

# ASU

ARIZONA STATE UNIVERSITY  
VOLUME 24 NUMBER 4

## Thrive<sup>®</sup>

**PLUS**

**CAREER HACKS  
FOR YOUR 20s**  
3 key principles to  
guide your ongoing  
success

**DOCTOR, DOCTOR**  
Meet two ASU Online  
grads who earned  
spots in medical  
school

**ECONOMIC GROWTH**

# Silicon IN THE Valley

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a semiconductor  
revolution that  
benefits Arizonans**

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**“I was born and raised in the Philippines. I had to stop school to be able to migrate to the U.S. Education is something my parents wanted for all of us and that’s something I gave them in my own little way, with the help of Starbucks and ASU, of course. **I graduated.**”**

*Fidel*



STARBUCKS  
COLLEGE  
ACHIEVEMENT  
PLAN

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[starbucks.asu.edu](https://starbucks.asu.edu)



## Contributors

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The former COO of Morgan Stanley Europe is now an executive coach, speaker, advisor, author and executive in residence in ASU's Office of the President.

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# Your voice in Arizona's future

Every 10 years, the Center for the Future of Arizona and the Gallup organization conduct The Arizona We Want, which asks Arizonans for their vision of the future success of their state. The recent results demonstrate that we share public values of immense merit. We are united around the fact that our future can be fantastic.

Arizona is an exciting and beautiful place with incredible diversity, a pioneering spirit and a unique ability to balance the history of our past with the forward-thinking, innovative and entrepreneurial needs of our future.

Arizonans agree that a highly educated and skilled population is good for the region and that opportunities to build careers are paramount, especially for young people. This input gives me a compass heading of where to guide our university, where we should focus our energy and what new tools are needed. With this information, we know what we need to do and why we are doing it, and can begin collaborating to deduce how we will achieve our collective goals.

This issue highlights students, faculty and alumni who are making meaningful progress toward these objectives. Aspiring health care professionals in ASU Online are on their way to medical school and working to develop better health outcomes. Semiconductor manufacturing is critical to the Valley's future success, and cross-sector teams are working to meet international demand while also generating thousands of new job opportunities and innovative partnerships to our state. These are only two of the many ways that Sun Devils are working to keep Arizona moving forward.

Despite the challenges and complexities we face, our community of learners, scholars, partners and friends has both the vision and talent to turn these aspirations into reality. I invite you to learn more about The Arizona We Want at [arizonafuture.org](http://arizonafuture.org) and join us in creating the change we want to see in our world.

### Michael M. Crow

President, Arizona State University

[✉ michaelcrow](https://twitter.com/michaelcrow) [in michaelmcrow](https://www.linkedin.com/in/michaelmcrow) [@asuprescrow](https://www.instagram.com/asuprescrow)

[f presidentcrow](https://www.facebook.com/presidentcrow)



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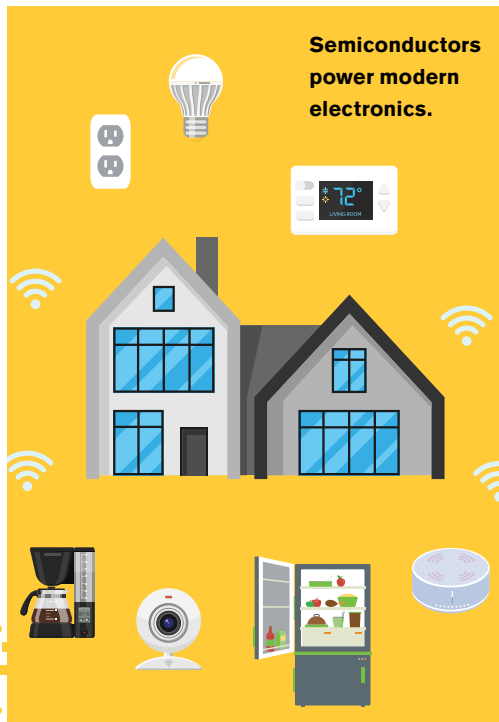
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JAROD OPPERMAN/ASU

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Alumni Jasmine Bhatti and Ayan Said provide on-demand nursing care.



David Reed pursued med school to better his sons' lives.

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## ASU Walk, Wag, Run 5K

Bring your dog for a 5K run or a 1-mile fun walk! Proceeds benefit the SummerUP camp scholarship fund.

**Saturday, Sept. 18, 7:30 a.m.,**

**West campus**

[raceroster.com/events/2021/34922/asu-walk-wag-and-run-5k](https://raceroster.com/events/2021/34922/asu-walk-wag-and-run-5k)

**Family** **Ticketed**



# Sept



## 'Hamilton'

"Hamilton" launches a national tour in Tempe, kicking off its return to Broadway at ASU Gammage. "The pent-up emotion and excitement for the return to live theater is off the charts, and there's no better way to welcome Broadway back to Arizona than with the opening of 'Hamilton,'" says Colleen Jennings-Roggensack, vice president for cultural affairs and executive director of ASU Gammage. "We know our community is aching to see it live, and the demand is so great we've expanded the tour's run to five weeks."

**Wednesday, Sept. 8–Sunday, Oct. 10, ASU Gammage**

[asugammage.com](https://asugammage.com)

**Ticketed**

## 'Movies on the Field'

Bring a blanket, sit on the grass and enjoy your favorite films on the big screen under the stars. ASU 365 Community Union presents "Movies on the Field" at Sun Devil Stadium. Events are open to ASU and the public.

**Kicking off Sept. 17. More dates and titles announced online.**

[asu365communityunion.com](https://asu365communityunion.com)

**Free** **Family**



## Yoga at the stadium

Live Well Yoga offers free one-hour yoga classes led by local instructors. Classes are open to the public, and all levels are invited to practice. The fall series will be led in a hybrid format, and a limited number of in-person spots are available for each class. All Saturday classes will be simultaneously broadcast on Zoom. Register to receive details on how to participate.

**Select Tuesdays at 7 a.m., Saturdays at 9:30 a.m., through Dec. 4, Sun Devil Stadium, in person and online**

[asu365communityunion.com](https://asu365communityunion.com)

**Free** **Family**



## Coffee and entrepreneurship

Join 1 Million Cups, a gathering on entrepreneurship open to students, business leaders, founders and others in every stage of their entrepreneurial journey. Explore what is happening across the Valley by listening to local founders share their ideas in a friendly, short presentation with time for questions.

**Wednesday, Oct. 6, 9–10 a.m., online, repeats every other Wednesday, register for link to join**

[entrepreneurship.asu.edu/events](https://entrepreneurship.asu.edu/events)

**Free** **Online**

# Now

**Check in to events to earn Pitchforks and rewards!**

Sign in to the Sun Devil Rewards app for ASU event listings, news, games and more. Earn and be rewarded! [sundeilrewards.asu.edu](https://sundeilrewards.asu.edu)







## Japanese Breakfast with special guest SASAMI

From the moment she began writing her new album, Japanese Breakfast's Michelle Zauner knew that she wanted to call it "Jubilee." After all, a jubilee is a celebration of the passage of time — a festival to usher in the hope of a new era in brilliant technicolor. From pulsing walls of synthgaze and piano on "Sit" to the nostalgia-laden strings that float through "Tactics," the album bursts with the most wide-ranging arrangements of Zauner's career.

Thursday, Nov. 4, 8 p.m., Coca-Cola Sun Deck at Sun Devil Stadium

[asu365communityunion.com](http://asu365communityunion.com)

Family Ticketed

## All systems go

"Ready to Launch: Arizona's Place in Space" investigates the impact that the people, landscape and universities in Arizona have had on space exploration. From capturing the first image of a black hole to creating and hosting telescopes to sending missions to Mars, the state has been at the forefront of discoveries and NASA missions for decades. The exhibition features objects from the collections of ASU, in collaboration with NASA, Lowell Observatory, The University of Arizona and the U.S. Geological Survey.

Through Nov. 30, Arizona History Museum, 949 E. Second St., Tucson

[arizonahistoricalsociety.org/museum/arizona-history-museum/#programs](http://arizonahistoricalsociety.org/museum/arizona-history-museum/#programs)

Family Ticketed



PETER ASH LEE; NASA, ESA AND THE HUBBLE HERITAGE TEAM (STSCI/AURA)



## 'Don't Go'

This inventive theater format invites six strangers based in the metropolitan Phoenix area to meet onstage for the first time and perform surprising tasks, dialogue and epic stories guided by the Sojourn Theatre, an award-winning ensemble theater company comprising of 17 artists who reside in seven cities and perform together across the nation. The performance is a playful exploration of where we are across differences.

Saturday, Nov. 13, 7 p.m., ASU Gammage

[asugammage.com](http://asugammage.com)

Family Ticketed

## 'My Fair Lady'

From Lincoln Center Theater comes a brand-new rendition of Lerner and Loewe's "My Fair Lady." Director Bartlett Sher's production is "thrilling, glorious and better than it ever was," according to The New York Times. Boasting such classic songs as "I Could Have Danced All Night," "The Rain in Spain," and "Wouldn't It Be Lovely," the musical tells the story of Eliza Doolittle, a young Cockney flower seller, and Henry Higgins, a linguistics professor who is determined to transform her into his idea of a "proper lady." But who is really being transformed?

Tuesday, Dec. 7–Sunday, Dec. 12

[asugammage.com](http://asugammage.com)

Family Ticketed



## D Smoke with special guest Jean Dawson

Hailing from Inglewood, California, D Smoke personifies the potent cultural duality of Los Angeles. Nurtured by the boulevards, and natured by a family's legacy in gospel music, Smoke studied classical piano at age 6 and honed his talents in the church. Focusing on the creative arts helped him to circumvent the throes of violence present on his doorstep and propel himself into the classrooms of UCLA. Having collaborated with chart-defying legends, he gained global notoriety as the undisputed breakout star of Netflix's "Rhythm + Flow." See D Smoke perform hits from his "Inglewood High" EP, which captures the essence of the city that raised him.

Wednesday, Nov. 3, 8 p.m.,

Coca-Cola Sun Deck at Sun Devil Stadium

[asu365communityunion.com](http://asu365communityunion.com)

Family Ticketed



Visit [asuevents.asu.edu](http://asuevents.asu.edu) for events.

Visit [thesundevils.com](http://thesundevils.com) for athletics.





# 2021 Football Schedule

VS

## SEPTEMBER



**2 (THU) vs Southern Utah**  
TEMPE, ARIZONA



**11 (SAT) vs UNLV**  
TEMPE, ARIZONA



**18 (SAT) at BYU**  
PROVO, UTAH



**25 (SAT) vs Colorado**  
TEMPE, ARIZONA

## OCTOBER



**2 (SAT) at UCLA**  
LOS ANGELES, CALIFORNIA



**8 (FRI) vs Stanford**  
TEMPE, ARIZONA



**16 (SAT) at Utah**  
SALT LAKE CITY, UTAH



**30 (SAT) vs Washington  
State**  
TEMPE, ARIZONA

## NOVEMBER



**6 (SAT) vs USC**  
TEMPE, ARIZONA



**13 (SAT) at Washington**  
SEATTLE, WASHINGTON



**20 (SAT) at Oregon State**  
CORVALLIS, OREGON



**27 (SAT) vs Arizona**  
TEMPE, ARIZONA

### FOLLOW US

- Sun Devil Football
- SunDevilFB
- ASUFootball

For tickets, please call  
**480-965-5812** or visit  
[thesundevils.com](http://thesundevils.com)

Running back DeaMonte Traynum.



# GAIN



## Homecoming week

A time-honored tradition, ASU Homecoming brings together students, parents and alumni to celebrate our Sun Devil spirit. The weeklong festivities highlight all things Sun Devil through athletic events, fun on- and off-campus activities and entertainment.

Sunday, Oct. 24–Saturday, Oct. 30 [homecoming.asu.edu](http://homecoming.asu.edu)

### Legends Luncheon

The Legends Luncheon is an annual event that pays a powerful tribute honoring the players and coaches who have helped build the Sun Devil Football program through more than a century of competition. Join us this year as we celebrate the 25th anniversary of the 1996–97 Pac-10 champs.

Friday, Oct. 29, 11 a.m.–1 p.m.,

Arizona Biltmore, Phoenix

[alumni.asu.edu/events/legends-luncheon](http://alumni.asu.edu/events/legends-luncheon)

**Ticketed Family**

### Lantern Walk

The Lantern Walk was first celebrated in 1917 when juniors and seniors hiked “A” Mountain and passed paper lanterns to lower-division students to represent spirit, pride and tradition being passed to the next generation. Now, on the eve of every Homecoming game, students, alumni, faculty, staff and friends carry lanterns to the top of “A” Mountain, following in the footsteps of generations of Sun Devils.

Friday, Oct. 29, meet at the base of “A” Mountain at 6 p.m. and begin the climb at 7 p.m.

[homecoming.asu.edu](http://homecoming.asu.edu)

**Free Family**

### Homecoming parade

Student organization floats, the ASU Marching Band, colleges,

departments, community organizations, local celebrities and the most famous Sun Devil of all, Sparky, parade down University Avenue.

Saturday, Oct. 30, four hours prior to kickoff of the football game

[homecoming.asu.edu](http://homecoming.asu.edu)

**Free Family**

### Block party

Come one, come all to this festival-like event filled with food, fun, entertainment and 100 tents of demos and information about many units and projects at ASU.

Saturday, Oct. 30, immediately following the parade. The event is family friendly with plenty of bike parking. Please do not bring pets.

[homecoming.asu.edu](http://homecoming.asu.edu)

**Free Family**

### Football game: ASU vs. Washington State

Sun Devil Football is back! ASU Homecoming brings together students, parents and alumni to celebrate their Sun Devil spirit. Cheer on your favorite team as they take on Washington State at Sun Devil Stadium.

Saturday, Oct. 30, Sun Devil Stadium, Blackout Game

[thesundevils.com](http://thesundevils.com)

**Ticketed Family**

## Sparky's Touchdown Tailgate

Built for fans of all ages, Gameday is what every fan looks forward to. Experience Sparky's Touchdown Tailgate during home games and away games. The pregame event features live entertainment, big-screen TVs with Pac-12/NCAA game action, a chance to mingle with notable Sun Devils including Sparky, and much more!

[alumni.asu.edu/gameday](http://alumni.asu.edu/gameday)

**Free Family**

## Salute to Service

To honor students, alumni, faculty and staff who put service before self, the Sun Devil Football home game against USC will shine the spotlight on these outstanding individuals who give so much back to their communities and nation.

Saturday, Nov. 6, Sun Devil Stadium

[veterans.asu.edu/salute-service](http://veterans.asu.edu/salute-service)

**Ticketed Family**

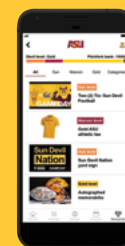
## Hispanic Heritage Night

It's time to create a Maroon Monsoon and cheer the Sun Devils on to defeat Stanford! Celebrate Hispanic Heritage Night throughout the game, including the display of new graphics designed by ASU alumni Justin Gilbert, '19 MS; Michael Torres, '18 BFA, '21 MS; and Iván Delvasto, '17 MS.

Friday, Oct. 8, Sun Devil Stadium

[thesundevils.com](http://thesundevils.com)

**Ticketed Family**



## Gameday perks

To celebrate the return of Gameday, Sun Devil Rewards has exclusive swag for you and your crew. Redeem 'Forks to score football tickets, plus ASU-branded apparel and gear (new this year: Gameday yard signs!). Be that lucky Devil to get the prize pack giveaway featuring a Grizzly cooler, jersey and other fan-related gear. Tailgates and football games are available for check-in on the app and when you're at Sparky's Touchdown Tailgate, be sure to look for a secret word displayed for all to see.

Download the app today! [sundevilerwards.asu.edu](http://sundevilerwards.asu.edu)



# Chapters



## Stay in touch

Update your info to stay in the know with invites to special events and more.

[alumni.asu.edu/update](https://alumni.asu.edu/update)

## Get involved with chapters based on your interest, college or location

Attend meetups to catch up with friends and make new connections. For a list of all chapters, visit [alumni.asu.edu/chapters](https://alumni.asu.edu/chapters).

### United States chapters

Austin	<a href="#">f</a> <a href="#">t</a> <a href="#">in</a> <a href="#">m</a>
Chicago	<a href="#">f</a> <a href="#">t</a> <a href="#">@</a>
Colorado	<a href="#">f</a> <a href="#">t</a> <a href="#">in</a> <a href="#">m</a>
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Florida	<a href="#">f</a> <a href="#">m</a>
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Inland Northwest	<a href="#">f</a> <a href="#">m</a>
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Phoenix	<a href="#">m</a>
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Portland	<a href="#">f</a> <a href="#">m</a>
Prescott	<a href="#">m</a>
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Yuma	<a href="#">f</a> <a href="#">m</a>



## Tech industry job calling your name? Answer it.

ASU has partnered with Trilogy Education and Thinkful to offer digital bootcamps with a shared goal in mind: helping you earn a high-paying job in the tech industry. Gain valuable training in relevant fields from hands-on learning and career services. As a graduate, you'll walk away with a digital badge or professional certificate from ASU Learning Enterprise to verify your hard work and skills learned in programs such as software engineering, data analytics, UX/UI design, cybersecurity, digital marketing and fintech.

[cpe.asu.edu/bootcamps](https://cpe.asu.edu/bootcamps)

**Free** Lifelong learning **Online**

## Career services for you, for life

All ASU alumni have lifetime access to career fairs, webinars, networking opportunities and career development events. ASU is here to help you chart and excel on your career path.

[career.asu.edu](https://career.asu.edu)

**Free** Networking

Lifelong learning **Online**

## Kick-start your career in film

The ASU Film Spark Careers in Entertainment Online Expo provides opportunities to network with representatives from entertainment companies and is open to ASU students and alumni.

**Friday, Oct. 8,  
10 a.m.–1 p.m.**

[asuevents.asu.edu](https://asuevents.asu.edu)

**Free** Networking

# Career







Dive into the rainforest to see where butterflies, snakes and other animals fit into the ecosystem in a Virtual Field Trip to Panama.

## Resources for you

**For parents**

### Online learning resources for young Sun Devils

This fall, ASU for You is your go-to resource for fun, exciting and educational activities to keep your kids busy outside of schoolwork.

[asuforyou.asu.edu/parents](https://asuforyou.asu.edu/parents)

**Free Online**

**For teachers**

### Resources from teachers college

Curated by education professionals at ASU's Mary Lou Fulton Teachers College, these resources help both educators and families take the stress out of remote learning.

[asuforyou.asu.edu/teaching-resources](https://asuforyou.asu.edu/teaching-resources)

**Free Online**

## Beyond the classroom

Looking for an innovative educational resource? Check out these Interactive Virtual Field Trips. From the Panama Rainforest to the deserts of Australia, explore some of the world's most fascinating locations with a click of a button. The user-focused experience features photos from recent science expeditions, and some field trips even include responses to your feedback in real time.

[asuforyou.asu.edu/k12](https://asuforyou.asu.edu/k12)

**Free Online Family**



## Design Thinking 101

What is design thinking? In this lesson, participants will learn about the stages of design thinking by taking part in a series of interactive lessons meant to expand their understanding of and familiarity with the assortment of tools and techniques related to the design thinking process. [innovation.asu.edu](https://innovation.asu.edu) **Free Online**

## Do you know someone aged 50+ who loves to learn?

The Osher Lifelong Learning Institute at ASU provides learning experiences and a community where adults ages 50+ engage in noncredit university-quality classes, member-driven programs, campus-based learning opportunities and pathways to public service. Classes range in topic from history to chemistry and everything in-between, all taught by ASU faculty and community experts. More than 130 classes are available in fall 2021 with Zoom, hybrid and in-person options. Membership is \$20, classes are \$14 per session and engagement opportunities beyond classes are free.

[lifelonglearning.asu.edu](https://lifelonglearning.asu.edu)

**Ticketed Lifelong learning Online**





**“ASU is absolutely unique in its commitment to promoting scholarship and research aimed directly at the real challenges society must overcome. We have a model that allows entrepreneurial faculty to pursue a broad range of potential applications, and that prioritizes long-term impact.”**

— AUGIE CHENG, SKYSONG INNOVATIONS CEO AND CHIEF LEGAL OFFICER

LEADING THE WAY

## Top in patents

For the third consecutive year, ASU is in the top 10 for U.S. patents issued to U.S. universities — and 11th worldwide — according to an annual ranking of the top universities by the National Academy of Inventors and the Intellectual Property Owners Association. In 2020, ASU was issued 140 U.S. patents, up from 137 the previous year, a total that ties with the University of Florida and puts ASU just one spot behind Harvard. Other U.S. universities in the top 10 include MIT, Stanford and Caltech. Tsinghua University in Beijing was the only non-U.S. university to surpass ASU on the global list. The commercialization of innovations created by ASU researchers is led by the team at Skysong Innovations, ASU’s exclusive technology transfer and intellectual property management organization.

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**ASU researchers are expanding natural plantings in research settings and developing new “mechanical trees” to remove carbon at scale. They allow the captured gas to be sequestered or sold for reuse in a variety of applications, such as synthetic fuels, enhanced oil recovery and food and agriculture.**





# Update in the news

## **Burrowing owls move in**

Animals make  
a home at  
Polytechnic  
campus.

**16**

## **Natalie Diaz wins Pulitzer**

Poet receives  
major award.

**17**





## ASU moves up nearly 30 spots on list of top US institutions

QS World University Rankings has released its list of more than 300 of the top universities in the U.S., with ASU moving up nearly 30 spots to No. 62 from last year's position at No. 91. ASU also ranked No. 1 in the state, ahead of both Northern Arizona University and The University of Arizona. Quacquarelli Symonds is a leading provider of services, analytics and insight to the global higher education sector. This is the second year for its U.S.-focused rankings, which are based on a methodology that looks at four key indicators: research, learning experience, employability, and diversity and internationalization.

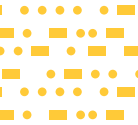


Carmen Avalos and Skylar Fomond prepare to teleport into a 360-degree Dreamscape Learn portal where an immersive VR environment empowers them to develop high-level critical thinking skills.

## Immersion in the digital landscape

Check one, check two. Students prepare to enter a virtual reality pod on Tempe campus. Once seated inside, they will be transported to an orbiting intergalactic wildlife sanctuary. They will work in a virtual laboratory with a plethora of fictional animal species that function based on biological laws. This new virtual reality immersive biology curriculum is called Dreamscape Learn and is made possible through a partnership with Dreamscape Immersive.





## Alumna honored with JFK Profile in COVID Courage Award

All her life Lauren Leander, '14 BS in nursing, has been “the quiet one, I've always been more subdued. I have never been one to be loud or draw attention to myself,” she says.

So it's not lost on the intensive care unit nurse that she became known globally for a counterprotest in which she stood masked, silent and defiant with two other nurses in the midst of a crowd at a protest. After the protest, a powerful image taken by an Arizona Republic photographer of her silent counterprotest went viral. She was finally ready to use her voice.

“The world just pushed me into this spotlight and pushed me out of my shell,” Leander says.

Since that day in April 2020, Leander, an alumna of ASU's Edson College of Nursing and Health Innovation, continued working in the COVID-19 unit of her hospital while also advocating on behalf of her patients and colleagues. She also started a GoFundMe campaign that raised \$286,000 for medical supplies and compassion fatigue gifts for Navajo and Hopi front-line nurses.

Her bravery and continued advocacy recently were recognized with a John F. Kennedy Profile in COVID Courage Award.



COURTESY OF SANDY LEANDER; STARBUCKS



## Protein sequencing poised to transform medicine

It is the job of the body's proteins to carry out the complex commands dictated by DNA's genetic code. Stuart Lindsay, a researcher at the Biodesign Institute at ASU, has been at the forefront of efforts to improve rapid DNA sequencing and has applied his skills to exploring the much thornier problem of sequencing protein molecules. A new article in Nature Methods describes his efforts, along with those of his international colleagues, toward applying innovative strategies for protein sequencing at the single-cell, and even single-molecule, level.

**Keep up with the headlines at ASU** by subscribing to the **ASU News e-newsletter** at [news.asu.edu/subscribe](https://news.asu.edu/subscribe).



## ASU-Starbucks Center to focus on delivering scalable impact

Building on a long-standing partnership, Starbucks and ASU are joining forces to create the ASU-Starbucks Center for the Future of People and the Planet — a new research and rapid innovation facility to find new ways to design, build and operate Starbucks stores.

**“ASU and Starbucks are aligned in our missions to be of complete service to the communities we serve and build a better future for both people and the planet.”**

— MICHAEL M. CROW, ASU PRESIDENT

Scheduled to open in December 2021 on ASU's Tempe campus, the center will be built on the same principle as the Starbucks Tryer Center — bringing ideas to action — supported by ASU's applied research and on-campus test store ecosystem. The Tryer Center, located in the Starbucks Support Center in Seattle, is an incubation lab where partners can quickly test, learn and adapt ideas for more rapid decision-making. This space represents a mindset of innovation embraced across the organization.

The project builds on a shared belief that the two entities have the power and the responsibility to forge a better future for both people and the planet. In the first year, the work will focus on initiatives such as greener stores, food and wellness, community betterment and innovation test stores.



## GLOBAL IMPACT

**Volunteers help get SolarSPELL back in action**

Volunteers from the Phoenix Peace Corps Association and the ASU community came together to build dozens of portable, digital SolarSPELL libraries. The small devices are powered by a solar panel connected to a rechargeable battery and a tiny computer. The small containers cast a Wi-Fi signal that allows any user to connect a smartphone, tablet or computer in areas with no telecommunications infrastructure, and the libraries are loaded with relevant, localized educational information.

SolarSPELL, which is short for Solar Powered Educational Learning Library, will host future build days for Peace Corps partnerships so that volunteers can carry the libraries to communities worldwide and further their work.

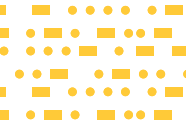
**Learn more and get involved at [solarspell.org](https://solarspell.org).**



Volunteers help create dozens of SolarSPELL libraries at the ASU Polytechnic campus. The libraries will be sent to an Ethiopian refugee site for students to have access to educational materials.







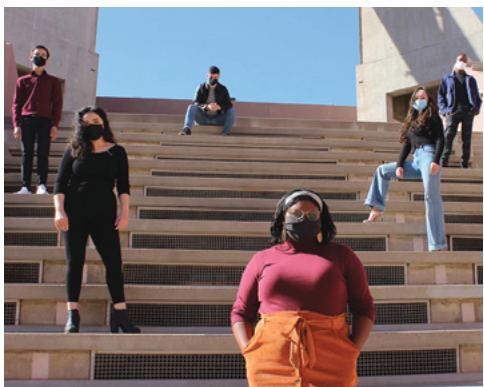
**“We are so often assigned roles to play that ... feature us being oppressed or hide us as background characters.”**

– YOPHI AIDA BOST

## Color Cabaret creates space for artists of color

Graduate music theater and opera student Yophi Aida Bost wanted to take ownership of the art she shared. She got that chance as part of the School of Music, Dance and Theatre’s Color Cabaret last spring. Organized by ASU’s Music Theatre and Opera program, the student-led cabarets for the Tempe Center for the Arts’ “Edge” series feature the work of students, composers and authors of color, and create roles for or reimagined with artists of color.

The online streamed event showcased performances from musical theater repertoire to Brazilian rock songs. Students who chose to perform were encouraged to bring music they felt was most authentic to themselves, so the cabaret would be a place where the artists could perform without limitations. The event also served as a fundraiser for the BIPOC student scholarship fund, led by the ASU Music Theatre and Opera Student Organization.



Bost (front) and fellow student cast members of Color Cabaret.



## No. 1 in sustainability for second year in a row

ASU remains a national leader in addressing sustainability when it comes to research, outreach and stewardship, according to Times Higher Education magazine, which ranked ASU No. 1 in the U.S. in 2021, ahead of Purdue University, MIT, Penn State and the University of North Carolina at Chapel Hill. The ranking is driven by the university’s efforts on such issues as poverty and hunger, gender equality, clean water and air, climate change and providing quality education.

For the second year in a row, the university retained the top national spot when it comes to impacts made addressing 17 specific goals known as the United Nations Sustainable Development Goals.



## Professor Julia Himberg featured on FX docuseries ‘Pride’

In “Pride,” a new FX docuseries currently streaming on Hulu, Julia Himberg, an associate professor of film and media studies, describes the increased LGBTQ media representation of the 1990s and 2000s as an “explosion in queer visibility.” Himberg is the author of “The New Gay for Pay: The Sexual Politics of American Television Production,” which examines the role of television production in creating and challenging popular notions about LGBTQ identities and social change. She was featured in “2000s: Y2Gay,” the final episode of the six-part docuseries, which spans the struggle for LGBTQ civil rights from the 1950s through the 2000s.

“There’ve been several documentaries lately about LGBTQ history and media representation, which to me says that we’ve reached a kind of turning point, where there’s enough interest that it’s actually being documented as a history,” Himberg says. “But I think the way that FX did their docuseries was kind of interesting and unique compared to the other ones I’ve seen because they tried really hard to tell the story of both the mainstream and the underground radical movements together, and to put those in conversation in ways that a lot of other documentaries have not, that is productive in opening people’s horizons to a wider LGBTQ world.”

## WELCOME HOME

**Burrowing owls move into new habitats at Polytechnic campus**

ASU Polytechnic campus has rolled out the welcome mat for several distinguished — and feathered — guests: four burrowing owls. Their arrival in towel-covered cardboard pet carriers midmorning on May 22, 2021, was a year in the making, and the finishing touches on their burrows — dug out with backhoes and constructed 24 hours before — had just been completed.

In a partnership with Wild at Heart raptor rescue, ASU College of Integrative Sciences and Arts faculty, students, alumni and staff, with the help of ASU Facilities Management staff, have built and will monitor habitats for burrowing owl pairs needing relocation. Burrowing owls that have lost their natural homes in one part of the Valley are rescued by Wild at Heart and monitored for about a month in aviaries before being translocated to another location across the Valley as appropriate sites become identified and artificial habitats constructed.

For students studying applied biological sciences at ASU's Polytechnic campus, the burrowing owl habitats offer yet another addition to a great outdoor classroom in this desert arboretum, which already includes a lizard habitat, a date grove, bee colonies, greenhouses and a community garden.



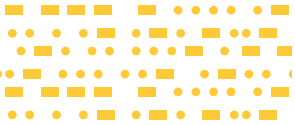
Tyler Obermeit, '21 BS applied biological sciences, and Zahra Husrieh install rebar into each side of a burrow entrance.

**“We’re taking a really integrative approach to conservation.”**

— PEDRO CHAVARRIA,  
LECTURER







## Hispanic students continue to thrive

Hispanic students make up an increasing part of Arizona’s student population, but the key to their success in higher education is for universities to be intentional about supporting them, according to ASU President Michael M. Crow.

Crow spoke at the “Arizona Briefing on 25 Years of Hispanic-Serving Institutions,” sponsored by Excelencia in Education, a Washington, D.C.-based organization that promotes Hispanic student success in higher education.

The event looked at progress over the past 25 years, when the federal designation of “Hispanic-Serving Institution” was created to describe colleges and universities whose student bodies were at least 25% Hispanic.

At ASU, Hispanic enrollment increased 51% for combined on-campus and online students from fall 2016 to fall 2020, to nearly 29,000.

Excelencia in Education has awarded ASU its “Seal of Excelencia” to acknowledge the university’s work toward supporting Hispanic students’ journeys to achieving bachelor’s degrees. Among ASU’s programs cited by Excelencia in Education were the Hispanic Mother-Daughter Program, the Joaquin Bustoz Math-Science Honors Program and the Quantitative Research for the Life and Social Sciences Program.



## American Academy of Arts and Sciences recognizes faculty members

Two members of the ASU community are named in the new membership rolls of the American Academy of Arts and Sciences. They are President Michael M. Crow and Regents Professor of English Ayanna Thompson, who directs the the Arizona Center for Medieval and Renaissance Studies and is a Shakespeare Scholar-in-Residence at The Public Theater in New York.

They are among those newly elected to the prestigious academy, one of the oldest learned societies in the U.S. More than 1,300 nominations are considered each year. Others elected this year include Howard D. Schultz, Oprah Winfrey, James N. Mattis, Maria Hinojosa, Angela Y. Davis and Sanjay Gupta.

## Natalie Diaz wins Pulitzer Prize

Topping the headlines again, Natalie Diaz, ASU Department of English associate professor, won the 2021 Pulitzer Prize in Poetry for her collection, “Postcolonial Love Poem,” which has been described as “an anthem of desire against erasure.”

The honor comes mere months after the MacArthur Fellow made history by becoming the youngest chancellor ever elected to the Academy of American Poets.



“I care so much for the book and for the people that the book has brought me to, but also for the people I hope the book could carry of my life, you know, of my beloveds and my strangers,” Diaz says.

“And so in a lot of ways I don’t think I’ve ever felt this way about a prize before, whether it was winning a championship or some of these other prizes — in some ways I feel like the things I’m trying to fight for in language, this was a kind of recognition that I know that they matter even if it’s in a small way,” she says.

According to ASU President Michael M. Crow, “There is unbelievable power when intelligence, creativity and insight fuse together. That’s what Natalie Diaz brings to language and poetry, and her voice is incredibly important. This Pulitzer Prize is very well deserved.”



## SURROUND YOURSELF WITH COLLEGIATE ENERGY!

*Explore the engaging lifestyle at Mirabella.*

Mirabella at ASU is the nation's most exciting new community for older adults! Located right on the Arizona State University Tempe campus, our integration with ASU means an experience like no other, with access to classes, lectures, performances, sporting events and so much more. Along with luxurious high-rise residences, resort-like living and a continuum of on-site healthcare services, Mirabella at ASU is a revolution in retirement!

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Mirabella at ASU is a nonprofit, resident-centered community developed in partnership with Pacific Retirement Services and Arizona State University. Equal housing opportunity.

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**Because of donors like you**, students are granted life-changing opportunities. The world becomes the classroom for students to deepen their understanding through mentorship, networking and hands-on experiences. With your help, we can continue to provide abundant opportunities and resources—taking students to the next level.

[asufoundation.org](https://asufoundation.org)

**ASU Foundation**  
Arizona State University





# Advance your career

**“Don’t assume  
people want to be  
treated the way you  
want to be treated.**

**Treat people how  
they want to be  
treated.”**

– MAY BUSCH



## CAREER EDGE

### Working well with your younger co-workers

Here are ways to work with colleagues, especially those who are in their 20s, in order to benefit your company, your team and both of your careers.

**Don’t make assumptions.** Go find out. And these assumptions include what you’ve heard about people in their 20s. Understand who your colleagues are as people. Look at things from their perspective. Get some insight into what they’re going through now. What are their aspirations? What might they need from you? How could you support them?

**Tap into their strengths.** What are their unique abilities? What are they good at and love doing? You might get new insights, a new lens on things and discover a better way of working together.

**Remember, the golden rule doesn’t apply.** Don’t assume people want to be treated the way you want to be treated. Treat people how they want to be treated. At the same time, don’t expect people to respond in the same way you would have to things when you were their age.

### Career hacks for your 20s

3 steps for  
success.  
20

### Joining the market

Careers by  
the numbers.  
23

# Career hacks

## FOR YOUR 20s



### May Busch

The former COO of Morgan Stanley Europe is now an executive coach, speaker, advisor, author and executive in residence in ASU's Office of the President. Find her at [maybusch.com/asuthrive](http://maybusch.com/asuthrive).

You've just started your career. It's such an exciting time — and possibly stressful.

There's a lot of pressure to get it "right," and it feels like everyone has an opinion. These three principles will help you thrive in whatever career path you choose.



### Focus on your signature strengths

Within your many strengths are some "super strengths" that you do well and also love doing, when things feel simple, easy and fun.

Sometimes these are so natural you don't even regard them as real strengths. Like being really good with people and having conversations that land well, or being able to quickly synthesize data.

And if you're not sure what your strengths are, ask people who know you well, like parents, former professors and teachers, former or current coaches, siblings and friends.

The key to a fulfilling career is to make sure you're using those signature strengths in the work you're doing.

**What are your strengths and how are you using them?**





“

Within your many strengths are some **'super strengths'** that you do well and also love doing. The key to a fulfilling career is to make sure you're using those signature strengths in your work.

”



## 2

### **Try different tasks, roles and even jobs to find your passion**

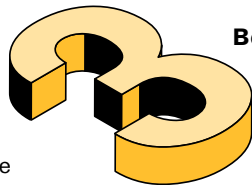
You've probably heard the advice, "Follow your passion." While well-meaning, it can cause stress if you're not sure about your passion.

Finding your passion is a discovery process, and your 20s are a time to try out career options. Even when something doesn't work out, you've gained valuable information on what you don't want to do. And remember, managers hire people in their 20s for their energy, fresh perspective, thirst for knowledge and ability to grow.

“  
**Everything is an opportunity to learn. The great bosses, the bad ones, the projects that go well, the ones that don't.**  
 ”



There's no need to put pressure on yourself to determine the direction of the rest of your career or to compare yourself to others.



If you know what your passion is, follow it. And if not, don't worry. Trying a range of project types, roles and even jobs can help you to find your passion. Plus, some of us, like me, don't find one specific passion — and still turn out OK.

**Have you already found your passion? Or are you still on your way to discovering it?**

**Be like a sponge**

These are your formative years. There are so many new experiences and people around you at this point in your career. Soak everything up.

Everything offers opportunities to learn: the great bosses, the bad ones, the projects that go well, the ones that don't.

The key is to pay attention to what's going on around you. Notice what skills are valuable. Think about how you would handle a challenging situation your boss is facing. Look for gaps in the market and new ways to do things.

And then take moments to step back and reflect. When you write down takeaways, it helps cement your learning.

**What have you learned from your experiences so far? To what extent are you taking time to reflect on your experiences?**

**It's part of the journey**

Tap into who you are, what you're good at and what your values are. Use these as your guide, and know that your journey won't be the same as anyone else's.

Remember to enjoy and trust the process and treat yourself with compassion. You're going to make mistakes along the way, maybe even U-turns. But that's OK.

Through it all, allow yourself to be authentic. You are enough. ■



# Grads meet the marketplace

Each year, a powerful, diverse group of talented graduates emerges from ASU ready to take the next step in their career paths. Using skills developed in the classroom, the laboratory, clubs, startups and community work, they bring expertise and energy to the Arizona and global workforces.

A recent grant of \$8 million from the U.S. Department of Labor is poised to propel that contribution, namely in the high-demand industries of advanced manufacturing, cybersecurity and information technology. The One Workforce grant will help address a critical skills shortage in the U.S. by establishing the Arizona Workforce Training Accelerator Partnership for Next Generation Jobs. The program, which will be led by ASU and partners, is designed to train at least 2,000 participants, with a goal of achieving industry-recognized credentials and permanent job placement over the next four years.

**83%**

**of undergraduate alumni were employed**

or received at least one job offer within six months of graduation.

**\$55,000**

**Median starting salary for undergraduate alumni**

**87%**

**of graduate alumni were employed**

or received at least one job offer within six months of graduation.

**\$64,000**

**Median starting salary for graduate alumni**



**126**  
companies chose ASU as a top-tier recruiting school.

**420**  
companies on the Fortune 500 list recruit at ASU.

**Top industries for first job out of ASU**

- Aerospace.
- Commercial banking.
- Construction.
- Electronics and computer hardware.
- Government – local, state and federal.
- Health care.
- Higher education.
- Internet and software.
- K-12 education.
- Nonprofit.
- Manufacturing.

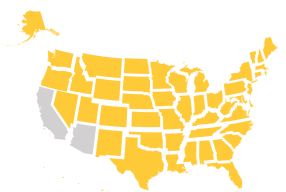
**Top locations for undergraduates' jobs after graduation**



**Arizona 62%**



**California 10%**



**Other U.S. states 27%**



**International 1%**

SOURCE: ASU Career and Professional Development Services, 2019–20 First Destination Survey



SPACE TO INSPIRE

## Out of this world

As part of the first all-civilian crew to go to space for multiple days, ASU alumna and Faculty Associate Sian Proctor is set to make history. She earned a spot on the four-person SpaceX Crew Dragon mission Inspiration4, where she will serve as the pilot and backup commander. Proctor, inspired by her father, a NASA contractor for the Apollo lunar missions, has always loved the cosmos and made it to the finalist stage of the 2009 NASA astronaut selection. Now she will spend three days in space orbiting Earth and participating in research to advance human spaceflight. Proctor's motto, "Space2Inspire," encourages people to use their unique strengths and passions to galvanize others. As an artist, she created Space2Inspire Art to encourage conversations about a J.E.D.I. (just, equitable, diverse and inclusive) space for humanity. In addition to teaching at ASU's Osher Lifelong Learning Institute, she is a full-time geoscience professor at South Mountain Community College. She also is a poet, trained pilot, writer and athlete.

Learn more and watch the launch at [inspiration4.com](https://inspiration4.com)





# Boost the economy.

**“This opportunity is proof that hard work and perseverance can pay off in unimaginable ways.”**

— SIAN PROCTOR, REGARDING HER UPCOMING HISTORIC FLIGHT WITH SPACEX

## **From lab to industry**

Fueling the silicon revolution.  
**26**

## **Global impact**

Innovation zones create jobs.  
**38**

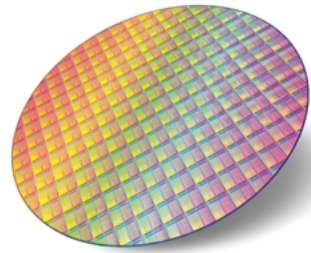


Semiconductor companies must squeeze more performance out of chips — and constantly optimize production processes. Through early stage research that translates into real-world applications, ASU researchers like Wahab Alasfour help the industry do both.



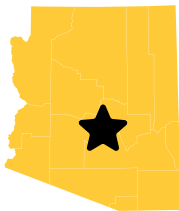


# Silicon



IN  
THE

# Valley



**ASU is fueling a semiconductor revolution that benefits Arizonans**

**Story by** DANIEL OBERHAUS, '15  
BA ENGLISH, BA PHILOSOPHY  
**Photos by** JAROD OPPERMAN



# Semiconductors power modern devices.

You rely on them every single day. We all do. They're in



phones, computers, smart appliances, cars, solar panels and



more. These electronics depend on circuits etched on razor-thin wafers of silicon.





Silicon is an example of a semiconductor, materials that have the characteristics of both a conductor, such as copper, and an insulator, like glass, allowing engineers to precisely dial in exact electricity flow under specific conditions. This makes semiconductors well-suited for building the microscopic circuits at the heart of the computers in our devices.

Every year, more than a trillion semiconductors roll off assembly lines to meet an insatiable appetite for microelectronics that are faster, smarter, cheaper; demand is growing.

The U.S., birthplace of semiconductors, was once the global manufacturing leader. But over the past few decades, competition drove many manufacturers abroad. According to the Semiconductor Industry Association, today, the U.S. manufactures about 12% of the world's semiconductors.

The coronavirus pandemic exposed the risks of relying on an international supply chain for a critical product. As the virus circled the globe, worldwide semiconductor manufacturing facilities — called fabs — came to a standstill. Suddenly, no one could get their hands on the chips that power the modern world. The shortage has held up production for cars, televisions, washing machines and even smart toasters.

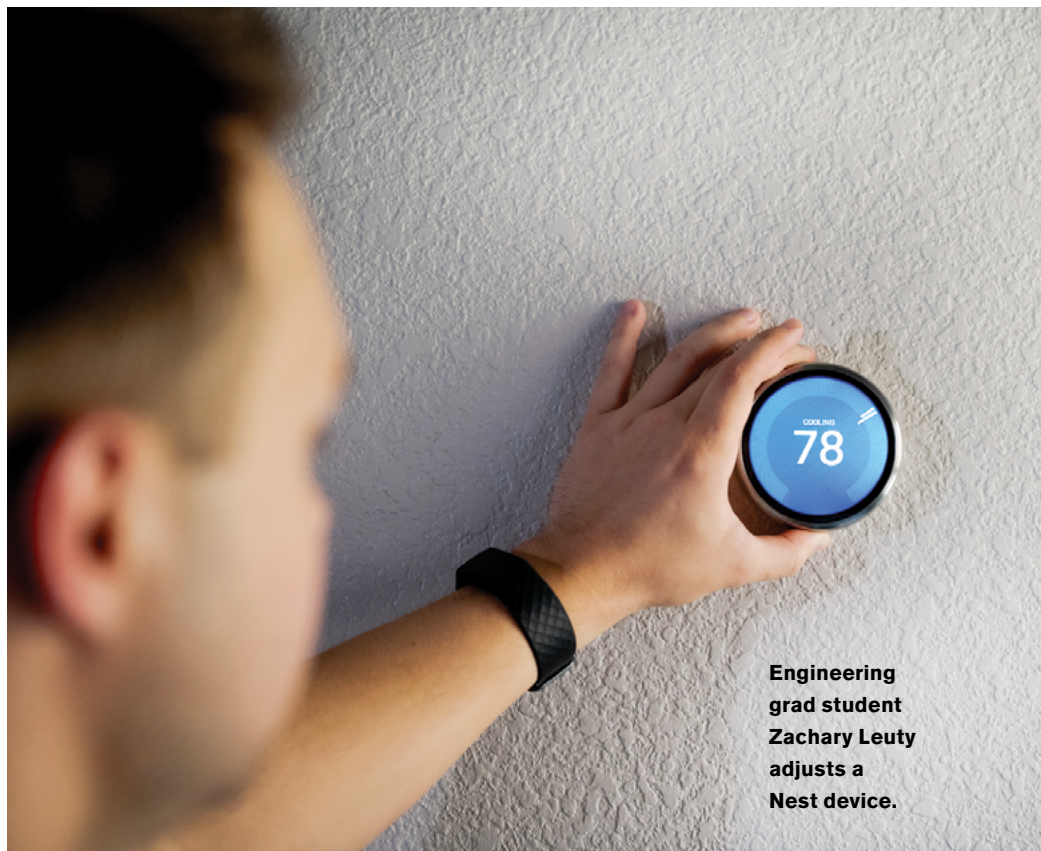
Politicians in Washington, D.C., realized that semiconductor manufacturing in the U.S. is a matter of national security.

**“Building up the semiconductor ecosystem in this state will bring industry and jobs. This is an economic opportunity that improves our well-being.”**

— SALLY C. MORTON,  
EXECUTIVE VICE  
PRESIDENT, ASU  
KNOWLEDGE  
ENTERPRISE

When President Joe Biden announced his administration's \$2 trillion infrastructure bill, he held a semiconductor chip aloft to underscore the industry's prominent place in the bill. “This is infrastructure,” Biden said. “We've been falling behind on research and development and manufacturing, and, to put it bluntly, we have to step up our game.”

Sally C. Morton, executive vice president of ASU's Knowledge Enterprise, agrees. She highlights the fundamental importance of semiconductor chips in our daily lives and in national security.



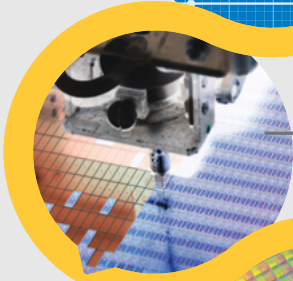
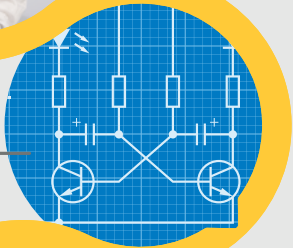
**Engineering grad student Zachary Leuty adjusts a Nest device.**

# A computer chip's journey



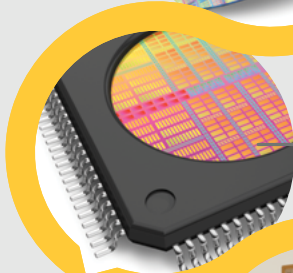
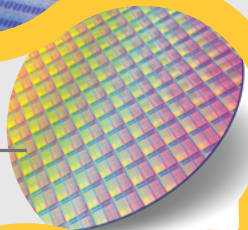
**Prefab**  
ASU researchers and others help improve semiconductor processes and materials to give U.S. companies an edge.

**Design and mask ops**  
Engineers build digital blueprints, then make mask templates.



**Fabrication**  
“Techs use photolithography machines to shine light through masks on the wafer surface to create chips,” Intel explains.

**Die and sort**  
Machines cut wafers into dies (chips).



**Test and assembly**  
Techs test each chip, then assemble them to make a package.

**Shipping**  
The semiconductor manufacturer ships chips to end-user manufacturers.



“Everyone is impacted by semiconductors, but we don’t always see all the ways that microchips support the lives we lead,” Morton says. “We need to have autonomy in this space for both production and distribution.”

## Arizona's chip investment

Because of strong historical roots and rapid expansion, Arizona is poised to be at the epicenter of the American semiconductor revolution, with ASU playing a starring role. Last spring, two of the world’s largest chipmakers, Intel and Taiwan Semiconductor Manufacturing Company, announced plans to spend a combined \$32 billion building three semiconductor fabs in the Phoenix region, with TSMC purchasing enough land to possibly build five more fabs, which would invest billions of dollars more. Around the same time, Samsung shortlisted Phoenix as a possible factory site.

The interest in Phoenix makes sense. For decades, city officials, business leaders and ASU cultivated the infrastructure, regulatory environment and human talent the industry needs. And their timing couldn’t have been better. Worldwide semiconductor industry sales hit \$439 billion in 2020, according to the SIA, with the industry projected to reach \$803.15 billion by 2028.

“Building up the semiconductor ecosystem in this state will bring industry and jobs,” Morton says. “This is an economic opportunity that improves our well-being.”

COURTESY OF INTEL



### Local partnerships, global impact

When Michael Kozicki, a professor of electrical engineering and director of the Center for Applied Nanoionics, first arrived at ASU in 1985, semiconductor manufacturing had already established a foothold in the area. Intel and Motorola anchored it, building a foundation that includes NXP, ON Semiconductor, Microchip Technology, Medtronic and others.

Kozicki's ability to straddle the divide between industry and academia has proved invaluable for preparing generations of Sun Devils for careers at the world's largest chipmakers. Today, he leads courses covering everything from working in the planet's cleanest laboratories to designing next-gen chips, a heady mixture of practical and experimental knowledge that students need to drive nonstop innovation in microelectronic engineering.

"There are not many universities that do courses in semiconductor fabrication where you get a hands-on, industry-relevant education," Kozicki says. "It's all part of getting people ready to be productive professionals within the semiconductor industry. We're a major supplier of talent."

ASU's emphasis on industry-relevant research has forged mutually beneficial partnerships with local semiconductor firms. In 2017, for example, the university partnered with ON Semiconductor, a Phoenix-based supplier to the global industry, to establish a \$2 million, five-year

**"There are not many universities that do courses in semiconductor fabrication where you get a hands-on, industry-relevant education. We're a major supplier of talent."**

— MICHAEL KOZICKI,  
PROFESSOR OF  
ELECTRICAL  
ENGINEERING  
AND DIRECTOR OF  
THE CENTER FOR  
APPLIED NANOIONICS

award to support two ASU professors working on the leading engineering and supply chain issues faced by manufacturers.

One of the award recipients is Bertan Bakkaloglu, a professor of electrical engineering. His research focuses on analog circuit design. It's foundational for the emerging Internet of Things, connecting machines to the web to monitor and control them remotely. To turn off lightbulbs while away, a conventional copper switch isn't going to cut it.

Bakkaloglu says the ON Semiconductor professorship critically supports his students' research efforts. Manufacturing small batches of experimental semiconductor chips can cost tens of thousands of dollars. Still, the process of taking a chip from concept to fabrication is a critical experience that prepares students for the industry's challenges.

## Fabricating a chip

Worldwide semiconductor manufacturing facilities — called fabs — came to a standstill during the coronavirus pandemic, creating ripple effects now being felt throughout the economy. The shortage has held up production for devices across commercial and residential uses from industrial machinery to cars to home appliances. Each delay in the steps in the process makes delivery of final goods more difficult to predict. Adding capacity with new fabrication lines in Arizona is expected to impact the availability of goods in the years to come.

### Semiconductor fab production time scales required to increase fab utilization



COURTESY OF SEMICONDUCTOR INDUSTRY ASSOCIATION



**Through a partnership, Zachary Holman and his research group help semiconductor giant Applied Materials improve processes and materials.**



“Our students gain experience in areas that almost every semiconductor company in town requires,” Bakkaloglu says. “My PhDs don’t go to the Bay Area or Texas. They stay in Arizona. So it’s a fundamental win-win because there’s a shortage of qualified semiconductor designers, and these companies get graduates who hit the ground running.”

**“The more of those kinds of interactions with prominent industry people in the semiconductor space, the better ideas faculty develop.”**

— KYLE SQUIRES,  
DEAN OF ASU’S IRA  
A. FULTON SCHOOLS  
OF ENGINEERING

Last year, the university struck an agreement with Applied Materials, a California-based company that builds the precision machinery used in most of the world’s chip fabs. As part of the partnership, Applied Materials funds at least five years of research with selected faculty members, including Kozicki, and their students, and leases lab space at ASU’s MacroTechnology Works in Tempe.

MTW, formerly a fabrication facility, came equipped with specialized infrastructure

to handle semiconductor research. It already housed two semiconductor research powerhouses — ASU’s Flexible Electronics and Display Center and the Solar Power Laboratory.

“Faculty connecting with industry leaders not only speeds the process of translating university research discoveries and innovations to practice but can also provide a critical pathway for industry to de-risk some of their early ideas,” says Kyle Squires, dean of ASU’s Ira A. Fulton Schools of Engineering. “Promoting interactions with industry leaders matters. It helps our faculty sharpen their research ideas, substantially benefits our students, and leads to genuine impact. Unique infrastructure in locations such as MTW has given Arizona a competitive advantage.”

The Fulton Schools will further boost Phoenix’s reputation as semiconductor central with the recent launch of the School of Manufacturing Systems and Networks, which focuses on the research and education needed to drive the ideas critical to technology development for the Fourth Industrial Revolution. ASU’s newest engineering school will prepare students to meet the challenges of industry 4.0, with semiconductor-related engineering and research a core component.

“Without a doubt, the school will play a role in helping industry leaders think about what the fab facility of the future looks like,” Squires says. “How can you neglect that, given what’s

## Semiconductors: By the numbers

# #1

**contributor to labor  
productivity growth**

The U.S. semiconductor industry has made virtually all sectors of the U.S. economy, from farming to manufacturing, more efficient.

**277,000**

**Number of people  
employed in the U.S.**  
by the semiconductor industry

**1.6 million**

**Additional U.S. jobs**  
the semiconductor industry supports

**~1 trillion**

**Number of semiconductors  
sold in 2020**

**\$440 billion**

**Worldwide semiconductor  
industry sales in 2020**

*Source: Semiconductor Industry Association*

happening in the Valley with semiconductor manufacturing?”

### **ASU science and engineering driving innovation**

Advanced research and development is the name of the game in the semiconductor industry, and those who can't innovate don't last long. Throughout Kozicki's time at ASU, he's seen the industry undergo massive changes. When he first started, “We thought we were cool for making chips on the micron-scale,” he says. These days, semiconductor companies manufacture chips hundreds of times smaller. The complex process involves stacking layers of silicon and other materials that are just a few atoms thick and etching microscopic circuit patterns into them by exposing them to chemicals and intense UV light. While these processes have

**“Every electronics manufacturing job accounts for another five or so jobs in vendors and suppliers. It's a valuable asset for the state's economy.”**

— DENNIS HOFFMAN,  
PROFESSOR OF  
ECONOMICS AND  
DIRECTOR OF THE  
L. WILLIAM SEIDMAN  
RESEARCH INSTITUTE  
AT THE W. P. CAREY  
SCHOOL OF  
BUSINESS

enabled chips with circuits just a dozen atoms wide, manufacturers constantly look for ways to achieve more performance.

Cun-Zheng Ning is a professor of electrical engineering whose research shows just how far semiconductor fabrication techniques have come. Ning joined ASU in 2006 from NASA's Center for Nanotechnology, and his work focuses on using semiconductors to create optical devices such as nanolasers. These tiny lasers are made by growing semiconductor wires only a few nanometers in diameter — thousands of times smaller than a human hair — but their exact mechanisms aren't fully understood. The goal of Ning's research group is to probe the limits of nanolaser size and performance. He hopes to lay the foundation for a “supercomputer on a chip” that would allow small electronic devices to crunch data at speeds that today would require a room-sized computer.

Historically, the primary driver of performance increases in semiconductor devices has been size. For decades, the industry has been locked in a race to make ever smaller circuits. But as semiconductor companies approach the physical limits of circuit miniaturization, to improve chips, they're looking to advanced manufacturing processes that use tools such as 3D printing or artificial intelligence.

Bruno Azeredo, an assistant professor of manufacturing engineering, recently won a \$500,000 award from the

## **Entrepreneurship at ASU**

**#4** in  
startups  
launched

**#4** in  
patents

*Source: Skysong  
Innovations*



**#1** in U.S.

for innovation  
for six straight years

**140 patents  
issued in 2020:  
ASU ahead of  
MIT and Stanford**



National Science Foundation to continue his work on Mac-Imprint, a new way of mass manufacturing 3D chips. Today, most chips are made by stacking films, but this creates performance issues. Building circuits in three dimensions can solve this problem and open new applications. But existing 3D nanoscale fabrication processes are ill-suited for mass manufacturing. Azeredo's technique uses electrochemistry carving to make 3D structures in silicon at unfathomably small scales.

These days, he's working with Honeywell to develop optical interconnects that allow data to flow from a chip into an optical fiber without losing information. The semiconductor lenses can focus the light pulses from the chip and cross the barrier into the optical fiber so it can be routed to another location.

"The companies that are coming here are doing more advanced work," says Azeredo. "The semiconductor industry wants to have an edge, they want to know what's coming next, and I can get the technology from readiness level 0 to readiness level 1."

These represent some of ASU's many faculty members engaging in semiconductor research. A few others include additional Applied Materials funding awardees Sefaattin Tongay, associate professor of materials science, for new semiconductor base material for advanced transistors; Heather Emady, assistant professor

of chemical engineering, for material flow and heat transfer in semiconductor materials and processes; and Zachary Holman, associate professor of electrical engineering, for new materials and device designs for high-efficiency silicon.

### Benefiting Arizonans

Dennis Hoffman, a professor of economics and director of the L. William Seidman Research Institute at the W. P. Carey School of Business, says semiconductor manufacturers making a home in the Grand Canyon State support Arizonans.

"Every electronics manufacturing job accounts for another five or so jobs in vendors and suppliers," Hoffman says. "It's a valuable asset for the state's economy."

Earlier this year, the Senate passed the United States Innovation and Competition Act, which includes \$52 billion to boost semiconductor manufacturing in the U.S. Hoffman sees this, and other national and state funding, as prudent investments that will deliver benefits to Arizonans.

For Morton, the growth of the semiconductor industry in Phoenix underscores the importance of collaboration between the university and industry driven by organizations such as ASU's Knowledge Enterprise. It's critical that the R&D Sun Devils do in the lab makes its way into the real world so that new technologies don't get trapped in the so-called "valley of death," the gap between academic innovation and



## Supplying the supply chain

Global supply chains matter. Disruptions lead to decreased output — and product shortages. Each year, the W. P. Carey School of Business graduates talent to keep supply chains functioning better.

**3,431**

Number of ASU supply chain management grads from 2011–21

*Source: W. P. Carey School of Business*

commercial application.

"We don't want to just do research, we want to disseminate research and implement it to have an impact on the world," Morton says. "This is at the heart of the mission of ASU: research of public value and service to our communities. This is what we do. This is primary." ■

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**Smart appliances**

Home appliances have leveled up. They are saving energy and offering new functionality, just for you. TV apps recommend shows you might like and new washer and dryer sets share your settings between them via Bluetooth.



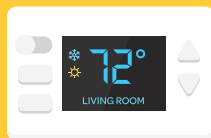
**Synchronizing and sustaining the modern home**

Semiconductors are tiny but mighty. From a technological standpoint, this small microchip packs quite the punch and helps put the “smart” in our smart devices. From TVs to refrigerators and almost everything in between, semiconductors fuel the Internet of Things by connecting devices that aren’t computers to the internet. **Learn more about Internet of Things research and innovation at [iot.engineering.asu.edu](http://iot.engineering.asu.edu).**



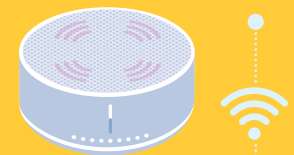
**Power, power, power**

What’s at the root of all technological devices? Energy. Because solar cells are made of semiconductors, they play a pivotal role in the global shift to a more energy-efficient future.



**Comfort and safety**

Thanks to devices like smart thermostats and wireless security systems, managing your home has never been easier, more sustainable or more cost-conscious.



**Alexa, let’s program the house to help**

When ASU’s Tooker House, a dorm that largely houses students from the Ira A. Fulton Schools of Engineering, opened, Amazon donated a virtual assistant to each student resident. With this collaboration, students can use the kind of technology they hope to one day build.

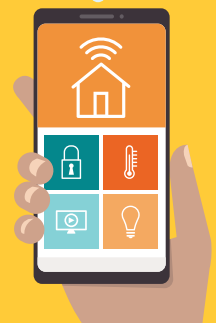


**In the kitchen**

High-tech appliances can schedule your next pot of coffee or order your groceries when they are low. Scheduling and maintenance reminders use semiconductors to make life a little easier.

**The ultimate remote control**

Making devices “smart” is one thing, but controlling them is another. Smartphones, made of billions of microscopic transistors composing each tiny semiconductor, use apps to pair with and control your smart devices remotely.



Sources: energystar.gov, Ira A. Fulton Schools of Engineering



## Industry highlights

Greater Phoenix is one of America's longest standing semiconductor hubs. Motorola kicked off the region's microelectronics boom when it opened a research and development facility in Phoenix in 1949. Now we have a thriving and diverse ecosystem that is home to research and development, manufacturing and headquarters facilities.

**1 Intel** established a presence in Arizona in 1979 that has grown into the company's second largest site in the U.S. Each year, Intel spends more than \$500 million to support areas such as packaging and autonomous vehicles.  
**Total employment: 11,405**

**2 Taiwan Semiconductor Manufacturing Company** is building a fabrication plant, with the first phase expected to produce computer chips by 2024.  
**Estimated first wave employment: 2,000**

**3 NXP** entered Greater Phoenix when it merged with a Motorola spinoff in 2015. Its facility in Chandler is a wafer fab, one of three operated by the company in the U.S.  
**Total employment: 1,696**

**4 Microchip Technology** is a spinoff of General

Instrument that became fully independent in 1989 and is headquartered in Chandler.  
**Total employment: 1,953**

**5 ON Semiconductor** headquartered in Phoenix, was spun out of Motorola in 1999. It has been at its Phoenix campus since 1952, both as a part of Motorola and as its own company.  
**Total employment: 1,038**

**6 Benchmark Electronics** relocated its headquarters and opened an Internet of Things Design Center for sensor design and wireless infrastructure. It also does manufacturing for circuit design and precision machining.  
**Total employment: 670**

**7 Amkor Technology** moved its headquarters to the Valley in 2005 and leads in packaging and testing.  
**Total employment: 332**

### ASU West campus

High-potential development opportunities tapping into research and technology on the campus.

2

Deer Valley Municipal Airport

### ASU Downtown Phoenix campus

In the heart of the state's capital, provides connections for students across the health care spectrum; in law, government and public service; with nonprofit and public social service providers; and in arts and sciences, journalism, media and the corporate sector.

### Phoenix Biomedical campus

Vibrant community built on a foundation of research, discovery, innovation and entrepreneurial activity.

Phoenix Sky Harbor International Airport

### Key

- ASU Innovation Zones
- High-tech manufacturing and development  
*Size of circle indicates number of employees.*
- Airport
- Light rail
- Interstate
- Federal highway
- State highway

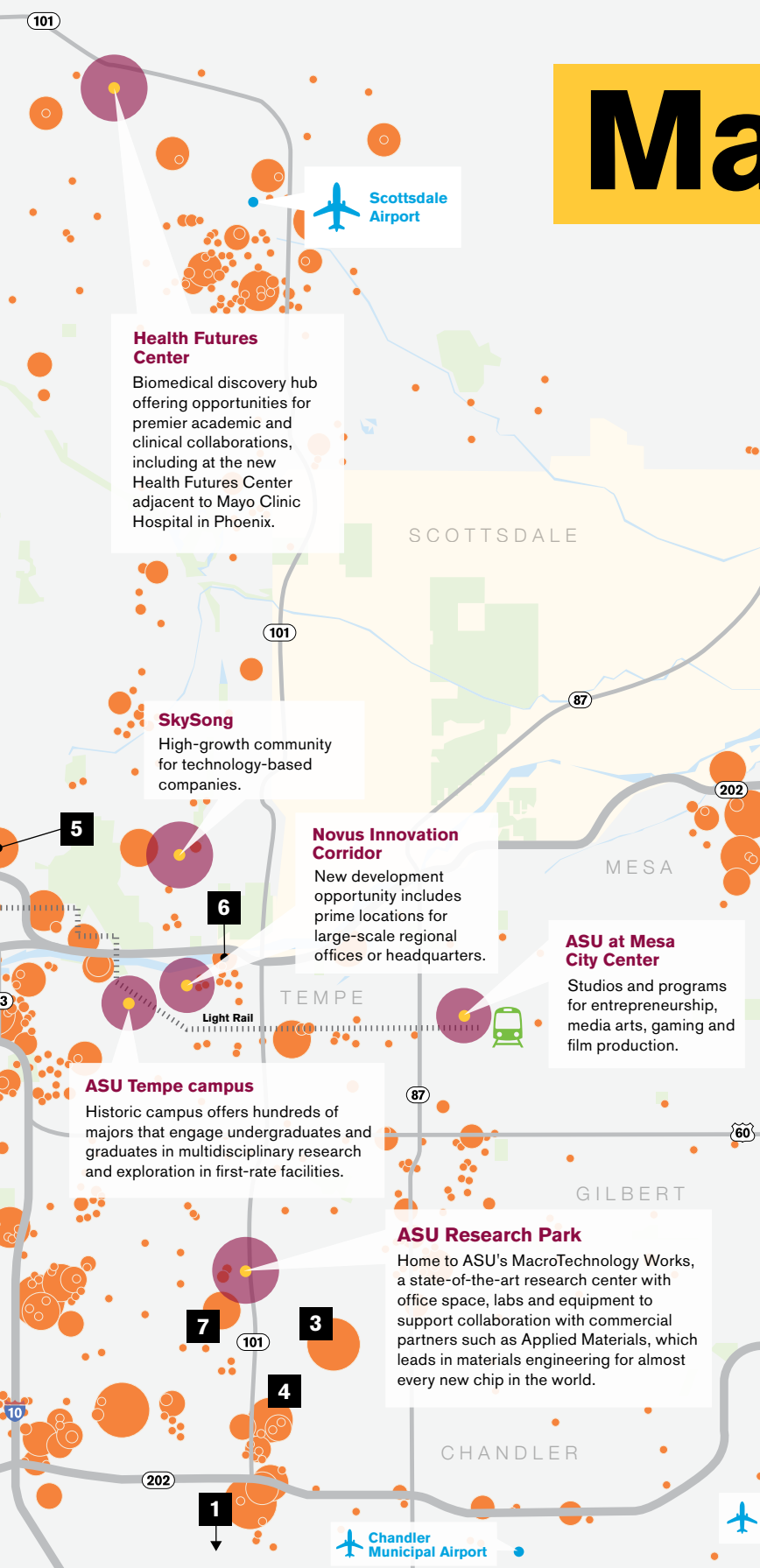
Mapping is approximate, not to scale.

See more companies in the ecosystem at [gpec.org/ecosystem-semiconductor](http://gpec.org/ecosystem-semiconductor).

Map Sources: Maricopa Association of Governments, GPEC, ASU  
MAP BY ASU KNOWLEDGE ENTERPRISE AND ASU THRIVE



# Magnetic centers



## Health Futures Center

Biomedical discovery hub offering opportunities for premier academic and clinical collaborations, including at the new Health Futures Center adjacent to Mayo Clinic Hospital in Phoenix.

## SkySong

High-growth community for technology-based companies.

## Novus Innovation Corridor

New development opportunity includes prime locations for large-scale regional offices or headquarters.

## ASU at Mesa City Center

Studios and programs for entrepreneurship, media arts, gaming and film production.

## ASU Tempe campus

Historic campus offers hundreds of majors that engage undergraduates and graduates in multidisciplinary research and exploration in first-rate facilities.

## ASU Research Park

Home to ASU's MacroTechnology Works, a state-of-the-art research center with office space, labs and equipment to support collaboration with commercial partners such as Applied Materials, which leads in materials engineering for almost every new chip in the world.

## ASU Polytechnic campus and ASU Polytechnic Innovation Zone

Lab and major specialties include engineering and other technical expertise, this campus is ideal for advanced manufacturing, aviation and alternative energy.

## Research and business alignments lure (and spur) jobs creators

Generating high-paying clusters of jobs in the Greater Phoenix region takes planning — sometimes over decades. ASU; the Greater Phoenix Economic Council; city councils, chambers of commerce and mayors; the legislature; homegrown industries and local startups all make it happen.

More than 2,800 Arizona-based advanced manufacturers directly create more than 138,000 high-paying jobs, according to GPEC, with many more businesses and jobs generated in downstream industries. Bringing together vibrant economic ecosystems requires prime conditions purposefully designed. Big multinational companies and research universities like ASU act as magnetic centers, producing and attracting skilled workers that create conditions for companies — big and small — to thrive.

Learn more at [innovationzones.asu.edu](http://innovationzones.asu.edu).

**“As an international destination for care in Arizona, our team is relentlessly advancing solutions for serious or complex conditions within a patient-centered model. To this end, we are privileged to have the No. 1 university for innovation as our neighbor as we — together — create more opportunity for health care discovery.”**

— RICHARD J. GRAY, VICE PRESIDENT OF MAYO CLINIC  
AND CEO OF MAYO CLINIC IN ARIZONA

#### COLLABORATION SPACE

### **ASU's new Health Futures Center provides fresh intersections with Mayo Clinic to transform health care**

A new silhouette that represents the future of health care in Arizona stands tall against the backdrop of the Valley. It is the latest development in the nearly two-decades-long relationship between ASU and Mayo Clinic, the recognized world leader in patient care, medical education and research. It features facilities for biomedical engineering and informatics research labs, advanced simulation health care technology and workplace and meeting spaces. It is the first of several buildings planned to dot the surrounding landscape, creating a hub for innovative medical research and development in the coming years. The goal is to transform the health care workforce by advancing professional education, exploring innovative treatments to ultimately create cures, streamlining health care delivery provided by digital tools that reach patients everywhere and creating and developing new medical devices and startup companies.

**Learn more at [health.asu.edu/mayo-clinic-and-asu](https://health.asu.edu/mayo-clinic-and-asu).**





# Transform lives

The center is adjacent to Mayo Clinic's Phoenix campus in northeast Phoenix, on Mayo Boulevard just south of Loop 101.

## Leveling up home health care

Nurse entrepreneurs create access to expert in-home care. 42

## From ASU Online to med school

Rigorous courses and in-person labs fuel grads' med school goals. 50

# Navigating THROUGH healing

Lucille and Thomas Julian welcomed a repair technician — masked — into their home last December. One week later, the company called to tell them that the technician had been diagnosed with COVID-19. The Goodyear, Arizona, couple initially tested negative for the virus, but within a few days, Thomas, who was 79 at the time, exhibited symptoms.

Lucille, then 74, managed to evade the virus's wrath, but for Thomas, a cancer survivor, the virus was less kind.

Meet two nurse entrepreneurs who have gone all in to improve home health care

**Story by** STEPHANIE R. CONNER, '01 BA JOURNALISM  
**Photos by** BRANDON SULLIVAN





“He kept getting worse,” Lucille recalls. “My brother suggested a private nurse.”

In an online search, Lucille found Navi Nurses, co-founded by Jasmine Bhatti, a registered nurse and PhD student in the Edson College of Nursing and Health Innovation; and registered nurse Ayan Said, '14 BA psychology. The nurses see an opportunity to help improve patients' health and create positive professional nursing experiences by closing a gap in health care.

#### **From idea to startup**

As a PhD student, Bhatti taught sections of ASU 101 for students in the Edson College of Nursing and

**“We meet people exactly where they’re at in their health care journey. We fill the gaps and provide care. We help take away caregiver burden and help people attain the best quality of life possible.”**

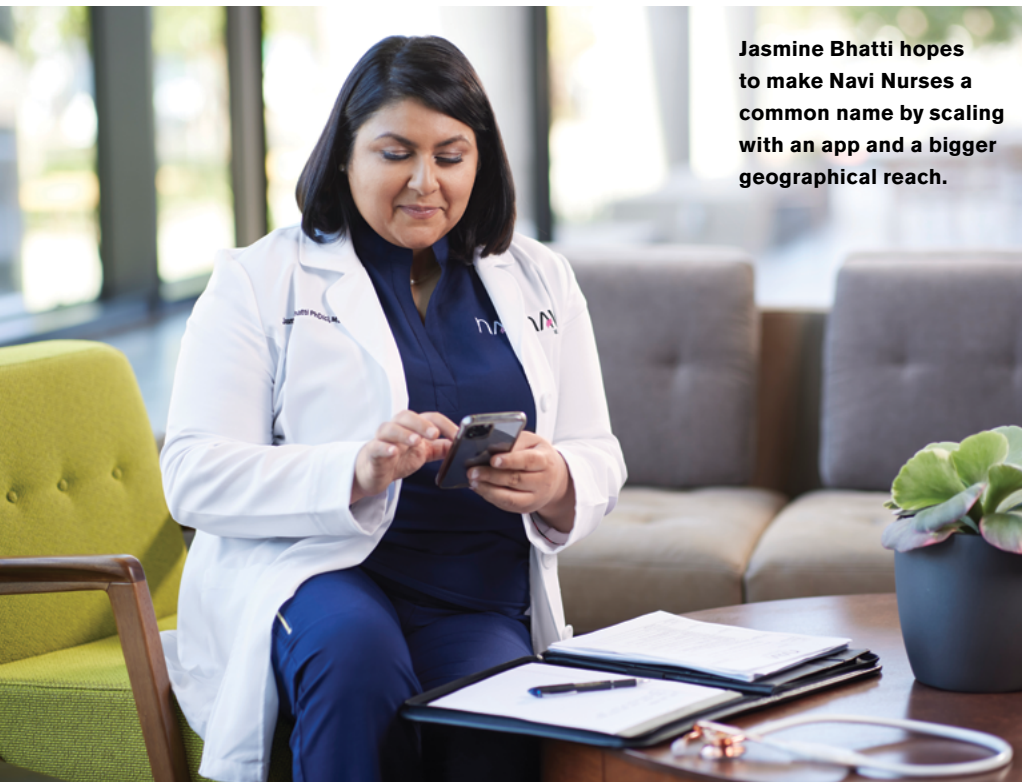
— JASMINE BHATTI,  
CO-FOUNDER  
NAVI NURSES  
ALUM, PHD  
STUDENT

Health Innovation, which introduced her to the Health Entrepreneurship Accelerator Lab (HEALab), which provides resources for innovators and entrepreneurs seeking to take health-related business ventures to market. Primarily located on the Downtown Phoenix campus at 850 PBC (Phoenix Biomedical Campus) with additional programming on the West campus and online, HEALab is an initiative supported by the J. Orin Edson Entrepreneurship + Innovation Institute, the Edson College of Nursing and Health Innovation, the College of Health Solutions and the New College of Interdisciplinary Arts and Sciences. In their ASU 101 classes, Nursing and Health Innovation first-year students receive a semester-long small-group assignment to develop an innovative solution to a particular health problem. The HEALab provides innovation and ideation training, with some students receiving startup funding.

“That’s over 600 nursing students, health innovation students, community health students and integrated health students every fall,” says Rick Hall, senior director and clinical professor of health innovation in Nursing and Health Innovation.

When Bhatti brought her students to the HEALab, the lectures sparked something in her. “I keep this book of things I want to change in health care,” Bhatti says. So, she asked Hall for his opinions. When he heard her ideas, he encouraged Bhatti to pursue Navi Nurses, which the founders liken to an Uber that families and individuals can reach out to for professional,

**Jasmine Bhatti hopes to make Navi Nurses a common name by scaling with an app and a bigger geographical reach.**







Ayan Said believes everyone should have access to expert in-home nursing care.

on-demand nursing care.

“This is the one right here, the one you should go with,” Hall told her. He, too, saw the unmet need and the potential to scale it using technology.

### **A journey of entrepreneurship**

“We meet people exactly where they’re at in their health care journey. We fill the gaps and provide care,” Bhatti says, allowing patients and families to make the best health care decisions. “We help take away caregiver burden and help people attain the best quality of life possible.”

The founders named the company after the Hindu word “anavi” — meaning the first ray of the sun, and also a peace-loving, kind person — both apt descriptions for nurses. It also helps connote “navigation,” for the many patients requiring help finding their way through their health journeys.

Bhatti discovered the ideal co-founder in Said at a Phoenix Startup Week event. “We realized that we both had that drive and desire to improve health care,” Bhatti says. “We’ve taken an idea that started with me, but it’s our journey now together.”

In the early stages, the company brought in Shawn Harrell, '84 MS in nursing, a retired health care administrator and executive who previously sat on the Arizona State Board of Nursing, to help them navigate the licensing process. Being able to work with someone with licensing expertise was valuable in getting the company going, Said points out.



## **Transforming lives**

Get support from the HEALab for your health innovation

[entrepreneurship.asu.edu/entrepreneurship-innovation-healab](https://entrepreneurship.asu.edu/entrepreneurship-innovation-healab)

Contact Navi Nurses at [navinurses.com/contact](https://navinurses.com/contact)

As part of running Navi Nurses, Said and Bhatti work as nurses for their company and train nurses to work for them. Until earlier this year, they also maintained their full-time hospital nursing jobs.

“It’s a big, big step for us,” Bhatti says. “But we can’t make this happen unless we’re able to dedicate 100% of our time. We took our first [Navi] patient in February 2020, and then everything happened. We paused because we needed to care for our community. Since this past January, Navi Nurses has been able to blossom — and it’s exciting.”

In the first five months of 2021, the company hired 45 contract nurses to serve the Phoenix metro area.

The company also has been able to hire three nursing grads — Gianna LaPaglia '19 BSN, Mea Valli Doherty '19 BSN and Jasmine Cura '20 BSN — whom Bhatti taught when they were juniors at ASU.

“It is really fulfilling to go from watching them learn as students, to being incredible nurses who make such a difference,” Bhatti says. “I get to watch them blossom and help them continue to grow.”





### Filling a gap

Navi Nurses helps patients transition from the hospital to home, reducing the risk of hospital readmission, Bhatti says. They work with people who fly in for a procedure and then need a professional nurse after surgery. And for patients like the Julians, they provide care and serve as advocates to help people stay in their homes longer.

"The cost of assisted living runs about \$100,000 per year," Bhatti says. "People want to stay at home. We help them do it safely and under the watchful eye of an expert, compassionate nurse."

With additional funding from competitions and investors, the company plans to build a

custom app and broaden its geographical reach.

As Navi Nurses grows, they plan to expand their charity care program. Currently, they donate care to one person or family in need every month.

They feel grateful to ASU and its resources. In addition to their start at the HEALab, Bhatti and Said took advantage of Venture Devils, a semester-long program that supports founders and helps connect them to funding. In May of 2020, they competed in a Demo Day and won \$10,000 to help build their venture.

"Building a business can feel daunting," Said says, "but one of the biggest lessons we've learned is that it's so important to surround

yourself with the right people. Galvanizing others with a single powerful vision is how you truly make an impact. Everything else, you pick up along the way."

### Benefiting others

During their journey, the founders discovered that they can provide a positive working environment for nurses.

"Research shows that at least 25% of nurses work multiple jobs. And that can be hard if you're working two hospital jobs because you're going from one stressful environment to another stressful environment," Bhatti says. "Our nurses tell us they can work a 12-hour shift [for Navi] and not feel exhausted afterward. We hope to keep people in the profession doing what they've always wanted to do."

For the Julians, Navi Nurses proved invaluable.

"The day that Ayan came, my husband was very sick," Lucille says. "I was so glad she was there that day because I could not have handled it myself."

They were so impressed with Said that they hired her on an ongoing basis. And Said helps keep their daughter, who lives in California, in the loop.

The Julians' experience, Bhatti and Said say, shouldn't be isolated.

"We believe that every family, every person deserves a nurse, and that's what we want to be — we want to be a household name," Bhatti says, noting that building capital is an essential next step. "We can do this on our own, but it would take longer. We want to grow big and make an impact." ■

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which includes Personal Property Replacement.<sup>3</sup>



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<sup>1</sup>Savings validated by new customers who switched to Liberty Mutual between 1/2020-10/2020 and participated in a countrywide survey. Savings may vary. Comparison does not apply in MA. <sup>2</sup>The property damage must be covered by your policy, and repairs completed by a Guaranteed Repair Network Vendor. Guaranteed Repair Network not available in Rhode Island or Massachusetts. In Massachusetts we offer you our Superior Service Program (SSP), which is similar to the Guaranteed Repair Network, however, the estimate is completed by a Liberty Mutual appraiser. For more information, speak with your Liberty Mutual Claims Representative. <sup>3</sup>Not available in all states. Coverage provided and underwritten by Liberty Mutual Insurance and its affiliates, 175 Berkeley Street, Boston, MA 02116 USA. Equal Housing Insurer. ©2019 Liberty Mutual Insurance 14591054  
This organization receives financial support for offering this auto and home benefits program. AFF686950-11 CW-AH 2019/09



Mapping Access project members included (left to right) Jordyn Stebbins, a medical science student; Miguel Tym, an entrepreneurship student; David Jaulus, a justice studies student; and RaNiyah Taylor, a political science and family human development student.

#### DISRUPTING DIS/ABILITY

### Creating inclusion

A new course offered through ASU's Humanities Lab called Disrupting Dis/Ability increases university accessibility, one project at a time. Last semester, two of the course's student teams went above and beyond. One team created the Accessibility Coalition, an ASU organization focused on advocating for accessibility and acceptance for ASU students with visible and invisible disabilities, formally approved into the ASU Council of Coalitions. Another team created the Mapping Access project, adding accessibility indicators to ASU's campus maps.

See options in the layers of the campus map at [asu.edu/map/interactive](https://asu.edu/map/interactive).



f r o m

Rigorous courses, in-person labs help grads Desiree' Brionne Dillard and David Reed earn spots in med school

**Story by** MARY BETH FALLER, '19 MEd

**Photos by** JEFF NEWTON AND JILL RICHARDS

# ASU Online



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Two recent graduates are on their way to medical school, thanks to the opportunity to earn bachelor's degrees through ASU Online.

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Desiree' Brionne Dillard, '20 BS in biological sciences, will attend Mayo Clinic Alix School of Medicine in Scottsdale. David Reed, '21 BS in biochemistry, will attend the Joan C. Edwards School of Medicine at Marshall University in West Virginia, where he lives.

Dillard and Reed, who both have children and worked while taking classes, say they could not have completed the rigorous prerequisites without ASU Online.

"I would not be here if that program wasn't available," Dillard says. "There is no question that they prepared me well."

Ara Austin, managing director of online programs in the School of Molecular Sciences, says that ASU Online coursework is exactly the same as the on-campus curriculum.

"Lots of people have this misconception that the online degree is not as rigorous as the on-campus program, and that is

simply not true," she says. "How they go through the class is different, but the timeline and what they complete in the lab courses are identical."

ASU Online students must complete their lab experiments in person, either on ASU's Tempe campus or at institutions near them. The biochemistry degree requires three labs, and students can do all three at once over seven days on campus.

"There are certain lab instruments that students have to learn to operate, and they can cost \$10,000," says Austin, who also is a clinical assistant professor and teaches organic chemistry online and in person.

"In organic chemistry, they do infrared spectroscopy and use a PCR (polymerase chain reaction) machine."

Austin, who has been with the online biochemistry program from the beginning, says that administrators assumed most ASU Online students would take their labs near their homes and transfer the credit. But they have found that about 85% of the students prefer to visit ASU's Tempe campus.

"It gives them an opportunity to connect to their peers and the faculty, and they want to come and be part of our culture because that's meaningful to them," Austin says.

#### **Transferable to real life: Desiree' Brionne Dillard**

Dillard knew from a young age that she wanted to be a doctor, though her journey to medical school took some turns.



“My grandmother worked in a cath lab back when Black women really couldn’t become physicians, and my mother also spoke about how she always wished she had attended medical school,” Dillard says.

When Dillard was pursuing her undergraduate degree in psychology at The University of Arizona, she became pregnant with her daughter.

“After a rough semester, I sought out guidance from my advisors, and every single one of them discouraged me from applying to medical school. I was

**“I learned so much about patient care ... through ASU Online. It was completely transferable to real life, even though it was a virtual setting.”**

— DESIREE’ BRIONNE DILLARD

told to pursue a different career.

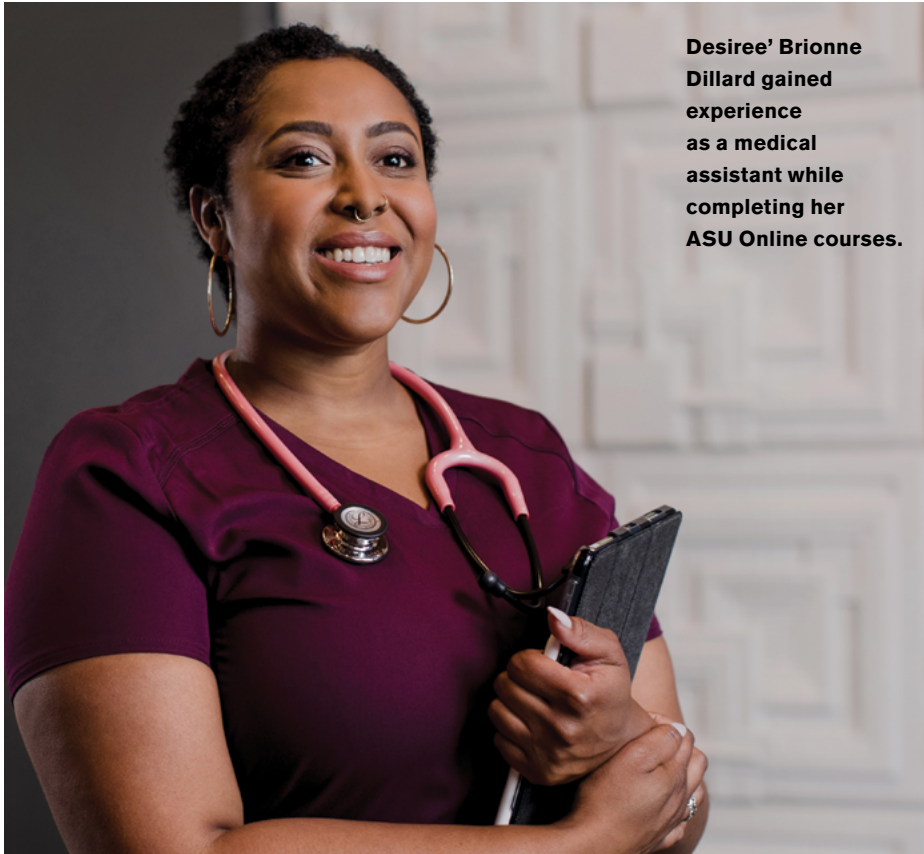
“So I thought, ‘If it’s meant to be, it will happen.’”

She started a career managing energy-efficiency programs for low-income customers at Tucson Electric Power. The utility paid for employees to take classes related to their jobs, so Dillard earned a bachelor’s degree in psychology and an MBA from Grand Canyon University, although business was not her true passion.

“I had started a PhD program and thought, ‘I don’t enjoy this. I want to go to med school,’” she says.

**Desiree’ Brionne Dillard earned her degree and studied for her MCAT while raising her family.**





**Desiree' Brionne Dillard gained experience as a medical assistant while completing her ASU Online courses.**

Shortly after giving birth to her son, Dillard moved to Tucson to be closer to family. Her son's father, accepted into The University of Arizona medical school, had been a pre-med student at ASU and was the one who told her about the ASU Online program.

Hearing him discuss his courses got her excited about the field again, so she started taking the science prerequisites she would need to apply to medical school.

"I went to undergrad for four years in person, and I felt like I was learning more at ASU Online just because of the structure and

the ability to do things in my own time," Dillard says.

"You can watch the videos over and over. There were more resources. And the professors were so involved.

"I was blown away by the fact that they have so many opportunities for office hours through Slack and Discord. Someone is always available to help you."

Dillard worked as a medical assistant while taking classes.

"I learned so much about patient care, such as how to take a blood pressure reading and patient history, through

ASU Online," she says. "It was completely transferable to real life, even though it was a virtual setting."

Dillard says she is interested in specializing in dermatology and pursuing a joint MD-JD through a partnership with ASU's law program.

"I know it's incredibly ambitious, but I'd like to find a way to incorporate both into my practice," she says. "There's a lot of need for Black women in those areas."

#### **Powering through: David Reed**

While Dillard had a lifelong dream of attending medical school, Reed had never thought about it until a few years ago, when his infant son was hospitalized with meningitis and he saw the physician at work.

"It was a flashing-neon-light moment, and I started researching how I could get the prerequisites to go to medical school. I kept coming across ASU Online, which was popping up in my Facebook feed. And I realized it was the only option," he says.

He was working 12-hour shifts at an aluminum mill at the time, so an in-person program was impossible.

Reed had earned a teaching degree at college, which he attended right after high school because he earned a scholarship to play golf.

"I wasn't ready, maturity-wise," he says.

"I tried a bunch of things. I worked in a lumberyard. I ran my own business. I worked in an



**David Reed earned his bachelor's degree in biochemistry from ASU Online and is on his way to medical school. He says he hopes to inspire others. "They can see that someone with kids did it, someone turning 40 did this."**



aluminum mill. But now I'm finally excited about what I'm doing."

Reed started taking chemistry and biology courses through ASU Online when his twin sons were 7 months old.

"It was a lot of work. It felt like every spare moment, I was constantly watching a lecture or taking a quiz," says Reed, who cared for his sons while his wife worked her full-time job.

He failed a chemistry exam and realized that he needed to change his studying methods.

"I had just powered through the material through sheer force of will, and I couldn't do that anymore," he says.

"I had to do practice problems because the exams don't ask for regurgitation. They ask for application. And that mode really prepared me well for the MCATs."

### Things got better

"It doesn't stay pedal to the metal because you learn how to be more efficient and budget your time. And the boys began to sleep through the night and feed themselves."

In the spring of 2020, Reed quit his job at the aluminum mill to focus on academics. That summer, he took his lab courses while studying for the MCATs.

"I would not recommend that," Reed says.

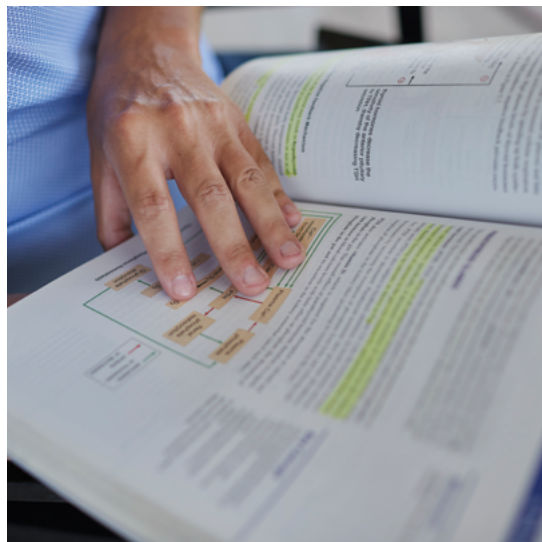
Both graduates showed remarkable levels of perseverance in achieving their goals.

"I can't impress upon everybody how difficult this was," Reed says. "You have to decide, 'Am I going to practice balancing chemical equations instead of



**"I tried a bunch of things.  
I worked in a lumberyard.  
I ran my own business.  
I worked in an aluminum mill.  
But now I'm finally excited  
about what I'm doing."**

— DAVID REED



watching Netflix?' You basically give up everything that takes your time, and you reappportion that time into your schooling."

### Serious preparation

Austin says that while Dillard and Reed are the first graduates of ASU Online to get into medical school, many graduates of other universities have taken individual ASU Online courses before being accepted to medical school.

"We're willing to break the mold of a four-year university to open the door to all learners," she says.

"Whatever goal they have, we can facilitate that by offering those courses to a wider audience by going online."

Reed, who is considering specializing in pediatrics or palliative medicine, says he wondered how medical schools would perceive his online degree program.

"I was slightly worried about it until the pandemic. Then everyone finally realized that online is no joke," he says. "My MCAT score shows that I learned the material and I had a rigorous path."

Dillard, who turned 30 the week after she started medical school in July, says she hopes to show that online degrees open doors.

"I'm a huge advocate for nontraditional students," she says.

"I questioned it for almost a decade, but now that I'm in this position, I realize that there are resources available and I don't think I would be here without ASU Online." ■



It's time to get  
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- E**ducate yourself.
- A**ct if a child feels uncomfortable.
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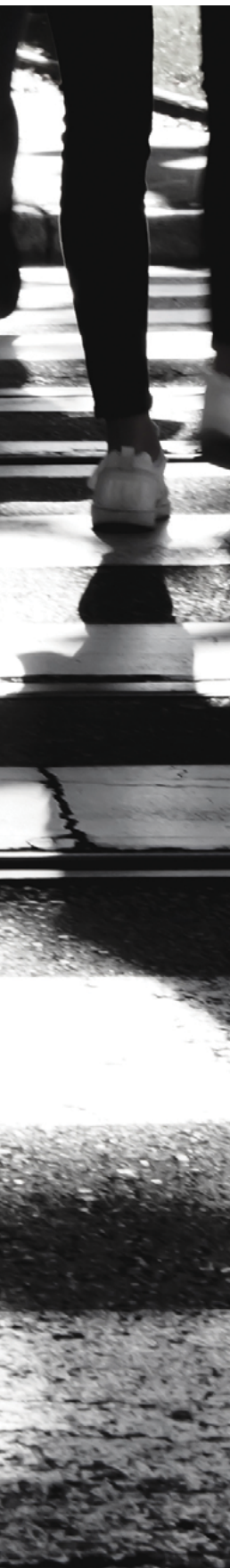
Under shade sails and structures



# How can we best add shade?

In the shade of a tall building





Under a leafy tree

## Measuring the comfort power of different categories of city shade

**Story by** STEVE FILMER

**It's a bright, hot day.**

To cool off, you have the choice of taking shelter under a shade sail, in the shade of a tall building or beneath a leafy tree. Which will you choose?

Climate scientists at ASU put in the legwork to get the answer. Now, the American Meteorological Society is sharing these findings with the publication of the study "50 Grades of Shade."

"Cities have started to plant trees as a means to shade the environment. But oftentimes you can't really plant trees, because of infrastructure challenges. There may be sewer lines underground, internet cables or business signs that will be blocked. We went out to see if there are any viable alternatives to trees for providing shade to keep people comfortable outdoors," says Ariane Middel, assistant professor in ASU's School of Arts, Media and Engineering and principal investigator for the study. She also has a joint appointment with ASU's School of Computing, Informatics, and Decision Systems Engineering.





ASU climate scientist Ariane Middel with a MaRTy unit — which measures mean radiant temperature. The carts are packed with sensors that measure MRT, an important component of thermal comfort or how we experience heat in a given space.

**“You really feel what it is to have impervious surfaces that trap the heat and give it back.”**

— FLORIAN SCHNEIDER, PHD CANDIDATE IN THE SCHOOL OF SUSTAINABILITY WHO HELPED WITH MUCH OF THE DATA GATHERING WITH THE MARTY INSTRUMENT

Learn more about the work of the Sensable Heatscapes and Digital Environments team at [shadelab.asu.edu](http://shadelab.asu.edu).

Their yardstick to measure the comfort power of different shade sources is MaRTy, a garden cart packed with sensors.

“MaRTy measures mean radiant temperature — MRT — the radiation that hits your body,” Middel says, “so it’s much more accurate in how you’re experiencing the heat, compared to air temperature alone.”

The team repeatedly wheeled MaRTy to spots around Tempe, Arizona, near ASU’s campus. On hot summer days, they took readings at bus stops, parks and city sidewalks.

Each checkpoint fit one of three categories: lightweight or engineered shade, shade from urban forms or natural shade from trees. Lightweight or engineered shade includes things like umbrellas and shade sails. Shade from urban forms are places like building overhangs, tunnels and breezeways. Tree shade was

measured from native and desert-adapted trees that are common in central Arizona. At each stop, several sun-exposed readings were included as references. The fieldwork includes measurements taken right after sunset.

The winner: shade from urban forms.

“That does not mean we should stop planting trees,” Middel is quick to add. “Trees have a lot of co-benefits. But if a city has limited resources, you may not need to add trees near tall buildings.”

The study adds important findings to the understanding of what scientists call the urban heat island effect, which causes urban areas to stay hotter, longer.

“You really feel what it is to have impervious surfaces that trap the heat and give it back,” says Florian Schneider, a PhD candidate in ASU’s School of Sustainability who helped with much of the data gathering of the MaRTy instrument.

“Especially right after sunset. It’s like you’re standing next to an oven that’s open and running, because it’s giving back the heat with such intensity.”

Next, the team will work toward building an online decision-making tool that cities can use to assess the performance of any shade type. The tool would give city planners a simulated shade curve specific to their position on Earth and help them decide which shade source to add to their designs.

Middel’s team has just received funding from ASU’s Healthy Urban Environments initiative, and they hope to create the tool over the next year. ■





# Play like a Sun Devil®

Jon Rahm credits family as part of the reason he won. In addition to his parents and his wife, Kelley, who ran track and field at ASU, and their newborn son, Keppa, his ASU golf family also came out to support him — including Alberto Sanchez, Ki Taek Lee and Phil Mickelson.



A YEAR FOR CHAMPIONS

## Rahm wins U.S. Open

Professional golfer and Sun Devil Jon Rahm, '16 BA in communication, took home first place at the U.S. Open in Torrey Pines, marking his first major championship win. With the current men's team taking third place at the NCAA Tournament the week after Phil Mickelson, '92 BA in psychology, became the oldest golfer to win the PGA Championship, Rahm's historic win is the cherry on top of a monumental year for ASU. Rahm is the first Spanish player to win the U.S. Open and has made ASU the first school to have alumni win back-to-back majors since 1996.

**Smart sportswear**  
Three biosensor startups partner with Sun Devil Athletics. **62**





### Muscle activity

Light Lace sensors use fiber-optic technology to predict muscle fatigue.

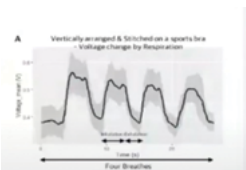
### Football

## Wearables keep athletes at the top of their game

The first winner, wearable biosensor company Organic Robotics Corporation, will beta test its Light Lace sensors with the Sun Devil Football and Triathlon programs to enhance the safety and performance of athletes. Using photonics instead of electronics, these soft, stretchable sensors track motion, muscle fatigue and respiratory levels to prevent injuries and boost physical performance.

"Light Lace sensors create an artificial skin that allows us to create digital twins of our tactile biometric information," says Ilyada Samilgil, Organic Robotics co-founder and CEO. Each sensor is equipped with a light that warns the user of high fatigue levels.

Sensors are easy to use and can survive high-speed motions and intense exercise. **Learn more at [organicroboticscorp.com](http://organicroboticscorp.com).**



### Respiration rate

Real-time monitoring helps improve performance.



### Motion data

Feedback helps prevent injuries and improve performance.



### Triathlon

## Swimming tracker revolutionizes training

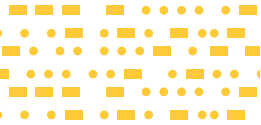
Designed by Olympic swimmers, IronMan triathletes and coaches, the Phlex Edge garnered second place plus a beta opportunity for use in the Women's Triathlon program. The goggle-worn swimming tracker provides swimmers with a detailed understanding of their training, from real-time heart rate to stroke analysis and full set breakdown. The Phlex app uses machine learning technology to capture valuable data, empowering swimmers and coaches to customize each athlete's training plan.

**Learn more at [phlexswim.com](http://phlexswim.com).**



The Phlex Edge tracks laps and workout breakdowns featuring precise sets, times and heart rate.





# Pitched and testing

Tech startups beta test performance and analytics with Sun Devil Athletics teams



## Baseball and Football

### Embedding circuitry into fabrics yields intelligent sportswear

The velocity of a throw. The direction of a lunge. The force of a stride. Tracking player data with smart threads enables athletes to boost their performance and it's why Nextiles won third place and a beta opportunity with Sun Devil Baseball and Football.

"We've tested thousands of athletes and we're able to provide important information like range of motion and joint power back to the coaches and back to the elite athletes," says John Peters, Nextiles chief business officer. Nextiles blends traditional sewing techniques with innovative printed circuit boards, allowing for sensors to be placed within fabrics. **Learn more at [nextiles.tech](http://nextiles.tech).**



Nextiles weaves semiconductors into sportswear to measure an athlete's biometrics.

At ASU's J. Orin Edson Entrepreneurship + Innovation Institute's Demo Day competition this spring, students, staff, faculty and community entrepreneurs pitched short videos about their original products in hopes of being awarded funding. In the Sun Devil Athletics Venture Challenge category, three new biosensor companies won funding and will be beta tested by Sun Devil athletes. The Global Sport Institute is providing mentorship and \$25,000 in grant funding and mentorship elements.

With an emphasis on expanding research, sharing knowledge, supporting innovation and advancing education, the Global Sport Institute's mission is to use sport to create positive change throughout the world. **Learn more at [globalsport.asu.edu](http://globalsport.asu.edu).**



## Then

In the early 2000s, engineering students in the Simulator Building prototyped parts designed in CAD (computer-aided design) and CAM (computer-aided manufacturing) software to cut materials into parts for use in a wide variety of products.



## Now

Today's students work with international companies on advanced technologies like "digital-twinning" to replicate machinery using the Internet of Things to increase efficiency, advance operations and reduce risk, offering a test before application in the real world.

### EXPANDING HORIZONS

This fall ASU's Polytechnic campus in Mesa is celebrating its 25th anniversary by launching new developments that will further its legacy of connecting students with programs that are both accessible and cutting-edge. The Ira A. Fulton Schools of Engineering is expanding to include a new school with a focus on the future of work, industry 4.0, human-machine teaming and systems engineering. Learn more about the growth in engineering at [engineering.asu.edu](http://engineering.asu.edu).



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# What's next

## ASU innovation is key

Next is more federal funding flowing to our state. Attracted by Arizona State University's world-class faculty, federal agencies like NASA and the Department of Energy are sending more of their research dollars to ASU. In fact, ASU now ranks third in the nation for NASA R&D expenditures, ahead of the University of Arizona, MIT, UCLA and Stanford.\*

**It's just one example of how ASU innovation and partnerships are fueling our economic future.**

## for research with impact?



\*Federally financed higher education R&D expenditures, financed by the National Aeronautics and Space Administration, ranked by NASA R&D expenditures, by R&D field: FY 2019