Welcome to Wildcat Country!

If you live in Arizona, we create positive impact in your life and we are here to serve you. At the University of Arizona, we are very proud to provide every student, county and community high-quality education, research and outreach.

The UA touches your life every day. Our graduates move into the workforce ready to lead Arizona businesses and communities in the ever-changing world of the 21st century. UA researchers create new ideas and products that benefit all of us. And UA Cooperative Extension and outreach efforts from every college help serve you. At the University of Arizona, we create positive impact in your life and we are here to serve you. At the University of Arizona, we are very proud to provide every student, county and community high-quality education, research and outreach.

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Hope for Children with Autoimmune Diseases

The nation’s first center to bring together basic science and clinical research is saving the lives of children with CPAE, an autoimmune disorder that targets the brain.

“This center became a reality from the shared vision of Banner Health, the UA, the National Institutes of Health, the Arizona Legislature and the PAME Foundation in Phoenix,” said Dr. Fayze K. Ghishan, director of the UA Steele Center and physician-in-chief of Banner Children’s at Diamond Children’s Medical Center. “This unique center is making a huge impact in Arizona and beyond as we see more children with CPAE,” he said. “Now, plans are underway to open a Banner-UA CPAE clinic in Phoenix.”

The Children’s Postinfectious Autoimmune Encephalopathy (CPAE) Center of Excellence recently opened in Tucson with plans underway to open a Center in Phoenix.

The Banner-UA team saved Holland’s life,” Blandini said. “We are so grateful for this lifesaving center. After three years, Holland can now return to school.”

The CPAE Center combines patient care, research and education as an integrated team works to understand and provide treatment for these devastating disorders. CPAE occurs when a child’s immune system—while fighting off a virus or infection—mistakenly targets the brain. This creates a range of neuropsychiatric symptoms that can include obsessive-compulsive disorder (OCD), tics, severe anxiety, ADHD, restrictive eating, depression and migraines.

Growing the Silicon Desert

The next hotbed of tech talent isn’t coming from Silicon Valley or the Ivy League, but an internationally savvy “start-up” right here in Tucson.

You might not expect to see a team of future tech titans working in the UA Office of Global Initiatives, but Tech.Global isn’t your ordinary coding program. The experience empowers students who love technology and want to explore the world. The Tech.Global boot camp is comprised of U.S. and international students who are committed to studying abroad. Not only do they overcome complex challenges, but they also examine ways that technology is interpreted across cultures—understanding the importance of diversity in innovation. Participating students work up to 18 hours per week with premier coding languages as they master application design and cybersecurity principles, even creating virtual-reality environments.

The atmosphere is highly collaborative, and for good reason. The students must meet rapid-fire deadlines as they launch applications directly supporting the UA’s academic and research efforts. In many ways, Tech.Global resembles a startup embedded within a university setting. Students apply their coding knowledge in the context of real work and produce a professional portfolio, setting the stage for a tech career straight out of college.

Tech.Global is one of many opportunities for students offered through the Office of Global Initiatives. For more information, go to global.arizona.edu/wildcatcountry.

Read more about preparing the next-gen workforce: pages 6–9

Read more on innovation you need to know about today: pages 12–26

Soldiers to Students: Building Hope and Resilience

-"We were ecstatic to find this center in Tucson,” said Scottsdale resident Karen Blandini, whose daughter, Holland, was diagnosed with the CPAE disorder PANS (Pediatric Autoimmune Neuropsychiatric Syndrome).

Developed by the University of Arizona Steele Children’s Research Center and Banner Health, the CPAE Center combines patient care, research and education as an integrated team works to understand and provide treatment for these devastating disorders.

CPAE occurs when a child’s immune system—while fighting off a virus or infection—mistakenly targets the brain, causing inflammation. This creates a range of neuropsychiatric symptoms that can include obsessive-compulsive disorder (OCD), tics, severe anxiety, ADHD, restrictive eating, depression and migraines.

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Students and alumni at the UA recognized the growth and dynamic needs of non-traditional students early on and created a solution. Today, through expanded certificate programs and degree offerings, non-traditional students at the UA are thriving.

"Many of you, in fact, adult learners are working professionals who are either looking to enhance their existing career or change careers entirely by picking up the essential technical skills to support professional goals," says Vincent J. Del Caño Jr., vice president for academic initiatives and student success. "To meet the dynamic and changing needs of our students and state, we’re offering new certificate programs and degrees in high-demand fields such as web development and cybersecurity.

According to the National Center for Education Statistics, 30 percent of college students today are older than 25, that number is projected to increase by an additional 23 percent. The UA Coding Boot Camp, a certificate program that teaches students the basics of web development in only 24 weeks, already has found popularity and success in Arizona. The program provides them with engaging content and real-world experience—enabling them to work in high-impact, high-demand fields," says Melissa Vito, senior vice president for student affairs, enrollment management and strategic initiatives. "Through UA Online and our distance education offerings, we’re providing educational access for located, driven students and creating a desirable workforce that will bolster Arizona’s economy."

Preparing Non-Traditional Students for Tomorrow’s Jobs

Students success and wellness will take center stage in the forthcoming construction of the UA’s new student success district in the heart of campus. The Bear Down Success District is a reimagining of the college student experience. The project aims to create a campus core that captures the best of the UA’s academics, research, student support and success services, which will power academic and career success for students from day one.

"Today’s students live digital, 24/7 lives," says Kaysey Depult, vice president for enrollment management and student affairs advancement. "The success district is designed not just to be a 21st-century student hub, but advance their ability to engage in healthy study habits, collaboration, exercise and career prep."

At the new space, students will be able to move from group settings in collaborative study spaces, to learning stations at Think Tank, a favorite workbar space. Like modern corporate campuses, the success district mirrors the student hub line, work and play. "The space not only builds student-to-student bonding," says Karen Williams, vice president for information strategy and university libraries. "The workplaces and gathering areas are also rapidly changing, requiring us to anticipate and meet new student needs.”

The success district will expand the reach of 100% Engagement experiences combining leadership, creative expression and liberal arts curriculum with career competencies and skills such as innovation, professionalism, civic responsibility, communication, collaboration and problem-solving.

"The success district is a physical expression of what we do better than anyone else,” says Melissa Vito, senior vice president for student affairs, enrollment management and strategic initiatives. “It acknowledges that as a student, your experience and your ability to stay healthy and active — all contribute to your likelihood to graduate and be successful." Today, 100% Engagement is paying off in a big way for UA students and employers.

Keeping It Real: Preparing More Graduates for Day One

A college graduates leaving the classroom with workplace-ready skills? According to employers, they’re not. In a 2016 survey by Gallup, just one-third of business leaders agreed that graduates had the necessary skills and competencies to succeed in the workplace.

In the midst of this national gap in workforce readiness, the UA created the 100% Engagement Initiative with the goals of producing graduate students who are among the most competitive in career and graduate school markets and creating a better way to fill the talent pipeline for Tucson and Arizona.

Two years later, the initiative has made a profound impact in the lives of students and employers.

"Before 100% Engagement, our students were already some of the most sought-after graduates in the country," says Vincent J. Del Caño Jr., vice president for academic initiatives and student success. "With the initiative, we’ve continued to build on the UA’s great tradition of experiential learning and ensuring our students are successful in the job from day one."

Statistics show that UA graduates are among the most knowledgeable and workforce-ready students in the nation.

Students for Tomorrow’s Jobs

In 2016, 32 percent of employers said UA graduates had the skills needed to succeed on the job. Additionally, nine out of 10 employers rated UA graduates as equaling the quality of their peers, according to internal employment satisfaction data.

100% Engagement experiences combine activities such as leadership, creative expression and interdisciplinary explorations with career competencies and skills such as innovation, professionalism, civic responsibility, communication, collaboration and problem-solving.

The result is that students not only connect what they are doing to their passions and career goals, they also learn and apply skills imperative for career success.

Unique to this innovative model is the engagement notation that students can earn on their official UA transcript.

"The only institution of our size and reputation to document a notation of engaged learning on a student’s academic transcript," says Melissa Vito, senior vice president for student affairs, enrollment management and strategic initiatives. "This serves as a gold seal to employers and graduate schools that our students have gone above and beyond the classroom experience.”

Today, 100% Engagement is paying off in a big way for UA students and employers. A
Partnership Arizona companies and organizations, such as Fry's Food Stores, City of Phoenix, American Express, and GameStop are partnering with the University of Arizona to improve the number of online degree and certificate programs that have high growth potential for graduates in Arizona.

Under these new partnerships, the UA will provide college degree opportunities for an additional 63,000 employees in Arizona and 2,000,000 employees nationwide.

“Through UA Online, we’re creating new opportunities for our employees to advance their education and careers forward,” said Vincent J. Del Casino, Jr., vice president for academic initiatives and business development.

“Expanding access to higher education is an important focus for the UA and the state, as the Arizona Board of Regents recognizes the need for improved college degree attainment and new career paths.”

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Departments with working families for those who have aspirations for a college degree. With 123 locations throughout the state, Fry’s is one of the largest employers in the state.

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Partnerships play a key role in not only increasing access to college degrees, but also helps our Associates grow into strong leaders,” said Donna Tauer, HR Manager, Fry’s Food Stores. “We’re passionate about our partnership with the UA because we’re committed to serving the communities that we live in and providing the best educational opportunities both to our employees, Fry’s family to turn a job into a lifelong career.”

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College graduates are turning to first jobs and lifelong careers that make a difference in the communities around them. They want their work to matter.

The UA McGuire Center for Entrepreneurship, renowned for more than 30 years for its New Venture Development and Innovative Mindset programs, is responding to the trend by introducing a new educational track: Social Impact. The track will provide social innovation, social entrepreneurship, nonprofit leadership and economic development offerings for students and community members who desire to make the world a better place.

To celebrate the new direction, the McGuire Center hosted a Social Impact Summit in October at the UA. The event kicked off TENWEST, a weeklong festival of entrepreneurship, technology, arts and communities, and included a social impact pitch competition, as well as workshops and roundtables on maximizing innovation within nonprofits and social ventures.

The UA’s VETS office inherited the dog tags from the TOP (Tours of Peace) Vietnam Veterans, a nonprofit organization that authenticated and returned more than 500 dog tags. In 2016, the group barned everything over to the UA, and the TOP Legacy program was born. "With each passing year, more Vietnam veterans are passing away," said Cody Nichols, the UA’s assistant dean of students for military and veteran engagement. "We developed a better understanding of the project, we determined to continue the legacy of TOP in an effort to return the dog tags to the Vietnam veterans or their families." The UA’s Office of Digital Learning knew it was important for UA Online students to have access to campus resources and staff. So, from a student’s first phone call all the way to commencement, UA Online provides direct support via UA professors and advisors.

"It’s important for online students to feel like they are part of the greater UA community," noted Joshua Steele, senior director of UA Online. "And that tomorrow will be shaped by the students of today. We want to hear from them and learn their stories. So, we talk to them, we meet them at work, and we’ve formed key corporate sponsorships to provide amazing benefits.”

To learn about the 80-plus online degree programs the University of Arizona has to offer, visit UAonline.arizona.edu.
The Scent of a Rainforest

Yeethen Taylor moves catlike along a narrow path tucked inside a simulated Brazilian rainforest. The scent of damp earth and greenery predominates.

This living lab is part of the University of Arizona’s Biosphere 2, where Taylor conducts much of his study of climate change—specifically volatiles, the molecular compounds that are small enough to become a gas.

“My work is about what you smell as you walk into the rainforest, which is plant volatiles,” says Taylor. “I’m studying the volatiles that help plants deal with stress like that which comes from high temperatures and drought.”

These volatiles are produced in response to ever-changing environmental conditions. Taylor explains that once the temperature of a leaf climbs, enzymes start modifying particular molecules inside the leaf, turning these molecules into gas, which is then released.

Although plants that inhabit rainforests exchange massive amounts of carbon dioxide and oxygen, it’s this process of volatile production, says Taylor, that mitigates damage and helps plants cope with climate change—and, in turn, affects the world’s climate.

Impacting Arizona, Our World and Beyond

Join us in thanking the University of Arizona for making an impact through education, knowledge and innovation that reaches far beyond Southern Arizona. Hughes Federal Credit Union is proud of the trusted partnership it has with the UA™ and the values and goals that both organizations share. We applaud them for their successes and their commitment to excellence that makes our community a better place to live and work.

There’s more to learn (and gain) beneath solar panels than we think.

Barron-Gafford and his colleagues found that the solar array most photovoltaic plants with just soil beneath them created a locally warmer environment than normal — a solar heat-island effect — which was likely being fueled by what Barron-Gafford refers to as “transforming who is in this ecosystem.” That is, in a normal environment, a mix of soil and plants in the open air would allow the air to circulate unencumbered. The plants would take up carbon dioxide for photosynthesis by opening up their pores in a holding water source from their leaves. “So think about it, if you get rid of all the plants when you put in renewable energy, you’ve gotten rid of that cooling potential and you get a warmer environment. We wanted to see if you put the cooling effect back into the system, you can actually cool these panels back down and mitigate that heat-island effect.”

Next, Barron-Gafford will focus on trying to reduce water use even more by taking advantage of the shade gleaned from the solar panels, then take the system to rural Arizona and northern Mexico, where there’s no reliable water or power.

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schooled of Architecture students in the UK Col-
gage of Architecture, Planning and Landscape Architecture are typical in many respects: Their work is often theoretical design projects; they work long hours in their studio spaces; looking to their classmates for inspi-
ration; and they dream of just how and when they will get to see their projects come to life. While theory and research are necessary parts of the curriculum, students at CAPA also have the unique opportunity to work on real-world design solutions. One such way is through the Brick-
edge Design-Build Coalition, or DDBC, a nonprofit housing provider organization. The DDBC is the product of professor Mary Hardin’s desire to ensure that her architecture students see their designs come to life and help an underserved population of low-income Tucsonans achieve home ownership. Recently, the DDBC, through the design-build studios and hard work of 33 students across three semesters, completed its sixth residence, the “Sentinel House.”

“My involvement in DDBC has allowed me to bring the excitement of designing and building real projects into the studio experience with students,” Hardin says. “I get incredible pleasure from seeing them enthralled about their own project designs. I also have been buoyed by how much extra work my students put into these projects, knowing they are building homes for a family who would not other-
wise benefit from the talents of architectural designers. Seeing my students put so much into each project has constantly renewed my own sense of commitment and enthusiasm.”

Hardin and her students received a grant from the UA Office of Shaded Engagement because the project met the requirements of the 100% Engagement initiative. The initiative works to provide students with experiences beyond the classroom, helping to enrich their professional and personal growth. Even with the grant, the residence was designed under a strict budget so that it could be sold to a Tucson family earning below 80 percent of the Area Median Income.

The home was built with several sustainability practices to help keep utility bills and lifetime maintenance costs lower for the homeowners. For example, scoria, a thermal mass material, was used for the exterior walls of the home. This dense material holds onto temperature for a long period of time, meaning it works hard to prevent outdoor heat from coming indoors. Additionally, a layer of rigid foam was placed in the center of those walls to help hinder the heat transfer. The team also built two water-harvesting cisterns to collect rainwater from the roof for use in the landscaping. The landscaping is xericace, low-water-use desert plants that are tolerant to heat and water stress. The air-conditioning system consists of four mini-splits rather than one central unit, so that each room can be programmed for comfort separately from the others. This will allow the homeowners to fine-tune their use of the cooling system to keep bills down. The mini-split units are much more efficient than the typical central unit.

Educational experiences such as these help UK students move beyond the classroom and into their professions. They have had the opportunity to face real challenges and find efficient solutions. “These opportunities simply aren’t found elsewhere,” Hardin says.

From labs to launch pads and bench to bedside, UA research is leading the way to create a better Arizona. Research that saves lives. Inventions that create new businesses and jobs. Our R&D goal is to do more—more for Arizona. More for our nation. More for the world.
According to the U.S. Mine Safety and Health Administration, new miners must have a minimum of 40 hours of safety training to qualify to work at mining sites, with an additional eight hours of training each year. “We know from teaching that sitting there, staring at a screen, listening, is not a way to engage people,” says Mary Poulton, who until recently was a University Distinguished Professor of Geosciences, Mining Engineering, Law and Public Health at the UA, and director of the Lowell Institute for Mineral Resources. “It doesn’t make people more safety-conscious and it doesn’t lead to better safety behaviors at the job site.”

To address the challenge, Poulton, Leonard Brown of the UA Department of Computer Science and Michael Peltier of the Center for Mine Health and Safety teamed up to invent a new serious computer game, “Harry’s Hard Choices.” The game brings together the latest computer gaming research with Poulton’s extensive expertise in mining to create what Poulton describes as “immersive, hands-on experiences that you hope to never encounter on the job,” with the ultimate goal of saving lives.

With help from Tech Launch Arizona, the team started a company, Desert Saber, which has licensed the invention from the UA and is bringing it to the marketplace.
A childhood connection to a famous Andy Warhol work led one UA School of Theatre, Film & Television professor to direct a film for HBO.

Researchers Develop Public-Health Playbook for Airports

If you answer, you might be surprised what you learn and how much your talk could mean to a student caller.

Zach Johnson, Farron Shanahan and dozens more students serve as callers and connectors throughout the school year. They raise money for the university and its colleges, and they update UA alumni, parents and friends on what’s new.

“The roles and responsibilities of airport managers, attorneys and other stakeholders must be defined clearly prior to an outbreak to ensure all parties can respond effectively and swiftly,” she adds. Barraza and Hall-Lipsy, both attorneys, are searching federal law and cases in other countries for examples of how contracts and regulations on population health, both nationally and globally.

“The roles and responsibilities of airport managers, attorneys and other stakeholders must be defined clearly prior to an outbreak to ensure all parties can respond effectively and swiftly during a public-health emergency,” she adds. Barraza and Hall-Lipsy, both attorneys, are searching federal law and cases in other countries for examples of how contracts and regulations on population health, both nationally and globally.

In the HBO documentary film “Brillo Box ($6 Off),” Skyler blends personal narrative with pop-art history to tell a universal story about the ephemeral nature of art and value — and about the decisions that shape a family’s history.

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“Parents are curious about what’s happening and excited their students are here. They tell me their families were sold on the UA after just one tour. It’s the atmosphere — the experience they see when they come here. I’m a supervisor, and helping callers improve is my favorite part of the job. I tell them about the times student callers have been invited to interview for jobs or internships. It happens more than you would think.”

Give Now!  uafoundation.org/support-ua/give
could bring sustainable energy
to every community

Solar-powered Stirling engines are the first to explore how communities could use large-scale, renewable power to areas that currently have no access to electricity.

Together, they have been researching
with the heat that powers them. McHugh and
expansion of natural gases to produce
are unable to pro-
tect their inventions
because of the
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costly legal process. "They don't have a Plan B," he says. Sternstein sees the Arizona Public Patent Program as a resource for both inventors and the state economy. "There are people with some very good ideas, and we'd help protect them," he says. "It will certainly help those individuals, and we think it will help the community, too." McHugh received a grant from the UA Green Fund that enabled her to build a test version of the Stirling engine. McHugh is now working toward a master's degree in civil engineering with an emphasis in sustainable systems.

She has received a number of applications from inventors seeking to be paired with patent attorneys providing pro bono services. The applicants come from a variety of fields, including consumer products, medical technology and solar energy. Allan Sternstein, director of the clinic, says that

UA helps connect inventors with pro bono legal services

with the pro bono program, most
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You Invented It. Now, Protect It.

A
ccess to inexpensive electricity is a global issue. UA grad and professor team are the first to explore how a solar-powered Stirling engine could bring sustainable energy to communities everywhere.

Imagine a world in which all communities have access to sustainable energy. Megan McHugh, a recent graduate in Sustainable Built Environments, or SBE, from the UA College of Architecture, Planning and Landscape Architecture, has not only imagined it — she has started the research to make that vision a reality. The goal of her project is to bring affordable and renewable power to areas that currently have little access to electricity.

This year, McHugh has been working with Cho Lik Chan Ph.D., a professor in aerospace and mechanical engineering. Together, they have been researching how communities could use large-scale, solar-powered Stirling engines to pump generators that would make electricity more accessible.

Stirling engines use cyclic compression and expansion of natural gases to produce the heat that powers them. McHugh and Chan are the first to explore a solar-powered version of the Stirling engine. McHugh received a grant from the UA Green Fund that enabled her to build a test model of the solar-powered Stirling engine as her senior capstone project for the SBE program. McHugh is now working toward a master's degree in civil engineering with an emphasis in sustainable systems. Students who pursue SBE have the

Humanities’ New Digital Reality

In today’s complex digital world, Humanities teachings are evolving into intercultural game-based learning and virtual reality modeling to help better identify and solve the world’s emerging needs.

Over the past 10 years, many as 1,500 refugees come to Tucson annually and are given only 90 days to become self-sufficient. Many neither speak nor read English and do not know how to read a map. Simply finding a grocery store can be a challenge. The research of Jill Koyama, an associate professor in the UA College of Education, centers on how newcomers — immigrants and refugees — access and create networks rich in resources, even under difficult circumstances.

"I struggle with how we, as adults, create so many situations in which these children are at risk,” she says. “So often we focus on what they can’t do, and we don’t look at what they can do.” Koyama is captivated by the de-termination and spirit of immigrants. “They still believe in the American Dream,” she says. "Even after spending as many as 17 years in refugee camps, I am drawn to their resilience, their survival joy.”

Through the organizational, analytical and visualizing power of digital technologies, the center will provide creative, scholarly and educational support for researchers, teachers and community members seeking to more fully understand the world's working and emerging needs.

Survival Joy: Strong Spirit of Refugees

Human nature shows its strength to survive through nearly 1,500 Tucson refugees each year, thanks to a UA program helping them adjust to life in the United States.

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Making STEM Culturally Relevant

Carlene Martinez says her son is “all about science” and is thankful he can benefit from programs such as STEM RISE Arizona, which creates culturally relevant STEM support programs for K-12 students in predominantly American Indian and Hispanic schools.

STEM RISE Arizona encourages students to explore science, technology, engineering and mathematics through “project-based learning activities that are culturally relevant to their backgrounds, pulling from their experiences and relating it to environmental issues in the Southwest,” said Geraldine Lopez, assistant extension specialist in the UA School of Animal and Comparative Biomedical Sciences.

Thanks to a $600,000 challenge grant from the Agnese Nelms Haury Program in Environment and Social Justice at the UA, STEM RISE Arizona will be able to do even more.

STEM RISE promises to incorporate environment, social justice and cultural elements into effective education through authentic collaboration between dedicated UA and community members,” said Anna Spicer, director of the Haury program.

The challenge grant calls on teams of UA and community partners to create systemic and transformational changes for society and the environment. In addition to the UA, STEM RISE Arizona includes the San Xavier District of the Tohono O’odham Nation, the Pascua Yaqui Tribe, Sunnyside Unified School District, Pima Community College and Pima County 4-H Youth Development.

An innovative, high school students are learning STEM subjects in their classrooms while earning college credit in Engineering. The semester-long college course is expanded to 21 students in one school in 2008 to 2,000 students in 40-plus schools in 2017. The semester-long college course is expanded to a full academic year for high school students, who learn the fundamentals of daunting subjects like physics and calculus in the familiar setting of their classrooms and from their own teachers and practicing engineers.

In U.S. News & World Report’s latest rankings of public high schools, six of the top 20 participate in the program, and three of them are listed among the top 10 in the nation.

“We are proud that six of our partnering high schools are so highly ranked,” said Jill Rogers, assistant director of the program. “The collaboration is a model for the country.”

Improving Food Security

Around the World

Dr. Monica Schmidt works with students on pioneering technology to improve food security.

In the U.S., crops meant for human consumption are tested for toxins, ensuring food safety and preventing the future loss of millions of tons of crops. But crops around the world are susceptible to infection by a fungus that produces aflatoxins. Aflatoxins cause stunting childhood growth, increasing the risk of liver cancer, and making people more susceptible to HIV and malaria.

The Centers for Disease Control and Prevention estimates that 4.5 billion people in developing countries are exposed to aflatoxins through their diet. For this reason, a new team is working on a defense mechanism in plants that will shut off the toxins, ensure food safety and prevent the potential to improve food security on a global level.

Induced Gene Silencing, or HIGS, essentially puts genetic material into crops that then triggers the plants to shut off the toxins. That approach, called Host-Induced Gene Silencing, or HIGS, holds great promise because it is highly specific and targeted in its effect, according to UA Professor Monica Schmidt.

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At the UA College of Medicine—Phoenix and the UA College of Agriculture and Life Sciences, researchers are testing the use of the gene's expression using remote sensing imagery, allowing users to actually view surface greeness. A key drought impact group, environmental scientist, plant geographers, federal and state land management agents, and ranchers have been using the site, finding it helpful.

"It's a Swiss Army knife for land management out here in the Southwest," says Mike Crimmins of Cooperative Extension.

"It's the direct connection from high-level science to solving problems on the ground, taking a satellite in space and supporting a specific action at a ranch, at a park," Crimmins says. "It is the spirit of Cooperative Extension, literally on the ground, making the science useful, applying it and bringing it to the right scale.”

DroughtView: The ‘Swiss Army Knife’ of Land Management

Where the grass is greener means more than you think: Cutting-edge tech developed at the UA helps fight drought and boosts agriculture by identifying surface greenness.

“DroughtView illustrates the mission of Cooperative Extension, which is to take the science of the UA and share it with the people of Arizona,” Crimmins says.

“DroughtView is a model for the country.”

The event devotes an entire day to inspiring careers in science, technology, engineering, math and medicine. Connect2STEM also offers an opportunity for high school students to learn more about STEM fields through Connect2Career and Connect2Mentor.

The next Connect2STEM, hosted by the UA College of Medicine — Phoenix and Cox Communications, will take place on Jan. 27, 2018.

Southgate will wear the white coat and perform “surgery” with the DaVinci Robot — a machine with the precision to peel a grape and treat patients with operations. All ages can participate in dissections and experiment with exploding toilet paper. Small children can take their stuffed animals for “checkups” at the Wildcat Play Hospital.

For five-year-olds, the event includes a stop at the UA College of Medicine — Phoenix and Cox Communications, will take place on Jan. 27, 2018.

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Shortly before 10 a.m. on Friday, Sept. 22, NASA’s asteroid-bound OSIRIS-REx spacecraft zipped past Earth less than 11,000 miles above Antarctica and just south of Cape Horn, Chile, before following a route north over the Pacific Ocean.

In Tucson, a countdown clock in the lobby of the University of Arizona’s Michael J. Drake building — which had been ticking down the seconds until this flyby since the spacecraft launched last September — hit zero. A team of scientists and engineers, gathered at the mission’s Science Processing Operations Center below, held their breaths, cheered and then turned to their computers awaiting the first rounds of new data.

Meet OSIRIS-REx

OSIRIS-REx (short for Origins, Spectral Interpretation, Resource Identification, and Security – Regolith Explorer) had reached a milestone on its journey to collect some of the oldest material in the solar system. Just as planned, the spacecraft performed a maneuver known as an Earth Gravity Assist, flying low over Earth’s surface and using the planet’s gravity to slingshot itself onto a new path toward its target, the asteroid Bennu. Later that day, the team would receive confirmation that the maneuver was flawless.

A fuel-saving technique that has been used by a handful of other NASA missions, the Earth Gravity Assist gave OSIRIS-REx the extra boost needed to change its orbital plane. Bennu’s orbit around the Sun is tilted six degrees from Earth’s orbit, and this maneuver changed the spacecraft’s direction to put it on target for a rendezvous with the ancient asteroid next August.

Bonus: Images of Earth

The mission team also used OSIRIS-REx’s Earth flyby as an opportunity to see and calibrate the spacecraft’s instrument suite. Approximately four hours after the point of closest approach, and on three subsequent days over the following two weeks, the spacecraft’s instruments were powered on to scan Earth and the Moon. In addition to producing beautiful images of home, these data are being used to calibrate the spacecraft’s science instruments in preparation for OSIRIS-REx’s arrival at Bennu next year.

The maneuver also allowed the full mission team — many hailing from the UA’s Lunar and Planetary Lab or connected virtually from Phoenix, Denver, Maryland, Washington, D.C. and beyond — to practice sharing the data from different instruments on the spacecraft and weaving together their processes.

“The opportunity to collect science data over two weeks provided the OSIRIS-REx mission team with an excellent opportunity to practice for operations at Bennu,” said Dante Lauretta, OSIRIS-REx principal investigator and UA professor of planetary science. “During the Earth flyby, the science and operations teams were co-located, performing daily activities together as they will during the asteroid encounter.”

With the successful Earth Gravity Assist under its belt, OSIRIS-REx is just over one year into a seven-year journey to rendezvous with, study and return a sample of Bennu to Earth. The surface material of a primitive asteroid will help scientists understand the formation of our solar system more than 4.5 billion years ago.

Slingshot Toward an Asteroid

EGA was like a slingshot. It used Earth’s gravity to fling OSIRIS-REx onto a new course toward asteroid Bennu.
Visiting Tucson

Tucson is surrounded by The Loop, with cooler temperatures (there's even a ski lift, believe it or not). Want smooth paths ready for road bikes? There are countless hiking trails here in Tucson. You might take a quick trek into Sabino Canyon — with or without the aid of the tram that transports visitors deep into the canyon. Both sections of Saguaro National Park offer paths into their respective forests of cacti. Head up Mt. Lemmon to see an entirely different side of the Sonoran Desert as seen in Tucson. The five inspiring landscapes at Saguaro National Park, the amazing sunsets. What's great is that there's so much out there to explore. Hiking, biking, great drives, bird-watching, stargazing: the options are infinite.

If you want to take it a bit easier, grab a copy of the latest edition of the Tucson Attractions Passport with discounts and offers at the best of what Southern Arizona has to offer.

Is life on two wheels more your speed? Tucson has plenty to offer, both on and off campus — you’ll need more than just a weekend to explore it all. Start your journey at VisitTucson.org.

First U.S. City of Gastronomy

Visit Tucson.org/events

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On Monday, Nov. 23, 2009, Mia, who was 12 at the time, was diagnosed with ependymoma, an extremely rare form of brain cancer that affects fewer than 200 kids in the United States each year. One day, she was playing soccer and the next day she was in surgery to remove her tumor. “From that moment,” Jeannine said, “it was a whirlwind of doctors, surgery, waiting rooms, radiation treatments, and weeks and months of recovery. We learned so much about the research that had been done that enabled Mia’s doctors and radiologists to map out exactly where the radiation needed to go and what areas they needed to avoid. Only through research were they able to be so precise.”

A great sports mentality and a little Lady Gaga music made things a little easier for Mia during radiation treatments. “I knew I had to do it, so I just tried to go with it and remind myself that I had a whole team behind me: family, friends and doctors supporting me every step of the way. Listening to Lady Gaga made it a little bit better for me, too.”

Weeks later, Mia got to meet Lady Gaga backstage at one of her concerts and that experience remains one of her favorite life moments.

A few years ago, a friend approached Jeannine Mason about becoming an advisory board member of the University of Arizona Steele Children’s Research Center. She immediately agreed. Since joining the board, she has made it her mission to help raise awareness of the UA Steele Center. “Tucson is where I grew up and we have deep family roots here. We wanted to make a difference here.”

As long-time supporters of cancer research, Jeannine and Mia want to share with more people that research at the UA Steele Center is saving kids’ lives all over the world. They recently launched a campaign to help other children with cancer. “I want other survivors to know that looking at me might give them hope,” says Mia.

“Dr. Ghishan has built an extraordinary team and they’re doing the research that will lead to answers for diseases that affect thousands of children,” says Jeannine. “Steele is, and will continue to be, a lifesaver for kids and their families in Arizona for many years.”

Going Gaga to Get Over Brain Cancer

Mia Mason’s experience with brain cancer didn’t slow down her passion for sand volleyball, life … or Lady Gaga. To learn more about the University of Arizona Steele Children’s Research Center or the Mia Mason Fund for immunology research, visit bit.ly/MiaMason.
Millenial Doctors’ Kits Now Include Cybersecurity

Cybersecurity is a threat to identity, and now health. Fortunately, patients can rest a little easier as two UA alumni doctors develop a system to better protect their medical data.

“We had first-of-their-kind cybersecurity simulations,” Tully said. “We brought together people all across the world.

“We offer an even free of charge to the public, and we had the chance to show the UA College of Medicine—Phoenix as an innovative center that will lead the world in this issue.”

Dameff said that he and Tully want to become a voice for patients in trying to prevent cyberattacks on medical devices.

“It’s an opportunity, but it’s also a responsibility,” Dameff said. “When you see the waterfall coming and you’re on the raft, it’s your job to warn everyone to get to the side.”

The center’s staff developed proprietary health-information technology that analyzes millions of prescription records and other medical data daily. Using this software, potential problems are prioritized based on urgency and complexity.

“The problem is not limited to devices and pharmacy interns — students enrolled in UA pharmacy and pre-pharmacy programs — created plans and simulations with patients and their doctors to help identify, prevent and resolve medication-related problems.

The model has dramatically improved patient care while creating hundreds of jobs for health care professionals and students-in-training.

“There weren’t any MTM programs or models to follow in 2005 and the industry was very much taking a wait-and-see approach,” Boesen says.
Researchers at the University of Arizona are working to help predict and prevent a disease familiar to many in Arizona and the southwest — valley fever. With help from a $2.27M federal grant, Dr. John Galgiani and other researchers at the UA Valley Fever Center for Excellence are working with computational expert, Dr. Yves Lussier, associate director of informatics for the BIO5 Institute, to build genetic profiles of people who get severely ill from valley fever.

Although the biggest risk factor for valley fever is geography (more than 65 percent of all cases in the U.S. occur in Arizona, and 30 percent in California), some genetic factors — gender, blood type, ethnicity and immune status — already are known to put people at higher risk for the potentially deadly respiratory disease.

About 60 percent of those who come into contact with the fungus Coccidoides that causes valley fever don't have any symptoms, according to the U.S. Centers for Disease Control. About 5-10 percent develop serious or long-term problems in their lungs. For about 1 percent, the infection spreads to other parts of the body. Of the roughly 150,000 cases reported each year, valley fever kills about 160 people.

But the disease is unpredictable. According to Galgiani, “Some have no problem. Others die of it. We think it has to do with their immune response and differences in genetics behind those.” The NIH-funded study is designed to inform early diagnosis and treatment, and may even lead to a preventative vaccine in the longer term.

Valley Fever Vaccine in Sight

Dr. John Galgiani of UA Valley Fever Center for Excellence

Patients no longer are trapped in the dark with pain. Relief may be found in green LED lights.

Participants used a green LED light strip in a darkened room for one to two hours a day for 10 weeks. Those who received the green light treatment saw a decrease of 40 to 50 percent in pain. At the end of the study, several participants kept the green lights.

Because the correlation of the green light and pain is unknown, Ibrahim and Khanna hope to secure grants to expand the study. Green LED holds significant promise to manage some types of chronic pain and could be an option to opioids.

Researchers Give Green Light to Pain Treatment

Researchers at the UA Health Sciences have found promise in a novel, non-pharmacological approach to managing chronic pain by treating it with green light-emitting diodes, or LED.

Upon learning that his brother’s headache pain was relieved by sitting among green trees, UA pain researcher Dr. Mohab Ibrahim decided to see whether replicating the green light filtering through the leaves might be an effective treatment for pain.

After success with green LED lights in the laboratory of co-researcher Rajesh Khanna, Ibrahim conducted a small, randomized, double-blind clinical trial to study the effects on people with fibromyalgia — a common source of chronic pain and migraines.

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Can’t sleep?

You’re not alone. An estimated 15 to 20 percent of U.S. adults suffer from sleep and wakefulness disorders. What’s more, individuals with these disorders are more likely to suffer from chronic disease, including depression, substance abuse, hypertension, diabetes, cancer and stroke or even death.

But thanks to a collaborative dream team focused on sleep research, relief is available.

UA researchers and Banner Health physicians seek to better understand sleep’s effect on memory, mental health, stress, alertness and decision-making, and how environmental factors affect sleep. Their efforts have revealed how sleep deprivation can impair perception, thought processes and behavior. Even changes in your sleep schedule on the weekend result in overall poorer health, worse mood and increased sleepiness and fatigue. The team of experts also recognize the need to further understand how sleep is influenced by the complex intersection of social and economic inequality.

While no single cure exists for insomnia, things such as blue light exposure, alcohol, smoking and caffeine, sleep apnea and even understanding and coping with childhood trauma affect how and how much we sleep.

The UA Health Sciences Sleep and Circadian Science Research Center, led by Dr. Sairam Parthasarathy, allows UA investigators to conduct sleep and circadian science. Circadian science, the study of the 24-hour cycle response to light and darkness on research volunteers named the CATS, is key to understanding the body’s internal biological clock, or sleep.

Among others on the UA campus and nationally, the center partners with the sleep research teams at the Social, Cognitive and Affective Neuroscience (SCAN) Lab, led by Dr. William D. “Scott” Killgore, and the Sleep and Health Research Program, led by Michael A. Grandner. With their clinical delivery partner, Banner Health, the research meets clinical practice at a key community resource: The Center for Sleep Disorders at Banner — University Medical Center Tucson. There patients are treated and sweet dreams become reality.

The Dream Team

Treating Sleep Disorders

Sleep deprivation can cause serious physical and mental health issues. But Arizonans have resources at the UA and Banner Health to help the sleep-deprived finally get some shut-eye.

As a child watching his mother struggle to breathe during her severe asthma attacks, Dr. Fernando Martinez vowed one day that he would cure the disease.

At the UA Health Sciences Asthma and Airway Disease Research Center, directed by Martinez, UA experts in many disciplines have joined forces to attack respiratory disease in children and adults. Their efforts have paid off with much greater understanding of the genetic and environmental factors that cause asthma.

A new U.S.-led nationwide clinical study, funded by a $27 million cooperative agreement grant from the National Heart, Lung and Blood Institute, is building on UA asthma research that has continually been funded since 1971.

The study will enroll more than 1,000 infants, 6 to 18 months old, who are considered at high risk for developing asthma. Using a bacterial extract, the study seeks to safely stimulate the immune system in early life to prevent wheezing illness and, hopefully, the later development of asthma.

“Following these children during the preschool years will further enhance our understanding of the disease, provide additional precision approaches to therapy and lead to optimal prevention strategies, and — hopefully — a cure,” Martinez says.

Waging a Winning Campaign Against Asthma

Asthma affects one in 10 children in the United States. With a better understanding of genetic and environmental factors, such as exposure to bacteria at a younger age, we may see an end to asthma in our lifetime.

We develop better pediatric vaccines and treatments for cerebral palsy and autism while taking diseases like cancer, schizophrenia and epilepsy out of the picture. So you enjoy the sweeter things in life.

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HEALTHIER. STRONGER. SAFER.
An era of medicine in which researchers, health-care providers and patients work together to develop individualized care has been launched by the University of Arizona Health Sciences and Banner Health. The UA is among the first institutions to launch the All of Us Research Program as the key element of the National Institutes of Health Precision Medicine Initiative, funded by an award totaling $43.3 million over five years, the largest NIH non-renewal grant in Arizona history. The mission of All of Us is simple: speed up health research and medical breakthroughs.

The program is asking for 1 million people to lead by way of providing the types of information that can help create individualized prevention, treatment and care, for all of us.

This research community of 1 million people will volunteer to share their unique health data. This will include answering survey questions about health, environment and lifestyle. Some participants also may be asked to have physical measurements taken and/or give blood and urine samples. Individuals who participate will decide how much data to share. The health information will be added to a secure database that researchers can access to understand how factors like environment, lifestyle and genes can impact health. This may help develop new medical treatments unique to individuals and create a future of precision medicine, for all of us.

The lifestyles, environment and biology of Arizonans are shaping the national Precision Medicine movement to create individualized prevention, treatment and care for all of us in the United States.

For more information or to join, please go to AllOfUsAZ.uahs.arizona.edu
When we think of hypothermia, most of us picture the condition that results from exposure to extreme cold. But body temperatures also commonly drop to dangerous levels in people who go under anesthesia during surgery.

To address the problem, researchers at the UA College of Medicine — Tucson and Dignity Health St. Joseph’s Hospital and Medical Center — Phoenix have come up with a new method for treating this corporeal cooling in the surgical suite known as anesthesia-induced hypothermia.

The team, which includes anesthesiologist Dr. Amol Patwardhan, working with Frank Porreca of the UA and Dr. Andrej Romanovsky at St. Joseph’s, had been investigating the utility of TRPV-1 antagonists to target pain. But their research showed that the treatment proved effective in elevating body temperature.

Warming Up

Surgical Hypothermia

Discoveries gone right: UA scientists repurpose originally sidelined findings from one study to reverse anesthesia-induced hypothermia.

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The Banner Alzheimer’s Institute, the UA Distinguished Professorship, the UA Center on Aging, the UA Center for Innovation in Brain Science, the Endowed Methodist Healthcare Foundation, the UA Department of Neurology and others are working independently and together to find treatments for the underlying disease.

Conducting research and clinical trials ranging from brain imaging to the study of neurotransmitter and immune changes during aging, the role of estrogen and other hormones on the aging brain, and dietary/exercise interventions, their goal is to help people live better every day.

Arizona expects a 54 percent increase in Alzheimer’s disease diagnoses in the next decade. A joint effort between academia and industry is bringing the most brilliant Arizona minds together to find a cure.

More than 5 million Americans are living with Alzheimer’s disease, and those numbers are growing. Arizona expects a 54 percent increase in the number of individuals diagnosed with this disease between 2017 and 2025. With common brain cell damage and deactivation, leading to memory loss and changes in thinking and brain function, overcoming this grand challenge is the best way of finding a cure, the UA and its clinical partners, Banner Health, have built public and private partnerships with pharmaceutical companies, genetic institutes, neurologists and experts on aging from a variety of fields to advance knowledge of the aging brain.

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UA researcher Jennifer Barton is leading a project funded by the National Cancer Institute to identify imaging biomarkers that could enable the first effective screening system for ovarian cancer, the most deadly gynecological cancer in the U.S. “Located deep in the body, with few early symptoms and no effective screening techniques, ovarian cancer has remained unhelpfully difficult to understand, much less effectively combat,” says Barton, a professor of biomedical engineering and urology director of the BIO5 Institute. Currently, the only way to confirm ovarian cancer is with a surgical biopsy.

In collaboration with UA researchers in physiology, medical imaging, and obstetrics and gynecology, Barton is working to identify biomarkers at the earliest possible stage of ovarian cancer, and build a viable optical imaging technology that will detect these cells before they spread to the ovary and cause advanced disease.

Caught early, ovarian cancer often can be treated effectively with surgery and chemotherapy. But without good tools for catching it early, fewer than half of women diagnosed survive five years. Dr. Evan Unger, a UA professor of radiology and bioengineering who, with Barton, co-leads the Cancer Imaging Program at the Arizona Cancer Center, said the predictive biomarkers will help to more accurately stratify women in risk groups for ovarian cancer and “open the door for more intensive screening using a noninvasive or minimally invasive technique like the microwave dosecope (Barton) has developed.”

The first line of defense against skin cancer could be your massage therapist. Skin cancer is the most common form of cancer, with nearly 3.5 million new cases diagnosed each year. The study, “Massage Therapists Skin Health Awareness, Referral and Education to Reduce Skin-Cancer Risk in Arizona,” seeks to determine the effectiveness of this innovative form of skin cancer surveillance. “All we’re doing is advocating for another set of eyes in the medical healthcare,” Loescher says.

“Located deep in the body, with few early symptoms and no effective screening techniques, ovarian cancer has remained stubbornly difficult to understand, much less effectively combat,” says Barton, a professor of biomedical engineering and urology director of the BIO5 Institute.

What if those massage therapists could be enlisted to help reduce this risk? UA College of Nursing associate professor Lois J. Loescher aims to answer that question, thanks to a three-year, $750,000 award from the Arizona Biomedical Research Commission’s (BRC) “Redefining Skin Cancer Prevention, Awareness.”

“Zeroing in on Ovarian Cancer

Less than half of women diagnosed with ovarian cancer survive five years. But a new noninvasive screening system will detect dangerous biomarkers before they spread.

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Imagine testing hundreds of drugs on your gut without ever ingesting them. That is exactly what UA scientist and innovator Frederic Zenhausern has developed: the first-ever human organ on a microchip.

The technology comes from groundbreaking research in partnership with the University of Luxemburg, and it can determine something simple (why a person’s stomach is hurting) or complex (whether diseases such as Parkinson’s or Alzheimer’s are connected to microbes in the digestive tract).

The discovery came to life in Zenhausern’s lab in the state-of-the-art facilities of the new Biomedical Sciences Partnership Building in Phoenix, part of the UA College of Medicine. Zenhausern and his team of 12 researchers at the Center for Applied Nanobioscience and Medicine create platforms to analyze molecules that carry genetic instructions to the body. The analysis translates into medical uses, as well as better diagnoses and treatments for diseases. The scientists build devices on a micro and nano scale for academic, clinical and industrial users throughout the world.

Heart disease is the #1 killer of women. So why don’t we ever talk about it?

“The truth is, most women don’t recognize they are even at risk for heart disease. We need to change this and that’s why I’ve created a video series so you and your loved ones can live heart healthy.” – Martha Gulati, MD

Share the video. Save a life. Visit UAHeartToHeart.com
The University of Arizona has had a club hockey team for nearly 40 years, but the campus isn't always bursting with awareness. "We have a hockey team here?" is something that the team's players hear regularly, prompted simply by their wearing of an "Arizona Hockey" shirt. Nevertheless, you won't catch coach Chad Berman whining. He's too busy on and off the ice, and he's getting results. This year, the team narrowly missed qualifying for the postseason tournament in Division I of the American Collegiate Hockey Association, and it was a big winner in the community, receiving the ACHA's Community Service Award — tops among all men's and women's teams in all four divisions of the ACHA.

"We value character even above talent," Berman says. "We try to reinforce with our players that kids look up to them. I understand the impact we have, and our players understand the responsibility they have."

Exhibit A might be Chase Lock, a local boy with a brain tumor who has been "adopted" by the team and enjoys unofficial teammate status. Chase's family has had the team over for dinner, and the team also attended his school play. Exhibit B might be "Pink the Rink," an event that raised more than $10,000 for the UA Cancer Center in January. Other efforts by the team included a "Pucks and Paws" event to benefit the Humane Society of Southern Arizona, a "Teddy Bear Toss" and Military Appreciation Weekend. The team also participated in a food drive, an elementary-school reading program and a Heart and Stroke Walk.

Athletes who are serious about the sport and their studies are common on the team, according to Berman, who usually makes a four-point recruiting pitch: a first-rate education at the UA, great winter weather, an enviable hockey environment (the 9,000-seat Tucson Arena) and an emphasis on community outreach.

"You can't get that experience anywhere else, and the philanthropic stuff is part of the experience," the coach says. "A major part of this job is to prepare these guys for the rest of their lives."
Helping you live better through game changing medicine.

Being well is about more than not being sick. That’s why giving you the care you need to live your healthiest life is at the heart of everything we do. We put some of the best doctors in the state on your team to help determine which proven treatment is the best fit for your specific needs. From the common to the complex, we put game changing medicine to work for you.

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(U.S. News & World Report, 2017)

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