

# arizonaengineer

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College of Engineering/Pete Brown

**All Systems Go**—Some of the 23 systems and industrial engineering team members who gave new life to the Freeport-McMoRan vehicles. Left to right: Robbie Hart, Sean Martinez, Patrick Lewis and Jon Schwab.

## Students and Mining Industry Team Up to Reanimate Robotic Mine Vehicles

In a single semester, a group of systems and industrial engineering students built two autonomous mining vehicles from an abandoned test program and a few crates of spare parts donated by mining company Freeport-McMoRan.

In just 10 weeks, a group of University of Arizona engineering students took five crates of surplus hardware and two heavy-duty test vehicles, which didn't run, and mixed them with youthful enthusiasm, tenacity and many long hours to build a couple of robotic vehicles that recently drove themselves around UA's test mine.



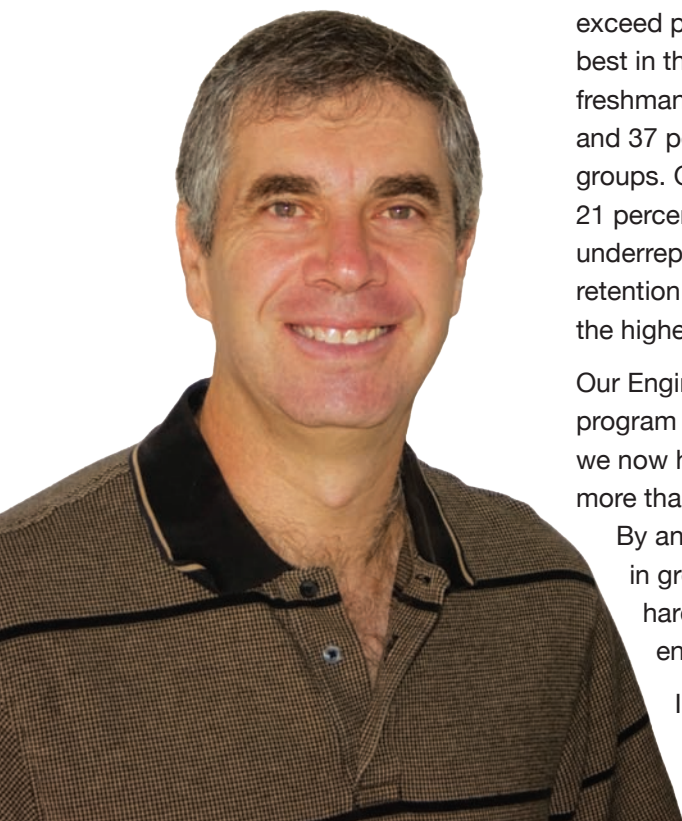
This was no easy task, and some said the job was too big for the one-semester course: ENGR 450/550, autonomous vehicle systems. But they didn't factor in the can-do attitude of 23 undergraduate and graduate students, who were willing to put in late nights following classes and day jobs.

CONTINUED ON PAGE 10

# College Surges Forward Amid Change

Brighter, more diverse student body and bigger research expenditure signal bright future

Welcome back to UA Engineering. If you do not like change, then the UA is a bit unsettling right now. We are in the middle of a presidential search process and even the football coach has been changed. Despite the uncertainty, we are moving forward in our three key missions of education, research and outreach, and this edition of *Arizona*



*Engineer* contains articles from all three of these areas.

We had a great spring and summer, and we are still on a roll this fall semester. All of our undergraduate programs were reaccredited in July, and we have a freshman class that ranks among our best ever academically.

SAT scores and GPAs for this new class exceed previous years and are still the best in the UA. It's also our most diverse freshman class, with 26 percent women and 37 percent from underrepresented groups. Our undergraduates are now 21 percent women and 30 percent from underrepresented groups. Our first-year retention is now better than 87 percent, the highest at the UA.

Our Engineering 102 in High Schools program has helped enrollment and we now have 20 Arizona schools and more than 300 students enrolled.

By any measure we are bringing in great students and working hard to give them a strong engineering education.

In research, our expenditures were almost \$29 million, another record, and our

graduate student numbers are up. We also had a great year in competitive proposals, winning two Major Research Infrastructure awards from NSF, and five new awards of more than \$1 million. This surge will provide new knowledge and opportunities for our students and boost our national rankings. We are forging stronger ties with industry, and remain strongly committed to our land grant mission to help the students and industries important to Arizona.

I hope that during the past six months you have had the chance to connect with our expanded development and communication teams, who have launched a monthly email newsletter to keep all our alumni up to date on the latest UA Engineering news.

If you are in our neighborhood, I invite you to drop by and see first-hand what we have been doing. Hope to see you in the near future.

Bear Down!

A handwritten signature in black ink that reads "Jeff".

Email: [jgoldberg@arizona.edu](mailto:jgoldberg@arizona.edu)  
Telephone: 520.621.6594  
Twitter: @UA\_ENGR\_Jeff\_G

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The University of Arizona  
College of Engineering  
P.O. Box 210072  
Tucson, AZ 85721-0072

editor/designer pete brown  
telephone 520.621.3754  
e-mail [pnb@email.arizona.edu](mailto:pnb@email.arizona.edu)

[www.engineering.arizona.edu](http://www.engineering.arizona.edu)

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Many stories in this print edition have been edited for length, and it is not feasible to include related multimedia material such as video and audio files, and hyperlinks to related websites.

 To get the full story, look for the story number by the **Ae** icon embedded in the article, then go to the online edition and enter the story number in the search box.



Courtesy of Tyler Spivey

**Got Mud?**—Josh Spivey powers the Baja Racing off-road vehicle through the mud at the SAE Collegiate Design Series race meet at Pittsburg State University in May 2011.

### UA Baja Racing Gives Best Performance in Club History at International Competition

UA Baja Racing placed 21st out of a field of 100 teams in the 2011 international collegiate off-road racing competition, a personal best for the student engineering club.

One hundred student teams from the United States, Brazil, Canada, France, Mexico, Argentina, Israel, and India converged on the Pittsburg State University campus in Kansas in May 2011 to compete in the Baja SAE Collegiate Design Series, organized by the Society of Automotive Engineers.

The last few years have seen the UA Engineering club climb steadily up the rankings. The team ascended from the back 20 in 2007 to come in 33rd in 2008 and 2009, but wrecks and mechanical problems pushed them back to 52nd and 53rd in 2010, when they entered two cars.

The UA team showed race-hardened engineering expertise this year with a solid performance against the experienced international field. UA Baja Racing's overall score was 668 points out of a possible 1000.

"We built a really solid car this year," said Josh Spivey, who graduated in May 2011 in mechanical engineering and recently stepped down as UA Baja Racing club president. Spivey's senior design project, which he and his design team presented at Engineering Design Day in May 2011, was building a drive train for the Baja racecar.

The final event, the endurance race, is an epic test of every aspect of the car's design and driver's ability, and carries fully 40 percent of the overall points available. UA tackled the demanding course to finish 22nd in this event with 281 points out of a maximum of 400.



College of Engineering/Pete Brown

**Key Player**—Tau Beta Pi laureate Jonathan Gross giving a piano recital.

### Tau Bate is Laureate

With majors in computer engineering and piano performance, Jonathan

Gross was named a 2011 laureate by national engineering honor society Tau Beta Pi.

Gross was cited by Tau Beta Pi for his achievements in the arts, and received a \$2,500 cash award and plaque in October at the Tau Beta Pi Association's 106th annual convention in Indianapolis.

"I am humbled to have been chosen for this award, and will strive to conduct my life in a manner worthy of such an honor," Gross said. He also noted that the cash element of the award was well received. "I have been very fortunate during my time as a student regarding scholarships, but many are only designed to fit the standard four-year student," he said. "Since pursuing computer engineering and piano performance together puts me on a longer track, it is nice to receive some extra financial assistance as a result of my work in both fields."



France, Mexico, Argentina, Israel, and



Gross was named a 2011 laureate by

national engineering honor society Tau Beta Pi.

## STUDENT ACHIEVEMENTS



College of Engineering/Wildcat Racing

**Winning Formula**—Members of the Wildcat Racing team and their car at the FSAE race meet in Fontana, Calif.

## Formula Team Completes Endurance Race for First Time in Club History

For the first time in the club's history, Wildcat Racing, the UA's formula race team, completed the 20-lap marathon, along with only 29 other teams out of an initial field of 80.

Completing the endurance event is a testament to the solid engineering underlying the car's construction. "It's a 20-kilometer race, and everybody is afraid of it," said Sean Culbertson, team president and mechanical engineering junior. "You can change drivers once, but you can't make any repairs, and the marshals will pull you out of the race if they see any problems."

At the track before the endurance test, the team scrambled to get their car race ready. "We had some problems with the fuel regulator and missed two events, but we managed to come back and do something the club has never done before," said Culbertson, who was also one of the drivers in the endurance event, along with teammate Jon Earnist. Overall, the UA team finished 40th out of the field of 80.

The race crew at the event included nine of the entire club membership of about 15. "We can always use new members," said Culbertson. The 80 teams in this year's Formula SAE Collegiate Design Series hailed from Brazil, Canada, China, India, Japan, Mexico, UK, USA, and Venezuela.

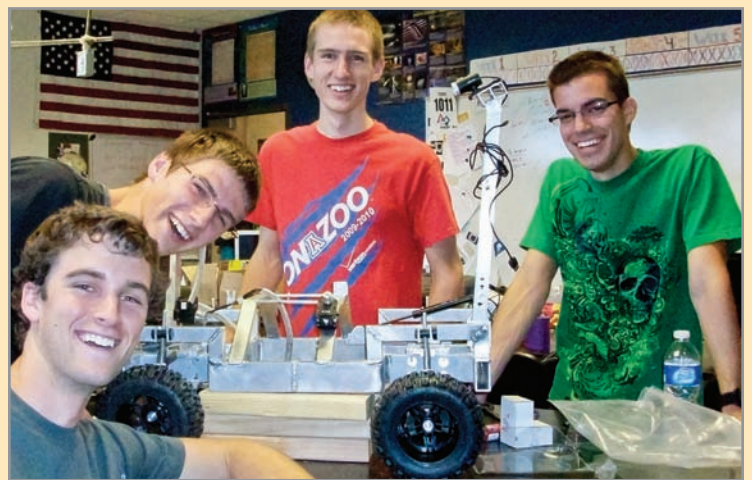
## UA Student Robotics Team Among Best in U.S.

UA Engineering students recently won \$10,000 funding to compete in a new NASA robotics competition.

Only seven teams in the nation qualified for the National Institute of Aerospace award, which enabled them to design and build a planetary rover and demonstrate its capabilities at the NASA Johnson Space Center's Rock Yard in Houston.

NASA and the NIA established the new student rover competition, snappily titled Revolutionary Aerospace Systems Concepts, Academic Linkage, Exploration Robo-Ops, aka Rascal, to test the robot-building skills of university students, and to spark interest in planetary rovers and robotics. The competition required the rover to negotiate obstacles and traverse difficult terrain, and to identify and collect various colored rocks while being controlled via broadband from mission control at UA.

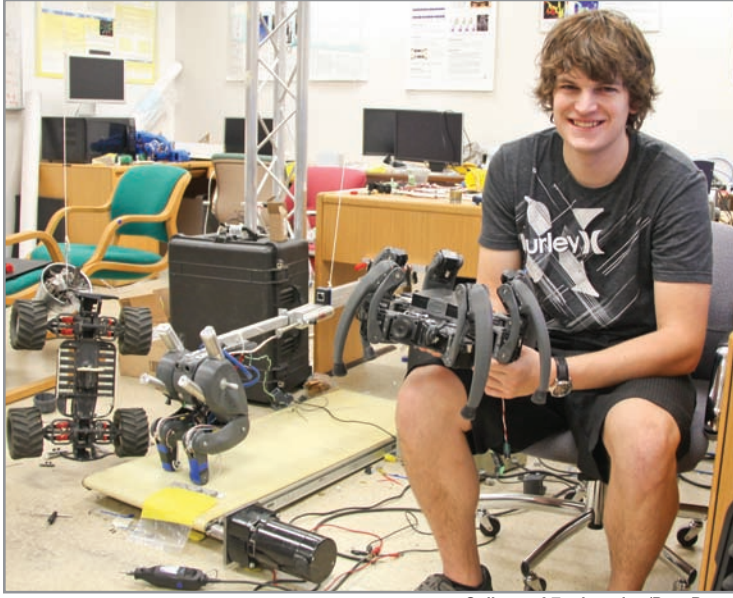
Teams also had to submit a technical paper to support their rover projects, and the UA team scored the highest among the seven finalists for its technical paper.



Courtesy of Brandon Pitts

**Roboticists**—The rover and some team members, left to right: Lane Ellwood, Jesse Odle, Jordan Odle, and Brandon Pitts.

"This was our first time in a robotics competition," said Brandon Pitts, Rascal team member and aerospace engineering junior. "We were competing against teams that had master's and PhD students, so we were shocked when we got the highest score for our paper."



College of Engineering/Pete Brown

**Run, Robot, Run**—Matt Bunting holds the hexapod robot that has created a huge buzz among robotics fans. A prototype of Bunting's latest project, robotic cheetah legs, can be seen lower left.

## Industry Media Group Names ECE Robotics Whizz Student of the Year

Electrical and computer engineering graduate Matt Bunting was named student of the year at the Annual Creativity in Electronics awards for his design of a six-legged robot.

The ACE awards were held May 4 in Palo Alto, Calif., and organized by Electronic Engineering Times, a leading industry publication with more than 500,000 subscribers worldwide. Bunting's hexapod robot has been wowing robotics fans and the electronics industry since he built it as a class project in 2009 while still an undergraduate in electrical and computer engineering.

Bunting graduated in 2010, and is still in electrical and computer engineering on a direct-to-PhD program with a robotics focus. "I'm interested in robot locomotion that emulates biological movement," Bunting said. "And in doing more work on robotic vision."

He attributes his ACE award to the fact that EE Times was looking for innovation, and liked the way he used the robot in class projects to explore machine learning.

Bunting's current research, which is funded by DARPA, includes designing a pair of robotic cheetah legs, which he hopes will lead to an attempt to break the robot land speed record. It's early days and Bunting has so far only designed a scaled down version of artificial legs that mimic the world's fastest land animal. "If we scale it up," Bunting said, "I think we can actually achieve 70 mph."

## Rare Distinction Conferred on UA Engineering Regents' Professor



Chandra Desai

Regents' Professor Chandrakant S. Desai of the civil engineering and engineering mechanics department has been made a distinguished member of the American Society of Civil Engineers.

Distinguished ASCE members are recognized for their eminence and worldwide reputation of outstanding

leadership and research activities in engineering, and are elected by the ASCE board of directors.

The honor is second only to becoming ASCE president. Fewer than 200 of ASCE's 146,000 living members have been made distinguished members, and only 601 have been similarly honored in the 159 years since the society was founded.

"I am happy to be recognized with such an honor," said Desai, who was formally inducted as a distinguished



member Oct. 20 at ASCE's 141st annual conference in Memphis, Tenn. "This honor is also a tribute to many interdisciplinary contributions made by the civil engineering and engineering mechanics department at the UA," Desai said.

Specifically, Desai is being honored for his seminal contributions to the field of interdisciplinary geomechanics. Particular note was made of his innovative approaches to modeling and computational mechanics, and his development of new lab test devices. The honor also recognizes his work in establishing an international association and two international journals, and for educating prominent civil engineers.

Desai is regarded as an outstanding teacher at all levels. In addition to the many graduate students he has advised, he has participated in and promoted special mentoring programs for undergraduates and high school students. He has received a number of awards for his dedication to and excellence in teaching.

Over the years, Desai has received much national and international recognition, recently including the 2009 Nathan Newmark Medal awarded by the Structural Engineering Institute and Engineering Mechanics Institute, and the 2007 Karl Terzaghi Award by the Geo-Institute of the ASCE.

## Engineering Psychology

Ricardo Valerdi, recently appointed associate professor in the UA department of systems and industrial engineering, is a systems engineer and an expert in the growing field



**Ricardo Valerdi**

of enterprise transformation and cost estimation. He received his bachelor's in electrical engineering from the University

of San Diego in 1999, and his master's in systems architecture and engineering in 2002 from the University of Southern California, where he got his doctorate in industrial and systems engineering in 2005.

That Valerdi is enrolled at Harvard, where he's pursuing a master of liberal arts in psychology, speaks volumes about this emerging field of engineering. He joins UA Engineering from MIT's System Design and Management program.

"Engineers do not typically consider the psychological aspects in the design and scope of a project," Valerdi said. "They are trained to understand the math behind their decisions, not human dimensions such as optimism."

"This is a major leap forward for UA Engineering," said College of Engineering Dean Jeff Goldberg. "Ricardo has stellar corporate and academic experience, and his achievements and unique approaches to tough problems in systems engineering will propel UA to be a significant leader in this emerging area."

## UA Engineers Patent Protein-Based Microchips



**Pierre Deymier**

Engineers at UA have patented a process that could lead to the next big leap in microelectronics, completely changing the way microchips are made.

The bioengineering breakthrough patented by researchers at the UA College of Engineering is used to build microscopic wiring circuits made of copper insulated by proteins.

Through a combination of biological processes and electroless copper deposition, the research team has created tiny wires based on proteins called microtubules, aka MTs. These tubes have an inner diameter of 15 nanometers and an outer diameter of

25 nanometers, and can grow to lengths of several micrometers. Red blood cells have a diameter of about 8 micrometers, a distance in which 320 MTs could be lined up side-to-side.

The key component of this patent is the ability to deposit copper inside the nonconducting MTs to make tiny insulated wires, said Pierre Deymier, a professor of materials science and engineering and one of the UA faculty who invented the process. Deymier is also director of the School of Sustainable Engineered Systems. Co-inventors include Ian Jongewaard, James Hoying, Roberto Guzman and Srinu Raghavan.

The next step is to apply this nanowire research to devices and manufacturing processes. "We would be happy to see people license this technology to develop microchip manufacturing processes or any other related processes," Deymier said.

## UA, Industry Partner on New Water Lab

Shane Snyder of the department of chemical and environmental engineering is working with Agilent Technologies and the BIO5 Institute to advance current detection methods for emerging waterborne contaminants. The resulting improvements in the level of contaminant detection will guide future engineered water use and reuse strategies, and help protect public health and the environment.

"Not only will we investigate known potential threats to water quality, we'll bridge the gap between detection and health effects with the development of original methodologies designed to screen water for toxicity from multiple compounds, using similar action," Snyder said.



**Shane Snyder**

The partnership allows the UA to expand its role influencing water reuse and desalination strategies by providing assurance that the required

water quality has been achieved for its intended use, said Snyder. The concept of addressing contaminants in potable water as mixtures, as opposed to individual chemicals, is of great interest to the regulatory, scientific and public health communities.

The collaboration also provides the UA and BIO5 with unique analytical capabilities. Nearly any imaginable trace organic and inorganic contaminant can be detected and analyzed by the new Snyder lab, allowing for an ultra-comprehensive analysis of water.



Roberto Furfaro admires the mural on the wall of LPL's Osiris-Rex operations center, location of his Space Systems Engineering Laboratory.

College of Engineering/Pete Brown

## Mission: Possible or Impossible? UA Space Systems Engineer Has the Answer

Our solar system is becoming a familiar backyard, thanks to UA's Lunar and Planetary Lab, a world leader in interplanetary exploration.

LPL's Phoenix Mission to Mars scooped up the first evidence of water-ice on the Red Planet, and its HiRISE camera continues to beam stunning images of the Martian landscape back to Earth. LPL leads the billion-dollar Osiris-Rex mission, which will launch in 2016 and bring back a pristine asteroid sample in 2023.

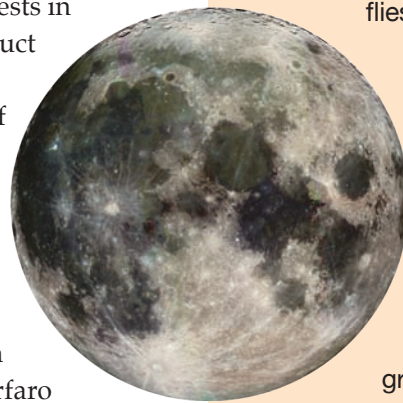
While science drives these missions, engineering expertise is essential to their success, and assistant professor Roberto Furfaro, of UA's systems and industrial engineering department, is among those providing vital in-house support for LPL efforts.

Furfaro's Space Systems Engineering Laboratory, a collaboration between Furfaro, his students, LPL and Raytheon, helps scientists plan missions, design spacecraft and run simulations.

The simulations can create multiple "what-if" mission scenarios, and operation-readiness tests in which scientists conduct dry runs of daily operations to head off problems before the real mission starts.

Developing an optimized mission plan and designing spacecraft starts with the science goals, Furfaro explained. Then it's a matter of finding an efficient trajectory that uses the least propellant to reach the target planet or asteroid.

"You have propulsion systems, attitude and control subsystems, structural considerations, power systems and communications needs," Furfaro said. "This all translates into a delta-V budget, which determines how much propellant you need, which determines how big the fuel tanks need to be and whether that results in a viable spacecraft."



## UA Engineer and Moon Team Eye \$30 Million Google Prize

When the autonomous guidance system Furfaro and his colleagues are developing flies the privately funded Moon Express lander to the lunar surface in 2014, the lander will touch down to within 10 meters of its target, and may simultaneously capture the Google Lunar X Prize.

The \$30 million X prize will go to the first privately funded group to land a spacecraft on the moon and deploy a robot, which must travel 500 meters and send back an image and data to Earth.

Furfaro calls this kind of rocket-assisted soft landing a "very difficult and exciting project."

"Roberto's guidance algorithm will take over with three minutes to go before landing," said Tom Gardner, chief engineer at Moon Express. "There is a big rocket burn that slows us way down to about 50 or 60 miles per hour. His guidance takes over and that's at about three miles above the surface. It takes us from there to a very precise point on the surface."



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# Red, Blue & Bold

The UA Alumni Association chose this year's Homecoming theme of Red, Blue & Bold to celebrate UA's bold roots and brilliant future. The College of Engineering matched that spirit with a series of alumni events and a showcase talk.

Almost 400 alumni attended the 48th annual Engineers Breakfast Nov. 4, where Engineering Student Council President Jose Estrada introduced the proceedings. He congratulated the department of electrical and computer engineering for having the greatest number of alumni at the breakfast (75), and noted that 21 separate degree subjects were represented among the alumni gathered for breakfast. Guests included Jacqueline Mok, senior vice president



for academic affairs and provost, and Melinda Burke, president and executive director of the UA Alumni Association. Engineering Dean Jeff Goldberg delivered a state of the college address, during which he pointed out some of the many successes the college has enjoyed recently (see Dean's View on page 2). During his talk, Goldberg premiered a new video about Design Day, which can be viewed on the College of Engineering YouTube channel at [www.youtube.com/uaeng](http://www.youtube.com/uaeng).



**Homecoming Honors**—The UA Alumni Association at the Engineers Breakfast. The Alumnus of the Year, the founder, chief technical officer, and chairman of the on the left in the above picture, with College of Engineering was made in absentia to Ray Haynes (BS/AE 1967, M university strategic technical alliances at Northrop Gr



**Class Act**—Nine alumni from the class of 1961 attended, and seven of them posed for a group shot. From left to right are Theodore Polychronis, Frank Scussel, Richard Bartholomew, Marylyn Schumann Tobey, Gene Tobey, Matthew McDole Jr., and Gordon Shipp.

College of Engineering/Pete Brown





College of Engineering/Pete Brown

and the College of Engineering honored two alumni Award went to Vahan Garboushian (BS/EE 1966), the board of directors of Amonix Inc. Garboushian is Engineering Dean Jeff Goldberg. The Bear Down Award (MBA 1970), who recently retired as director of Humman Corp.



**Presidential Address**—Much of the emcee work at the Engineers Breakfast was done by Jose Estrada, above, president of the Engineering Student Council and a systems engineering junior. He quipped in his introductory remarks: “I have approximately 554 days, 6 hours, and 32 minutes remaining until spring 2013 graduation... but who’s counting?”

## The Secret Life of Paintings

The 2011 Collegiate Showcase featured a talk by materials science and engineering assistant professor Rob Erdmann on image analysis he’s conducted that has revealed new histories of old masters.

Historically significant paintings by such masters as Vermeer, Matisse, Monet, Renoir, Rembrandt and Van Gogh are being re-examined by an advanced image processing technique developed by Robert Erdmann, materials science and engineering assistant professor, in collaboration with researchers at Cornell and Rice universities and numerous museums around the world.

In fact, some 53 museums are collaborating with Erdmann’s project, resulting in the re-examination of more than 600 paintings using nearly 4,000 x-rays. The new image-processing techniques help reconstruct paintings from partial historical photographs, find accurate chronological sequences in which artists such as Van Gogh produced paintings, and reveal sketches underneath famous works.



Rob Erdmann

Erdmann and his colleagues can also look at how canvases were mounted onto various frames during their lifetimes, determine which paintings

originated from the same piece of canvas, or even identify whether the work was cut down or added to at some point in time.

Such image processing helps art historians piece together missing clues about lost works and provide a clearer understanding of the artist’s original intentions.

“We provide the data,” Erdmann said. “It’s up to the art historians and curators to draw conclusions.”

## Good at Being Wrong

Dave Lowell (BS/MinE 1949), who has lent his name to UA’s Lowell Institute for Mineral Resources, gave the sixth Annual Lacy Distinguished Lecture. Lowell is known around the world in mineral explorationist circles for his 50-year career during which he has discovered some of the biggest mineral deposits on the planet. Lowell’s humorous talk was on the contrarian approach to mineral prospecting, which seems to have worked well for him over the years. “Ignore dogma and take risks,” he



Dave Lowell

said. “Being good at being wrong may be my most outstanding talent.” In response to an audience question about getting into mineral exploration, his advice was: “Get involved with one of the smaller, faster-moving, shoot-from-the-hip junior companies.”

## UA Engineering Research Wows Thousands at Arizona Best Fest

UA Engineering was a big hit at the Arizona Best Fest, which took place Sept. 16-18 in Prescott, Ariz. The University of Arizona exhibit was packed solid even before doors officially opened as thousands of festival goers piled into the Science and the Future Pavilion to view hi-tech, hands-on demonstrations by UA students and faculty.



The Arizona Best Fest is a series of three festivals organized by the Arizona Centennial Commission to celebrate Arizona's first 100 years of statehood. The first festival, in Prescott, will be followed by similar events in Tucson, in January 2012, and Phoenix, in February 2012. By some estimates, 100,000 visitors descended on Prescott to attend the Best Fest.

UA Engineering shared the Science and the Future Pavilion, sponsored by a generous gift from a UA supporter, with the College of Optical Sciences, Biosphere 2, the College of Science, Steward Observatory Mirror Laboratory, and the College of Medicine, Phoenix.



College of Engineering/Pete Brown

**All the World's a Stage**—Professor Wolfgang Fink, right, and ECE grad student Alex Jacobs take to the stage and demo a pair of Fink's planetary rovers before a crowd of Arizona Best Fest attendees in downtown Prescott, Ariz.

UA College of Engineering projects on display were Wolfgang Fink's planetary rovers, Matt Bunting's hexapod robot, and the solar-powered car built by Arizona Solar Racing. Fink and Bunting are both in electrical and computer engineering; the solar racing team are part of AzRISE, the Arizona Research Institute for Solar Energy.

## Robotic Mine Vehicles

CONTINUED FROM PAGE 1

"It's amazing what happens when you say, 'Here's our goal, here are the resources, now go for it,'" said Sean Martinez, a systems engineering master's student and teaching assistant for the course. "This is what engineering is truly about. The enthusiasm was wonderful. The students just said, 'This is what we want to do. Let's make it happen.'"

The autonomous vehicles, which replace human drivers with computer control, satellite navigation and robotic vision, were originally part of a research program at Freeport-McMoRan in Safford, Ariz.

"Their mine technology group has been pursuing autonomous vehicle programs, and they asked if we could use some of the equipment they finished testing in 2008," said Mary Poulton, director of the



Lowell Institute for Mineral Resources, which worked with Freeport-McMoRan to set up the equipment donation to UA. IMR is collaborating with the Science Foundation of Arizona, the mining industry and Arizona's universities to build a global center of mining excellence.

Larry Head, who teaches ENGR 450/550; Jonathan Sprinkle of the electrical and computer engineering department; and Ricardo Sanfelice of the

aerospace and mechanical engineering department are all conducting research related to autonomous vehicles, and they saw this as an unmissable opportunity to give students hands-on experience with the latest, bleeding-edge technology.

Tucson Embedded Systems stepped in and offered space to house the equipment and a place for students to work. Then it was just a matter of loading five 4x8x3-foot crates of hardware and two 7,500-pound vehicles onto a semi and transporting them to Tucson.

"The vehicles had been sitting for two years, and didn't start or run," Martinez said. "The communications equipment was inoperable. None of the control software was correct for what we were doing. The hardware was all there, but nothing worked." And some important things were missing, such as a complete wiring diagram for the vehicles.



Michigan Technological University/Kurt Paterson

**Test Audience**—Watched by curious children, PhD student Aminata Kilungu, kneeling, and Linda Powers, right, use a portable analyzer to test water samples from Tanzania’s Kilombero River.

## UA Engineer Goes Back Country Biking in Tanzania to Test Local Water Sources

There are few sanitary facilities and no municipal water system in this remote Tanzanian town. Ifakara and the surrounding region get water from open wells, the Kilombero River, and more than 100 deeper wells.

Most of the open wells are hand-dug, shallow, and prone to contamination, while the drilled wells, which are capped and topped by hand pumps, can provide pathogen-free water. Despite their humble appearance, these hand pumps, and the wells below them, can be critical to public health.

MSABI, a nonprofit, nongovernmental organization that drilled many of the wells, wants to determine which are polluted so they can be fixed or shut down. To do this, MSABI teamed with a group from Michigan Technological University to sample the wells. MTU researchers, in turn, turned to UA for help.

That’s how Linda Powers and PhD student Aminata Kilungo ended up bicycling to various Ifakara water sources in July. They were out cycling and testing for as much as 15 hours a day, with their instrument and a laptop computer tucked in backpacks. On site, they set the instrument above a plastic tub of water, hooked up the computer, and focused light (ultraviolet, amber and red) on the water samples, looking for the telltale fluorescence emitted by bacteria.

No need to laboriously label samples or to transport them to the lab for incubation. The instrument designed by Powers provides results on-site in real time.

## Jumbo Gift for UA Mining Lab

Mining engineers at the UA College of Engineering are the proud new owners of a 40-foot-long monster drilling rig, thanks to industry partners Asarco and Atlas Copco.

The diesel-powered mobile drilling vehicle, known in the mining industry as a “drill jumbo,” will be used by mining

**Ae FULL STORY** engineering students to carve out new tunnels at the UA’s San Xavier Underground Mining Laboratory, about 23 miles south of Tucson, Ariz.  
Number 331

The drill jumbo was formally donated to the San Xavier Mine Aug. 11 by Asarco president Manuel Ramos, and Steve Holmes, UA mining engineering alumnus and general manager at Asarco’s copper- and silver-producing Ray mine near Kearny, Ariz.

Asarco operated the drill jumbo for more than 10 years at the Ray mine, but the rig fell into disrepair and languished in the mine’s truck yard for a few years until Holmes decided it was a waste of good equipment and could be benefit his alma mater.

To refurbish the drill jumbo and make it once again fit for use, Holmes enlisted the help of the Tucson division of mining services company Atlas Copco, whose service engineers train Asarco’s equipment operators and keep the Ray mine’s fleet of heavy duty vehicles safe and operational.

“The drill was sitting around for a while, so I saw a use for it,” Holmes said during the donation ceremony at the San Xavier Mine.

The restored drill jumbo at the San Xavier mine.



Photo: Pete Brown

## Nick R. Schott

MS/ChE 1968, PhD/ChE 1971

*Schott credits his success and his current position as emeritus professor at the University of Massachusetts Lowell to the camaraderie and training he received at UA Engineering.*

### How has your UA education benefitted you?

My whole career as a university professor was only possible because of my education, earning a PhD degree at the UA. The doctoral degree was a basic requirement for my position in academia. I was fortunate to meet up with Don White, who founded the chemical engineering department in 1965. He offered me a one-quarter teaching assistantship, which allowed me to finish my first year of graduate studies. Earlier that year I had finished my BS/ChE at UC Berkeley, and I was surprised to see fellow Berkeley alum, John Heibel, also start graduate school with me at the UA in the fall of 1965.



Courtesy of Nick Schott

**Group Schott**—Nick Schott, center, is flanked by UMass Lowell chancellor Marty Meehan, left, and associate chancellor Jacqueline Moloney.

When I started my teaching career at the predecessor institution to UMass Lowell, the Lowell Technological Institute, the director of job placement, Aristomenes Panos, claimed that the only reason I got into graduate school was that Don White had a quota to take two hippies from Berkeley each year!

### What are your reasons for supporting UA financially?

I have great loyalty to the UA and the chemical engineering department. The department was a close-knit family and we had some exceptional professors. They all encouraged students, instilled professionalism, and celebrated students' achievements.

### What are your hopes for the future of UA?

The UA was chartered as a land grant college. As such, its mission is to support the state, regional and local economy and social development. I believe the UA has to live up to that charter and help the state grow its economy and provide leadership and skilled graduates for the local economy. In particular, engineering has to seek out the new areas that provide solutions to problems that we face in technology, the environment and in social issues.

Edited for length. Read the full version online at: [www.engineering.arizona.edu/news/alumni.php?id=75](http://www.engineering.arizona.edu/news/alumni.php?id=75)

## Nathan Palmer

BS/CE 2003, MS/CE 2005

*Alumni Nathan and Karen Palmer remember their journey at the UA and want to keep that spirit alive by supporting the college.*

### How has your UA education benefitted you?

Beyond being crucial to our professional success, our education at the UA encompassed more than books and degrees. We felt the UA was such a wonderful blend of all people, and we made friends of many cultures, countries and religions. This taught us both how big the world is, and what a small world we live in.

### What are your favorite memories from your time at UA?

Karen's favorite thing to do was to take a jog around the UA Mall in the evenings. That would always help her clear her mind, give her peace, or energize her. Some of my favorite memories were from the ASCE engineering competitions in California.

### What are your reasons for supporting the UA?

The students of today are the future. They will be responsible for an array of advances and technologies that we will grow to rely on and eventually won't be able to live without. But they need our support. We had reservations at first because we didn't know if we were financially ready to make this commitment. But we were reminded of our undergraduate and graduate days, and how there were many years when we only had \$20 a week for food and gas. We realized that a financial contribution to our students is not just a commitment, it's an investment in that future we believe in. It allows them to concentrate on their studies by relieving them of some of the financial burdens they face. It's simply a way to give back.

### What are your hopes for the future of UA?

We hope to see the UA on the cutting edge of science and technology as a



The Palmers

premier research university in the country, making celebrated advances in areas such as engineering and medicine.

### Describe something remarkable or noteworthy you have experienced since graduating.

Parenthood. We know in today's society that answer might be antiquated, boring, and even offensive to some. But we have been blessed with two fantastic sons whose temperaments are like night and day. They have truly enriched our lives.

Edited for length. Read the full version online at: [www.engineering.arizona.edu/news/alumni.php?id=74](http://www.engineering.arizona.edu/news/alumni.php?id=74)



College of Engineering/Pete Brown

**Helping Hands**—Sylvia and Herb Burton stand behind scholarship fund recipients Ashley Anhalt, left, and Ali Baier.

## Herb Burton

### BS/Engr Math 1960

*The retired executive director of AT&T Bell Labs talks about his time at UA and why he gives back to the college he greatly appreciates.*

#### How has your UA education benefitted you?

The best benefit was that it enabled me to get a job at Bell Labs. Fortunately, the UA was one of the engineering schools that Bell Labs recruited from.

#### What are your favorite memories from your time at UA?

I met my wife here and we got married before we graduated. We were poor as church mice: tiny apartment, no telephone, no TV, but we had a lot of fun.

#### What are your reasons for supporting UA financially?

I was the first in my family to go to college. My parents hadn't been to college. Fortunately, tuition for residents was zero. All I had to pay for were books and lab fees, my car, insurance, etc. I worked all of the time I was in college, sometimes as

many as three part-time jobs. I was also fortunate also to get some financial support from the UA. So, in a sense, it is paying back. The students I have helped to support with scholarship funds and through the da Vinci Circle are delightful. It gives Sylvia and me a great deal of satisfaction to help.

#### What are your hopes for the future of UA?

I think the UA has done remarkably well in maintaining excellence as the state has provided less and less support. For example, the College of Engineering continues to attract an incoming freshman class with the highest SATs.

#### What else would you like readers to know?

There is so much to enjoy as seniors living near the University of Arizona: the Distinguished Lecture Series; humanities seminars; dance, music and theater in UA Fine Arts; annual science lectures in the spring; Steward Observatory Public Evening Series lectures.



## Steve Holmes

### BS/ME 1983

*Steve Holmes and his employer, Asarco, were behind the gift of a 40-foot drill jumbo to the San Xavier mining lab. He recently left Asarco and headed for Chile, where he will lead the construction, commission and operation of a large copper and molybdenum mine.*

#### How has your UA education benefitted you?

The UA gave me the engineering and social skills to be a successful problem solver and communicator. It taught me that working hard to do well academically pays off and opens all types of life opportunities.

#### What are your favorite memories from your time at UA?

Football games, passing tough tests, meeting all kinds of different people, painting Wildcat footprints across campus, and just having a blast!

#### Tell us something about yourself that people might be surprised to learn.

I married my high school sweetheart, who attended UA on a track and field athletic scholarship, and who is also a Golden "A" award winner. Keeping the tradition of being a Wildcat, my oldest daughter, Mandy, was a UA cheerleader – Go Cats!

#### Describe something remarkable or noteworthy you have experienced since graduating.

That your university experience is just the beginning of what the world has to offer. In working in many countries you learn to appreciate the opportunities we have in the United States. It's too easy to take what we have for granted.

#### What are your hopes for the future of UA?

I hope the UA maintains its rich traditions of providing a terrific learning opportunity plus the diverse social networks that thrive there. I hope that the state of Arizona is willing to support this unique land grant university and that the university doesn't become driven mostly by private funding. Small niche programs give the UA much of its great character and history, and need to be supported.

• See page 11 for the drill jumbo story

## Michael Reader BS/GeoE 1985

Michael Reader was named as CEO of Group Delta Consultants Inc. in 2008. "Since 2008, Group Delta has become the fastest growing geotechnical engineering company in the western US," Reader said, adding that the company now has six offices and more than 150 employees in California and Washington. Mike is married to UA alumna Betsy Guinn Reader, who graduated in 1985 with a bachelor's in communications. Their daughter, Sarah, is a business and sports marketing junior at UA. The Reader family, who live in Torrance, Calif., recently went on an 8-day rafting trip in the Grand Canyon to celebrate Mike's 50th birthday. The picture was taken at Lee's Ferry on the Colorado River in Arizona.



Courtesy of Mike Reader

**Down by the River**—The Readers, from left: Mike, Laura, Betsy, Nick and Sarah.

## DONOR PROFILE

### Gregory A. Lorton

BS/ChE 1971, MS/ChE 1973

*Lorton works for the Naval Facilities Engineering Command as manager of the air quality team, and for the Navy Region Southwest as the air quality program manager.*

#### How has your UA education benefitted you?

The emphasis on practicality in both degree programs was important to me at several stages in my career. The lessons learned from the process design class project allowed me to make significant contributions in my first job assignment, and this led to a promotion within a year of starting on the job.

#### What are your favorite memories from your time at UA?

Three of us in the 1971 class stayed on at UA to get our master's degrees. Through these years we studied together and socialized together. It was not uncommon for the majority of us to break from study sessions in the afternoons to go over and pick up a baseball game at what was to become

Sancet field. I made a lot of good friends in grad school.

#### What are your reasons for supporting UA financially?

I am appreciative of the practical aspects of the engineering education that I received at UA. But probably more so, I received a scholarship during my MS program that covered tuition costs and waived out-of-state tuition, since I was a California resident. Because of that scholarship, I have felt obliged to support the UA.

#### Tell us about your hobbies and pastimes.

My current interest is narrow-gauge railroads. But my biggest passion is in making and enjoying beer and mead. I have been making beer and mead for 25 years, and I'm a registered beer judge.

#### What are your hopes for the future of UA?

When I graduated and got a job in L.A., most people were more familiar with ASU than UA, primarily because of ASU's success in athletics at the time. But since then, I've seen a gradual increase in public stature both



Greg Lorton

in academics and research, and in athletics. It's great to see the success that UA has had in many sports, but I am most proud when I see the school prominently positioned in academics and research.

#### Describe something remarkable or noteworthy you have experienced since graduating.

On the homebrewing front, I received national gold medals for a traditional mead and a German dark lager in 2001, a Baltic porter in 2005, and a classic American pilsner in 2006.

Edited for length. Read the full version online at: [www.engineering.arizona.edu/news/alumni.php?id=72](http://www.engineering.arizona.edu/news/alumni.php?id=72)

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**Dave Few**  
**BS/ME 1954**

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Dave Few retired from NASA's Ames Research Center as associate director of aeronautics for flight projects in 1989, and from part-time consulting for Boeing in 1993. Few and his wife, Kathleen, sold their 36-foot sailboat in 1994 and downsized to a 25-foot Cal. "Kathleen and I still wanted to race and the 36-footer was getting to be a bit much for us," Few said. "The little Cal boat is much easier on us as I complete my 80th trip around the sun with Kathleen close behind." The Fews live in Burlingame, Calif., and keep the boat just south of San Francisco International Airport at Coyote Point Marina about 5 miles from home, and have a waterfront home on Bethel Island in the delta region of the central valley. Dave is still an active member of the San Francisco Bay Yacht Racing Association, and for six years chaired the performance handicap racing fleet committee, which rates the speed potential of sailboats and assigns a handicap rating in seconds per mile.

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**Tony Serksnis**  
**MS/ME 1977**

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"I have a passion for USTA tennis, which resulted in publication of my book, *A Player's Guide to USTA Tennis*, and a signing at the U.S. Open in September," Serksnis said. New Chapter Press published Serksnis' book in May 2011. "I'm happy it's out there getting

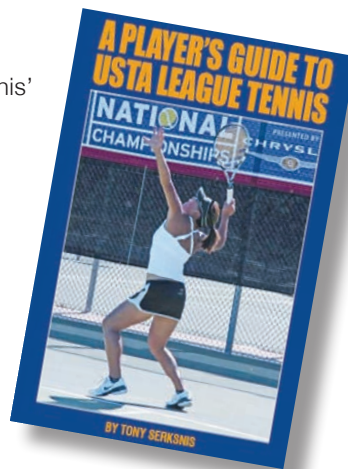


Courtesy of Dave Few

**Few Two**—Dave and Kathleen Few, left, in their Burlingame backyard overlooking San Francisco Bay; and on the bay itself, right, in their 25-foot Cal sailboat.

read," he said. Serksnis is a mechanical engineering manager for Trimble, and has run more than two dozen marathons, including Boston, New York, and Big Sur.

Tony Serksnis' new book



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**Jerry Fossum**  
**BS/EE 1966, MS/EE 1969, PhD/EE 1971**

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Fossum is currently distinguished professor emeritus of electrical and computer engineering at the University of Florida, Gainesville. "I've been at the University of Florida for 33 years," said Fossum. "I was at Sandia Laboratories for seven years prior to moving to Gainesville, Florida, in 1978." Although Fossum recently retired from classroom teaching, he still directs the research of PhD students, and is on the advisory board of a solar-cell start-up company, AstroWatt, which aims to reduce the cost of solar cells by using an ultrathin silicon metallic substrate. "I enjoy the Arizona Engineer!" Fossum said.

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