

CLAS MAGAZINE

Spring | Summer 2016 | Volume 4 | No. 1

FROM WORMS TO CANCER CURES



College of Liberal Arts and Sciences Dean Patrick Kenney walks on campus with students Rafael Nunez and Katelyn Duffy. Photo by Felipe Ruiz Acosta.

WELCOME FROM THE DEAN

The summer issue of the College of Liberal Arts and Sciences Magazine celebrates innovation. You've likely heard Arizona State University is ranked No. 1 in the U.S. for innovation. We want to show you how our students and faculty have helped make this achievement possible.

This issue asks the pivotal question: how are we creating positive change in the world? Our exceptional faculty and students personify our college's commitment to ingenuity through intellectual inquiry and a desire to discover transformative innovations.

You'll meet students who have showcased academic excellence while making strides in research for global change. Adenike Opejin has collected data to find solutions for organic waste in Nigeria, her home country. Jessica Fletcher has advocated for prison reform, mentoring writers who are inmates in various types of prose. Carl Fields has studied stellar evolution in hopes of creating 3-D simulations of supernova explosions to better understand our universe.

You'll see how renowned faculty members are making groundbreaking discoveries that help solve some of society's biggest challenges. Our faculty are improving the well-being of vulnerable populations (including the elderly and immigrant families) and finding a new weapon that kills antibiotic-resistant bacteria.

You'll join our faculty and students as they embark on a journey to find innovative cures for cancer in the Virginia G. Piper Center for Personalized Diagnostics at ASU's Biodesign Institute. Graduate student Justin Wolter has been working with professor Marco Mangone to identify how biological mechanisms play a role in cancer. Undergraduate student Bianca Varda has been working with Dr. Karen Anderson to develop diagnostics and treatments through immunology.

These stories represent only a small portion of the vast amount of innovations happening within our college. Please help us support our students and faculty as they reimagine the future and create solutions to better our world. You can learn more about making an impact on our community at clas.asu.edu/impact.

Patrick Kenney
Dean
College of Liberal Arts and Sciences

CREDITS:

ART DIRECTION AND DESIGN: ESLY DIAZ | **COPYWRITER:** AMANDA STONEMAN
DIRECTOR OF MARKETING: NICK ADAMAKIS | **MANAGING EDITOR:** ANNA CONSIE

CONTACT US:

THE CLAS MAGAZINE IS PUBLISHED BY THE COLLEGE OF LIBERAL ARTS AND SCIENCES. FEEDBACK, ARTICLE IDEAS AND SUBMISSIONS WELCOMED. PLEASE CONTACT THE MANAGING EDITOR AT ANNA.CONSIE@ASU.EDU.

SUPPORT:

TO LEARN ABOUT THE MANY WAYS YOU CAN SUPPORT OUR COLLEGE, PLEASE VISIT CLAS.ASU.EDU/ENGAGE OR CONTACT WILLIAM.KAVAN@ASU.EDU OR CALL **480-965-3391**.

TABLE OF CONTENTS

4 MAKING URBAN CLIMATES MORE LIVABLE

6 WATCH OUT SUPERBUGS ▼



8 WORLDS COLLIDE: ENVISIONING A HUMANITIES LAB AT ASU

10 DESIGNING AND BUILDING BIG MISSIONS FOR SPACE ▼



12 FROM WORMS TO CANCER CURES

16 A TRANSBORDER INNOVATOR UNCOVERS THE HEALTH EFFECTS OF 'LIVING WITH OUT PAPERS'

18 ASU ANTHROPOLOGIST TAPS REALITY OF 'BLACK MARKET' WATER ▼



20 TWO ACADEMIC PROGRAMS AT ASU INSPIRE THE NEXT GENERATION OF MATHEMATICIANS AND SCIENTISTS

22 OUR RESEARCH IMPACT ▼



26 THE NEXT GENERATION OF INNOVATORS

30 WHEN GIVING IS ALL WE HAVE

31 CELEBRATING THE PHILANTHROPY OF SCHOLARSHIPS



MAKING URBAN CLIMATES MORE LIVABLE

IMPROVING QUALITY OF LIFE AND SAVING LIVES

In early October, Los Angeles was gripped by triple-digit temperatures – unpleasant for everyone, but life-threatening for some people. When temperatures rise, the elderly and impoverished are most at risk – their incomes may not allow for adjusting the thermostat to stay cool, or they may not have air conditioning at all.

It's easy to understand the risks that poor air quality can pose when it accompanies a heat wave, especially for those with fragile health.

"The elderly tend to spend more time indoors, so to address heat-related risks to their health, we need to focus on not just urban climate but indoor climate," said David Sailor, who joined Arizona State University's School of Geographical Sciences and Urban Planning this January.

Sailor, who comes to ASU from Portland State University, is well known for his work on mitigation of urban heat islands. With his move to ASU, Sailor is turning his focus toward two projects that address the problems urban heat creates for the elderly. As is typical for his work, the projects bring together knowledge from the realms of engineering, climatology, mapping and health sciences.

One of Sailor's current projects investigates the Los Angeles urban heat island by asking 'how can we most effectively make urban areas more livable with limited resources?'

The answer, Sailor argues, is to first focus on the most vulnerable areas, determining what strategies moderate heat the best – with options ranging from green or sun-reflective roofs to street-level plantings.

ASU Professor Emeritus Tony Brazel, whose work on urban heat phenomena is internationally recognized, explains how Sailor's work differs from the norm: "Many climatologists focus on understanding the phenomena of urban heat islands. Sailor's work focuses on improving urban climate through design of buildings and communities."

In the first phase of the Los Angeles project, Sailor and his team will use atmospheric models, demographic data and mapping software to find neighborhoods with the greatest tendency for extreme heat, the poorest air quality, high numbers of aged people and high rates of poverty.

"In these neighborhoods, we'll survey residents and study individual buildings," said Sailor. "We'll look at climate and air quality in buildings both with and without air conditioning, and we'll use models to assess what kinds of mitigations could improve conditions the most."

The second study, set in Houston, has an even closer focus: indoor spaces in assisted-living facilities. Industrial activities, warm temperatures, sunshine and air circulation patterns combine to make high levels of ozone an ongoing challenge in Houston, even indoors where elderly residents spend the majority of their time. Compounding the health risks, assisted-living facilities may have extra-high levels of chemicals in the atmosphere – emitted

by cleaning products, fresh paint and new carpet – that can react with the ozone.

Sailor plans to install sensors within the facilities, interview residents and facility managers, and carry out lab work to fill gaps in knowledge of how ozone interacts with indoor materials and what roles occupant behavior and management practices play in affecting indoor air quality.

Both studies will have an impact beyond Los Angeles and Houston. The methods Sailor develops could be applied to any city – with the Phoenix urban area high on the list.

In the spirit of ASU's interdisciplinary nature, Sailor will work closely with colleagues across the university who focus on sustainability, engineering and public health. In collaboration with these colleagues, Sailor is already working to develop an urban climate initiative, which will leverage ASU's extensive capacity in urban climate science and policy to address pressing research needs in the field.

"David Sailor has produced a solid body of new knowledge about how cities will respond to climate change and a range of policy interventions to reduce urban heat island effects, and has worked to translate this knowledge to the urban design community," said Patricia Gober, interim director of the School of Geographical Sciences and Urban Planning. "We look forward to the linkages he'll create here at ASU."

– Barbara Trapido-Lurie, *School of Geographical Sciences and Urban Planning*

RESEARCH ACROSS ASU

Building Resilience Against Climate Effects

Nalini Chhetri, assistant director, *Consortium for Science, Policy and Outcomes*; Senior Sustainability Scientist, *Julie Ann Wrigley Global Institute of Sustainability*

This initiative aims to recognize and anticipate public health effects of climate change by applying climate science, predicting scientific impacts and preparing flexible, localized programs.

Physics-Based Predictive Modeling for Integrated Agricultural and Urban Applications

Alex Mahalov, Wilhoit Foundation Dean's Distinguished Professor, *School of Mathematical and Statistical Sciences*

A collaborative effort to develop physics-based capabilities to characterize environmental and socio-economic impacts associated with agricultural productivity and to predict future impacts.

Understanding Impacts of Desert Urbanization on Climate and Surrounding Environments

Soe Myint, Senior Sustainability Scientist, *Julie Ann Wrigley Global Institute of Sustainability*; professor, *School of Geographical Sciences and Urban Planning*

The research examines the distribution of urban infrastructure and vegetation in sub-tropical desert cities and the effects on local and regional climate to foster sustainable cities.

Urban Resilience to Extreme Weather-Related Events

Charles Redman, Distinguished Sustainability Scientist, *Julie Ann Wrigley Global Institute of Sustainability*; founding director and professor, *School of Sustainability*

This project will develop new methods and tools to assess infrastructure resiliency, provide ecosystem services, improve social well-being and exploit new technologies to benefit urban populations.

Urban Water Innovation Network

Matei Georgescu, Senior Sustainability Scientist, *Julie Ann Wrigley Global Institute of Sustainability*; assistant professor, *School of Geographical Sciences and Urban Planning*

A consortium of 14 academic institutions and key partners across the nation is addressing the challenges that threaten urban water systems in the U.S. and around the world.

Urbanization and Global Environmental Change

Charles Redman, Distinguished Sustainability Scientist, *Julie Ann Wrigley Global Institute of Sustainability*; founding director and professor, *School of Sustainability*

This project seeks to understand interactions and feedbacks between global environmental change and urbanization at local, regional and global scales through an innovative framework.

ASU'S COMMITMENT TO SUSTAINABILITY AND GLOBAL ENGAGEMENT INCLUDES MULTIPLE USE-INSPIRED RESEARCH PROJECTS EXAMINING THE RELATIONSHIP BETWEEN URBAN ENVIRONMENTS AND THEIR IMPACTS ON OUR WORLD.

Watch out 'superbugs'

ASU IS PLAYING DIRTY WITH A NEW WEAPON: CLAY

There's nothing really 'super' about antibiotic-resistant bacteria, other than their incredible strength. They infect more than two million people and kill 23,000 in the United States every year, according to the Centers for Disease Control and Prevention.

But now, researchers at Arizona State University are fighting dirty. They've discovered a new weapon to use in the battle against deadly 'superbugs' – clay, or Oregon blue clay to be exact.

Keith Morrison, a former graduate student working with ASU research professor Lynda Williams, had suspicions about how blue clay, found in Oregon, killed bacteria, but he didn't have the knowledge or equipment to find the answer alone. Morrison turned to School of Life Sciences professor Rajeev Misra, an expert in microbial genetics, to help uncover the mystery.

"There has been a constant battle between the application of antibiotics and the development of antibiotic-resistant bacteria," said Misra. "We often see that scientists are looking for novel chemicals that bacteria aren't yet resistant to."

With standard treatments rendered ineffective, Misra said it's important to understand chemicals with newly discovered antibacterial properties so they can be turned into life-saving treatments.

"The idea of the study was not simply an observation, but to go significantly deeper into the mechanistic aspects," Misra said. "Because if you want to take this to the next level and try to convince companies to convert this into a product, you have to be confident in how it functions."

Using ASU's Nanoscale Secondary Ion Mass Spectrometer facility, a resource shared with the National Science Foundation that can analyze the molecular makeup of solid materials, Misra and Morrison found the unique composition of Oregon blue clay was the key to explaining its antibacterial properties.

The clay is made of aluminum, ferrous iron and ferric iron, and the researchers theorized that a toxic oxygen reaction caused by the iron results in lethal DNA damage inside the bacteria. What still wasn't clear was the role aluminum played or how the clay overcame the defensive mechanisms that make bacteria resistant to antibiotics in the first place.

The bacteria's defensive mechanism, Misra explained, is called the drug efflux system and its rapid adaptability allows it to protect itself. Using a number of pumps along the cell's exterior, antibiotics are pushed away from the cell before any damage can occur.



ASU's School of Life Sciences professor Rajeev Misra in the NanoSIMS facility. Image by Deanna Dent.

According to Misra, the only way to beat the drug efflux system with normal antibiotics is to overwhelm the pumps. However, this forces doctors to use dangerously high doses of medicine that also damage healthy cells in the body.

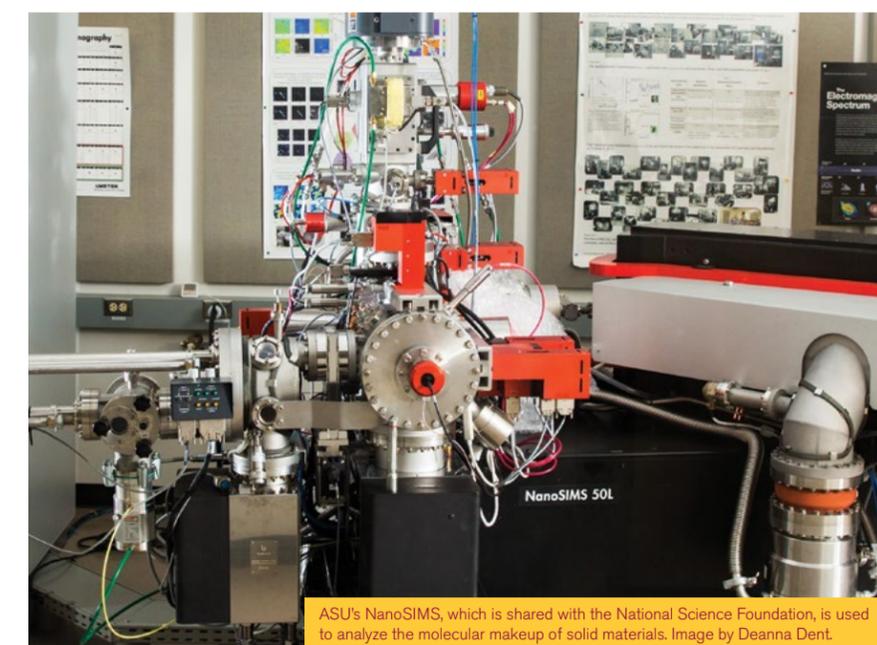
Based on Misra and Morrison's microscopic and macroscopic observations, the clay managed to overcome the efflux system with a slightly different method.

First, the aluminum and ferric iron contained in the clay overwhelm the bacteria's pump system and create oxygen reactions outside the cell that destroy proteins along the exterior. Second, the ferrous iron infiltrates the cell and damages the bacteria's DNA, killing it with a one-two punch strong enough to eliminate antibiotic-resistant bacteria, such as known superbug methicillin-resistant *Staphylococcus aureus*.

Now that this clay's antibacterial process is clearly understood, Misra said scientists can create treatments that are strong enough to kill bacteria without harming the human body. He suggested a medicine derived from the Oregon blue clay would be topical, applied in a manner similar to neomycin – an antibiotic found in many creams such as Neosporin.

Though it would be some time before a new medicine could see public use, the innovative work of Misra, Morrison and Williams has ensured society isn't defenseless in the face of an increasing number of lethal, antibiotic-resistant bacteria.

– Jason Krell, *School of Life Sciences*



ASU's NanoSIMS, which is shared with the National Science Foundation, is used to analyze the molecular makeup of solid materials. Image by Deanna Dent.

WORLDS COLLIDE:

ENVISIONING A HUMANITIES

LAB AT ASU

People wearing lab coats, machines churning out data, liquid bubbling in beakers – these are the typical images of a laboratory. But what does a lab look like for a writer? Or a philosopher?

It's a question the Institute for Humanities Research has been asking for a while.

How can Arizona State University transform our perception of traditional spaces for experimentation and inquiry? The process starts by incorporating the creativity and connectivity of intellectuals who have traditionally been conspicuously absent from labs: humanities scholars and students.

The university created a collaborative team, pulling expertise from specialists across a range of fields – including deans in the arts and humanities, directors of research centers and laboratories, renowned professors and the university librarian – to address these questions with a new vision for experiential spaces – a humanities lab at ASU.

The humanities lab will offer innovative ways for scholars to integrate traditional humanistic inquiry with cutting-edge technology and transdisciplinary collaboration, so they can tackle the “big questions” of human existence –

Why are we here? Where are we from? Where are we going?

In keeping with ASU's tradition for innovation, the humanities lab will be unique among American universities. Similar to a scientific facility, the lab will create research exchange through architecture by offering students and faculty space for performances and experimentation, conferences and collaboration, and digital and traditional collections of source material.

“Transdisciplinary research requires ‘trading zones’ of inquiry – neutral spaces where scholars can participate in a type of intellectual free-play,” said Steven Tepper, dean of the Herberger Institute for Design and the Arts.

The lab will bring together the engines of humanities explorations already in progress at ASU, such as the Institute for Humanities Research, the Nexus Lab for Digital and Computational Humanities, and the Synthesis Center.

It will also house the core humanities collections from Hayden Library, opening the door for pioneering reclassifications of subject matter. University librarian Jim O'Donnell thinks it's “high time” for the lab, pointing out that

“humanists remain leaders in thinking and reinventing the university.”

Within the humanities lab, research teams composed of faculty and students will map out designs and build collaborations around compelling themes using innovative techniques.

By mixing different levels of expertise and methods of inquiry, the team hopes to foster creative research directions for humanities scholarship. And, instead of avoiding traditional humanities sources, they plan to merge their field's rich histories with new technologies like big data and social networking.

“Data and quantitative analysis is an open challenge for all mixed-method research, including the humanities,” explains Michael Simeone, the director of the Institute for Humanities Research Nexus Lab.

By engaging with this challenge, Institute for Humanities Research Director Sally Kitch believes the lab will showcase humanities scholarship for what it really is: “a relevant and vital partner in approaches and solutions to real-world challenges.”

Solving global crises is something that George Justice, dean of humanities in the College of Liberal Arts and Sciences, sees as an area where humanities researchers can play an essential role.

“Almost everyone agrees that we have most of the technology we need to address wicked problems including food and water distribution, environmental sustainability and our energy needs for a growing planet,” Justice said. “The problems are human-based: How do we make our world better for people? The answers are largely human-based, too.”

The team has been invited to submit a proposal for a National Endowment for the Humanities Chairman's Grant in order to fund a meeting in Washington D.C., which will generate a national conversation about humanities labs, using the ASU proposal as a model.

– Susie Anderson, *Institute for Humanities Research*

THE TEAM

Sally Kitch
Director, Institute for Humanities Research

Michael Simeone
Director, Institute for Humanities Research Nexus Lab

George Justice
Dean of humanities, College of Liberal Arts and Sciences

Jim O'Donnell
University librarian

Steven Tepper
Dean, Herberger Institute for Design and the Arts

Xin Wei Sha
Director, Arts, Media and Engineering

Members of ASU's Humanities Research Council

DESIGNING AND BUILDING BIG MISSIONS FOR SPACE

Arizona State University is going into space. Through the design and creation of innovative spacecraft, researchers are exploring Earth's closest neighbors and beyond to some of the most distant galaxies in our universe.

As one of only a handful of higher education institutions capable of building NASA-certified, deep-space hardware, the School of Earth and Space Exploration in the College of Liberal Arts and Sciences has quickly become a leading center for space exploration.

"ASU brings together scientists and engineers to work on radical new concepts together, from the start," said Jekan Thanga, a professor in the school. "This innovative collaboration strategy leads to greater science return, and more creativity and capability."

NASA selected a team at ASU to build a thermal emission spectrometer for the asteroid mission OSIRIS-REx. The spectrometer, referred to as OTES, is the first space instrument constructed entirely at the university. The mission is scheduled for launch this year, which will take it to the asteroid Bennu and collect samples of its rocks and dirt.

Designed by Regents' Professor of geological sciences Philip Christensen, OTES will use infrared light to map Bennu's minerals, helping mission scientists select where to collect rock and dirt samples.

ASU also designs, builds and tests CubeSats, miniature satellites about the size of a shoebox. One CubeSat in progress is the Asteroid Origins Satellite, headed by science principal investigator Erik Asphaug and engineering principal investigator Thanga, both professors in the School of Earth and Space Exploration.

"Within the United States there are only about seven institutions that are doing interplanetary CubeSat missions," Thanga said.

The AOSAT I, as the CubeSat will be known, is being designed and developed at ASU's Space and Terrestrial Robotic Exploration Laboratory and cleanrooms, with a scheduled launch in the fall of 2017. It will be the world's first CubeSat centrifuge laboratory, designed for experiments to help answer fundamental questions about how the solar system formed and to understand how materials behave on the surface of asteroids and comets.

A second CubeSat being built at ASU is the Lunar Polar Hydrogen Mapper, headed by planetary geologist Craig Hardgrove and co-investigator, astronomer and planetary scientist Jim Bell. The LunaH-Map will produce a detailed map of the moon's water deposits, helping NASA understand how much water might be available, which will guide the agency's strategy for sending humans farther into the solar system.

In parallel, the NewSpace initiative, headed by professor Bell, is coordinating efforts to build up ASU's mission control, which will serve as a satellite ground station.

"As small spacecraft launches surge with increased capabilities, commercial space partners will need additional uplink and downlink access and data analysis from academic partners like ASU," said Bell.

With this mission control center, ASU joins an elite club of government institutions, private entities and universities in having complete control of space missions in-house.

This is good news for ASU researchers, NASA and space enthusiasts alike, as the mission control center will be part of the main lobby of ASU's Interdisciplinary Science and Technology Building 4 on the Tempe campus, with open viewing for the public and tours.

— Karin Valentine, *School of Earth and Space Exploration*



Instrument scientist Philip Christensen, left, opto-mechanical engineer Bill O'Donnell, rear, and project engineer Greg Mehall. On the bench is OTES, the first space instrument entirely built on ASU's Tempe campus. Image by Charlie Leight/ASU Now.



FROM WORMS TO CANCER CURES

ASU STUDENTS AND FACULTY ARE STRIVING TO ERADICATE CANCER

The path from roundworm genes to curing cancer isn't an easy one.

But a handful of students and faculty at Arizona State University are joining forces to increase our understanding of how small biological changes in genes can influence the development, diagnosis and treatment of cancer.

Two faculty laboratories within ASU's Virginia G. Piper Center for Personalized Diagnostics – and the students who work there – are fusing fundamental science with clinical research to create more effective diagnostic and treatment options for multiple types of cancer.

“Neither of our labs could do this on our own,” said Dr. Karen Anderson, medical oncologist at Mayo Clinic Arizona and associate professor in the Biodesign Institute and School of Life Sciences. “We have the potential of thinking about the problem in a different way, and I think that's really important.”

The collaborative effort and shift in thinking allow students like Justin Wolter, who's pursuing a Doctor of Philosophy in molecular and cellular biology, to identify how biological mechanisms play a role in cancer development and progression.

Bianca Varda, an undergraduate in Anderson's Lab, has been utilizing Wolter's expertise in molecular biology to develop new ways to activate the immune system to fight a specific strain of HPV before it leads to oropharyngeal cancer, which affects tissues in the throat such as the tongue and tonsils.

Their research, along with other lab initiatives, is part of finding innovative cures for diseases from some of the most unexpected places.

“Maintaining a balance between basic and translational research is really important to allow for fundamental discoveries that can be applied to human health,” said Wolter.

WORM TO HUMAN GENES

Wolter is on a team of researchers in assistant professor Marco Mangone's lab who have been conducting experiments – using the roundworm as a model organism – to explore what key roles genes play in producing a variety of complex life forms, from fruit flies, to mice, to humans. The newfound understanding

of this tiny worm's genetics can then be translated to human cell lines when trying to determine how genes are broken in diseases.

“Cancer is an incredible model because essentially it's just cells growing and dividing,” said Wolter. “The exact opposite of what they should be doing.”

Under the mentorship of Mangone, Wolter's research has focused on two genes, known as microRNAs, that are relevant to breast cancer prognosis and progression. One gene limits tumor formation by slowing cell division and growth. The other gene triggers the transition from a benign tumor to the more aggressive metastatic form by allowing cells to break free and colonize at a new site in the body.

“What's really interesting about these two genes is they're tiny,” said Wolter. “How they regulate a large number of genes and give you such different behaviors, different phenotypes and different contributions to the disease is really unknown.”

Using evidence from the genomes of different animals, Wolter's research aims to show how single mutations in these genes throughout the course of evolution can have an effect on human disease.

“There's a lot of interest to study disease-relevant genes,” said Wolter. “So that's a big motivational factor for me and our lab to try to look at ways we can modulate these genes or change when and where they're expressed to combat some of the more severe forms of cancer.”

TRANSLATING BASIC RESEARCH INTO CURES

Anderson, who also serves as a faculty member on Wolter's graduate committee, utilizes these types of findings from basic research to develop cancer detection and treatment options through immunology.

Researchers in Anderson's lab have been studying how our immune systems can detect cancers based on small changes in our cells. Differences in proteins and other changes create biomarkers for different cancer types, which serve as another method for early disease detection.

“The real question right now is how early can we find these cancers,” said Anderson.

By measuring biomarkers in the blood specific to breast cancer, researchers in her lab have been working to develop a blood test that can be used with mammograms to find cancer earlier.

"We have a number of blood test-based biomarkers that are currently under investigation to determine how useful they might be clinically," said Anderson.

Anderson's team has also been examining how to change and activate the immune system to fight off cancer – a project undergraduate Bianca Varda has been working on solving for HPV-related cancers. ▼

Varda's work centers on activating the immune system by finding specific cellular protein, or peptide, sequences that trigger antigens, a molecule responsible for creating an immune response. Specifically, she's looking to activate T cells, a type of white blood cell that assists in an active immune response.

"Right now we're working on identifying specific peptide sequences that correspond to the HPV 16 antigens," said Varda. "So we can stimulate T cells ... and essentially use the immune system to fight off the cancer."

Varda hopes her research will lead to the development of treatments for the millions of people infected with HPV, preventing the progression of HPV 16-related cancers.

"Every single person we've sponsored with our scholarship has done a superb job with research, and Justin is continuing that terrific tradition," said ASU alumnus John Maher. "He's willing to work hard and get it done."

NEXT STEPS

While the discovery of a simple cure for cancer is still underway, the research is already having a positive impact on Wolter and Varda.

After completing his PhD, Wolter said he wants to stay in academia and run a lab at a university to continue his research in gene regulation and developmental biology.

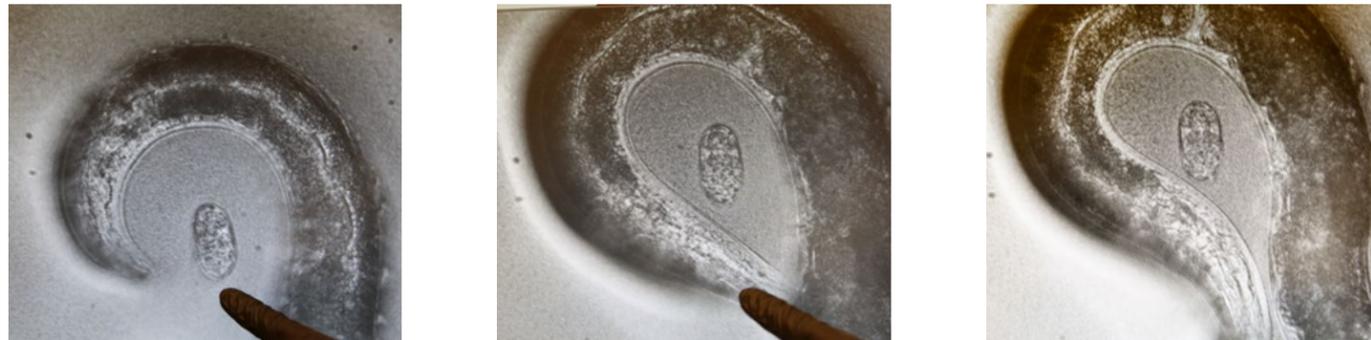
Similarly, Varda wants to continue her research as a physician and is applying to medical school this spring.

"I definitely plan to use and apply [my research] hopefully in the medical world," said Varda. "I think it's really important to understand the science behind the medicine you're practicing."

The unyielding motivation and scientific curiosity of students in the lab are part of what makes the work worth it, said Anderson.

"I like being able to educate the next generation of scientists," she said. "They will solve this, I believe."

– Amanda Stoneman, *College of Liberal Arts and Sciences*



Varda, a biological sciences major in the School of Life Sciences and Barrett, the Honors College, has been studying how the immune system interacts with HPV 16 – one of a dozen types of high-risk HPVs that cause nearly five percent of all cancers worldwide. She's been engineering a system that will help measure and initiate an immune response to detect head, neck and cervical cancer.

HPV 16, along with HPV 18, is responsible for most HPV-caused cancers, including cervical, throat and anal cancers. In the U.S., more than 50 percent of cancer diagnoses in oropharynx (the middle part of the throat) are linked to HPV 16, while HPV 16 and 18 cause nearly 70 percent of all cervical cancer cases.

"I got lucky to find a lab that's doing something really interesting," said Varda. "[But] without scholarships I wouldn't be in the lab as much or at all."

FUNDING STUDENT RESEARCH EXPERIENCES

Student research has been a long-time priority for two different families who have seen the devastating effects of cancer.

Dawn Carson Senger and Erston Senger, donors for Varda's scholarship, established the Carson Senger New American University Scholarship to support a student with an interest in medical, biomedical or cancer research.

"We need good researchers," said Carson Senger. "They're the future of our world."

John and Rose Maher, donors for Wolter's scholarship, created the Maher Alumni Scholarship to support a graduate student pursuing cancer research while at ASU.

Affected by the loss of a friend and family member to the disease, John Maher said this was their answer to finding a cure for cancer and defeating it.

"WE NEED GOOD RESEARCHERS. THEY'RE THE FUTURE OF OUR WORLD," SAID DAWN CARSON SENGER



Graduate student Justin Wolter in assistant professor Marco Mangone's lab within ASU's Virginia G. Piper Center for Personalized Diagnostics. Image by Esly Diaz.

A TRANSBORDER INNOVATOR UNCOVERS THE HEALTH EFFECTS OF 'LIVING WITHOUT PAPERS'



Assistant professor Airin Martinez, right, works with a student on immigration studies and the public health of Latino communities. Image by Robin Kiyutelluk.

When the Supreme Court met in April to hear arguments on President Barack Obama's immigration reform policy, the Deferred Action for Parents of Americans and Lawful Permanent Residents, the session was out of the ordinary.

United States v. Texas could grant around five million immigrants lawful presence in the U.S. – an area of heated debate for those on both sides of the immigration issue, especially during an election year. The court adjusted its typical session, from 60 to 90 minutes, for arguments from the 26 states suing the federal government, plus additional time for a representative from the U.S. House and a lawyer on behalf of immigrant mothers who could benefit from the policy.

The change in standard procedure reflected the gravity of the situation.

Life as an immigrant without authorization to reside in the U.S. is filled with ongoing distress from the threat of deportation, especially in Arizona which has the strictest immigration enforcement policies. Innovative research from a professor at Arizona State University shows how this type of chronic stress is impacting the health of not only immigrant parents, but also their citizen children in detrimental ways.

"If I produce evidence to demonstrate that it's better if parents have some form of legality ... it may actually improve the health outcomes of children who are U.S. citizens," said Airin

Martinez, assistant professor in the School of Transborder Studies.

Over the last decade, medical sociologist Martinez has been conducting research on the complex relationship between immigration and public health for Latino communities in multiple U.S. cities.

"Martinez's research is at the cutting edge of her field," said Alejandro Lugo, professor and director of the School of Transborder Studies.

While the topic is of increasing interest to social scientists, most studies have utilized qualitative approaches or survey methods to discern immigrants' subjective experience of living without authorization. Much of this research reports that they feel immigrant enforcement policies are affecting their overall health due to stress and fear, Martinez said.

While meeting with congressional aides and policy makers, Martinez was told "we need more objective measures," she said. "Biological data is needed to support this argument."

In collaboration with Douglas Granger, director of the Institute for Interdisciplinary Salivary Bioscience Research, Martinez completed a pilot study with 30 families in Phoenix last year. She examined several biomarkers, including salivary uric acid and C-reactive protein.

Salivary uric acid is a promising biomarker for detecting high blood pressure, metabolic syndrome and oxidative stress. Oxidative stress, the burden placed on our bodies by the production of too many free radicals, can lead to the development of cancer, cardiovascular disease, age-related neurodegenerative diseases and other conditions. C-reactive protein is a better predictor of future heart disease, according to the American Heart Association.

"I wanted to add an extra layer of evidence," said Martinez. "So I'm trying to make a connection between chronic psychosocial stress that's related to being an undocumented immigrant, and how that's actually shaping the potential to develop chronic disease."

Martinez used multiple methods of analysis to determine how everyday stressors from local and national immigration enforcement policies shape negative health outcomes for Mexican children (including those born in the U.S. to immigrant parents) and their families.

Her research examined the relationship between physical biomarkers and chronic stressors, such as chronic economic stress and caregiving stress, to establish a relationship between mental and physical health.

"Just because the child isn't undocumented, doesn't mean that one of their parents' undocumented status doesn't have some sort of effect on their everyday living and health," she said.

Among families, Martinez found a relationship between increased deportation fears and chronic economic stress. The fear of deportation also has physical ramifications including lower body mass index and levels of salivary uric acid. Low levels of salivary uric acid, a natural antioxidant that reduces physiological stress and helps prevent oxidative stress, can negatively impact long-term health.

She has submitted three articles on her research for publication in *Developmental Psychobiology*, the *Journal of Immigrant and Minority Health*, and the *American Journal of Public Health*.

"Hopefully the research will have an impact in terms of providing evidence to policy makers that immigration enforcement policies need to be transformed," said Martinez. "Parents wouldn't have these structural barriers keeping them from engaging in health practices and living a less stressful life."

– Amanda Stoneman, *College of Liberal Arts and Sciences* in collaboration with Alejandro Lugo, *School of Transborder Studies*

“
I WANTED TO ADD
AN EXTRA LAYER
OF EVIDENCE,” SAID
MARTINEZ

ASU ANTHROPOLOGIST TAPS REALITY OF ‘BLACK MARKET’ WATER



“
WATER VENDORS
ARE OFTEN PAINTED
AS THE VILLAINS IN
THE URBAN POOR’S
STRUGGLE TO
GET WATER,” SAID
WUTICH

(Pictured above)

What happens when fresh water isn't available?

In areas of the world with no piped water, informal vendors who operate with no oversight take advantage of people's need for water on the “black market.”

This type of water is often priced high with dangerously poor quality, which creates unjust and unsafe outcomes for some clients. But since “black market” water is crucial to the survival of many in these areas, the troubling system is likely to remain for the foreseeable future.

However, there are practical ways of making the system better for both clients and vendors, according to Arizona State University anthropologist Amber Wutich, a pioneer in the study of water insecurity and the personal distress and burden it creates.

Her most recent research indicates that when informal vendors establish their own unions, they adopt rules to self-regulate and provide improved water pricing, quality and delivery.

“Water vendors are often painted as the villains in the urban poor's struggle to get water,” said Wutich, director of the Center for Global Health and associate professor in the School

of Human Evolution and Social Change at ASU. “Our work suggests that they can be allies, and points to ways that these informal water markets can become more reliable and just for the people who depend on them for survival.”

Along with anthropology doctoral student Melissa Beresford and Cinthia Carvajal of Geneva's Graduate Institute of International and Development Studies, Wutich studied how water markets in Bolivia operate; how cooperation among water vendors helps or hinders fair water delivery; and the differences in how vendors and clients view fairness as applied to rules, quality, quantity, costs, distribution and service related to the water market.

The research – appearing in *World Development*, the top international development journal – involved long-term participant observation in squatter settlements and interviews with 12 water vendors and 41 clients in Cochabamba, Bolivia, the scene of a noted “water war” in 2000.

That event, a protest turned deadly, brought to light the plight of many to secure life-giving water and also sparked a conversation about water as a commodity versus a human right.

Wutich's team found that vendors and clients share a desire to see everyone, even the poor, achieve a “human right to water.” However, vendors tend to focus on issues like ensuring fair pricing, while their customers are more concerned with problems such as unreliable delivery and discriminatory treatment.

Among the researchers' recommendations is a greater role for water unions and increased community oversight over – and engagement with – these unions, such as community meetings and advisory boards. They also state, while regulatory oversight is being bumped up to address the safety of water, more is needed to curb injustices in water delivery.

In addition, more research needs to be conducted in these areas such as understanding how vendors can be more closely affiliated with poor communities to increase their commitment to social justice.

The bottom line, stressed Wutich, is positive. “Our research shows that there are ways to ensure people have safe and affordable water service, even when they are not able to connect to a piped water grid.”

– Rebecca Howe, *School of Human Evolution and Social Change*



TWO ACADEMIC PROGRAMS AT ASU INSPIRE THE NEXT GENERATION OF MATHEMATICIANS AND SCIENTISTS

So much can happen in the span of three decades. For two academic programs within the Simon A. Levin Mathematical, Computational and Modeling Sciences Center, it's enough time to push the limits of academic excellence from high school to the postdoctoral level.

That time frame was long enough for faculty and researchers to prepare 2,653 high school students, mentor more than 400 undergraduate students and encourage 174 underrepresented minorities to pursue degrees in science, technology, engineering and mathematics fields.

The Joaquin Bustoz Math-Science Honors Program and the Mathematical and Theoretical Biology Institute at Arizona State University celebrated their history of mentoring in 2015.

Their milestone anniversaries showcased a steadfast commitment to inspiring the next generation of mathematicians and scientists, with a focus on underrepresented minorities.

Beginning its tenure in 1985, the Math-Science Honors Program was created to provide motivated students an opportunity to begin university mathematics and science studies before graduating high school, enhancing their prospects for future academic success.

Over the last 30 years, the program has enrolled more than 2,500 first-generation, college-bound students who are underrepresented in the STEM fields. The participants represent diverse backgrounds—49 percent Hispanic, 16 percent Native American and 8 percent African-American—from high schools throughout the state of Arizona, including rural communities and the Navajo Nation.

Students live on ASU's Tempe campus for a six- or eight-week residential summer program. They take a university-level mathematics course for college credit, while working in groups to conduct applied mathematics research involving real-life mathematics problems.

HAYDEN LIBRARY

Thirty-five percent of the students attend the program for multiple summers, earning as many as 11 university credits before enrolling at a university as first-time freshmen.

Currently, 70 percent of ASU-enrolled students who attended this program major in a STEM field. In addition, program participants consistently earn higher grade point averages than their peers.

Program alumni have earned 1,178 degrees from ASU, and they have gone on to careers at companies including Boeing and Procter & Gamble, government organizations including NASA and the National Institutes of Health, and academic institutions.

Another program celebrating a milestone anniversary is the Mathematical and Theoretical Biology Institute, a summer research experience for undergraduates that encourages underrepresented minorities to pursue graduate degrees in applied mathematics.

As part of the institute's eight-week program, undergraduates participate in lectures and computer labs, preparing them to develop their own graduate-level research project.

"We let the students be the experts," said Regents' Professor Carlos Castillo-Chavez, the founder and executive director of the institute. "They decide what questions are interesting, what they think are the really important questions in society that they want to embrace with mathematics."

This student-led research is then presented by students at national conferences, where participants of the program have been recognized for outstanding research every year since 1998.

Two decades of the institute's mentoring excellence is due in large part to undergraduate participants returning to the program to continue and advance their academic training. Karen Rios-Soto first joined the institute as an undergraduate in 2000, but returned numerous times as a graduate mentor and, eventually, as an esteemed member of the faculty.

"The program has provided me with the training to be a successful undergraduate and graduate mentor, not only in research but in all aspects of the academic life," she said.

Similar programs across the nation have replicated this model because it has been so successful. The program received White House recognition in 2011, and was honored with a Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring. These awards are given to organizations with years of proven excellence in mentoring students and early career scientists in the STEM fields.

— Preston Swan and Sherry Woodley, *Simon A. Levin Mathematical, Computational and Modeling Sciences Center*

OUR RESEARCH IMPACT

ARIZONA

Pathways to Preparing Future Mathematics Faculty to Transform Undergraduate Mathematics Teaching and Learning

Marilyn Carlson and Pat Thompson
School of Mathematical and Statistical Sciences

The researchers are developing a sequence of courses and activities to support doctoral students in transforming the teaching and learning of pre-calculus and calculus.

Urban Adaptation to Mega-Drought: Anticipatory Water Science, Policy and Planning for the Urban Southwest

Patricia Gober
School of Geographical Sciences and Urban Planning

Professor Gober's team simulates the effects of mega-drought on water supply and demand in central Arizona, pointing toward policies that will reduce the risk of shortage.

Arizona Twin Project

Kathy Lemery and Leah Doane
Department of Psychology

The researchers examine the social and genetic influences on children's sleep, health and academics using innovative methods like saliva, accelerometers and spirometers in Arizona twins.

Humanities Film Series

Peter Lehman
Center for Film, Media and Popular Culture
Department of English

Professor Lehman and Ellie Hutchison of Arizona Humanities are developing a collaborative film discussion series throughout Metro Phoenix and Arizona.

Early Childhood Development in the Gila River Indian Community

Elizabeth Swadener
School of Social Transformation

The researchers interview children to learn their views on children's rights in relation to education initiatives.

From L2 Reading Input to Oral Output

Jianling Liao
School of International Letters and Cultures

Assistant professor Liao focuses on the acquisition of second language speech at the advanced and superior levels – the same goals for the National Chinese Language Flagship Program.

Developing the Civic Participation of Marginalized Youth Through a Literature-Infused Youth Participatory Action Research Program

E. Sybil Durand, Melanie Bertrand and Taucia Gonzalez
Department of English
Mary Lou Fulton Teachers College
College of Education at the University of Wisconsin-Madison

A project utilizing multicultural literature to civically engage underrepresented youth: low-income students, immigrant youth, students with special education designations, students of color and English language learners.

African-American Cardiovascular Disease Health Literacy Demonstration Project

Olga Idriss Davis
Hugh Downs School of Human Communication

A health literacy project to address cardiovascular disease in the black barbershop that promotes the training of barbers and implements blood pressure screening for African-American males.

Stepping Forward: Walking Between Art and Thought

Angela Ellsworth, Ron Broglio and Heather Lineberry
Department of English
Institute for Humanities Research
School of Art
School of Human Evolution and Social Change

A project on the art, science, philosophy, health, ecology, activism and sustainability of walking – consisting of the Museum of Walking and the Project Walk series.

Ask Dr. Discovery

Judd Bowman, Cassie Bowman and Brian Nelson

School of Earth and Space Exploration

Mary Lou Fulton Teachers College

School of Computing, Informatics and Decision Systems Engineering

A mobile app for local science museums, offering the latest research in earth and space science for visitors and analytic tools with evaluation data for staff.

The CAP LTER-Conservation Alliance Community Wildflower Survey

Sharon Hall
School of Life Sciences

Associate professor Hall's long-term research based in the greater Phoenix area monitors how the city's pollution, temperature and other factors affect wildflowers of the Sonoran Desert preserves.

Materializing the Invisible

Kostalena Michelaki and Richard Toon
School of Human Evolution and Social Change

An app, pop-up exhibits and classroom components will link the Tempe campus' present with the ancient Hohokam and Mexican communities it's built upon.

Connected Academics: Preparing Doctoral Students of Language and Literature for a Variety of Careers

George Justice, Eric Wertheimer, Pamela Garrett, Mark Lussier and Robert Joe Cutter
Department of English
School of International Letters and Cultures

The team is reshaping the future of doctoral students in humanities by opening doors to a wider range of careers, professional opportunities and earning potential.

Language Out of Place: Transgressive Semiotics and the Lived Experience of Race in Borderlands Education

Brendan O'Connor
School of Transborder Studies

Analysis of linguistic data from a high school in southern Arizona shows students form self-identity opinions based on speech differences, including errors and out-of-place utterances.

OUR RESEARCH IMPACT

NATIONAL | INTERNATIONAL

Investigating the Impacts of Institutional and Contextual Factors on Protection Order Decision-Making

Alesha Durfee
School of Social Transformation

Associate professor Durfee's team gathers research on domestic violence civil protection orders to develop more effective victim outreach and service programs.

PolarGlobe: Powering up Polar Cyberinfrastructure Using M-Cube Visualization for Polar Climate Studies

Wenwen Li
School of Geographical Sciences and Urban Planning

The researchers are developing interactive tools to visualize climate data for polar regions, which will facilitate governance of these regions in the face of environmental change.

Carlos Montezuma's Wassaja Newsletter: Digitization, Access and Context

David Martinez, Joyce Martin and Jodi Reeves Flores
ASU Libraries
American Indian Studies
Center for Digital Antiquity
Institute for Humanities Research

The team digitized Montezuma's Wassaja to produce an online database and exhibition, documenting the American Indian rights leader's intellectual history and career.

The Shrimp Ladies: Engendering Space and Place in Mazatlán, México

María Cruz-Torres
School of Transborder Studies

An ethnographic project documenting land struggles and the role of women in local politics, grassroots social movements and as workers in shrimp processing plants.

James Webb Space Telescope

Rogier Windhorst, Seth Cohen and Rolf Jansen
School of Earth and Space Exploration

The team is building the James Webb Space Telescope, which will study the evolution of galaxies and investigate the epoch when stars began to shine.

North American Observatory of the Humanities

Sally Kitch
Institute for Humanities Research

Working with observatories around the world, researchers illustrate how the humanities evolve to meet the modern challenges contributing to environmental issues in civil and academic life.

D3 Receptor Compounds for the Treatment of Psychostimulant Abuse

Janet Neisewander
School of Life Sciences

The researchers study how the brain interacts with new compounds to develop treatment strategies for cocaine dependence and behaviors associated with stimulant drug abuse.

Sustainable Large-Scale Deployment of Perennial Biomass Energy Crops

Matei Georgescu
School of Geographical Sciences and Urban Planning

A project that models physical, agricultural and economic factors to identify locations within the U.S. where perennial biomass energy crops can be cultivated sustainably.

ADHD Project

Federico Sanabria
Department of Psychology

Associate professor Sanabria works with individuals with ADHD in Mexico to identify the ways stimulants reduce impulsivity so that more targeted treatments may be developed.

Computation Neuroscience Modeling

Sharon Crook
School of Mathematical and Statistical Sciences
School of Life Sciences

Associate professor Crook's computational neuroscience group uses mathematical modeling of treatment strategies to understand the effect of trauma on the nervous system.

The Mediterranean Landscape Dynamics Project

Michael Barton
School of Human Evolution and Social Change

A project studying human interaction with the land in the Mediterranean region to understand how human and natural forces transform landscapes over long periods of time.

International Visiting Scholar Program

Center for Film, Media and Popular Culture

The center develops relationships with visiting international research scholars from China, Brazil, Norway and Korea.

Globalizing Research and Teaching of American Literature: A University Partnership Between ASU and Kinnaird College (Lahore, Pakistan)

Claudia Sadowski-Smith, Yasmin Saikia and Neal Lester
Department of English
School of Historical, Philosophical and Religious Studies

The three-year partnership with Kinnaird College in Pakistan will create an academic, research and knowledge exchange helping empower Pakistani women in academia and society.

The Digital Archaeological Record

Keith Kintigh and Francis Pierce-McManamon
School of Human Evolution and Social Change

A project preserving and making available the digital products of global archaeological investigations so they can be used for synthetic and comparative social science research.

Oman Drilling Project

Everett Shock
School of Earth and Space Exploration

Drilling through rock samples from the Sultanate of Oman, our researchers seek to understand what happens when oceanic crust is born and modified by earth processes.

The Ngogo Chimpanzee Project in Kibale National Park

Kevin Langergraber
School of Human Evolution and Social Change

With less than 300,000 chimps in the wild, assistant professor Langergraber has been studying the Ngogo community of chimpanzees to learn how to conserve endangered animal populations.



THE NEXT GENERATION OF INNOVATORS

Meet some of our remarkable graduates, selected by their academic units, who exemplify our college's commitment to achievement in leadership, academic success and innovation.



Jason Borchert
School of Life Sciences

From the start of his six-year biology doctoral program, Borchert has been committed to community outreach through the School of Life Sciences Graduate Partners in Science Education program – where graduate students teach science to dozens of local middle school students. While biology is the main focus, co-director Borchert included graduate students from other STEM fields to widen the curriculum and spark interest in more topics. After graduation, he hopes to teach at a small college.



Aditya Dhumuntarao
Department of Physics
School of Mathematical and
Statistical Sciences

Barrett, the Honors College student Dhumuntarao will graduate with concurrent Bachelor of Science degrees in physics and mathematics. He has participated in multiple research endeavors from applied mathematics to theoretical physics. Currently, he's studying quantum gravity. Outside of academics, Dhumuntarao enjoys preparing for national conferences and being involved in community outreach as president of the Society of Physics Students and Sigma Pi Sigma at ASU.



Carl Fields
Department of Physics
School of Earth and
Space Exploration

As a dual major pursuing bachelor's degrees in physics and astrophysics, Fields plans to pursue a doctorate degree after graduation. He's currently a research assistant with the Joint Institute for Nuclear Astrophysics, Center for Evolution of the Elements. His research interests include compact objects, supernovae and stellar physics. Among his recent accolades, Fields was named a Carl A. Rouse Fellow by the National Society of Black Physicists and awarded fellowships from the Ford Foundation and the National Science Foundation.



Caroline Fish
School of Politics and Global
Studies | School of International
Letters and Cultures | School
of Historical, Philosophical and
Religious Studies

As a triple major pursuing bachelor's degrees in political science, Spanish literature and European history, Fish will graduate in the spring of 2016. She's an honors student in Barrett, the Honors College with a certificate in international studies. She's been a teacher's assistant, a member of Phi Beta Kappa Honors Society and has studied abroad in Salamanca, Spain. After graduation, Fish will continue her studies in graduate school, pursuing a master's and doctorate degree in history.



Jessica Fletcher
Department of English
Department of Psychology

Honors student Fletcher will graduate with dual bachelor's degrees in English (creative writing) and psychology, plus a minor in family studies. As a true artist-citizen, Fletcher has been engaged in many community projects. She has been president of the Prison Education Awareness Club, served as a teacher's assistant for PSY 101 at Arizona's Florence State Prison and mentored writers who are inmates at the Penitentiary of New Mexico. She's applying to graduate programs in counseling and psychology.



Maraen Foley
Department of Psychology
T. Denny Sanford School of Family
and Human Dynamics

In May 2016, Foley will graduate with two Bachelor of Science degrees in psychology and family and human development. She's been a research assistant for the Peers Everyday Emotions and Relationships at School project and vice president of Psi Chi, an international honors society for psychology. Foley also participated in a cross-cultural psychology study abroad program in Alicante, Spain. She wants to pursue a doctorate degree in clinical psychology and conduct research in child psychopathology.



Jose "Pete" Galvan
School of Human Evolution
and Social Change

Galvan has racked up an impressive amount of legislative experience as an undergraduate pursuing a Bachelor of Arts degree in global health. He's interned at the Arizona Department of Administration, the Arizona State Senate and the Centers for Disease Control and Prevention. He's also worked with the city of Phoenix's FitPHX program and traveled to Washington D.C. several times to lobby for health issues. Currently, Galvan is interning at Molera Alvarez, a government relations firm based in Phoenix.



Ashley Knutson
Hugh Downs School of Human
Communication

As a communication major, Knutson has become very passionate about studying interpersonal relationships and conflict management. During her time at the university, she has taught two first-year success courses for the College of Liberal Arts and Sciences, served as the director of social sciences for the college's council and worked in the residence halls for three years as a community mentor. Upon graduation in May, Knutson will pursue a Master of Education degree in school counseling.



Cinthia Manjarrez
School of Transborder Studies
School of Social Transformation

Manjarrez will graduate with dual bachelor's degrees in justice studies and transborder Chicana/o and Latina/o studies, plus two certificates in LGBT studies and women and gender studies. She's passionate about helping her community and has worked for multiple organizations on and off campus, including the National Movimiento Estudiantil Chicano de Aztlán, the university's chapter of MEChA and Gina's Team. Currently, she's the facilitator of the Womyn's Coalition and part of the Leadership Scholarship Program.



Adenike Opejin
School of Geographical Sciences
and Urban Planning

Opejin enrolled in Arizona State University's Master of Urban and Environmental Planning program to address the challenge of managing waste in Lagos, Nigeria – her home country with rapidly filling landfills from a massive population. She took advantage of ASU's partnership with the city of Phoenix and the Sustainability School at Lagos to spend the summer abroad characterizing the components of the city's organic waste. Opejin is using the data to create pragmatic solutions for the government.



Scott Prada
School of Historical, Philosophical
and Religious Studies

Prada will graduate in May with a Bachelor of Arts degree in religious studies. A fluent speaker in Russian, Spanish and French, Prada's research focuses on comparative theology, mysticism and modern society. Following graduation, he will pursue a Master of Arts degree in religious studies focusing on Taoist mysticism in modern society.



Cory Stockman
School of Politics and
Global Studies

Stockman credits his eight years of service in the Marine Corps for giving him a sense of direction in his education and career path. After spending five years stationed abroad conducting diplomatic security for U.S. Embassies, he chose to pursue a Bachelor of Arts degree in global studies. Stockman recently accepted an internship with the U.S. Embassy in Vienna, Austria working for the Political/Economical Office. He's eager to gain experience in the world of American diplomacy.



Sarah Moser
School of Social Transformation
T. Denny Sanford School of Social
and Family Dynamics

As a concurrent major pursuing Bachelor of Science degrees in justice studies and sociology, Moser aspires to work for the federal government following the completion of her undergraduate education in May 2016. She will continue work based on her thesis project involving women service providers on a local and national level with an emphasis on the underrepresentation of female firefighters while pursuing her master's degree in justice studies. Moser plans to use the grant funds from her Bidstrup Undergraduate Fellowship to advance her research project.



Cameron Mundo
American Indian Studies

Mundo will graduate with a Bachelor of Science in American Indian studies. He is a member of the Golden Key International Honour Society and the Jicarilla Apache Tribal Historic Preservation Office. He was a recipient of the Norman Tecube scholarship from the Jicarilla Higher Education program. Mundo also participated in the Edson Student Entrepreneur Initiative. Following graduation he plans to pursue a master's degree in geographic information systems.



Daniel Ober-Reynolds
Department of Economics
School of Mathematical and
Statistical Sciences | School
of Historical, Philosophical
and Religious Studies

Beyond supporting himself with multiple part-time jobs, Ober-Reynolds triple majored in economics, mathematics and philosophy. He served as a tutor to fellow students as well as a research assistant to professor Michael Hanemann in the Center for Environmental Economics where he studied the effect of spatial scale measurement on econometric models.



Kenton Woods
T. Denny Sanford School of Social
and Family Dynamics | Department
of Psychology

A double major in family and human development and psychology, Woods has been involved in multiple research projects. Currently, he is a co-manager for the Macro Coding Lab as part of the Las Madres Nuevas research project. Woods has also worked as a research assistant for the ASPIRE project where he was able to visit several high schools and collect survey information. Additionally, he's worked as a senior community mentor in San Pablo Residence Hall.



Krystal Yeager
School of Mathematical and
Statistical Sciences

As the first graduate of the new Bachelor of Science degree in mathematics with a concentration in secondary education at ASU, Yeager will play an instrumental role in lessening the shortages of teachers in school districts across the country, particularly in math. She's currently teaching her own classroom at Chaparral High School in Scottsdale while completing her undergraduate degree. Upon graduation, Yeager will be certified to teach high school mathematics in the state of Arizona.



Sahba Zaare
School of Molecular Sciences

Barrett, the Honors College student Zaare will graduate with a Bachelor of Science in biochemistry. His honors thesis aimed at developing gas chromatography-mass spectrometry to detect the significance of glycosylation products in the blood plasma of breast cancer patients compared to healthy individuals. His first publication has been accepted by the Journal of Visualized Experiments. In addition, Zaare was the recipient of the Hypercube Award and the Merck Index Award. Following graduation, he plans to pursue a graduate degree while working in oncology research.

WHEN GIVING IS ALL WE HAVE

ALBERTO RIOS

*One river gives
Its journey to the next*

We give because someone gave to us.
We give because nobody gave to us.

We give because giving has changed us.
We give because giving could have changed us.

We have been better for it,
We have been wounded by it—

Giving has many faces: It is loud and quiet,
Big, though small, diamond in wood-nails.

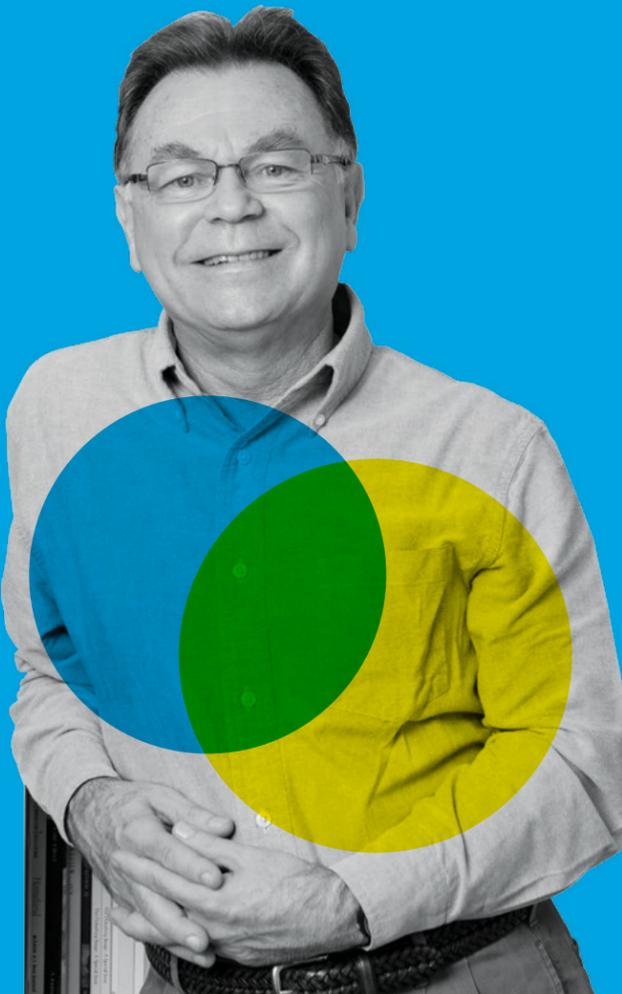
Its story is old, the plot worn and the pages too,
But we read this book, anyway, over and again:

Giving is, first and every time, hand to hand,
Mine to yours, yours to mine.

You gave me blue and I gave you yellow.
Together we are simple green. You gave me

What you did not have, and I gave you
What I had to give—together, we made

Something greater from the difference.



Alberto Álvaro Rios holds the Katharine C. Turner endowed chair in the Department of English in the College of Liberal Arts and Sciences. The resources from the endowed chair enable Rios to pursue his literary creativity and impact students across Arizona State University. Not only has his poetry and fiction received honors – including two National Book Award nominations, a Walt Whitman Award and a Guggenheim Foundation Fellowship – he was also named the inaugural poet laureate for the state of Arizona. Rios co-founded the Creative Writing Master of Fine Arts degree, shaping the next generation of writers.

Listen to Alberto Rios read the above poem online at asufoundation.org/impact

Learn more about giving at clas.asu.edu/impact



CELEBRATING THE PHILANTHROPY OF SCHOLARSHIPS

For more than a decade, the College of Liberal Arts and Sciences Hearts and Scholars event has brought together donors and student recipients to celebrate the philanthropy of scholarships. Outstanding students from a variety of fields receive thousands of dollars in financial assistance every year with the help of Arizona State University alumni and donors, many of whom received assistance themselves during their undergraduate and graduate careers. The Hearts and Scholars dinner is a chance for students to meet the donors who have personally impacted their educational success and share their unique achievements.

THE IMPACT ON OUR STUDENTS

“

IT BRINGS YOU ALMOST
TO TEARS TO THINK
THIS IS ACTUALLY
ACHIEVABLE, INSTEAD
OF THINKING, 'LET ME
GET THROUGH THESE
WALLS FIRST.'”

Jose Plascencia

Computational mathematics
and biomedical informatics
undergraduate
First-Generation Scholarship

“

I COULDN'T FIND
ANOTHER SCHOOL THAT
WOULD SUIT ME LIKE
ASU DID. I COULDN'T BE
HERE WITHOUT THIS
SCHOLARSHIP.”

Lauren Gold

Communications undergraduate
House of Broadcasting Inc.
Endowed Scholarship

“

I'M A FIRM BELIEVER
IN THE IDEA THAT 'THE
MORE YOU KNOW, THE
MORE YOU OWE.' IT'S
SOMETHING AS I MOVE
ON IN MY CAREER THAT
I WOULD WANT TO
EMULATE.”

Jose Flores

Spanish PhD candidate
Quino E. Martinez Scholarship

– Sarah Edwards, *College of Liberal Arts and Sciences*



Watch our student scholarship recipients share their stories at clas.asu.edu/hearts

20,000+ students

17:1 student to faculty ratio

1 academic home

This is our Sun Devil story

It isn't just the 250+

National Merit & Flinn Scholars who pick us over everyone else

It's the 4,000 who join us every year to innovate

It's the \$115

million we spend annually on research

It's our faculty experts, three Nobel laureates, Pulitzer Prize winner &

11 members of the National Academy of Sciences

It's the \$2.5 million in scholarships annually & 4 residence halls that our students call home

This is where you come to explore

To make your own path

To be at the school that's #1 in innovation

Because when you leave, you won't just be part of the 5th most qualified graduates in the nation

You'll be ready to take on anything,

make it better.

