

ARIZONA ENGINEER

COLLEGE OF ENGINEERING

VOLUME 47

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SUMMER 2024

COLLABORATION

How Teamwork Keeps the College Strong



INSIDE THIS EDITION



12 Robots Build
Termite-Inspired
Lunar Housing

PLUS

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Grateful for Powerful Partnerships

Every day the Wildcat Engineering team leverages hundreds of relationships to ensure students receive a quality education and have strong career opportunities.

DEAR ALUMNI AND FRIENDS,

As the college completes one of its most successful years ever, I hope you enjoy learning about how teamwork has played into every accomplishment. From more and better hands-on academic programs to life-changing research and far-reaching economic contributions, the spirit of collaboration is making UA Engineering a powerful force for change.

Seniors at the annual Craig M. Berge Design Day, for example, shared their real-life projects – the results of nine months of dedicated teamwork – with the world. Competing for nearly \$50,000 in sponsored prizes, they joined mentors, project sponsors, judges and volunteers in a day of celebration.

In spring 2024 the college graduated nearly 600 Wildcat engineers and at Admitted Students Day welcomed about 800 undergrads. It's always inspiring to see the energy of our incoming students, and the confidence and camaraderie of our newest graduates.

United in Education, Research, Service

This issue's theme of collaboration demonstrates ways the college is uniting with others to advance its missions of education, research and service.

Mark Van Dyke, associate dean for research, reports on a year of explosive growth in which hundreds of campus, government and industry partners as well as collaborative engineering hubs and centers have taken center stage.

The Cancer Engineering Initiative's pioneering work in personalized treatment is one example of what campuswide collaboration can accomplish. In fact, two of the college's most recently hired faculty members are dedicated to the initiative.

All for the Betterment of Humankind

While we are indeed proud of the growth, record funding and life-improving research, throughout the college we never lose sight of overarching goals: primarily, a top-tier, hands-on engineering education that positions today's students to lead the betterment of humankind.

To that end, Liesl Folks, university vice president for Semiconductor Strategy, discusses how the university is leading efforts to meet workforce needs in a crucial industry. Additionally, with its MateriAlZ program, the college has joined with ASU and industry to help connect students with materials science jobs.

Leadership Changes, Votes of Confidence

President Robbins, who has been a proponent of the college during this unprecedented five years of Engineering advancement, announced in April that he would not continue beyond his term. We look forward to working closely with him through the remainder of his tenure.

Speaking volumes to the college's ongoing importance at the university and in the state, I am honored that the Arizona Board of Regents has appointed me to the search committee for his successor.

Standing Strong, Together

Alumni, friends and partners are a tremendous factor in the college's successes. The achievements of faculty members and students who are supported through scholarships, fellowships and organizations such as the Society of Hispanic Professional Engineers are truly inspirational.

On behalf of the entire college team, thank you for your generosity and support. With your help, faculty, staff and students are standing strong. Wishing you a safe and wonderful summer. Go Cats and Bear Down!



David W. Hahn
Craig M. Berge Dean, College of Engineering



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COVER PHOTO

COLLABORATION



Wildcat engineers form ties across sectors to build a better world.

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Some articles in this print magazine are edited for length. Please visit news.engineering.arizona.edu for more stories, photos and videos.

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The University of Arizona is an equal opportunity, affirmative action institution. The university does not discriminate on the basis of race, color, religion, sex, national origin, age, disability, veteran status, sexual orientation, gender identity, or genetic information in its programs and activities. We respectfully acknowledge the University of Arizona is on the land and territories of Indigenous peoples. Today, Arizona is home to 22 federally recognized tribes, with Tucson being home to the O'odham and the Yaqui. Committed to diversity and inclusion, the university strives to build sustainable relationships with sovereign Native Nations and Indigenous communities through education offerings, partnerships, and community service.

Da Vinci Circle Fellow **Philipp Gutruf** Takes Atypical Route to Higher Ed

Developer of wearable and implantable medical devices ‘loves to bring people up with him.’

AS A BOY in the Black Forest area of Germany, Philipp Gutruf got his start tinkering on mopeds and electronics in the garage of his family home.

“That is not necessarily your typical academic path – getting the hands dirty,” said Gutruf, associate professor of biomedical engineering and associate department head of undergraduate affairs. “That gives you a different perspective on how you approach scientific problems.”

Now he is using that perspective to revolutionize health care with biomedical sensors for inside and outside the body. In recognition of these advances and his dedication to mentoring students, the college chose him as the 2024 da Vinci

Fellow. The award comes with a one-time grant of \$10,000, thanks to generous da Vinci Circle donors.

“We can do therapy now that is absolutely tailored to the condition of your rehabilitation.”

PHILIPP GUTRUF, 2024 da Vinci Fellow and associate professor of biomedical engineering

Personalized Health Care

“We are interested in capturing the state of the body very accurately to treat, monitor and mitigate disease,” said Gutruf, also a member of the BIO5 Institute.

His implantable devices are at the forefront of how medical professionals will measure signals

from internal organs. One wireless, battery-free sensor illuminates neuron damage, while “sticker” sensors provide real-time measurements of a broken bone’s healing progress – without the need for scans.

“We have X-ray and CT scans, but that’s been around for 20 years,” he said. “We can do therapy now that is absolutely tailored to the condition of your rehabilitation.”

Gutruf also pioneered a 3D-printed, personalized, wearable device that provides information with clinical-grade fidelity. The soft, mesh-like sensors continuously monitor biological signals and securely transmit data to health care providers up to 15 miles away.



Philipp Gutruf says donors’ gifts ‘allow professors to put students into engineering dreamland.’

“He makes them convenient, comfortable, inexpensive – just available to everyone, which is what we need,” said Jennifer Barton, BIO5 director, Thomas R. Brown Distinguished Chair and biomedical engineering professor, who has been a mentor to Gutruf.

Hands-On Learning

Throughout his career, Gutruf has perhaps been most passionate about mentoring his students, to ensure they get the opportunities for research and hands-on learning he received.

“He loves to bring people up with him,” said Barton. “I hope someday I’m as good a teacher as Philipp is.”

Awards such as the da Vinci Fellowship and philanthropic gifts, including the Peter and Nancy Salter Medical Device Design Lab, give Gutruf the resources to teach students how to build, experiment and test their own wearable sensors.



GUEST COLUMN

by **Liesl Folks**

*UA Vice President, Semiconductor Strategy
Director, Center for Semiconductor Manufacturing
Professor, Electrical & Computer Engineering*

*Partners across the state
have agreed to share
resources to ensure
coordinated movement for
the good of Arizona
and its growing businesses.*

Pulling in a Common Direction on Semiconductors

Arizona has emerged as a leader in the federal strategic push to increase domestic production of semiconductor chips. Supported by significant CHIPS Act investments, success will protect U.S. commercial interests and guarantee national security.

The university's Center for Semiconductor Manufacturing is establishing a network of academic and industry partners to rapidly develop the needed workforce, while also addressing the sector's research and development demands here in Arizona and throughout the nation.

With a focus on being efficient, nimble and responsive, these partners have agreed to share resources – facilities, curriculum, expertise, ideas and technology – to ensure coordinated programs for the good of Arizona and its growing businesses.

Educational Foundations

If all Arizona K-12 students could learn about semiconductors and the technologies they power, it would go a long way toward expanding the STEM pipeline. Just this summer, the university partnered with Chandler Unified School District to host the 2024 Chips and Wafers Camp – a weeklong immersion into the semiconductor industry for high school students. With our partners, we are developing a two-year career and technical education program in semiconductor manufacturing, to launch at Hamilton High School in Chandler in fall 2025 – the first course of its kind in the United States.

Those engaged in these efforts, including other learning institutions, have a goal to expand these programs nationally. Ultimately, we plan to build and share curriculum and learning modules to educational institutions at all stages, and we'll provide training to help teachers feel confident in delivering the material.

University Facilities, Programs and Collaborations

This spring, the university launched a major renovation and expansion of the Nano Fabrication Center, increasing our research and development capacity and creating a state-of-the-art training facility for students aiming to work on the next generation of semiconductor technology. The upgrade is thanks to a generous \$35.5 million award from the Arizona Commerce Authority. We're also building the Future Advanced Semiconductor Technology Laboratory (FASTLab) to offer hands-on experiences with semiconductor nanotechnology for students in high school through graduate school.

In parallel, we are launching an array of augmented-reality training modules, jointly developed with our academic partner institutions Pima Community College and Central Arizona College. These VR modules will bring nanotechnology and semiconductors to life for students all over the state and beyond. In addition, the university has formalized a significant agreement with Northern Arizona University to ensure we're collaborating closely on research and academic programs.

Finally, I'm proud to share that the colleges of engineering, science and optical sciences jointly developed several new university semiconductor programs to begin in the coming academic year. These include a minor in semiconductor manufacturing, plus three stackable graduate certificates and an accelerated master's program in semiconductor science and technology.

As you can see, the College of Engineering is at the forefront of the university's work to lead the way for the future of semiconductors.





UA Engineering Key Connector in Semiconductor Push

College serves as catalyst in workforce development and chip technology as Arizona becomes global powerhouse.

NATIONAL SUPPORT FOR the semiconductor industry goes beyond helping ensure supply of computer chips, the tiny brains in everything from cellphones to satellites. With Arizona attracting the most investment from the 2022 CHIPS and Science Act's \$53 billion to date, the state is becoming a global manufacturing powerhouse. And the university is further establishing itself as a key connector between educational programs, high-paying jobs and research and technology development.

"The University of Arizona is uniquely positioned due to its connections with local semiconductor titans to instill and refine specific knowledge, skills and abilities."

TODD YOUNKIN, *president and CEO, Semiconductor Research Corp.*

"We're proud of the students, faculty, alumni and fellow Arizonans who are improving our state's future through this crucial technology and economic engine," said David W. Hahn, Craig M. Berge Dean of the College of Engineering.

Biden Singles Out State

President Joe Biden visited Intel's Chandler, Arizona, chip factory in March



The UA's Nano Fabrication Center is being upgraded and expanded, thanks to a \$35.5 million award from the Arizona Commerce Authority.

2024 to celebrate the largest grant to any single company.

"Arizona is building the future." That's what Biden told Tilden Dickson, an Intel sheet metal worker and Navajo Nation member, during the tour.

The U.S. Commerce Department has preliminarily agreed to provide the tech company with up to \$8.5 billion in CHIPS funding and \$11 billion in loans.

The investment will "transform the semiconductor industry and create entirely new ecosystems," said Biden. Since 2020, the state has attracted more than 35 semiconductor expansions, representing 13,000 potential jobs, according to the Arizona Commerce Authority.

The college has moved quickly to implement educational programs and partnerships that make the most of these opportunities.

"The University of Arizona and the College of Engineering will continue to play a major role in the strides the state is making in the global semiconductor industry," said Hahn. "We're committed to making the investments, forging the workforce partnerships, and incorporating the newest science and technology."

University Expands Role

In February 2024, the UA's Center for Semiconductor Manufacturing hosted the first FuseNano conference, where 150 national leaders gathered to strategize on all aspects of the domestic industry.

"Universities are being called on to play a much stronger role in helping the U.S. semiconductor sector become more effective and efficient in manufacturing, not just in the design and development of new materials,"



The college is filling gaps in the semiconductor workforce shortage – estimated to be tens of thousands a year nationwide.

said Liesl Folks, director of the center and university vice president for semiconductor strategy.

Todd Younkin, the conference's keynote speaker and president and CEO of Semiconductor Research Corp., said the UA has the relationships to influence the industry's labor issue. While the U.S. is maintaining the lead in global market share, according to the Semiconductor Industry Association, manufacturers face a significant workforce shortage.

"The University of Arizona is uniquely positioned due to its connections with local semiconductor titans to instill and refine specific knowledge, skills and abilities," said Younkin.

Because the industry demands workers from the technician level to positions requiring doctoral degrees, the university is taking a comprehensive approach to educational partnerships – implementing not only undergraduate and graduate semiconductor programs as soon as spring 2025 but also assisting with community college curriculum and high school training.

"We're very excited about the opportunity to reduce the barriers to access for students everywhere in Arizona to get involved in the semiconductor sector," said Folks.

Class of 2024

Dean David W. Hahn (shown here) and members of the college faculty confer 479 undergraduate, 97 master's and 12 PhD diplomas at the university commencement in May.

Emmy Award-winning actor Craig T. Nelson delivered the commencement speech, applauding student resilience and sharing powerful lessons about learning from mistakes.

In addition to the university ceremony, each Engineering department holds its own celebration, giving graduates one last chance to walk past familiar classrooms as students and reflect on their time in the college.

“Every engineering professor I’ve had has been so supportive, and I feel like they truly want their students to succeed,” said CHEE graduating senior Hannah McCollum, who is headed to Stanford University to pursue a PhD. “It’s fun getting to work with a variety of students. My experience was full of growth, and challenging – in a good way!”



College of
ENGINEERING



Admitted Students Day

Admitted Students Day brought 900 hopeful engineering students to campus on April 4.

Students admitted to the university for fall 2024 flooded the College of Engineering’s tent on the UA mall to learn more about majors and minors, including the newest undergraduate degree program, computer science and engineering.

Representatives from college clubs like the National Society of Black Engineers welcomed attendees, made new connections, and invited incoming students to annual events. Engineering boasts a diverse range of clubs – 45 groups are active, and teamwork and community service are at the core of club membership.

Admitted Students Day was a success for the college; 821 students have committed to joining the fall 2024 class of incoming first-year engineers.



While researchers are analyzing microscopic grains, a pebble from the asteroid Benu sample, shown here in its entirety, has made the university's Alfie Norville Gem & Mineral Museum one of only three places in the world to display a non-lunar extraterrestrial rock collected from space.

Benu Findings Edge Toward Building Blocks of Life

Compounds found in the asteroid sample provide insight into the formation of the solar system about 4.6 billion years ago.

RESearchers throughout the world, including several at the UA, are studying sand-size pieces of the 4.29-ounce sample of Benu returned to Earth on Sept. 24, 2023, from NASA's UA-led OSIRIS-REx mission.

Initial tests identified high concentrations of carbon and water, which together could indicate the building blocks of life on Earth, as well as phosphorus, which is found in extraterrestrial oceans.

The presence of phosphates prompted OSIRIS-REx principal investigator Dante Lauretta, UA Regents Professor of Planetary Science and Cosmochemistry, to speculate that the asteroid “may be a fragment of an ancient ocean world.”

The asteroid “may be a fragment of an ancient ocean world.”

DANTE LAURETTA, OSIRIS-REx principal investigator and UA Regents Professor of Planetary Science and Cosmochemistry

Investigators have hypothesized that a catastrophic collision destroyed the parent body, liberating the shard known as Benu, which eventually made its way into near-Earth space.

Scientists, who are hoping Benu will uncover Earth's origins, know asteroids could have delivered carbon-bearing compounds necessary for life, but the question remains, did they?



Designing special tools to open the container without damaging the sample is one of the first challenges for engineers as the OSIRIS-REx capsule returns to Earth in September 2023.

MateriAIZ Opens Doors to Success

Weeklong undergraduate workshop paves the way to research and job opportunities.

Undergraduates from across the country traveled to Biosphere 2 in January 2024 for the weeklong inaugural MateriAIZ Winter School, sponsored by the National Science Foundation and Arizona Society for Coating Technology.

Scientists and engineers from the UA and ASU as well as industry partners schooled students on opportunities in quantum mechanics, biomaterials, machine learning and semiconductors.

Krishna Muralidharan opened with an introduction to planetary materials – leftovers from the formation of the solar system, such as meteorites and interplanetary dust particles.

“The unsung heroes of NASA space missions are the materials scientists,” said the UA professor of materials science and engineering, who is helping analyze asteroid samples from NASA's OSIRIS-REx mission.



(From left) MSE faculty members Marat Latypov and Krishna Muralidharan plan to organize the workshop annually with ASU faculty Bruno P. Azeredo, Scott Sayres and Christina Birkel.

A career and networking panel included recruiters from InteVac, the National Science Foundation, Honeywell, Raytheon and Intel.

“Defense and aerospace companies are always looking for materials scientists,” added Muralidharan.

Jasper Konda, a junior from the University of New Mexico who was wavering on a career direction, left Arizona having glimpsed his future in academia.

“This field requires a lot of work, but nothing worth having comes easy,” he said.

COPPER IS CRITICAL

Symposium Points a Way Forward for Arizona and the World

The college and its partners are leading efforts to sustainably meet growing demand for the state's second-largest export.

CONGRESS SEEKS TO secure the country's critical mineral supply and reduce foreign reliance on vital materials. Meanwhile, the UA is pioneering sustainable mining practices, cultivating a domestic workforce, and powering the national transition to renewable energy and next-generation defense technology.

"The opportunities for hands-on learning here are unparalleled anywhere else in the world."

KRAY LUXBACHER, Greg and Lisa Boyce Leadership Chair and head of the Department of Mining and Geological Engineering

Copper is among the most important mineral priorities for Arizona, and three university leaders led vigorous discussions at the "Copper is Critical"

symposium on Capitol Hill in April 2024: David W. Hahn, Craig M. Berge Dean of the College of Engineering; Misael Cabrera, director and David and Edith Lowell Chair of the School of Mining and Mineral Resources; and Kray Luxbacher, Greg and Lisa Boyce Leadership Chair and head of the Department of Mining and Geological Engineering.

Representatives from the National Mining Association, Society for Mining, Metallurgy & Exploration (SME), other industry organizations, government agencies and academic institutions attended.

Equipped to Meet Demand

Copper ore – widely used in construction materials, electrical grids, electronics, vehicles and home appliances – is Arizona's second-largest export after aircraft parts. In fact, 70%



Misael Cabrera (right) leads a discussion in Washington about why the nation's copper production is so important.

of the nation's supply is produced in the state. Despite its importance for low-carbon technologies such as electric vehicles, copper is not designated a critical mineral.

The U.S. Geological Survey applies the label to 50 materials like gallium and



As global copper demand soars, representatives from mining companies, government and universities – including a noticeable UA showing: the dean of the college, director of the School of Mining and Mineral Resources and department head for mining and geological engineering – gather to discuss permitting laws and sustainable practices.

iridium that are crucial for energy, security and consumer products, and for which there is a future supply risk.

But copper demand continues to skyrocket, said Hahn, and in the next 30 years, the U.S. must produce more copper than ever.

“It needs to ramp up, and that requires a significant shift in the public’s understanding of how we can do this work in a safe, sustainable manner,” he said, adding that in such a vast industry cooperation and coordination are imperative.

“One thing we can do at the university, and in academia broadly, is to employ our knowledge and educational base,” Hahn said. “Research and design innovation, as well as workforce development, come to mind immediately as areas where the university is equipped to contribute.”



The San Xavier Underground Mining Laboratory is the nation’s only student-run, multilevel mine with a working vertical shaft.

While fewer than 200 engineers graduate from schools accredited in mining and engineering, the industry can hire 600 annually, according to Marc LeVier, 2023 president of SME.

As part of its emphasis on producing work-ready graduates to help meet the demand, said Luxbacher, the UA offers a one-of-a-kind teaching and research facility – San Xavier Underground Mining Laboratory.

“The opportunities for hands-on learning here are unparalleled anywhere else in the world,” she said.

Trade Group CEO Is a Longtime Proponent of Antimicrobial Alloys

USES FOR COPPER go beyond construction, transportation and telecommunications. Copper surfaces have been shown to combat infections in health care environments, a significant cause of major illness and death in the United States.

Adam Estelle has been championing the mineral’s antimicrobial potential since he graduated from the UA in 2008 with a BS in materials science and engineering and went to work for the Copper Development Association, a nonprofit trade group in McLean, Virginia.

Working with CDA colleagues, he developed bacteria-killing copper alloys that have been incorporated into hospital sinks and bed rails, which can harbor infectious microbes.

“Strategically placed copper and copper alloy surfaces offer an added line of defense,” said the now president and CEO of CDA. “They are continuously working to kill harmful microorganisms that cause infections in between routine cleaning and disinfection steps that only provide limited protection.”



Adam Estelle recognizes his CDA mentors ‘and constant access to industry leaders who put me on the path.’

Despite the demands of his leadership position, Estelle intends to keep up his research.

“COVID was a wakeup call that we are vulnerable to infectious diseases, and we need to have the right tools in place to keep people safe and healthy,” he said.

ROBOTS BUILD TERMITE-INSPIRED LUNAR HOUSING

Students central
to designing smart
sandbag shelters for
NASA's moon landings.



AME students (from left) Min Seok Kang, Athip Thirupathi Raj, Chad Jordan Cantin, Sivaperuman Muniyasamy and Korbin Aydin Hansen display a smart sandbag structure designed for astronauts on the moon.



WITH NASA FUNDING, associate professor Jekan Thanga and his students in the Department of Aerospace and Mechanical Engineering are using robot networks to create termite-inspired structures that will help astronauts survive the moon's harsh environment.

The team developed prototypes of these lunar sandbag structures, outfitted with sensors that aid the network of robot builders. Once assembled, the structures can alert astronauts to dangerous changes in the moon's environment, where temperatures range from -298 to 224 degrees Fahrenheit, micro-meteors bombard the surface at an average of 60,000 mph, and solar radiation and lunar dust threaten exploration.

"It's no accident this team has an academic partner, commercial partner and government agency."

JEKAN THANGA, *associate professor of aerospace and mechanical engineering*

The technology is designed for NASA's Artemis program, through which the agency plans to establish a lunar base for humans by the end of the decade.

Sivaperuman Muniyasamy, an aerospace engineering doctoral student, and Thanga presented a paper detailing their concepts in February 2024 at the American Astronautical

Society Guidance, Navigation and Control Conference.

"By publishing the paper at the conference, we're gaining feedback from other experts that really helps us move forward," said first author Muniyasamy.

Muniyasamy, who moved from India to study at the university and plans to launch a space mining company after completing his PhD, leads a team of eight undergraduate and master's students working on lunar surface projects. NASA granted Thanga's team funds for these efforts through the agency's Minority University Research and Education Project, or MUREP.

"The goal is to raise the participation of underrepresented groups in aerospace," Thanga said. "And these are hands-on, student-centric projects."

Teamwork Fosters Creativity

Thanga estimates astronauts will first land on the moon as part of Artemis in 2026 or 2027. As part of a consortium called LUNAR-BRIC, his team is partnering with NASA's Jet Propulsion Laboratory at Caltech and MDA, a space robotics company, to develop this and other technologies for Artemis moon landings.

"It's no accident this team has an academic partner, a commercial partner and a government agency," Thanga said. "Given the challenges, part of the path is for us to collaborate."

Insect Inspiration

Thanga was first intrigued by the work of Nader Khalili. In the 1980s, the late architect presented to NASA the idea of sandbag structures for lunar and space habitation. Khalili later developed SuperAdobe sandbag construction for homes around the world.



Jekan Thanga finds inspiration from desert insects for cost-effective solutions to lunar housing.

Thanga built upon Khalili's ideas with the concept of insect skyscrapers. These cathedral termite mounds are common in African and Australian deserts, extreme environments that are analogous to lunar conditions.

Thanga's team determined that sandbags filled with soil and mineral fragments from the moon's surface could replace traditional building materials for lunar housing. The robot-assembled sandbag shelters reduce the material that must be transported to the moon, provide good climate control, and protect against moonquakes and other hazards.

"Importantly, this whole approach doesn't rely on water," said Thanga. "Most of the moon is bone-dry desert."

Astronaut Alum Awaits Her First Mission

LT. CMDR. JESSICA Wittner is one of only 360 NASA astronauts, ever. The aerospace and mechanical engineering alum, who in 2021 joined a class of 10 from a pool of 12,000, completed training in March 2024.

NASA has yet to assign individual missions. Wittner's work could

range from conducting research aboard the International Space Station to launching commercial spacecraft or deep-space missions.

"I would love to go to the moon," she said. "That's like the next frontier right now. We know what questions need to be answered."



Like many recently trained astronauts, AME alum Jessica Wittner hopes to go to the moon.



The capstone team presenting Development of a Lightweight Structural Rechargeable Battery for Electric Aircraft wins the \$1,000 Ana Needham Award for Best External Collaboration by a Single Discipline Team. The project aims to help the aviation industry decrease its reliance on fossil fuels.

SENIORS WRAP UP YEARLONG CAPSTONE PROGRAM WITH 91 ELECTRIFYING CREATIONS

THE ANNUAL Craig M. Berge Design Day wowed a crowd of thousands as 91 multidisciplinary engineering teams competed for \$49,000 in prizes with their industry- and university-sponsored capstone projects. The award-winning inventions ranged from the top-prize basketball robot to a disaster relief system for turning waste plastic into fuel.

“The program is about designing, prototyping, testing, failing, trying again, and leaning on teammates. But ultimately, it’s about making the world a better place,” said David W. Hahn, the Craig M. Berge Dean. “I’m really proud of all our engineers, mentors and sponsors.”

Several local high school classes joined members of the public and industry judges on April 29, 2024, to explore



Team members winning the \$500 Dragoon Technology Award for Most Unintuitive Design Driven by Physics celebrate their success.

the engineering seniors’ creations. The \$7,500 Craig M. Berge Dean’s Award for Most Outstanding Project went to the team that developed Hoopster, a basketball-shooting robot. Raytheon Technologies sponsored the project to demonstrate STEM concepts for K-12 students and get a jump on the engineering jobs pipeline.

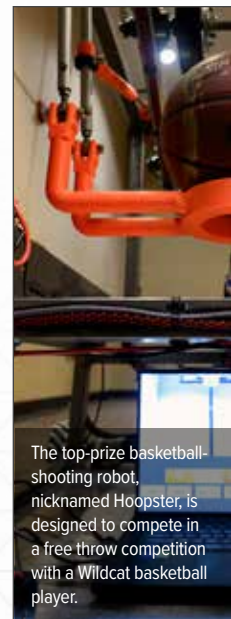
The device navigates with a familiar video game controller. Once in place, the robot uses a camera and computer vision algorithms to automatically detect basketball hoops, calculate the shot trajectory and power, and score from the free throw line with 90% accuracy.

“We worked for the past nine months to create something that’s a high-precision robot and excites students through science and sport,” said systems engineering major Eric Meyer, team lead.

Meyer is currently interning with Northrop Grumman, also a design program sponsor, then plans to complete the university’s accelerated master’s program in engineering management.

Clearing Hurdles to Lift Others

Hoopster wasn’t the only project aimed at student success. The team winning the \$1,000 Mark Brazier Award for Best



The top-prize basketball-shooting robot, nicknamed Hoopster, is designed to compete in a free throw competition with a Wildcat basketball player.

Biomedical System Design created an affordable, modular biomedical sensor board for lab students. It measures vital signs, such as oxygen saturation, and replaces the outdated devices currently in use – that average \$4,000 each.

“The MediBrick 2000 only costs \$500, and it’s easier to fix and modify,” said electrical and computer engineering major Muad Alsayar, project procurement lead.

The first prize Bly Family Award for Innovation in Energy Production, Supply or Use went to students who found themselves up against not just a design challenge, but also a lot of red tape.

The project stalled in its fourth month as the team awaited university approval of its safety plan to prototype a disaster-relief, small-scale pyrolysis plant that turns plastic waste into crude, diesel-like generator fuel for isolated nations. The process required heating plastic to 1,000 degrees Fahrenheit and stabilizing emissions of toxic gas.

“We had to work with multiple departments and administrations to get the safety plan approved,” said chemical engineering major Jamie Holmstrom, Team 24011 lead. “There was problem after problem we had to solve.”

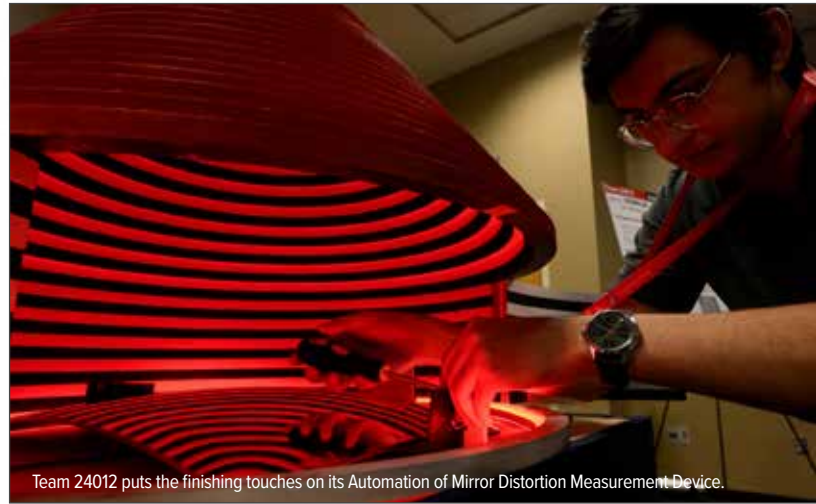
Team 24039 earned the \$2,500 BAE Systems Award for Best System Software Design for an AI-powered grid that automatically redirects power when a line goes down. And Team 24005 walked away with the \$1,500 Coherent Award for Best Optical Systems Design for its camouflage-identifying spectrometer.

In all, awards went to team members on 35 projects, also including a crop-management robot, space-based terrarium and carpal-tunnel relief brace.

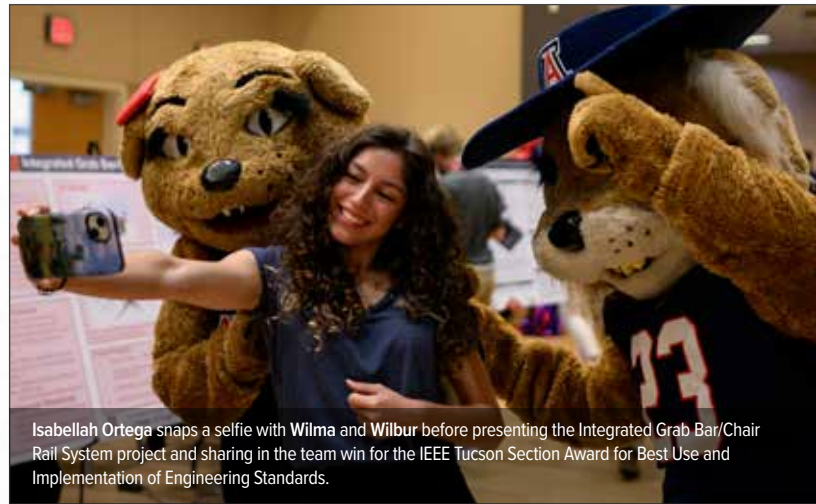
[VIEW FULL LIST OF AWARD WINNERS](#)



Team 24013 presents its Modular Automatic Camera Focusing System to a panel of industry experts and Engineering alumni.



Team 24012 puts the finishing touches on its Automation of Mirror Distortion Measurement Device.



Isabellah Ortega snaps a selfie with Wilma and Wilbur before presenting the Integrated Grab Bar/Chair Rail System project and sharing in the team win for the IEEE Tucson Section Award for Best Use and Implementation of Engineering Standards.



(From left) Barbi Berge Campbell stands with her mother, Nancy C. Berge, and Vicki Fleischer, senior vice president for development at the UA Foundation.

Gift That Keeps Giving

A generous donation from Nancy C. Berge and family in honor of her husband, an engineering alum who died in 2017, established an endowed chair for dean of the college. It also founded the four-year Craig M. Berge Engineering Design Program, which culminates on Design Day with displays of the yearlong Interdisciplinary Capstone projects.

“The program is about designing, prototyping, testing, failing, trying again, and leaning on teammates. But ultimately, it’s about making the world a better place.”

DAVID W. HAHN, Craig M. Berge Dean

Individualized Treatment at Core of Interdisciplinary Cancer Initiative

Engineers create models and high-performance microscopes, researchers apply biological principles, and clinicians provide cancer cells and biopsies to mimic patient-centric cancer environments.

THE UA CANCER Engineering Initiative, which began in 2022-2023 with \$10.8 million from the state's New Economy Initiative, is forging ahead with faculty

One promising technique is growing cancer cells in materials that mimic human organs to test unique factors that may have led to a patient's diagnosis.

Working with Song, Alexander McGhee is using 3D-printed bioinks to help create human tissue-like microenvironments.



"I plan to 3D print human organ models made by stem cells or a patient's biopsy – a chunk of healthy organ – infect it with their cancer, then do drug trials to see what combination and dose is most efficacious," said the assistant professor of biomedical engineering.

"I plan to 3D print human organ models made by stem cells or a chunk of healthy organ, infect it with their cancer, then do drug trials to see what combination and dose is most efficacious."

Complementary Expertise Speeds Progress

The initiative is opening doors to engineering partnerships with top UA Cancer Center researchers like Cindy Miranti, professor of cellular and molecular medicine and the BIO5 Institute.

Miranti, who has been researching prostate cancer for almost 30 years, is now using 3D organ-on-chips to

ALEXANDER MCGHEE, *biomedical engineering assistant professor*

isolate factors and test how they interact with a patient's cancer cells. Without engineering support, previous attempts to culture cells on a chip were unsuccessful.

"Cells would die; we couldn't maintain them," she said. "If I don't have a model that's going to work, my project is dead in the water."

Engineers build the models and high-performance microscopes, researchers apply biological principles, and clinicians provide access to cancer cells and patient biopsies.

"I don't think our research would move this fast without this initiative," Song said.



Biomedical engineering professors like Shang Song say the Cancer Engineering Initiative has enabled quicker research – strengthening collaborative relationships between biologists, clinicians and engineers who combine decades of experience to guide studies.



"I'm asking what nutrients, what physical or chemical cues are in the environment that influence cell behavior."

SHANG SONG, *biomedical engineering assistant professor*

hires and partnerships to develop individualized treatment methods. Biomedical engineers and other experts in biology and 3D printing are expediting understanding of the causes of cancer cell growth.

For example, Shang Song, assistant professor of biomedical engineering, is investigating how body parts – such as brain, breast, prostate and bone – stimulate tumor growth.

"Cancer cells are heavily influenced by their environment," she said. "I'm asking what nutrients, what physical or chemical cues are in the environment that influence cell behavior."

Because breast and prostate cancers in advanced stages are known to grow into bone, Song, who received the American Cancer Society Institutional Pilot Award, is developing gels that mimic a wide range of mechanic stiffness in bone, such as in marrow, to determine causes of cancer cell growth.




"If I don't have a model that's going to work, my project is dead in the water."

CINDY MIRANTI, *professor of cellular and molecular medicine*

Civil Engineer Looks to Remedy Transportation Inequities

Assistant professor Alyssa Ryan uses AAA Foundation for Traffic Safety award to identify age-old challenges in underserved populations.



Alyssa Ryan expands on her previous traffic inequity research. Uncovering gender disparities in driver injuries, she notes in her studies that using male starter crash dummies in vehicle design and testing leads to higher rates of abdominal and chest injuries for women.

ALYSSA RYAN, an assistant professor of civil and architectural engineering and mechanics, is leading a national study to identify disparities in traffic safety for all transportation users, including drivers, bicyclists and walkers.

“These inequities are grounded in our history, and we need to do something about it.”

ALYSSA RYAN, assistant professor of civil and architectural engineering and mechanics

“Transportation engineering is very focused on people and impacting society and how people interact with the world,” said Ryan. “If you don’t have transportation, you can’t do anything.”

With a \$467,000 award from the AAA Foundation for Traffic Safety and building

on Ryan’s previous research, the project aims to identify populations most at risk for crash injuries given factors such as location, race, sex, ethnicity and socioeconomic status.

“We’re really looking for trends, what is happening across the United States and who is getting into these crashes,” said Ryan, also assistant director at the college’s Center for Applied Transportation Sciences.

Ryan, in collaboration with Oregon State University professor David Hurwitz, will analyze massive datasets from the U.S. Census Bureau, National Emergency Medical Services Information System, Federal Highway Administration Highway Statistics and the Fatal Accident Reporting Systems to identify crash trends among different groups. This is the first time that

data of such magnitude has been used to research traffic inequity on a national scale.

“This is an issue in society, but it presents itself in transportation in really compelling ways,” said Hurwitz, the co-principal investigator, who is a professor of transportation engineering and director of the Kiewit Center for Infrastructure and Transportation Research at OSU.

Disparities have existed since the inception of the U.S. transportation system.

“The interstate system that runs across the United States primarily went through neighborhoods and homes of people who were Black, people who were poor, Indigenous populations – destroying their communities and displacing them.”

“These inequities are grounded in our history, and we need to do something about it,” said Ryan.

Equity ≠ Equality

Civil engineering doctoral student Saquib Haroon, who is helping build machine learning models to distill the mountains of data and identify patterns, said the project makes an important distinction between social equity and equality.

Equality means everyone is treated similarly, he explained, whereas equity accepts that some individuals need to be provided with additional or different resources to be successful.

“We all need to understand that not everything in this world is going to be equal and focus on ensuring those who are disadvantaged receive adequate resources,” he stressed.

Celebrating a Historic Year in Research Funding

Investment in partnerships and centers boosts regional economy and elevates the college's competitive status for major grants.

RESEARCH AT THE College of Engineering skyrocketed to an all-inclusive total of \$63 million in 2023. This growth was fueled by historical highs in federally funded centers and doubling average project budgets.

“Third quarter was one of our strongest quarters ever, indicating significant growth for the year,” said Mark Van Dyke, who joined Engineering as associate dean of research four years ago. “There is a renewed focus on the research enterprise in the college that has served to lift everyone.”

The college research expenditures for the third quarter this fiscal year saw a 76% increase over the average from 2018-2022. Van Dyke expects annual expenditures to double compared with 2018, the year before the college

began implementing its rapid growth strategies. Average project budgets, under \$100,000 in 2015, have also grown twofold.

David W. Hahn, Craig M. Berge Dean of the college, has envisioned strong research growth since joining the college in 2019.

“The plan has helped shape a new culture in the college, with colleagues supporting one another to go after big grants,” said Hahn. “Collaboration inside and outside the college and its departments is key to a healthy research enterprise.”

Changing Landscape

The college is gearing its pursuit of research dollars toward federally funded mega-projects and regional partnerships

Mark Van Dyke expects 2024 to be the biggest year in research expenditures for the college since 2018.



“There is a renewed focus on the research enterprise in the college that has served to lift everyone.”

MARK VAN DYKE, *associate dean of research*



Civil engineering doctoral student Sushmita Bhandari conducts traffic inequity and transportation safety research with assistant professor Alyssa Ryan in the Center for Applied Transportation Sciences.

that require working across government agencies, with multiple academic institutions and industry.

“Our average project is no longer a single PI doing something in a lab. The projects are becoming more attached to other things – whether that is other faculty laboratories across the university or other universities, the community, or economic development at the state level,” Van Dyke explained.

The strategy is built around the college's strengths in areas such as transportation infrastructure, water reuse, semiconductor manufacturing, hypersonic flight, mining, quantum mechanics, biomedical technology and sustainable energy. Labs and centers not only accommodate collaboration, but also serve as a public face for the university's research endeavors.

“It can be a challenge for outside stakeholders to come to a university and figure out where to go to get what they need,” said Van Dyke. “These research centers demystify the university's resources and facilities.”

One college center that caught the eye of federal sponsors in 2023 was the New Frontiers of Sound Science and Technology Center, which received \$30 million from the National Science Foundation.

The center, led by materials science and engineering



professor Pierre Deymier, focuses on topological acoustics, an emerging field in which researchers exploit the properties of sound in ways that could vastly improve computing, telecommunications and sensing.

“The quiet revolution advancing sound science and technology is afoot. And that is where the new center comes in,” said Deymier, center director and project principal investigator.

Dominant Force

Some research hubs are more reliant on funding closer to home – for example, those partnering with utility and transportation companies and agencies. But they are just as tied to economic development. The Center for Applied Transportation Sciences, partnering with the Arizona Department of Transportation, Pima County

and the City of Tucson, serves academic institutions, private companies and government agencies throughout the state.

“Our goal is to combine emerging technologies such as artificial intelligence with existing multimodal infrastructure to make traffic move more efficiently – thereby reducing emissions and preventing people from sitting in congested traffic,” said the center's director, Yao-Jan Wu, professor of civil and architectural engineering and mechanics.

Job Opportunities

The college's major research projects and centers all include outreach and workforce development, which for students means

well-defined career paths in industries experiencing high demand.

“The college has top-rated facilities such as biomedical device labs, hypersonic wind tunnels, the San Xavier Mine, clean rooms and design centers,” said Hahn. “These large research



Kim Ogden, department chair of CHEE, is converting a native shrub to natural rubber with \$70 million from the U.S. Department of Agriculture and Bridgestone Americas Inc.

grants in vitally important economic areas reinforce a hands-on, career-oriented education that prepares students for some of the best jobs locally, nationally and worldwide.”



(From left) Kama Svoboda, Rhea Carlson, Avery White and Uddav Ghimire are among the engineering students receiving 2023-2024 graduate fellowships and advancing high-profile research at the College.

Donor-Supported Fellowships Boost Life-Changing Projects

ENGINEERING FELLOWS are making breakthroughs in areas ranging from artificial intelligence and disease detection to ground stability, and fellowships are key to their research involvement.

“The recipients of our graduate fellowships are some of the most outstanding applicants to our graduate programs,” said Kelly Simmons-Potter, associate dean for academic affairs. “The ability to provide research fellowships to these students can be a critical factor enabling them to pursue their educational and research goals, to the benefit of both their careers and the broader fields of engineering.”

Fourteen top graduate students received fellowships this academic year as part of initiatives including the Engineering Dean’s Fellowship, funded by the Craig M. Berge Deanship, along with donor support through the annual Dean’s Fund for Excellence.

Shoring the Foundations

Nepali civil and architectural engineering doctoral student Uddav Ghimire is one of six Engineering Dean’s Fellows. His dreams of studying in the U.S. became a reality at the College of Engineering with multi-year fellowship funding.

Ghimire is probing an area of research designed to understand how soil – altered by climate change – affects infrastructure.

Climate change is known to cause extended flooding and droughts, which upsets water resources and increases the likelihood of soil salinization. Soil salinization – the accumulation of salt on top of soil – is widely considered a threat to arid land regions. High salt concentrations stunt plant growth and cause soil deterioration.

Ghimire is zeroing in on what this means for public works.

“In terms of geotechnical engineering, I’m asking how the strength of the soil increases or decreases and how that affects the dams and all the infrastructure that is built on the soil,” said Ghimire.

With the mentorship of adviser Tejo V. Bheemasetti, assistant professor of civil engineering and engineering mechanics, Ghimire is analyzing soil samples taken from an area in South Dakota with excessive salt deposits to answer some of those questions.

Grateful for Chance to Shine

Scholarship recipients meet donors at annual reception and share their hopes, dreams and accomplishments.

FIRST-GENERATION Latino student Angel Hernandez, a biomedical engineering senior awarded the Tulsi Memorial Scholarship, was among hundreds of undergraduate and graduate engineering students receiving philanthropic support in 2024. Many attended the annual scholarship reception in February to express their gratitude for donors who helped them shine inside and outside the classroom.

Hernandez is aiming for a career in neuroengineering, a field involved in developing technologies to

treat diseases such as Alzheimer's and Parkinson's.

"These financial awards not only met my concerns of homelessness or lack of food, but they also gave me significantly more time to get involved in research and mentoring other undergraduates who are underrepresented in STEM."

Donors, including alumni like 1998 civil engineering graduate Travis McCarthy, are dedicated to fostering the next generation of Wildcat engineers.

He spoke on behalf of the Henry George Mackintosh Foundation, which the family of McCarthy's wife established. The Mackintosh Family Engineering Scholarship is an endowed fund that supports civil



Angel Hernandez says he chose BME to 'help give me those technical and research skills I need for graduate school.'



'Your generosity fuels the success of our students,' says David W. Hahn, the Craig M. Berge Dean, to open the reception.

engineering undergraduates in construction engineering management.

"Remember the gift you are getting here tonight and look to pay it forward," said the transportation expert, who started at Sundt Construction right after graduation and is now a senior vice president

and Southwest regional manager with the company.

"Stay connected to the university and the college – maybe initially it's staying in touch with a professor or doing a class talk," he said. Then, "when the time is right, consider giving back financially."

"These financial awards not only met my concerns of homelessness or lack of food, but they also gave me significantly more time to get involved in research and mentoring other undergraduates who are underrepresented in STEM."

ANGEL HERNANDEZ, biomedical engineering senior

Master's Programs Clinch Top-Value Ranking

IN MONEY'S most recent "The Best Colleges in America," the college earned 4.5 out of 5 stars for its master's programs. With scores based on annual costs, typical debt burdens, employment rates and early salaries, only three of the top 50 engineering programs earned 5 stars.

Money's inaugural analysis of Best Graduate School Programs found that UA master's engineering graduates have a 100% employment rate and an average early career salary of \$94,070.

The college offers 15 master's and 11 PhD degrees. Online engineering degree options are available for many master's programs as well as graduate certificates, and most departments have accelerated master's degrees.

The diverse range of programs suits students with a wide variety of engineering interests, said Kelly Simmons-Potter, the college's associate dean for academic affairs. And alumni with graduate degrees find a wealth of fulfilling career options.

National Convention Launch Pad for Careers

Sixty members of the UA's SHPE chapter attended the organization's annual national convention in Salt Lake City, and several left with job and internship offers. The five-day November 2023 event – which included workshops, resume-building classes and professional networking – drew 13,000 SHPE members from across the country.

Job and internship opportunities included positions with leading engineering firms, tech companies and research institutions such as Honeywell, Northrop Grumman, T. Rowe Price and General Dynamics.

"I learned a lot," said UA SHPE treasurer Celeste Cortez, a senior majoring in electrical and computer engineering. "I obtained three interviews with Honeywell, Abbott and Lutron. The convention provided invaluable networking opportunities, enabling students to connect with professionals and peers from diverse backgrounds and fostering collaboration and future career prospects."



SHPE encourages students to complete their degrees. According to their national statistics, the graduation rate is 87% for SHPE members versus 50% for Latino students not in SHPE.

Hispanic Engineers Club Closes Generational Tech Gap

SHPE teaches family and community members to navigate popular apps and find jobs online.

STUDENTS LIKE Irbis Martinez often step into the role of tech support as their family members and elders

especially seniors, how to use technology confidently and independently.

navigating apps and finding jobs. "This exceptional city, the inviting people,



To celebrate a successful 2023 La Familia event, SHPE holds a drawing in the Old Engineering courtyard, giving away iPads, laptops and gift cards to winning event participants.

adapt to new cellphones and internet apps or adopt technology such as medical video conferencing, which has remained prevalent since the pandemic.

"Even now, my grandparents use Zoom for their doctors' appointments 50% of the time," said Martinez, an environmental engineering senior and president of the UA's Society of Hispanic Professional Engineers, or SHPE.

But Martinez can't always answer the calls. That's where La Familia, now in its 22nd year, comes in. SHPE organizes the free annual event to teach community members,

"Our grandparents and parents raised us; it's high time for us to teach them a few things," said Martinez.

"Our grandparents and parents raised us; it's high time for us to teach them a few things."

IRBIS MARTINEZ,
environmental engineering senior and president of UA chapter of SHPE

Two interactive workshops, provided in English and Spanish, in November 2023 were geared to what family and community members in Tucson wanted most:

the delicious tacos, the beautiful sunsets over the mountain range raised me into the person I am today," said Maximo Ybarro, mechanical engineering senior and vice president of La Familia. "I felt this could be my way of giving back to my community, my family."

Ybarro arranged a partnership with Bank of America to add a cybersecurity component to the Navigating Apps presentation.

"If anybody is going to have the best quality presentation, especially when it comes to financial scams, it is going to be Bank of America," he said.

Family Unites in Remembrance and Giving

Scholarship helps working students and honors Hom Moon Jung, the first in a line of UA engineering graduates.

HOM MOON JUNG, who emigrated from China as a teenager, started a family legacy when he graduated in 1937 with a mining engineering degree. His three sons – Moon, Paul and Don Hom – and two grandsons also completed UA Engineering degrees. Four grandchildren earned degrees at the university in other fields.

Hom – believed to be one of the first Chinese Americans to graduate from the college – worked briefly as a mine surveyor. Then, along with his two brothers, he served in the U.S. Army during World War II. Afterward, Hom opened two grocery stores in Tucson.



Hom Moon Jung is shown here serving in a U.S. Army Infantry Canon Company during World War II.

“The political and social environments were very different than today,” said Paul, a mechanical engineering alum. “He was not able to find an engineering job.”

The family home was attached to one of the markets, and the brothers grew up watching their father extend grocery credit to struggling families and feeding those with nothing to eat. The parents instilled that generosity and a strong work ethic in their children.

“Running the stores took 14 or 15 hours of hard work every day from our father and mother,” said Paul.

Moon and Paul endowed the HOM MOON JUNG Memorial Scholarship to help mechanical, mining and chemical engineering undergraduates working their way through college. It will first be awarded in fall 2025.

Hom passed away in 1973, and the

family kept the market open for another three years despite stiff competition from chain stores. Moon earned a mining engineering degree in 1974. Following a break to help in the store, Paul finished in 1977.

Paul began school with a plan to become a biologist, but many of his friends studied engineering, and he decided it would make a better fit. After graduating, he worked nearly 42 years for Arizona Public Service Company, retiring in 2019. His decades of working in design and modifications engineering and nuclear regulatory affairs were a continuous learning experience, Paul said.

Moon spent his career as a mining engineer with the Bureau of Land Management. Don earned a BS in mechanical engineering in 1978. He began his career in aircraft



The Homs – (left to right seated) Ted, Chris and Jaron, and (standing) Moon, Paul, Ashley and Yan – visit a memorial bench honoring the family patriarch as well as his close friend and fellow grocer William Bon Sam Tom, whose children also are rooted in UA Engineering.

engineering, then switched to financial planning and real estate in the mid-1990s.

Paul’s son, Chris, and Moon’s son, Ted, earned chemical engineering degrees together in 2008. Chris is a process engineering team lead at Chevron. Ted is a quality engineering manager with GE Healthcare.

“Although our grandfather passed before we were born, it is good to see his legacy live on with the scholarship,” said Chris.



Sons Moon and Paul (from left) receive Hom Moon Jung’s Congressional Medal of Honor posthumously in December 2021 from retired U.S. Army Maj. Gen. M. Ted Wong.

HIGHLIGHTING 2023-2024 HONORS

Faculty and Staff Professional Recognition



The Society of Mining Metallurgy and Exploration in 2023 named **Angelina Anani**, associate professor of mining and geological engineering, Outstanding Young Professional. Anani is working toward zero-accident mining and has placed the university among the nation's first higher ed institutions to incorporate virtual reality into mining instruction. She advises the Women in Mining student chapter and partners with ENGAGED, which serves students underrepresented in engineering.



Jennifer Barton, Thomas R. Brown Distinguished Chair in Biomedical Engineering and director of the BIO5 Institute, is the 2024 president of SPIE, or the International Society for Optics and Photonics. Barton develops miniature endoscopes that combine optical imaging techniques – such as optical coherence tomography and fluorescence spectroscopy – for early detection of cancer, including ovarian cancer, which often goes undetected until it has spread.



Pierre Deymier – professor of materials science and engineering and member of the BIO5 Institute – is among eight of the world's top scientists named to the second class of fellow-ambassadors for France's National Centre for Scientific Research. The role strengthens international ties and benefits the New Frontiers of Sound Science and Technology Center, which uses topological acoustics to exploit the properties of sound and improve computing, telecommunications and sensing.



The UA's Professional Advising Committee in October 2023 honored two long-time contributors to College of Engineering academic advising: **Dava Jondall** and **Mildred Curran**. Curran received a Region 10 National Academic Advising Association award for Excellence in Advising and Jondall a university certificate of merit.



US News & World Report | 2024 College Rankings

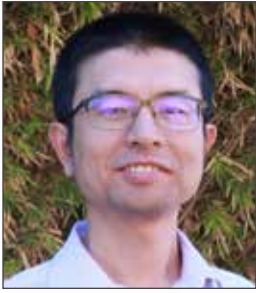


Top 30

UNDERGRAD ENGINEERING,
PUBLIC UNIVERSITIES

Top 25

ONLINE ENGINEERING GRAD PROGRAM,
PUBLIC UNIVERSITIES



The Institute of Electrical and Electronics Engineers, the world's largest technical professional organization, elected **Ming Li** to its 2024 Class of Fellows. The distinction, held only by a minuscule portion of IEEE members, recognizes Li's extraordinary contributions to controlling data breaches.



The American Ceramic Society elected **Pierre Lucas**, professor of materials science and engineering with a joint appointment in optical sciences, to its 2023 Class of Fellows. Lucas has advanced infrared optics, particularly with chalcogenide glasses, which appear opaque under ordinary light conditions but transparent with invisible-to-the-human-eye infrared light. The glasses are used in infrared cameras and vehicle sensors, for example.



Associated General Contractors named **Dean Papajohn**, professor of practice in civil and architectural engineering and mechanics, its Outstanding Educator for 2024. Papajohn is lauded for connecting students with industry, providing them with insightful real-world experiences and offering exceptional mentorship.



The American Institute for Medical and Biological Engineering selected **Janet Roveda**, jointly appointed professor of electrical and computer engineering and biomedical engineering, to its 2024 College of Fellows. Roveda is working on wearable devices to manage sleep apnea and stress. The devices give caregivers and health care professionals the means to track ailments in real time and help patients in remote locations.



The National Academy of Inventors elected two UA Engineering faculty members to its 2023 Class of Fellows: **Wolfgang Fink**, professor of electrical and computer engineering and biomedical engineering, and **Douglas Loy**, professor of materials science and engineering. Fink is known for his autonomous systems and health-related inventions, including devices for eyesight care. Loy is advancing additive manufacturing applications such as bio-based sunscreen.



Top 50
BEST VALUE UNIVERSITY
(FORBES)



#2
WATER RESOURCES
(SHANGHAI RANKING)



#5
SPACE SCIENCES
(NASA FUNDING)

HIGHLIGHTING 2023-2024 HONORS

University Awards of Distinction

Robert Fleischman, civil and architectural engineering and mechanics professor, was named a University Distinguished Professor. The award recognizes faculty members' long-

term commitment to undergraduate education and outstanding contributions to the university. Since joining the college in 2000, Fleischman has won several teaching awards, and he received a Fulbright U.S. Scholar Program Award in 2019.

leads the Stochastic Optimization in Algorithmic Research lab. Her proposed methods can help determine the optimal amount of power generation, considering resources, cost and integrated renewable energy sources.



Afroz Jalilzadeh and **Hal Tharp** were recognized with the Gerald J. Swanson Prize for Teaching Excellence.

Jalilzadeh, assistant professor of systems and industrial engineering,

Tharp, associate department head and associate professor of electrical and computer engineering, has served as an Engineering Teaching Fellow, and his honors include the Leicester and Kathryn Sherrill Creative Teaching Award. Tharp's research interests are in the application of optimization and control to real-world problems.

Leaders, Partners Usher in Fuel Wonder Campaign

Alumni and friends are helping the college lead the way in quality education and life-changing research.

P"PHILANTHROPY IS making a difference in the College of Engineering."

This was the message from senior undergraduate Katelyn Rees, who served as master of ceremonies at The Future of Engineering, the December 2023 kickoff for the college's participation in the UA's Fuel Wonder fundraising campaign.

More than 80 supporters attended at the Clayton House in Scottsdale, Arizona, as college leaders outlined the future of UA Engineering education and research.

The silent phase of the UA's \$3 billion Fuel Wonder campaign has raised

SEE HOW WONDER
FUELS ENGINEERING



Alumni **Christopher Stemple** and **Marla Peterson** stand to the left and right of master of ceremonies and ME alum **Katelyn Rees** at the college's Fuel Wonder launch event.

more than \$2 billion since 2017, with the college raising more than \$85 million toward its \$100 million goal. The public phase began at Homecoming 2023.

Outstanding senior Katelyn Rees says the college gave her the resources to thrive and prepared her to solve big problems, think critically and be a world changer.

Support to Change the World

Priorities for the university and college include providing a holistic student experience for future leaders like Rees, who was a student regent for the Arizona Board of Regents, the governing board for the state's three public universities, until she graduated in May 2024.

Rees, who double majored in mechanical engineering and computer science, said engineering means "solving big problems, thinking critically, and being a world changer."



College Dean **David W. Hahn** (right) leads a conversation with panelists (from left) **Larry Head**, **Kray Luxbacher** and **Mario Romero-Ortega**.

"The College of Engineering has prepared me to do this by challenging me in my classes, surrounding me with peers accomplishing feats in research and in their careers, and giving me the support and resources to thrive," she said.

Among other campaign priorities are endowed professorships, which help the college attract and retain renowned faculty members, a Student Design and Innovation Center, and health care research initiatives.

"With your support, we will continue to educate, innovate and flourish," said **David W. Hahn**, **Craig M. Berge** Dean of the college.

Inventive Faculty Attract Funding, Strengthen Economy

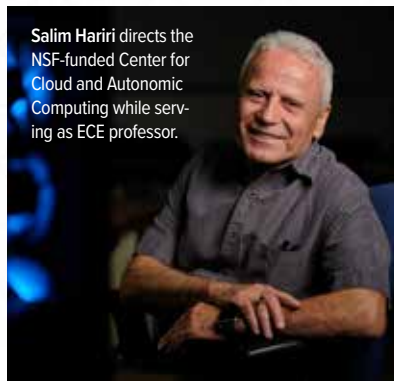
Patent luncheon celebrates UA entrepreneurs improving health care, computing, renewable energy and agriculture.



TECH LAUNCH ARIZONA, the university's commercialization arm, and the college awarded medallions at the 2024 annual patent luncheon to 11 engineering researchers who are bettering the human condition.

"Getting a patent issued is national acknowledgement of the importance of an invention," said TLA assistant vice president Doug Hockstad.

David W. Hahn, the Craig M. Berge Dean, said the college, which was involved in more than 20% of the university's 2023 patents, is an economic engine: "These technologies go into the world and create spinout companies."



Salim Hariri directs the NSF-funded Center for Cloud and Autonomic Computing while serving as ECE professor.

For example, electrical and computer engineering's Salim Hariri, with two professors from the College of Medicine – Phoenix, formed Senior's Virtual Assistant LLC to commercialize their patented artificial intelligence technology.

The TLA-funded prototype uses wearable sensors that record biological data and provide voice and word analysis to detect conditions such as dementia and depression earlier and more accurately than the standard Q&A-scoring method. The system can also alert caregivers to potentially dangerous situations, such as when a patient at risk of falling begins to rise.

"This can reduce the nursing load and help families care for loved ones," said Hariri.

Federal Funding Boosts Research

From a federal funding standpoint, said associate dean of research Mark Van Dyke, "it has become increasingly important for universities to conduct applied research."

For example, with a five-year, \$30-million National Science Foundation grant, materials science and engineering professor Pierre Deymier, who received a patent for quantum-like information encoding, is leading a center focused on topological acoustics – which exploits the properties of sound to improve computing, telecommunications and sensing.

"Getting a patent issued is national acknowledgement of the importance of an invention."

DOUG HOCKSTAD, *Tech Launch Arizona assistant vice president*

From Solar Energy to Sunscreen

Regents Professor of Medicine and Biomedical Engineering Marvin Slepian, who has developed diagnostics and therapeutics for cardiovascular diseases, received three patents in 2023 and was appointed to the U.S. Patent and Trademark Office's Patent Public Advisory Committee.

Patent medallions also went to ECE professors Ivan Djordjevic for probabilistic 56 network encoding, Marwan Krunz for a dielectric antenna array and Wolfgang Fink for an automated network-on-chip; retired chemical and environmental engineering associate professor Dominic Gervasio for metal leaching and energy storage; aerospace and mechanical engineering professor Peiwen Li for heat energy recovery; MSE professor Douglas Loy for nontoxic sunscreen; systems and industrial engineering associate professor Mohammed Shafae for adaptable IoT sensor signal prediction and former department head Young-Jun Son for simulated optimization of agricultural facilities and resources.

Near Space Forum Strengthens Ties with Industry, Government

Recently formed institute is exploring technological opportunities 60,000 to 300,000 feet above Earth.

THE COLLEGE of Engineering and its near space partner, Missile Defense Advocacy Alliance, co-hosted a symposium in April 2024, covering defense technologies – balloons, sensors, missiles and threat mitigation systems – advanced communication capabilities, and policy considerations. David W. Hahn, the Craig M. Berge Dean of the college, and MDAA Founder Riki Ellison welcomed representatives from the university, U.S. military and defense industry.

Balloons, airships and a few planes can reach near space – 60,000 feet to 300,000 feet above Earth – providing a unique environment for technology development, said Hahn.

“This symposium came together around a shared vision and a broad set of complementary interests.”

The college and MDAA established the Institute for Near Space Studies in October 2023 to bolster the university’s near space and hypersonic research as well as related academic programs and STEM outreach.

“I want us to dream big in the state of Arizona to lead the world and our nation on near space.”

RIKI ELLISON, founder of *Missile Defense Advocacy Alliance*

Space for Ingenuity

“I want us to dream big in the state of Arizona to lead the world and our nation on near space,” said Ellison.

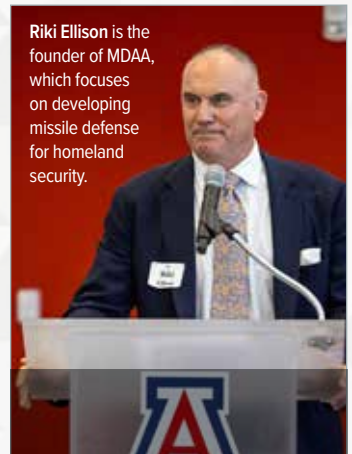
Emerging technologies in near space can ensure national security more cost-effectively, explained Mark Montgomery, senior director of the national

nonprofit Center on Cyber and Technology Innovation. Whereas “if you did it through traditional systems, the cost could be \$100 billion.”

For example, aerostats – lighter-than-air, gas-filled aircraft similar to blimps – can be outfitted with radar to detect farther than ground-based systems.

“A handful of these aerostats could observe all the approaches to the U.S.,” Montgomery said. “We should see near space as a technical opportunity.”

Near space also improves communication capabilities. Neither the ground nor oceans can block or disturb signals, so antenna and communication systems in near space can transmit farther and more securely in every direction, stressed UA engineering experts.



Riki Ellison is the founder of MDAA, which focuses on developing missile defense for homeland security.

Ongoing Education

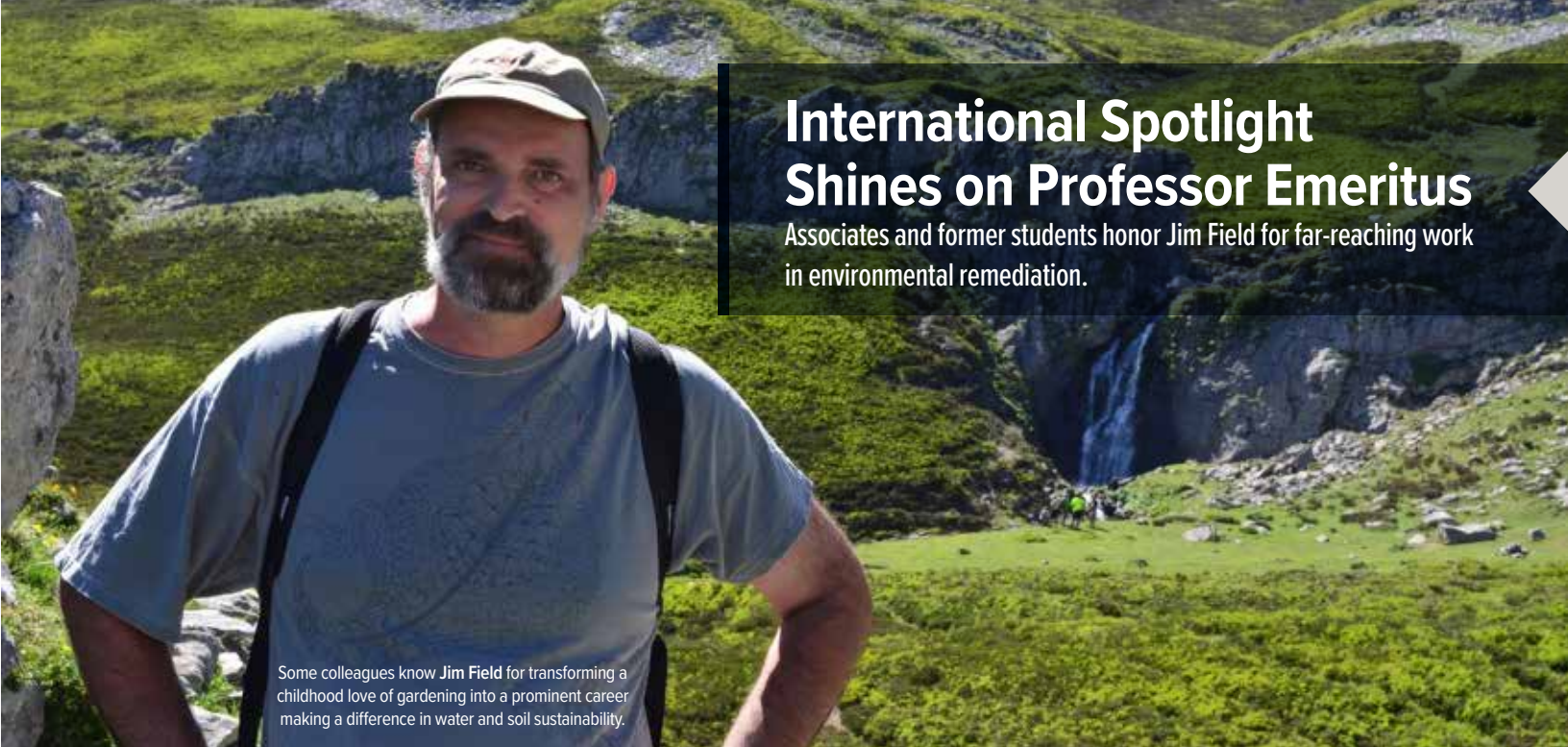
The benefits of the partnership reach beyond shared technology interests to youth outreach and professional development.

Through the Institute for Near Space Studies, MDAA is expanding its Youth Impact Program. Organizers of a summer 2024 UA camp for middle school students plan to incorporate balloons with instrumentation payloads. And, beginning with the fall semester, the institute will offer the AETOS program – professional engineering certification – for aspiring leaders from the military, government and technological communities.

“The near space realm is important and will only become more so,” said Hahn. “The college is fortunate to have valuable partnerships with MDAA, as well as all who joined us at the symposium. By continuing to pool our knowledge and capabilities, we will capitalize on all near space can offer.”



Panelists – (from left) Col. David Short, U.S. Northern Command; Col. Erikk Hurtt, U.S. Army Space & Missile Defense; AME associate professor Jekan Thanga; SIE professor Roberto Furfaro; astronomy professor Chris Walker; and Maj. Gen. Charles Corcoran, U.S. Air Force (retired) – discuss near space balloons and sensors.



International Spotlight Shines on Professor Emeritus

Associates and former students honor Jim Field for far-reaching work in environmental remediation.

Some colleagues know Jim Field for transforming a childhood love of gardening into a prominent career making a difference in water and soil sustainability.

JIM FIELD, professor emeritus of chemical and environmental engineering, continues to stack up honors worldwide for his decades-long work in environmental remediation and biotechnology.

At two fall 2023 symposiums in the Netherlands and Mexico, more than 100 colleagues and former students paid tribute to Field's bioremediation advancements, including removing hazardous compounds left behind from military explosives.

"All of my research to develop and implement environmental biotechnologies has required an international approach," said Field. "I am most proud of the fact that many of my former graduate students and postdocs went on to have successful careers as university professors."

The symposium accolades highlighted his commitment to teamwork and the enduring place he holds in their lives.

"My cooperation with Jim was exceptional from the first day I met him in October 1983," said Gatzke Lettinga, professor emeritus at Wageningen University in

the Netherlands and Field's PhD adviser. "He was the first and the last American who wanted to communicate [with me] in Dutch," said the 88-year-old in Delft, Netherlands, at the gathering dubbed a "Jimposium."

For most of his career, Field developed game-changing biochemical processes and biodegradation methods to quickly decontaminate soil and water. He helped pioneer the use of microorganisms that consume hazardous compounds and produce harmless waste in their place. That research was harnessed around the globe, including low-cost anaerobic wastewater treatment technologies in Latin America.

Diverse Input Nets Best Outcome

After his years of study and teaching in the Netherlands and postdoc work at the Autonomous University of Barcelona, Field went on to a prestigious 22-year career at the UA. Through those travels, his belief that a multitude of perspectives leads to the best solutions informed his passion for mentoring upcoming researchers.

"You have helped many students reach

their full potential and inspired a new generation of researchers to continue your work in academia," said one former PhD student, Lourdinha Florencio, at the Delft symposium. Florencio is now professor of environmental engineering at the Federal University of Pernambuco, Brazil.

Tributes from a number of students and colleagues at the "Jimposium" carried that common theme of teamwork, community and humanitarianism.

Field earned his BS and MS in environmental science from Virginia Tech before completing a PhD in environmental technology from Wageningen University in the Netherlands. After his postdoc work in Barcelona, he taught for nine years at Wageningen University before joining the Department of Chemical and Environmental Engineering at the UA in 2001. He retired in May 2023.



Juan M. Lema (left) embraces Jim Field.

▶ **2010s**

Katherine Sanchez, BS/ME 2011, is a managing consultant at MaxGrip, an asset performance management firm, in Houston. Sanchez recently wrote an article on optimizing asset performance that was published in Uptime, a magazine for reliability leaders and asset managers.

▶ **1990s**

Bob Ferris, BS/SE 1995, was inducted into the Modeling and Simulation Hall of Fame by the National Center for

Simulation. He was acknowledged as a trailblazer in the early adoption of virtual reality technology for educational and entertainment purposes. Ferris is founder and executive chairman of VirTra Inc., a provider of simulators for law enforcement and military.



Bob Ferris

▶ **1980s**

Jeff Martin, BS/EE 1984, is retired after working for Raytheon, Northrop Grumman and AECOM, preceded by 24 years in



Jeff and Laurie Martin

the U.S. Air Force. He fondly remembers the filming of “Revenge of the Nerds” and “Little House on the Prairie” on campus during his student days.

▶ **1970s**

Vern Eikrem, BS/GeoE 1979, retired in 2015 from Shell Exploration and Production Co. after a 36-year career as a petroleum geologist and team leader. He then began a second career as a science teacher in Katy, Texas. Eikrem is in now in his eighth year of teaching high school physics.



Vern Eikrem

Matt Frondorf, BS/ChE 1979, still owns and drives the 1973 Volkswagen Beetle that took him and his friends to destinations such as the Pawnbroker and the Stumble Inn decades ago. Frondorf also drove that car across the country to various summer engineering intern jobs. He appreciates the thoughtful excellence of the Beetle’s design – and says that his UA degree has also held up well.

was a longtime faculty member at the University of Massachusetts Lowell and helped make it a leader in plastics engineering education and research. His work in plastics processes led to developments that revolutionized the industry.

Robert Skelding, MS/AE 1963, turned 90 in November. He retired a decade ago following a 56-year career of engineering design, analysis and management. When he was a manager for IBM’s design group at Kennedy Space Center, Skelding assisted with NASA operations to ensure on-time launches.



Matt Frondorf still drives the Volkswagen Beetle from his college days.

▶ **1960s**

Nick Schott, MS/ChE 1968 and PhD ChE 1971, was inducted into the Plastics Hall of Fame. Schott



Nick Schott

F. Hugh Grinnell, BS/EE 1962, lives in Tucson following a career that began with international deployments for the U.S. Army. Grinnell also worked for the U.S. Air Force, Pan American Airlines, Ford Aeronutronic Company and as a financial adviser with New York Life Insurance Company.

FROM THE ARCHIVES

Jeff Martin BS/EE 1984, who also submitted a class note, sent in this photo of Bobbi Jones, which he took the year he graduated. Martin remembers Jones as a delightful person who worked in the Old Engineering Building for the electrical engineering department and wonders if anyone has a memory or update.



Gifts Create Powerful Synergistic Environments

Collaboration is crucial for the success and advancement of the college's vision for growth. Initiatives that align fundraising with research and student support play a pivotal role in fostering innovation, nurturing talent and driving impactful discoveries.

At the College of Engineering, philanthropic goals can align with strategic research priorities and student needs. The college has gratefully received substantial donations from alumni, industry partners and other stakeholders; these gifts have facilitated cutting-edge research projects, bolstered student scholarships and experiential learning, and enhanced infrastructure.

Cooperative fundraising and research initiatives help empower faculty members pursuing ambitious projects that address societal challenges and contribute to technological advancements. This approach enriches the college's research capabilities and encourages a culture of innovation and entrepreneurship among students and faculty. For example, the donor-supported Peter and Nancy Salter Biomedical Device Design Lab has demonstrated success at merging donors' interests with the needs of the growing biomedical program to create a space

for teaching and learning. Additionally, the college is working with collaborators across campus on the Cancer Engineering Initiative, featured in this issue, which has attracted funding from the state and donors, including alumni Mike and Sheri Hummel.

Donor support helps attract top talent, promotes diversity and inclusion, and improves the overall student experience.

Collaboration on student support ensures academic success, drives personal growth, and prepares the next generation of engineering leaders. One example is the partnership between the College of Engineering and the Eller College of Management that receives funding from the Muzzy family in support of the Eller-Engineering Entrepreneurship E3 Program.

From scholarships and financial aid to mentorship programs and career development initiatives, donor support helps attract top talent, promotes diversity and inclusion, and improves the overall student experience. By integrating fundraising efforts with student support

initiatives such as SnapCat's intern program, the College of Engineering has created a supportive ecosystem where students can thrive academically, professionally and personally.

These collaborations between fundraising, research and student support are essential for the University of Arizona College of Engineering to fulfill its mission of advancing knowledge, educating future leaders, and serving society. By inviting donors to join with the college through fundraising efforts across these key areas, the college can harness resources, foster innovation, and empower students and faculty to make a positive impact in the world. As the landscape of engineering continues to evolve, collaboration will remain a cornerstone of success, driving excellence and propelling the college to new heights of achievement and service.



Margie Puerta Edson

Assistant Dean, Development & Corporate Relations
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Homecoming 2024 DESERT BOUND

OCTOBER 18 - 20

Homecoming is nearly here! This action-packed weekend will kick-off with our 61st annual **Engineers Breakfast** on Friday, October 18. Join Engineering alumni & friends for a whole weekend of fun with informative and inspiring activities that you are sure to enjoy.

We'll see you at Homecoming!

VISIT OUR WEBSITE FOR THE LATEST HOMECOMING DETAILS.

engineering.arizona.edu/alumni/homecoming

START PLANNING
YOUR VISIT HOME



Engineering

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College of Engineering
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CALLING ALL ALUMNI!

Where has life taken you since graduation? We'd like to know and so would your college classmates. Please email us with details (no more than 300 words) and be sure to include the following information:

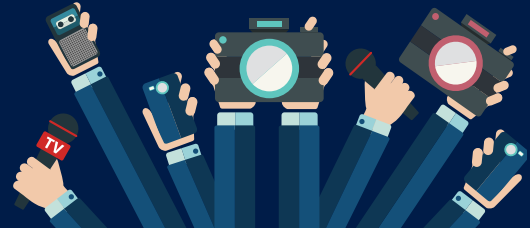
- Name and year you graduated
- Major
- Degree (BS, MS, PhD, etc.)
- Details of your activities

We'd also be interested to see – and share – pictures of your family, your latest work project, that boat or hot rod you just finished building in your garage, or your blossoming gardens. Vacation photos are great, too. We'll publish your news and photos online and in the next print edition.

Please send your email to classnotes@engr.arizona.edu

BEEN IN THE NEWS LATELY?

Let us know if you've been getting some media attention. Just email the link, and we'll keep spreading the news on the college website and in social media.



SEE HOW PHILANTHROPY
FUELS WONDER

