disintegrates, a ceramic tile crumbles or a painting cracks and fades, another link to the past is lost and we understand just a little less about where we came from and, ultimately, who we are.

When the last artisan dies and an ancient technology is lost, we're similarly impoverished, says Professor Pamela Vandiver, an internationally recognized expert in artifact preservation, who holds a joint appointment in Materials Science and Engineering (MSE) and in Anthropology.

Vandiver came to UA last year to start a program in Heritage Conservation Science (HCS) that trains students to stabilize, preserve and better understand ancient artifacts and how they were created and used.

The curriculum, which combines engineering, anthropology, architectural history and art history is particularly important today because many of the material links to our past are disintegrating, while the ancient technologies that created them are disappearing.

"To preserve our inheritance, we really need a group of scientists and engineers who can work with conservators and other experts to stabilize and preserve these objects," Vandiver says.

Knowing how these objects were made is just as important as preserving them, she added.

Vandiver came to UA because much of the basic infrastructure needed to start an HCS program already existed on campus.

In addition, UA has a long history of socio-cultural studies and interdisciplinary cooperation between the MSE

Continued on Page 11

Something Old Something New . .

UA Engineering spans technology from hypersonic aircraft to ancient cultures

This issue of *Arizona Engineer* once again highlights an incredible array of activities in our College.

In reading the galley proofs, what struck me most about this particular issue is the extent to which engineering expertise reaches not only into the opportunities and expanse of the future, but also into the past, including the ancient past, to help us understand more about the world's cultures and ourselves.

What could be more futuristic than the design of hypersonic airplanes that fly in the Earth's atmosphere (albeit the rarified atmosphere at 10,000 feet) at Mach 10? Issues relating to that complex problem are the purview of Anatoli Tumin in our Aerospace and Mechanical Engineering Department.

By the same token, faculty in our Materials Science and Engineering Department are using the most advanced methods in materials analysis to understand ancient technologies found in ceramic artifacts and Native American cultural materials. This work, a collaborative effort in Heritage Conservation and Science, demonstrates engineering's application to understanding cultures that existed hundreds and even thousands of years ago.

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It has been extremely gratifying to see how quickly our alumni and friends have embraced our efforts in engineering, and have recognized our importance both to the future as well as to the past.

This year saw the initiation of our new da Vinci Circle, a giving society named for Leonardo da Vinci (ostensibly one of the most creative engineers who ever lived). The financial support from society members is allowing our departments to move into ever more creative and wide-ranging areas of research and education.

At the same time, the inaugural event (a wonderful dinner at the Arizona Inn) included a presentation on the Heritage Conservation and Science Program described in this newsletter.

Meanwhile, two companies that have been incredibly important to the state of Arizona — SRP and Phelps Dodge Corp. — have demonstrated their appreciation for engineering by providing financial support for our programs.

SRP has continued its support, begun in 1999, of our program for the study of technology, public policy and the markets. This is a collaborative program with the Eller College of Management.

The initial focus of that work was on deregulation and changes in the power industry. In this next phase, beginning this year, the work will be expanded to study critical water issues primarily in the state of Arizona, but nationally as well.

Clearly, our College (led by the Hydrology and Water Resources Department) is the premier academic institution studying water issues in the nation.

Phelps Dodge, through its incredibly generous support, has funded an endowed chair, and we are currently conducting a search for a faculty member to fill that chair in our Mining Engineering program, which is one of only two such programs at Research I universities west of the Mississippi.

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The spring semester is getting into full swing now, and many exciting things are happening in the College. I hope you will find time to visit us in 2006. If you haven't been back to campus in recent years, you'll want to see the many new, modernized facilities, including the new student union.

Thank you for your continued interest and support for the College of Engineering. It is truly one of the state's academic treasures.

Using 'More info'

Go to our web site for more in-depth coverage of Arizona Engineer *stories*

At the end of several stories in *Arizona Engineer*, you'll find a word or phrase under "More info." You can use this phrase to search for a longer version of that story at http://uanews.org/engineering.

Type the word or phrase into the "Engineering Article Finder" box at the top left of the web page and click on "search."

Space is limited in this print edition of the magazine. But the web pages give us space for more in-depth coverage of the stories that appear here.

The ARIZONA
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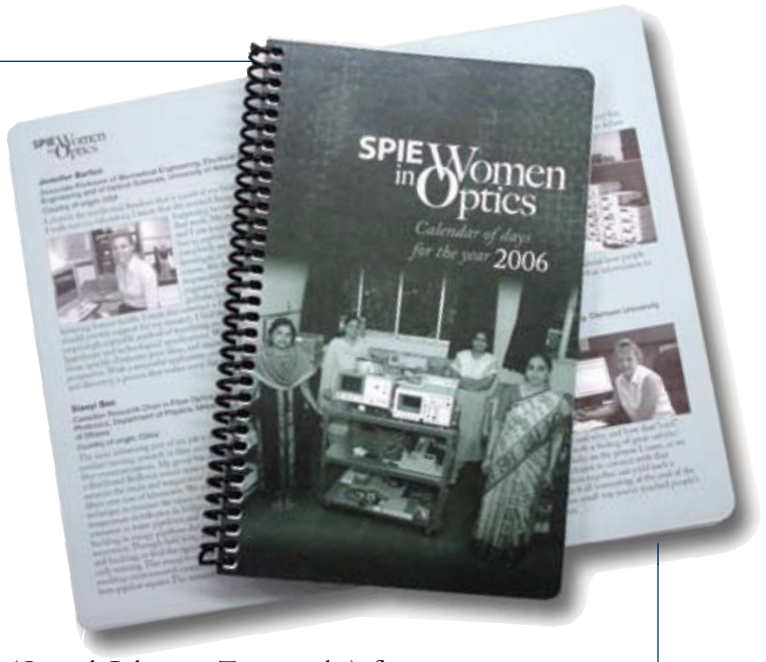
News Briefs

Society for Optical Engineering planner features two UA profs



Two UA engineering professors are featured on the 2006 Women in Optics monthly planner from the International Society for Optical Engineering (SPIE).

UA is the only university to have two faculty members in the planner.

Associate Professors Kelly Simmons Potter and Jennifer Kehlet Barton are both from UA's Electrical and Computer Engineering Department. Potter also holds a joint appointment in Optical Sciences and Barton holds a joint appointment in Biomedical Engineering and in Optical Sciences.

The planner highlights the accomplishments of women who are making significant contributions to the field of optics, and SPIE hopes that it will encourage young women to explore career opportunities in optics.

Those selected for the 2006 edition (this is the calendar's second year) were asked to answer the question "What do you regard as the most interesting part of your job and professional activities?"

Potter, who spent ten years at Sandia National laboratory before coming to UA, specializes in studying the interaction of lasers with materials.

Barton's areas of research interest include optical imaging (Optical Coherence Tomography), fluorescence spectroscopy, and laser-tissue interaction.

The SPIE monthly planner includes biographies, stories and pictures from the most influential women in the industry and in SPIE.

SPIE will provide free calendars to those interested in using them for outreach activities.

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More info: Monthly Planner

Ed Stiles

Marla Peterson *(center), senior manager in product data systems at Honeywell, spoke on behalf of the donors at the fifth annual Scholarship Donor Appreciation Reception. Brenda Paul (left) and Mark Debake received Honeywell Scholarships for Engineering Excellence.*

Scholarship donors, recipients honored

About 75 people attended the fifth annual Scholarship Donor Appreciation Reception at the Arizona Inn to honor individuals and companies that contribute scholarships to engineering students at UA.

Each year, one donor speaks on behalf of the donors and one student speaks for the scholarship recipients.

Marla Peterson represented the donors. She is the senior manager in product data systems at Honeywell and also coordinates internships and employment rotation for UA students hired by Honeywell for both the undergraduate and summer programs.

Kimberly Steward, a civil engineering senior and president of UA's Society of Civil Engineers, spoke for the students.

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More info: Donors

Jackson elected to NAE

Kenneth A. Jackson, professor emeritus of Materials Science and Engineering, has been elected to the National Academy of Engineering for his work in "advancing the science and technology of single crystal growth and materials made by casting."

Ed Stiles

Ken Jackson

Election to NAE is one of the highest professional distinctions for an engineer.

Jackson joined UA in 1989 and retired in 2004.

He has received many honors and awards and has published more than 145 papers. He also has edited ten books and holds four patents.

Jackson's research has focused on crystallization kinetics, thin film growth and characterization, ion beam processes and semiconductor processing.

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More info: Jackson

Students win $5,000 in cash at Engineering Design Day

Student engineers won at total of $5,000 in 16 award categories at UA's 2005 Engineering Design Day.

Design Day 2005 included 60 projects, which were judged by 54 engineers from 34 companies.

Some Design Day projects may eventually be commercialized. Others will provide important experimental data for companies that sponsored the projects or will become integral parts of ongoing engineering research projects at UA.

Lockheed Martin is the primary sponsor of Engineering Design Day, and several other companies also sponsor awards, including PADT, Ventana Medical Systems, BRO, and Texas Instruments.

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More info: Design Day

Ed Stiles

Civil Engineering seniors *Oliver Martinez (left), Kathleen West and Elias Clark displayed their concrete canoe during Engineering Design Day. UA's Society of Civil Engineers student chapter races a concrete canoe each spring against other collegiate teams during the annual Western Regional Conference, which is sponsored by the American Society of Civil Engineers.*

Robotics camp generates decibles

Ed Stiles

A robotic car *careens down a rocky slope during the final day of competition at the Summer Engineering Robotics Academy.*

If decibel level indicates enthusiasm for learning, 40 middle school students couldn't wait to discover more about robots in the University of Arizona College of Engineering.

"You can't pay to create this sort of excitement," said Ray Umashankar, assistant dean for industrial relations, as he strained a bit to be heard above the din. Umashankar had no desire to curb the noise. "They're excited about engineering and technology. So let them show their enthusiasm," he said.

All the noise was focused on ten robotic cars the teams built from Lego Mindstorms Robotics Invention System kits. The students used the sensors, motors, gears, Lego bricks and programmable microcomputer found in each kit to create the cars. The students also used CAD software and learned some basic concepts in physics and trigonometry during the camp.

Umashankar decided to start the program after reading a *Chronicle of Higher Education* article. It noted that 74 percent of the students enrolled in robotics programs are white males. So he decided to start a robotics program that eventually will attract middle school girls, who will be taught primarily by female engineering students.

Umashankar plans to recruit more female instructors and students to the program next year.

"The pilot program with 40 students was a huge success," he said. "Due to space limitations, we had to turn down several applicants, and parents are already asking about plans for next year." Intel Corp. and Lockheed Martin supported the workshop by providing funding for the Lego Mindstorms kits, which cost $200 each.

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More info: Robotics Academy

John Reagan wins top NASA award

Professor Emeritus John A. Reagan has won the highest honor that NASA awards to researchers who are not federal government employees.

Courtesy of John Reagan

John Reagan

He received NASA's Distinguished Public Service Medal, which NASA grants "only to individuals whose distinguished accomplishments contributed substantially to the NASA mission. The contribution must be so extraordinary that other forms of recognition would be inadequate."

Reagan, a professor emeritus in Electrical and Computer Engineering (ECE), is an internationally recognized authority on LIDAR (Light Detection And Ranging), which is similar to radar. But unlike radar, which uses radio waves, LIDAR uses laser light.

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More info: Reagan

News Briefs

Don Slack

Ace tractor driver *Dyan Pratt pulls the weighted sled during the American Society of Agricultural Engineers' ¼-Scale Tractor Student Design Competition. Pratt graduated in May in Agricultural and Biosystems Engineering.*

Gear Grinders second in tractor pull

UA's Arizona Gear Grinders, won second place in the pull competition during the American Society of Agricultural Engineers' ¼-Scale Tractor Student Design Competition and also received the event's Sportsmanship Award.

Kansas State University won the pull competition and University of Illinois placed third.

Tractor pulls involve dragging a weighted sled that creates more and more drag the farther it's pulled.

UA's design featured a totally mechanical drive system using two transmissions and four-wheel drive to produce a tractor that can crawl at 0.75 mph or fly at 26 mph. "If we took the governor off, it would go faster — probably faster than we should go," said Travis Wuertz, a mechanical engineering senior.

This is the fourth year that UA has entered the competition. "B&G Auto Salvage in Casa Grande has given us every drivetrain part we've used for the past three years," Wuertz said, which has made it possible for the team to compete on a tight budget.

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More info: Tractor

Prof, student win highest civilian contractor award

A UA professor and one of his master's students have received the highest award given to civilian contractors by Ft. Huachuca's Joint Interoperability Test Command (JITC).

Professor Bernard Zeigler and master's student Eddie Mak, from UA's Electrical and Computer Engineering (ECE) Department, won the award for their work on developing an Automated Test Case Generator (ATC-Gen). This software toolset — based on computer modeling and simulation — is modernizing and automating the testing of new systems being used by the military and other government agencies.

The software includes tests to verify that new systems can share information and are jointly operable by all U.S. forces and their allies. JITC is the test organization responsible for certifying that all Department of Defense systems will be jointly operable.

In 2003, a team under Northrop Grumman Information Technology, which includes ECE's Arizona Center for Integrative Modeling and Simulation (ACIMS), led the effort to formalize the standards for JITC tests and the sequences of the tests.

"The main system we're working to test right now is a network of different sensors and their associated computers and command systems," Zeigler said. "It's a very advanced and complicated radar system that is intended to produce a single integrated air picture.

"The various units have to share information especially when threats are happening very fast. They might have radar signals from airplanes, ships and ground-based units and these have to be shared and combined for the best view of what's occurring out there."

The awards recognize that the "leadership, guidance and knowledge" of Zeigler and the "systems engineering and software development skills" of Mak were instrumental in the "highly successful effort to provide a valuable testing tool to the testing community."

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More info: Zeigler

Wang Roveda wins NSF CAREER award

Janet M. Wang Roveda has won an NSF Faculty Early Career Development (CAREER) Award to create Electronics Design Automation (EDA) tools.

Courtesy of Janet Wang Roveda

Janet Wang Roveda

These software tools will help engineers design nanometer-scale integrated circuits. Integrated circuits are the building blocks behind today's amazingly complex and tiny electronic devices such as cell phones, iPods, and desktop computers.

Wang Roveda, an assistant professor in Electrical and Computer Engineering at The University of Arizona, will receive $400,000 over the next five years to pursue this research.

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More info: Wang

Tom Peterson

Engineering alums and friends of the College toured the Hoover Dam Bypass Project as part of the Civil Engineering Centennial Program.

Alums tour Hoover Dam project

UA Engineering alums got a behind-the-scenes look at Hoover Dam Bypass Project during a tour organized by the Civil Engineering Department and David Gildersleeve, CE '80.

The bypass project is a 3.5-mile transportation corridor that includes what will be the largest concrete arch bridge in the country. The bridge will have a 1,500-foot clear span and carry four lanes of traffic 840 feet above the river.

The project, which is scheduled for completion in 2007, will bypass the existing road, which crosses the river at the dam.

Twenty-six alums and college representatives from Tucson, Phoenix and the Las Vegas area met at the Roadrunner Saloon and took a shuttle to the river, where they first toured Hoover Dam.

Then they drove to the Arizona side, where heavy construction is taking place. From there, they returned to the Nevada side and got a closeup look at the construction in an area that's normally only open to construction crews and others who are building the bridge.

Later, the group gathered with spouses for dinner on the Nevada side of the river.

The tour is one of several events that were sponsored by Civil Engineering during its 2005 centennial celebration.

LIDAR workshop honors John A. Reagan

A workshop celebrating John A. Reagan's research was held in April at the Arizona Memorial Student Union.

Reagan, a professor emeritus in Electrical and Computer Engineering, is an internationally recognized authority on LIDAR (LIght Detection And Ranging), which is similar to radar. But unlike radar, LIDAR transmits and receives laser light.

IEEE sponsored the "Remote Sensing of Atmospheric Aerosols" workshop.

Reagan's contributions to aerosol research range from making LIDAR and solar-radiometer field measurements in Arizona's deserts to pioneering work on space-shuttle-based LIDAR techniques.

Reagan is a member of the IEEE Technical Activities Board and director of IEEE Division IX: Signals and Applications.

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More info: Reagan

Young-Jun Son wins top IIE award

Young-Jun Son has won the highest honor that the Institute of Industrial Engineers (IIE) awards to young university researchers.

Ed Stiles

Young-Jun Son

Son, an assistant professor in Systems and Industrial Engineering, received IIE's Outstanding Young Industrial Engineer Award at the 2005 IIE Industrial Engineering Research Conference.

IIE grants the award to only one person each year. Another Young Industrial Engineer Award is given annually to a young engineer working in industry.

The award was "in recognition of exhibiting outstanding characteristics in leadership, professionalism and potential in the field of industrial engineering in education."

Son also received the Best Paper Award in the area of Modeling and Simulation at the conference. It is one of eight areas in which best-paper awards were given.

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More info: IIE

UA MAVs shine

Team takes first in ornithopter, second overall at international competition

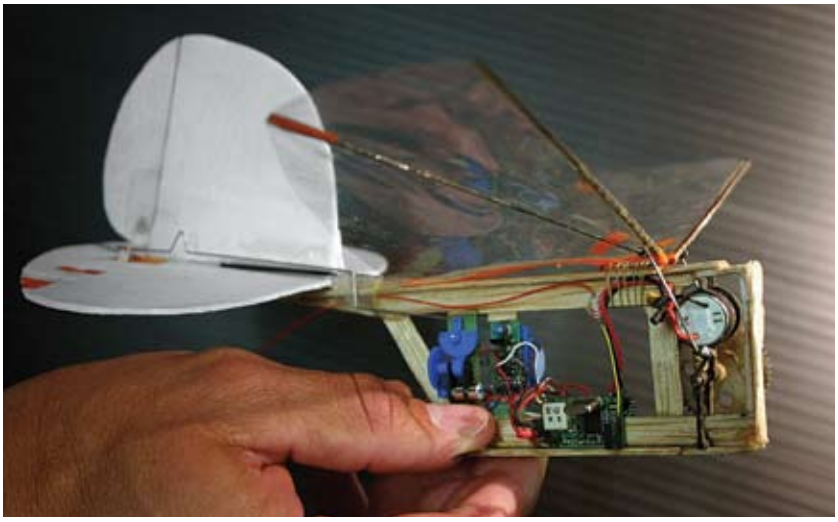
UA took first place in the ornithopter competition and tied for second place overall in the 9th International Micro Air Vehicle Competition, which was held May 21 in Seoul, Korea. UA tied with Korea's Konkuk University for second place.

The University of Florida, a longtime MAV powerhouse, took first place overall.

MAVs are tiny, radio-controlled airplanes — some have wingspans of only four inches — equipped with video cameras. They're designed for reconnaissance and can be used in search-and-rescue, law enforcement, military surveillance, or any situation too dangerous or time consuming for a human observer.

This was the second year that ornithopters participated in the event. These airplanes generate lift and forward motion with flapping wings, mimicking the aerodynamics of birds and insects.

Before the competition flights began, the UA team demonstrated what team members believe is the world's smallest radio-controlled ornithopter. With a wingspan of only seven inches, it drew lots of interest from competitors and spectators alike.



Ed Stiles photos

UA's MAV team *competed in the surveillance event at the 9th International Micro Air Vehicle Competition with an MAV like the one at right. The plane has a 12-inch wingspan and is powered by an electric motor. The team also set a new standard for micro-sized, radio-controlled ornithopters at the meet with the design above.*

During the surveillance competition, teams tried to fly the smallest MAV that could return a legible image of a symbol located about 4/10ths of a mile (600 meters) from the launch point.

During a demonstration flight, the UA team switched their autopilot to fully automatic mode. The plane flew itself to the target, sent back a video image and returned to the staging area, where it was landed manually.

The endurance competition involved building the smallest MAV that can fly for the longest time, up to 15 minutes.

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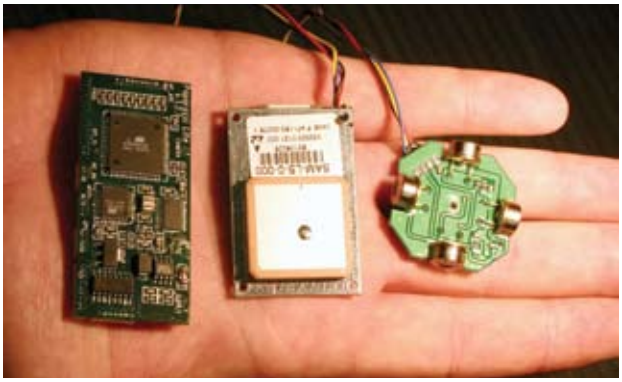
More info: MAV

Simple and elegant autopilot keeps UA's MAVs flying

UA's MAV team has developed an autopilot that is much simpler and smaller than conventional ones. It was built with help from two French MAV enthusiasts, and the team hopes to eventually commercialize it.

Commercial autopilots often have an accelerometer to measure acceleration, a pitot tube to measure airspeed, a magnetometer to measure the plane's heading, and a barometer to measure altitude. UA's autopilot has none of these.



The components *for UA's MAV autopilot will fit in the palm of your hand.*

Instead, it has just two sensors, an infrared sensor that detects the difference between sky and ground and measures the plane's attitude toward the ground (whether it's diving, climbing or banking) and a 4 Hz GPS to measure altitude and the plane's location.

UA's autopilot has proven very reliable and robust. It has flown autonomously (hands-off by humans) in 35 mph winds. Modelers who fly radio-controlled airplanes find it extremely difficult to keep a tiny plane in the air at these wind speeds.

The autopilot is part of the larger MAV development program at UA, which is focusing on development of a prototype Autonomous Micro Aerial Vehicle system.

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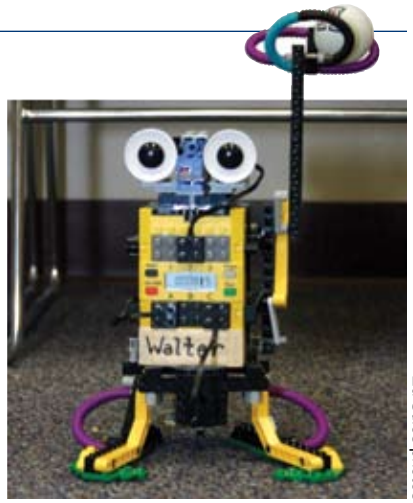
More info: Autopilot



Ed Stiles photos

Biomedical Engineering Ph.D. student Lise Johnson *(center at left) was one of the graduate students who taught girl scouts about robotics during the Girl Scout robotics camp sponsored by the Electrical and Computer Engineering (ECE) Department. (Above) Walter the Robot gets set to throw a Ping-Pong ball.*

Girl scouts learn that robots aren't just for boys

Sixteen girl scouts were on campus in July for a Girl Scout Robotics Camp sponsored by UA Electrical and Computer Engineering (ECE).

"The whole point of this camp was awareness," said ECE Associate Professor Charles Higgins, who organized the camp. "We're trying to make girls aware that it's possible for them to go into science and engineering, that it's not just a boy's thing."

"Since this was our first summer robotics camp, I was very careful not to over-plan it," Higgins added. "I had a lot of contingencies prepared, but I wanted the camp to be flexible enough to follow the interests and capabilities of the girls." As a result, Higgins made new plans almost hourly as the girls accomplished much more than he had thought possible.

"It was, in fact, a suggestion from one of the girl scouts that we have a robot 'style' competition," Higgins said. This competition included choreographing a dance for each robot.

The scouts, who ranged in age from 11 to 13, were be taught by Higgins and four graduate students, all of whom volunteered their time. The students included Lise Johnson, a Ph.D. student in Biomedical Engineering; Leslie Ortiz, a master's student in Electrical Engineering; Abby Hedden, a Ph.D. student in Astronomy; and Kristen O'Halloran, a Ph.D. student in Biomedical Engineering.

About 60 parents and friends of the scouts attended a robot competition and exhibition on the final evening of the camp.

"We haven't settled on what to do yet for next year," Higgins said. "But we're very likely to have another technology-related camp for girl scouts because this one was so successful."

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More info: Girl Scouts

UA, Intel and Urban League sponsor engineering workshop

Twenty students were introduced to the fun and creativity of engineering this summer at The Tucson Urban League Intel Computer Clubhouse in South Tucson.

This pilot program was taught by three UA engineering students who are Summer Engineering Academy (SEA) counselors and members of UA's Multicultural Engineering Program.

The workshop was so successful that the program will be expanded next year to include all six of Arizona's Intel/Urban-League clubhouses. Intel also will be offering four scholarships for the annual UA SEA to graduates of the Intel/Urban-League SEA. The UA SEA is held on campus.

The Intel/Urban-League SEA followed the same format as the one that has been used successfully for several years in the UA SEA.

Students in the one-week Intel/Urban-League SEA designed models of aerodynamic automobiles using CAD software. Then they voted on the designs and the selected designs were built on campus with a rapid prototyping machine.

"This program is designed to attract women and underrepresented high school students to engineering," said Ray Umashankar, assistant dean for industry relations, who directs the UA SEA and helped to organize the one sponsored by Intel and the Urban League. "This pilot SEA gave students a glimpse into the creativity of science and math and showed them that they can have an exciting, well-paying, creative career in engineering."

The Intel Computer Clubhouse Network is a community-based education program in which under-served youth gain access to high-tech equipment and mentors that will help them develop job and life skills.

For more on the clubhouse, see: http://www.intel.com/education.

For more on UA's SEA program, see: http://sea.engr.arizona.edu/

EPD reaches out to worldwide audience

For most engineers, learning is as vital as breathing if they want to advance their careers and stay current in their disciplines.

UA's Engineering Professional Development (EPD) program now is gearing up to meet the high demand for engineering education.

"We're going to take care of the engineer from the time they graduate to the time they retire," says R.D. Eckhoff, UA's new EPD director.

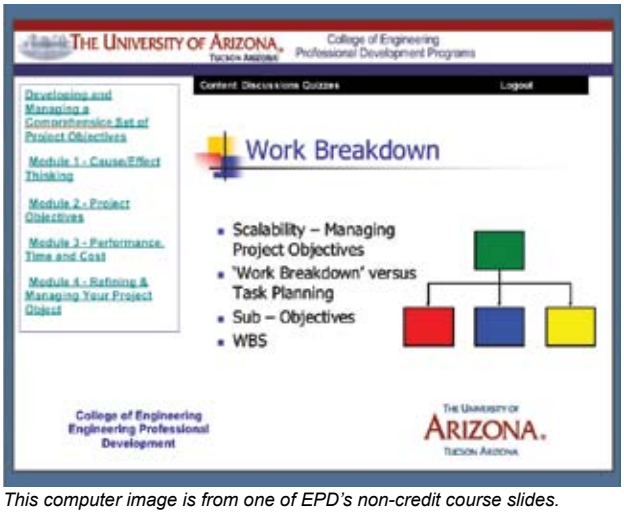
EPD expands its focus

He noted that until this year EPD was primarily a conference management service that faculty could turn to when organizing the hundreds of details required to sponsor a successful technical conference, workshop or seminar.

"We still do conference planning, but we're expanding to do a whole lot more," says Eckhoff, who came to UA in April after 27 years in continuing education at Auburn University and the University of Alabama.

EPD now will produce:

- Conferences and short courses
- Professional engineering exam review courses
- A Leadership Series
- Distance education courses (both credit and non-credit)
- Web-based courses for advanced degree programs



This computer image is from one of EPD's non-credit course slides.

Leadership series

EPD produced its first Leadership Series program on June 15. More than 1,100 people packed two venues in Tucson to see a satellite downlink program featuring former New York Mayor Rudy Giuliani, former GE CEO Jack Welch and leadership authority Steven Covey.

EPD will offer additional Leadership Series programs in October and November and more are planned for next year.

EPD's distance learning courses are being offered primarily through Desire-2Learn (D2L) software.

"We have a huge amount of high-quality course material that our engineering professors offer here on campus," Eckhoff said. "In addition, all the courses have a proven success record on campus and include information that can be critical to engineers in industry," he said.

Adult student is main focus

"Our main focus is the adult student, who has graduated, is in business and has a family and other activities in his or her life," Eckhoff said. "They're usually so busy that they're not pursing courses for degree credit. So we've designed the non-credit courses with this in mind, emphasizing the material that is very applications oriented."

Meanwhile, EPD has not forgotten its roots. It's still a crack outfit for organizing conferences. To find out more about EPD programs or to work with EPD to develop or facilitate corporate training needs, call 520-621-3054 or EPD web site, http://www.engr.arizona.edu/EPD

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More info: EPD

Class project blossoms into software that may save millions of trees

What started out as a project for a UA graduate course is turning into software that could save millions of trees during wildfires.

Lewis Ntamio, now an assistant professor at Texas A&M University, got interested in developing software that would predict the direction and speed of forest fires when he was a UA Ph.D. student in 2003.

That's when Ntamio took ECE 575, Discrete Event Modeling, from Electrical and Computer Engineering Professor Bernard Zeigler. After completing that course, Ntamio continued to pursue the research as an independent study project, even though it wasn't directly related to his Ph.D. work with Professor Suvrajeet Sen in Systems and Industrial Engineering.

Lori Stiles

Smoke billows from the Santa Catalina Mountains north of Tucson during the Aspen Fire in June 2003.

The software allows firefighters to enter factors such as wind speed, wind direction, slope conditions, temperature and vegetation type. Then it creates a simulation of where the fire will go, allowing firefighters to focus their efforts in areas that will have the greatest effect.

The software is based on research that was originally funded by an NSF-sponsored collaboration between Sen and Zeigler.

"This is how valuable research efforts often happen," Zeigler said. "They come out of the day-to-day, week-to-week work we do in class and in the lab. We look into various interesting things, not just those that are funded by a sponsor at the time. Eventually, a real capability emerges full-blown."

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More info: Zeigler

Mystery surrounds 'Porcelain of the Southwest'

Caitlin O'Grady hopes to crack a mystery that has puzzled archaeologists for more than 100 years.

It surrounds pieces of broken Hopi pottery, some of which are now in O'Grady's lab in the Materials Science and Engineering (MSE) department.

O'Grady, an MSE Ph.D. student, recently noted, "These ceramics are beautiful and incredibly well made," she said. "The artists who made them were amazingly skilled and able to very precisely manipulate the materials and technology."

The Hopi artists created what archaeologists call Jeddito ware between about 1200 and 1650 A.D., O'Grady explained. The potsherds that she's studying are a subset of Jeddito called Sikyatki Polychrome. They're named for a site that early archaeologists excavated on Northern Arizona's Hopi reservation.

The mystery is how they were made. No one knows for sure, and no one has been able to consistently produce ceramics with this even, tan-yellow buff surface since the last ones were fired around the time that Spanish settlers arrived in the Southwest.

Arizona State Museum

Caitlin O'Grady, *a Ph.D. student in Materials Science and Engineering, works on several pots in UA's Arizona State Museum. She's unraveling the secrets of the technology used to create prehistoric Sikyatki pottery.*

O'Grady's task now is to determine how these resources were manipulated to make what her advisor, Professor Pamela Vandiver, calls "the porcelain of the Southwest."

O'Grady is calling on several high-tech scientific tools to find the answers.

She has been refiring small bits of the potsherds to a range of likely temperatures and then creating fresh fractures in the refired samples. Next she uses electron microscopy to determine what percentage of the ceramic paste has a glassy structure. When the amount of glass exceeds the original, she knows that she's exceeded the original firing temperature, allowing her to determine the temperature at which each sherd was fired.

The problem now is to determine the exact chemical composition of the pottery samples, how long those chemicals were fired, in what temperature range, and how these components interacted during the firing process.

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More info: Sikyatki

Making iron the old-fashioned way is tricky business

It's one thing to imagine how an ancient technology worked and quite another to actually get your hands dirty trying it.

That's the whole idea behind "experimental archaeology" and the experiments Dan Jeffery is conducting with bloomery furnaces.

"Experimentation allows us to test theories about how we think technological processes worked in antiquity," said Jeffery, a Ph.D. student in Materials Science and Engineering. "And quite frequently experimental archaeology shows that the process didn't work the way we thought it did."

In this case, Jeffery is studying bloomery furnaces that were used to make iron and steel in Europe and the United States until 200 years ago. The furnaces also were used in other cultures stretching back 2,000 years.

"Like a lot of ancient technologies, it gets treated as a simplistic technology," Jeffery said. "But attempts to recreate it have proven that it's not nearly as simple as people would like to believe."

"Iron has been a critical, fundamental part of human existence for centuries," Jeffery said. "Understanding how iron was produced and having a clear concept of what it took to do that and replicating that process today is significant from a scientific and human perspective."

Ed Stiles

Dan Jeffery adjusts his bloomery furnace during an experiment to produce iron using an ancient technology.

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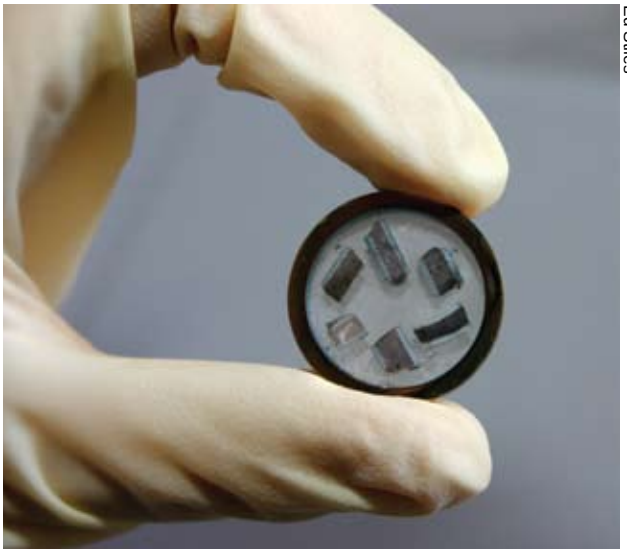
More info: Smelting

MSE researchers resurrect a 900-year-old technology



Ed Stiles

These tiny pieces of Ru-glazed pottery *were mounted on a slide before being analyzed under the scanning electron microscope in UA's Materials Science and Engineering Department. The Ru pottery samples were donated by museums and by other researchers who hope the MSE research team will be able to bring this technology back from the past.*

The last Chinese potter who knew how to create a translucent, blue-green glaze known as "Ru glaze," died more than 900 years ago.

The secrets of this highly prized glaze died with him.

Today, fewer than 100 Ru-glazed ceramics exist. Few were made because Ru ware was reserved for the 10th to 12th century imperial court, and none has been made during the past 900 years because no one has been able to reproduce the technology that created this delicate, opalescent finish.

That may soon change. UA engineers are using scanning electron microscopes, molecular-level understanding of materials and a knowledge of high-tech ceramics to time travel through bits of existing Ru glaze for a peek back into 12th century China.

Alix Deymier, a junior in Materials Science and Engineering (MSE), is working with MSE Professor Pamela Vandiver to unravel the secrets of Ru glazing.

Extensive analysis of the Jun glazes — which were used both before and after Ru glazing — has given Deymier and Vandiver some clues.

Deymier and Vandiver put a tiny sample of Ru glaze under a scanning electron microscope after etching the glaze with acid and found the same kind of pits they see in Jun ware, which are the telltale signs of a liquid-liquid phase separation.

Vandiver tried to replicate the composition of Jun glaze and then fired these samples at different temperatures. After that, she analyzed the microstructure of the various samples and produced a phase diagram that shows where in the compositional range the liquid-liquid phases occur and how to relate their microstructure to the firing temperature.

"We're now trying to look at the microstructure of the Ru glaze to determine where we can place it on this phase diagram," Deymier said.

But first they need to know the chemical composition of Ru glaze.

Deymier and Vandiver plan to use an electron microprobe in UA's Lunar and Planetary Laboratory to determine the exact composition of their Ru glaze samples. They are using the electron beam microprobe because they need to know the composition as well as the microstructure of the glaze.

Unraveling the mysteries of Ru glazing began as a class project for Deymier when she was taking a scanning electron microscope lab in the MSE department. It's now turned into an ongoing research project.

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More info: Ru Glaze

Heritage science

Continued from Page 1

Department, Anthropology and other programs.

For Vandiver, UA was the ideal location to transfer her work after 18 years as a senior research scientist at the Smithsonian and as a MSE faculty member in the cultural heritage program at Johns Hopkins University.

The Johns Hopkins program was discontinued when two key professors retired, and Vandiver also found herself being kicked upstairs into administration at the Smithsonian.

"So I couldn't go on excavations, couldn't work in the lab, and couldn't work with students," she says. "It was getting more and more frustrating all the time."

She knew about the critical mass for heritage conservation science at UA because her former Ph.D. thesis supervisor, the late David Kingery, was on the UA MSE faculty for many years and organized collaborative research on historic preservation.

So she decided to follow her passion, discarding a prestigious senior position at the Smithsonian to start a new program at UA.

"We're trying to put materials science education at the core of historic preservation, rather than just wallpapering over an archaeologist or conservator with a few materials science courses," she says. "We are producing students who are truly dual disciplinary.

Ed Stiles

Professor Pamela Vandiver *talks with a student during a lab class on flint knapping.*

•

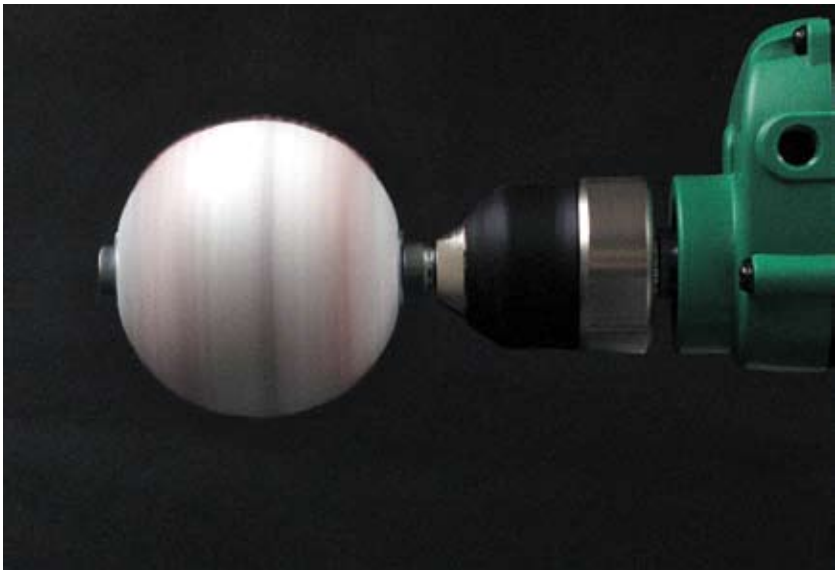
More info: Vandiver

Required reading for Major League 101

Baseball pitchers and hitters might want to track down the May-June issue of "American Scientist" magazine and thumb through a story written by two UA engineers and a former big-league pitcher.

The story, "Predicting a Baseball's Path," explains the physics of pitching, going into Bernoulli's principle, conservation of momentum and air turbulence. But readers don't need a degree in engineering or physics to understand this article or to pick up some valuable tips on analyzing a pitch as it hurtles toward them (if they're a hitter) or disguising a pitch (if they're a pitcher).

The problems in perceptual and motor skills are complicated for major leaguers because pitchers have developed a half-dozen or more pitches — all delivered at various speeds and with different trajectories — during the past 200 years, and good pitchers have an arsenal that includes several of them.



Professor A. Terry Bahill *attached baseballs to an electric drill to simulate the patterns that result from various pitches. The two-seam fastball, shown here, is given away by its vertical red stripes.*

"Predicting a Baseball's Path" was written by A. Terry Bahill, David G. Baldwin and Jayendran Venkateswaran.

Bahill is a professor in Systems and Industrial Engineering at UA.

Baldwin pitched for the Washington Senators, Milwaukee Brewers and Chicago White Sox for 16 years during the 1960s and 1970s and went on to earn a Ph.D. in genetics and an M.S. in Systems Engineering from UA.

Venkateswaran is a graduate student in Systems and Industrial Engineering.

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More info: Baseball 101

Civil engineers add muscle to Tucson's historic Fox Theatre

In 1930, *Tucson's historic Fox Theatre opened to the biggest block party that tiny Tucson had ever seen. But by 1974 the party was over and the theater closed its doors. Now it's being rebuilt and is scheduled to reopen on New Year's Eve.*

Tucson's historic Fox Theatre will soon be structurally stronger than on the day it opened in 1930, thanks to research from a UA Civil Engineering lab.

The Fox, which is listed on the National Register of Historic Places, is being restored after lying dormant for 31 years in downtown Tucson.

Like all buildings of its era, it was built primarily with unreinforced masonry. While unreinforced masonry is extremely strong in compression, it's weak against lateral loads from wind or earthquakes. There are some reinforced concrete columns and beams in the basement, but, for the most part, the theater's walls are unreinforced, said UA Civil Engineering Professor Mohammad Ehsani.

Retrofitting the building to meet current standards using steel bracing and supports would be extremely expensive and time consuming, and the steel supports would take up a lot of room inside the building.

Ehasni's company, QuakeWrap, Inc., isn't using steel. Instead, QuakeWrap is strengthening the walls by wrapping them with Fiber Reinforced Polymers (FRPs) that are similar to fiberglass and Kevlar. The FRP's are glued to the walls with epoxy, creating a tough, fiber-reinforced exoskeleton around the masonry.

•

More info: Fox

Microbe and tequila waste could yield affordable bioplastics

Environmentally friendly bioplastics — made from chemicals produced by microbes — need to clear two obstacles before they can replace plastics made from oil.

First, the microbes need an inexpensive source of carbon that they can convert to bioplastic compounds. Second, engineers have to find a way to remove the compounds from the organisms and purify them.

Research by graduate student Luis Alva could solve the first problem.

Once that first problem is cracked, the second should fall fairly easily to some straightforward engineering, says Alva's advisor, Mark Riley, associate professor of Agricultural and Biosystems Engineering (ABE).

Alva, an ABE master's student, has found that a marine bacterium can degrade a waste product generated during tequila manufacturing to produce a bioplastic compound.

Luis Alva stands among the agave plants in a Tequila Herradura orchard.

Alva is working with one of Mexico's largest tequila makers, Tequila Herradura, which generates 45 tons of agave waste (bagasse) each day.

Although Alva's research is promising on a lab scale, much needs to be done before the process can be scaled up to become commercially viable.

"It's a long time frame before we get to the point where we can handle tons of bagasse," Riley said. "There are still a lot of details that we need to pull together."

Alva conducted his research and is earning his degree through the USAID Ties Program, which funds four Mexican scholars at UA each year. The students take classes at UA for their master's degrees and conduct their research in Mexico.

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More info: Tequila

Understanding turbulence in the fast lane — Mach 10 and beyond

Associate Professor Anatoli Tumin is working on research that will help engineers design hypersonic aircraft like NASA's X-43A.

Although NASA's X-43A and other hypersonic airplanes use air-breathing engines and fly much like 747s, there's a big difference between ripping air at Mach 10 (around 7,000 mph) and cruising through it at 350 mph.

These differences are even more pronounced when hypersonic aircraft sip rarified air at 100,000 feet, while commercial airliners gulp the much thicker stuff at 30,000.

Aero-thermodynamic heating is a very big deal at Mach 10. It largely determines the engine size, weight, choice of materials and overall size in hypersonic airplanes. So engineers would like to have a much better understanding of what triggers turbulence and how they can control.

Associate Professor Anatoli Tumin, of Aerospace and Mechanical Engineering (AME), is among those studying the problem and has developed a model that predicts the surface roughness effects on the transition from laminar to turbulent flow at hypersonic speeds.

His theory has a lot to do with brain-taxing mathematics that Tumin and Applied Math Ph.D. student Eric Forgoston have grappled with during the past couple of years.

"In principle, the theory tells us what the optimal perturbations are that will lead to turbulent flow," Tumin said. "Now we can explore different geometries for roughness elements to see which are best. We can explore how to space them and where we should position them."

Tumin is working with Research Assistant Professor Simone Zuccher, of UA AME, to develop a software package that will allow designers to determine what happens when air flows across a roughened surface at hypersonic speeds. The software will help them predict when and where the transitions from laminar to turbulent flow occur in their designs operating at hypersonic speeds.

Ultimately, better understanding the transition to turbulence at hypersonic speeds will allow designers to build lighter, faster, more efficient airplanes capable of traveling at even higher speeds of Mach 15 or more.

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More info: Tumin

UA Engineering holds inaugural da Vinci Circle event

The UA College of Engineering sponsored its first event for members of the da Vinci Circle last spring.

About 160 da Vinci Circle donors and friends of the college attended a dinner and lecture about UA's new Heritage Conservation Science program at the Arizona Inn.

The da Vinci Circle is a new giving society named for Leonardo da Vinci. It will benefit engineering faculty and students while directly engaging patrons in the discovery process.

da Vinci Circle members either contribute to the Dean's Fund or support a favorite department or program within the college.

In return, the college is creating programs and events for da Vinci Circle members that reflect the diversity and richness of da Vinci's broad-ranging intellect.

The program includes a Renaissance-like combination of ongoing seminars, lectures, excursions, tours and other activities reserved exclusively for members of the da Vinci Circle.

The giving society was named for da Vinci because engineering students and faculty share his quest for knowledge and his vision for creating a better future by studying the natural world and applying what they learn to solving important problems.

In fact, Leonardo da Vinci, Renaissance painter, sculptor, scientist, and engineer, would feel right at home in one of UA's engineering labs. And he would understand the key role that patrons play in helping researchers to pursue new ideas and inventions.

Dave Areghini (CE '65), his wife, Dede (left), and Molly Ankney, associate director of development for UA Engineering, were among the guests at the inaugural da Vinci Circle event.

Da Vinci Circle members create infinite possibilites for students, faculty

Leonardo da Vinci understood that patrons provide the catalyst for advancing knowledge and creating inventions.

Patrons play an equally vital role in the UA College of Engineering, where their support fuels the creative sparks that enhance research and enrich education.

Da Vinci Circle patrons create infinite possibilities for faculty and students to pursue their passion and their dreams.

For this, we are truly grateful.

We want to take this opportunity to say, "Thank you" to all those listed below for their generous support.

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Lifetime Founding Members

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Analog Devices
Barbara Amos
APS
APS, Pinnacle West
Arizona Power Authority
Mike and Kathy Arnold
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Craig and Nancy Berge
James and Margaret Bly
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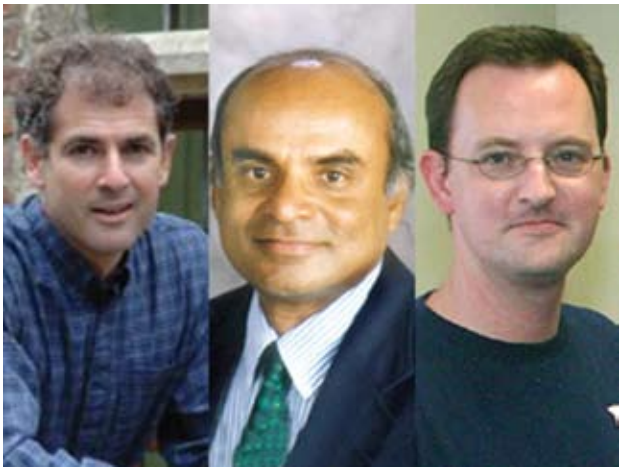
Continued on Page 16

Three professors named da Vinci Circle Fellows



The first da Vinci Circle Fellows have been named in the College of Engineering. They are (from left) Anthony Muscat, Chemical and Environmental Engineering; Achintya Haldar, Civil Engineering and Engineering Mechanics; and Charles Higgins, Electrical and Computer Engineering.

The first da Vinci Circle Fellowships have been awarded.

These fellowships are designed to recognize faculty who have made outstanding contributions to their department, college and profession. Each year, two fellowships will be awarded. However, three were named this year after a da Vinci Circle member generously funded a third fellowship.

They were selected for their distinguished and sustained records in teaching, research and service. Emphasis was placed on substantial and continued contributions.

In addition to the title of "da Vinci Circle Fellow," the award carries a $5,000 stipend to for teaching, research and service activities.

The fellows are:

• **Achintya Haldar**. Professor Haldar earned his Ph.D. from the University of Illinois and has been on the UA faculty since 1988. His research interest is in reliability-based structural engineering, health assessment of structures, and seismic load-tolerant structures. He has published more than 325 technical articles and several widely used, major books.

Haldar is known for his innovative teaching style, which includes video, physical models, and computer-base learning. His teaching and research activities have been recognized at various national and international levels.

• **Charles Higgins** earned his Ph.D. at the California Institute of Technology and joined the UA faculty in 1999. His research focus is on neuromorphic engineering, which combines engineering design with biologically inspired computer models.

Last summer Higgins organized a Girl Scout Robotics Camp to encourage girls to consider careers in math, science and engineering. He is continuing to work with groups of Girl Scouts and plans to sponsor a camp next summer in which Girl Scouts will build an underwater robot.

Higgins also developed the bi-weekly "ECE Currents" seminar, and advises Eta Kappa Nu, the Electrical Engineering Honor Society.

He created and supervises "The Techni," a technical group primarily for ECE freshmen and sophomores that's designed to introduce them to the ECE department early in their academic careers and to support them through their first years as undergrads.

• **Anthony Muscat** earned his Ph.D. at Stanford University, and joined the UA faculty in 1997. His research focuses on environmentally friendly microchip manufacturing technologies.

He has created a web-based course for graduate and undergraduate students on the chemistry and physics at solid surfaces. The course will be included in the Arizona Tri-University Masters of Engineering program and in the course offerings in UA's Chemical Engineering Department.

Muscat advises undergraduate students in his department and is part of the undergraduate studies committee. He also directs the department's seminar series.

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More info: da Vinci

da Vinci

Continued from Page 15

Herb and Sylvia Burton
Frank and Joni Castro
Richard Chartoff
William and Margaret Davenport
Wayne and Carol Dawson
Chandra and Patricia Desai
Jake and Beverly Doss
William and Ella Dresher
Karl and Sandy Elers
Jeff and Donna Goldberg
Dennis and Noreen Grenier
Dick Hall
Gary Harper
Ross Harvison
Ray and Patricia Haynes
Kenneth Head and Jamie Cain
Brent and Margaret Hiskey
Ernst and Judith Hofmann
Donald and Yolanda Hom
Moon Hom
Paul Hom
Michael and Robin Kaiserman
Daniel and Cynthia Klingberg
Peter and Patricia Likins
John and La Donna Marietti
Jack McDuff
Thomas and Lorene McGovern
Sara Meinert
William and Dianne Mensch Jr.
Ernest and Sally Micek
Mintec, Inc.
Anthony and Lynn Mulligan
Dan and Carolyn Neff
Edward and Patricia Nowatzki
Thomas and Margaret O'Neil
Donna Osborn
Thomas and Shannon Peterson
William and Mary Poulton
Charles and Maria Preble
Doug Pruitt
John and Elke Reagan
Dallas Reigle
Resolution Copper Company
Sam Robinson
Michael Roda
Matthew Shelor
Sergey and Nataliya Shkarayev
Jane Siegwarth
Douglas Silver
Ernest and Joanne Smerdon
Southwest Gas Corp.
Anatoli and Alla Tumin
Donald Uhlmann
Eugenie Uhlmann
Juan and Maria Valdés
Alan (Bud) Wendorf
Ann Wilkey
Mark and Guadalupe Woodson
Israel and Renate Wygnanski

PD funds endowed professorship

Phelps Dodge makes $2.5 million gift to Mining and Geological Engineering

Phelps Dodge Corp. has donated $2.5 million to set up an endowed professorship in UA's Mining and Geological Engineering (MGE) Department.

"This is a significant gift," said MGE Department Head Mary Poulton. "It allows us to establish a new faculty position immediately."

Poulton noted that the gift continues a relationship between Phelps Dodge and UA that spans more than 100 years. "The size of this gift and the effort that the company made in finding a way to donate it shows Phelps Dodge's long-term commitment to our department and UA."

The gift will fund the Douglas C. Yearley Phelps Dodge Chair in Mineral Processing. Yearley, former chairman and CEO of Phelps Dodge, joined the company in 1960 and retired in 2000 as chairman and chief executive officer.

The company also is investing in UA through the Leonard R. Judd Scholarship Program, which provides about $64,000 annually to students in mineral resources-related majors. These students also receive a paid summer internship as part of the scholarship package.

UA MGE currently is conducting a worldwide search, and the chair should be filled by next fall semester.

"The faculty member who fills this endowed chair will teach both undergraduate and graduate students," Poulton said. "But we see the teaching emphasis of this position as being largely at the graduate level, providing continuing education and potentially additional education for those who become involved in the mineral processing industries who do not have a background in mining or extractive metallurgy."

Professor William Davenport (left), who is the chairman of the search committee for the Douglas C. Yearley Phelps Dodge Chair in Mineral Processing, recently visited the company's Morenci Mine. With him are (from left) Erron Winsor, a mining engineering undergrad; UA alum Don Jensen, of Phelps Dodge; and Zachary Sparksman, a mining engineering undergrad. Students in mining engineering at UA will learn about the latest research in mineral processing technologies from the professor who will fill the Yearley chair, which is being funded by a $2.5 million gift from Phelps Dodge.

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More info: MGE

Mark Hickman named to Delbert Lewis endowed professorship

Associate Professor Mark Hickman has been named the first Delbert R. Lewis Distinguished Professor in UA Civil Engineering and Engineering Mechanics (CEEM).

Hickman, who earned his Ph.D. in 1993 from MIT, has research interests in transportation systems analysis and engineering.

His current research projects include:

• **Remote Sensing of Transportation Flows** — This project involves assessing the technical capabilities of airborne traffic sensors to measure vehicle traffic.

• **Evacuation Modeling** — In this project, Hickman is developing and evaluating a wide range of evacuation strategies for both natural and man-made disasters that require rapidly moving large numbers of people.

Mark Hickman

• **Arizona 511 Model Deployment Initiative** — The telephone number 511 in Arizona connects to the state's traveler information system, giving information on road conditions throughout the state. This project is examining the calling patterns of existing 511 users to propose future improvements.

Hickman teaches:

• CE 363, Transportation Engineering and Pavement Design

• CE 463/563, Traffic Flow and Capacity Analysis

• CE 466/566, Highway Geometric Design

• CE 469/569, Travel Demand Modeling

The endowed professorship is funded by Delbert R. Lewis, who graduated from UA in 1950. Money earned from the $500,000 endowment provides support for an outstanding faculty member who is in the early stages of his or her career. It funds:

• Supplemental salary.
• Graduate student assistance.
• Professional travel.
• Research support.
• Other academic and research activities.

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More info: Hickman

SRP supports engineering, business colleges for water issues study

The Salt River Project has committed $500,000 over the next five years to continue and enhance the SRP Program for the Study of Technology, Public Policy and Markets.

The program is a joint effort between SRP, the UA College of Engineering and UA's Eller College of Management.

The program, which started in 1999, has focused on issues related to transmission of electricity and deregulation of the electric power industry, but is now being expanded to study water issues in Arizona.

Between 1999 and 2005, Professor Pitu Mirchandani, of Systems and Industrial Engineering, and Professor Stanley Reynolds, vice dean of the Eller College, administered the program. They have directed research initiatives, mentored graduate students and organized three workshops to examine electric power policy issues.

The 2005-2010 program will expand that work by studying water as a strategic resource.

"UA is particularly capable to collaborate with SRP in this area," said Engineering Dean Tom Peterson. "Engineering's Hydrology and Water Resources Department is the country's most highly-rated program in this area. And the Eller faculty includes several scholars with long-standing research interests in water policy."

Ed Stiles

Water resource management and sustainability *are crucial to the future of Arizona and the Southwest. SRP has teamed up with UA to study water as a strategic resource.*

The collaborative research between engineering and business will focus primarily on water issues affecting Arizona. "But any lessons we learn should apply regionally because the Southwest faces largely a common set of water problems," said Reynolds, who is the professor working on this SRP program in the Eller College.

SRP will contribute $100,000 annually to the program, which will be split evenly between the two colleges.

Water policy and electric power issues are natural collaborations for the two colleges, Reynolds said. "In electricity, for instance, economists have quite a bit to say about regulatory policy and the development of things like wholesale power markets. But you can't really do that effectively unless you understand something about how electric power networks function and how power moves across a transmission grid," he explained.

"Those are areas where engineers have a lot of expertise. It's a similar situation with water issues. You can't understand how water policy should work unless you have a good understanding of how groundwater and surface water systems interact, as well as how the water renewal process works. And those are things where hydrologists from engineering can really add a lot of understanding."

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More info: SRP

Estate planning can help you and future engineering leaders

The nation's future hinges on its young people and how well they are educated to compete in a global marketplace. This is particularly true in engineering.

While State of Arizona funding and research grants help support UA's College of Engineering, the margin of excellence necessary to provide students with an outstanding educational experience comes through private support from both corporations and individuals.

Some of the college's largest gifts come from wills and living trusts made by those who have the foresight, dedication and vision to see the vital role that engineering education will play in the well-being of Arizona and the nation in the years ahead.

Some donors earmark a specific amount, while others commit a percentage of their estate or even the remainder of the estate after they have made other provisions.

Some donors realize tax advantages. If they are subject to federal estate taxes, a gift through their estate may reduce the taxes owed.

If you already have an estate plan, it's easy to add a commitment to the Engineering College. Just talk with your estate planning attorney and update your will or living trust with a codicil or amendment.

If you are considering an estate gift, please contact Beth Weaver, the college director of development, 520-621-8051. She can help you and your estate planners to set up provisions that will exactly benefit your interests.

In Memoriam

Ed Stiles

Edward M. Lonsdale, who helped create the team-based capstone class in Electrical and Computer Engineering (ECE) died in June. He was 89.

Lonsdale, an ECE adjunct professor, taught classes at UA until 2003, often partially donating his time.

"I personally miss him terribly," said his longtime colleague Martha Ostheimer. "He and I co-taught the senior capstone design classes, first with Ken Mylrea and then on our own after Ken left the university."

Lonsdale earned his B.S. degree at Kansas University in 1936 and his Ph.D. in electrical engineering at the University of Iowa in 1952. He taught at Iowa and the University of Wyoming before moving to Tucson in 1972 to open the clinical engineering department at St. Joseph's Hospital.

Lonsdale also was an avid outdoorsman and enjoyed trout fishing and hiking at his cabin in Wyoming. He often invited other faculty members to accompany him on his Wyoming fishing trips.

Lonsdale also enjoyed classical music, ballroom dancing and philosophical discussions.

Joe Gelt

Sol Resnick, professor emeritus of Hydrology and Water Resources (HWR), died in December. He was 87.

Resnick, who joined the UA faculty in 1957, was recognized as a leading expert on the hydrology of arid lands and worked on water projects in several developing countries.

In 2001, Resnick and his wife, Elaine, completed their book, *Irrigating India*, about his work with USAID.

Resnick directed UA's Institute of Water Utilization, which became the Water Resources Research Center (WRRC). He directed that center until he retired in 1984.

In 2003, WRRC named its conference room in his honor. Many of his colleagues and former students attended the dedication in November, 2003.

Sid Wilson, one of his former students and general manager of the Central Arizona Project, spoke at the conference room dedication, describing Resnick's interest in water as actually being an interest in people.

In addition to his many contributions to hydrologic sciences at UA, Resnick set up endowed funds in UA HWR and the UA Law College Assoc. The HWR fund supports graduate research programs.

Courtesy of William Kilcullen family

William A. Kilcullen, ME '62 and Col. USAR Ret., died of an apparent heart attack in November while returning home from the family cabin on Arizona's Mogollon Rim. He was 77.

Kilcullen was past president of the UA Phoenix Alumni Assoc., and a founding member of the UA East Valley Alumni Club. He was past president of the UA Engineering Alumni Council and past chair of the Dean's Advisory Council in UA Engineering.

He also was a member of the UA President's Club, the UA Wildcat Club and the UA National Board of Directors.

Kilcullen received a U.S. Army commission after completing ROTC at UA and was a veteran of the Korean War.

He was a graduate of the Army Command and General Staff College and of the Air War College.

After active duty at Fort Knox, Ky., he returned to Tucson, where he joined the Army Reserve 8th Med Tank Battalion, 40th Armor, which he eventually commanded.

Kilcullen moved to Tempe, Ariz. in 1963, where he joined the Headquarters 6224th USAR School and then the 164th Support, eventually commanding both groups.

He was a member of the Korean War Veterans of Arizona, Military Order of World Wars, Reserve Officers Assoc., and charter member of Desert Dragon Assoc. of the 8th of the 40th.

Kilcullen was a 37-year member of the Girl Scouts of Arizona Cactus-Pine Girl Scout Council, an active member of Our Lady of Mt. Carmel Church, a Life Member of the NRA, member of the Golden Eagles, member of the Elk Society, and Life Member of the Tucson High Badger Foundation.

In Tempe, he was the past chair of the Building Code Committee and past chair of the Plumbing Board. He also was a past member of the Plumbing and Mechanical Review Board.

Alumni Echoes

'60s

Stephen H. Waters, AE '65, recently retired after 37 years with The Boeing Co.

He spent the last 12 ½ years working on the new F/A-22 fighter aircraft, most recently as the Boeing logistics manager.

Early in his career he had a brief break where he worked for a Naval Architect and then for Dean Witter & Co. as a stock broker.

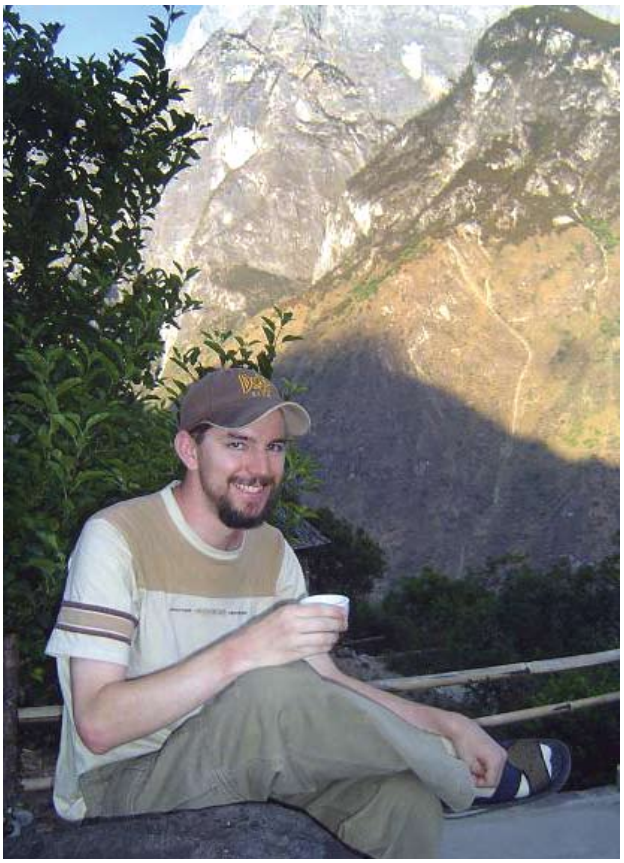
Waters and his wife, Dianne, have two children and five grandchildren and live in what he describes as "the fantastic Northwest."

Thomas F. Thoma, EE, '69, has been named president and CEO of T-Squared Enterprises, LLC, an information technology and acquisition consulting firm based in Springfield, Va. (near Washington, DC).

Thoma retired from the Senior Executive Service in April 2002 after completing 33 years in the civil service, climbing through the ranks from GS-5 to SES-4.

He was the director for acquisition at the Defense Information Systems Agency.

During his career he also was the program manager for Submarine Combat Control Systems, the commander of DOD's Center for Standards, and he assisted the chairman of the Joint Chiefs of Staff in developing national military



Brad Hemak, *MinE 01, has been traveling extensively in China.*

strategy and evaluating command and control systems.

Thoma was previously awarded the Secretary of Defense Meritorious Civilian Award, the DOD Superior Accomplishment Award, the DOD Civilian Service Award, and the Senior Executive Service Performance Award for Superior Achievement.

In addition, he was twice selected to the FCW Top 100 Federal Executives.

President Bush recently presented Thoma with the Distinguished Executive Presidential Rank Award.

Thoma earned a masters of public administration degree from the George Washington University and is DOD certified at the highest levels in program management and contracting.

'70s

Jerry G. Fossum, EE '66, MS EE '69, PhD EE '71, is a professor in the electrical and computer engineering department at the University of Florida.

He recently won the 2004 J.J. Ebers Award from the IEEE Electron Devices Society "For Outstanding Contributions to the Advancement of SOI CMOS Devices and Circuits Through Modeling."

This is the society's most prestigious award and was established in 1971 to foster progress in electron devices and to honor Jewell James Ebers, whose contributions shaped the understanding and technology of electron devices.

The award includes a certificate and check for $5,000 and is presented at the International Electron Devices Meeting.

Barbara E. (Neff) Mizdail, ME 72, is a lecturer in mechanical engineering at Penn State Berks.

She is the first female faculty adviser to take a student chapter of the Society of Automotive Engineers (SAE) to the SAE Mini Baja competition.

In addition, Mizdail is the first female engineering faculty member at Penn State Berks.

The Penn State Berks team finished 37th overall out of 116 teams in the Mini Baja event. The Berks team also placed 12th in the endurance race. Only 51 of the teams completed the endurance race, which is the most difficult part of the competition.

"Our Penn State Berks students were awesome!" Mizdail said. "They achieved their goal of finishing the race and building a Mini Baja car that endured. We can't wait till next year's competition in Milwaukee!"

Mizdail, who was president of the Engineer's Council and a member of the Beta Rho Delta engineering sorority during her undergraduate days, participated in the UVDC (Urban Vehicle Design Competition) SAE Team at UA. "We were given a green Ford Pinto by Jim Click Ford in 1971," she remembers. "And we competed in the competition at the GM Proving Grounds in Michigan. We did rather well, although the specifics escape me."

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'90s

Greg Tomooka, SE '91, MS IE '93, is the software configuration management (SCM) technical manager at Honeywell International, Inc.'s Commercial Electronic Systems (CES) Division. He has been

Thomas F. Thoma *(right), EE, '69, has been named President and CEO of T-Squared Enterprises, LLC, an information technology and acquisition consulting firm based in Springfield, Va. In 1993, General Colin Powell (left), then Chairman of the Joint Chiefs of Staff, presented Thoma with the Department of Defense Civilian Service Award. Thoma retired in 2002 after 33 years in the Senior Executive Service.*

with Honeywell since 1995.

Tomooka is responsible for all aspects of SCM oversight across the CES organization, which consists of the commercial air transport facility in Phoenix, Ariz., and the business, regional, general aviation and helicopters facility in Glendale, Ariz.

As technical manager, Tomooka directs the activities associated with ensuring configuration management requirements.

'00s

Brad Hemak, MinE 01, has been traveling extensively in China.

After studying in Kunming, he visited Lijiang. Both are in Yunnan Province, north of Burma and Vietnam.

Lijiang has been completely rebuilt in the last ten years. "It looks like an ancient Chinese town. And just to make the area a little more beautiful there are 18,000-foot snow-covered peaks just outside of town," he says.

Then Hemak visited Tiger Leaping Gorge, which is a two-day trek along a gorge in the mountains north of Lijiang.

Next he went to Zhongdian, which is sometimes called "Shangri-la," after a novel written in the '30s about a beautiful place in the Himalayas that was a paradise.

Then he moved on to Deqin (also claiming to be Shangri-la), the next town north and a dead end.

"The scenery on the way there was stunning," he said. "We started in Zhongdian, which is a grassland plateau, then went up to pine forests, then down to a dry, chalky desert that reminded me of Arizona's low-elevation mountains. Then back up to pine forests, then above the tree line to the pass at an elevation of 13,500 feet, then down to Deqin at a mere 10,000 feet.

"From there I stayed at an overlook for the night, which looked out to the Meili Mountain, which is over 21,000 feet, the tallest mountain I've seen (but later this trip it might get higher).

"At 21,000 feet it is higher than anything in the Rockies or Alps and about the same as McKinley in Alaska.

"I'm now in Zhongdian again waiting for a horse-racing festival in two days. After that I will travel north into Sichuan, the next province.

"There is a famous park in southern Sichuan called Yiding. The village just outside of the park has just been renamed Shangri-la."

Barbara E. (Neff) Mizdail, *ME 72, is a lecturer in mechanical engineering at Penn State Berks. She is the first female faculty adviser to take a student chapter of the Society of Automotive Engineers (SAE) to the SAE Mini Baja competition. Mizdail also is the first female engineering faculty member at Penn State Berks.*

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