

COLLEGE OF LIBERAL ARTS AND SCIENCES

Natural Sciences







OURS IS A BOLD VISION

USING RIGOROUS SCIENTIFIC METHODS, WE ARE RAPIDLY PUSHING BEYOND KNOWN BOUNDARIES TO SOLVE SOCIETY'S PRESSING PROBLEMS

Every day, ASU scientists are collaboratively driving use-inspired research projects. Their goal? Advancing research and discovery of public value. These enable cutting-edge technologies to transport us into deep space; innovate game-changing research methods to push discovery in diverse fields like cancer, climate change and nanotechnology; and drive scientific and policy expertise in the areas of greatest human need: energy, the environment, health and sustainability. Our work in the natural sciences is not only meaningful — it is imperative.

Join us on our scientific trek and help us answer questions yet to be asked.

TOGETHER, OUR POTENTIAL IS LIMITLESS



SCIENCE AT ASU: FORWARD-FOCUSED AND SOLUTIONS-DRIVEN

AT ASU, STUDENTS WHO STUDY THE NATURAL SCIENCES ARE EXPLORERS ON A JOURNEY, AND OUR FACULTY ARE THE GUIDES

Their quest? Answers to the very real problems our society faces today and in the future. Already, the brightest minds here on campus have collaborated with those around the globe to send a spacecraft to Mars, collect polar ice cap data to track climate change and pioneer a cure for the Ebola virus.

Through Campaign ASU 2020, our goal is to build on this work — advancing our students' journey toward discovery and furthering our faculty's search for

answers — by increasing opportunities at every level. Our size and ASU's interdisciplinary approach give us an advantage. We will expand resources for the natural sciences so that faculty and students have all the tools they need. We will focus on research that makes a difference to our state, the nation and the planet. And we will recruit more students into the sciences as we embed science in the community, raising awareness of how it transforms people's lives.

“OUR GOAL AT ASU IS NOT JUST TO DISCOVER THE FUNDAMENTALS THAT GOVERN NATURAL SCIENCE SYSTEMS BUT TO DO SO WITH A DELIBERATE SENSE OF URGENCY AND RAZOR-SHARP FOCUS ON SOLUTIONS. OUR AIM IS TO DEVELOP NEXT-GENERATION PREDICTIVE CAPABILITIES SO THAT WE CAN PROPOSE STRATEGIES TO ADDRESS OUR WORLD’S GREATEST CHALLENGES. OUR FACULTY AND STUDENTS ARE KEENLY AWARE OF YOUR SUPPORT. YOU MAKE US FEEL LIKE WE ARE NOT WALKING OUR TREK ALONE.”

— Ferran Garcia-Pichel, Dean, Natural Sciences and Virginia M. Ullman Endowed Professor in Natural History and the Environment

Successfully completing Campaign ASU 2020 will make certain that we achieve these ambitions—and that our students and faculty uncover solutions to the challenges of our constantly changing world.

OUR DONORS’ IMPACT

The passion and generosity of donors have already done much for the natural sciences at the College of Liberal Arts and Sciences, fueling discoveries that are creating meaningful change. Gifts from alumni and friends help students attend college and reach their full potential, allow faculty to innovate in teaching and research and ensure that programs transform learning not just at ASU but also throughout the region.

One example is our School of Earth and Space Exploration’s outreach spaces, which offer single-point field trip destinations to expose upper elementary and middle school students to the essence of science, exploration and discovery. Thank-you letters from these students fuel our determination to support outreach programs at schools that can no longer afford to send kids on field trips.

Through philanthropy, natural science students and faculty work together to develop alternative fuels and new vaccines, address biodiversity loss and climate change and create culturally informed approaches to resolve obesity, urban growth and the spread of infectious disease. We’re buoyed by our progress and excited for the future. By supporting this campaign, alumni and friends can ensure that our brightest days of research, teaching and developing creative solutions lie ahead.

10,000

students studying science and math, from psychology to conservation to space exploration, in six schools and departments and through 17 centers and institutes

TOTAL GOAL: \$70 MILLION

ENSURE STUDENT ACCESS AND EXCELLENCE

Students who study science and math in the College of Liberal Arts and Sciences at ASU enjoy the widest range of choices available anywhere in higher education, from atomic interactions to developmental psychology, from microbial ecology to space exploration. As part of their education, students work side-by-side with world-renowned faculty on advanced research projects, finding alternative fuels or new vaccines for developing countries, applying mathematics to solve problems in cancer, offsetting loss of biodiversity and ameliorating the effects of

climate change. Help us ensure that graduates not only acquire broad skills but also become master learners, infused with the indispensable skills of critical thinking, problem solving, contextual analysis and scientific inquiry, capable of addressing the challenges of today's constantly changing world.

GRADUATE FELLOWSHIPS AND AWARDS

Graduate students are the backbone of research. With the best and brightest graduate students, we



THE PATH FROM ROUNDWORM GENES TO A CURE FOR CANCER ISN'T AN EASY ONE

But two faculty laboratories within ASU's Virginia G. Piper Center for Personalized Diagnostics — and the natural sciences students who work there — are joining forces to increase our understanding of how small biological changes in genes can influence the development, diagnosis and treatment of cancer.

These researchers include Justin Wolter, a doctoral student in molecular and cellular biology who is a research assistant in School of Life Sciences assistant professor Marco Mangone's lab. "Cancer is an incredible model because, essentially, it's just cells growing and dividing — the exact opposite of what they should be doing," says Wolter.

Wolter is committed to finding an answer to this complex disease and plans on staying in academia after completing his degree to continue research in gene regulation and developmental biology.

can teach, discover and innovate at our highest capacity. Competition for exceptional graduate students, however, is acute, and current natural sciences endowments support less than 1 percent of our students. That's why the College of Liberal Arts and Sciences seeks at least 20 graduate fellowships we can use to recruit and retain the brightest students: we don't want financial barriers to prevent top candidates from choosing ASU. Graduate

fellowships are an essential recruiting tool, providing resources for innovative research that can then be published, thus helping advance research globally. In addition, more fellowships will help us meet our goal of propelling graduate programs in geology, space science, molecular science, chemistry and climate science into the top 10 nationally — a move that will allow ASU to accelerate important discoveries in these areas.

CHAMPION STUDENT SUCCESS

The College of Liberal Arts and Sciences natural sciences are committed to ensuring that every student persists to graduation. Through the campaign, we are investing in high-impact programs that have proven to increase student success, such as the School of Life Sciences BioBridge Program, which focuses on at-risk first-year students, as well as Exploration Scholarships for field camp and international summer study. In addition, students in the natural sciences will particularly benefit from philanthropic support of the following fund:

UNDERGRADUATE RESEARCH INNOVATION FUND

Undergraduate research is an integral part of an education in natural sciences at ASU, but it can be out of reach for students who need to work to help pay expenses. The Undergraduate Research Innovation Fund aims to address this issue by giving students hands-on experiences in meaningful research and providing stipends for their work. ASU offers undergraduate research experiences with faculty, graduate students and external research partners that transform knowledge into actual practice. Whether it is helping develop alternative energy from sunlight or therapeutics and vaccines against West Nile virus,

collecting soil samples or mapping desert rodent migration — students involved in faculty research gain valuable skills, retain knowledge and prepare for careers in the in-demand fields of science, technology, engineering and mathematics (STEM). They also persist to graduation at higher rates. Through the campaign, our goal is to create an endowed Undergraduate Research Innovation Fund that would support a minimum of 50 students looking to access these life-changing opportunities.





ELEVATE THE ACADEMIC ENTERPRISE

Some of the natural sciences' best minds and most productive researchers make their home at ASU. Faculty include Nobel Laureates, Pulitzer Prize winners, MacArthur Fellows and members of the National Academy of Sciences and the National Academy of Inventors. They provide vision, leadership and mentoring for the next generation, contributing their expertise to ASU's interdisciplinary mission. They engage in research that transforms our community and our world, creating partnerships with academic leaders in Arizona and around the globe. Support in this area will help draw like-minded intellectual leaders to join our team of luminaries.

ENDOWED CHAIRS AND PROFESSORSHIPS

Faculty are the principal catalysts of ASU's mission and experience—communicating knowledge, cultivating critical thinking, mentoring and inspiring. World-class faculty members, such as Nobel

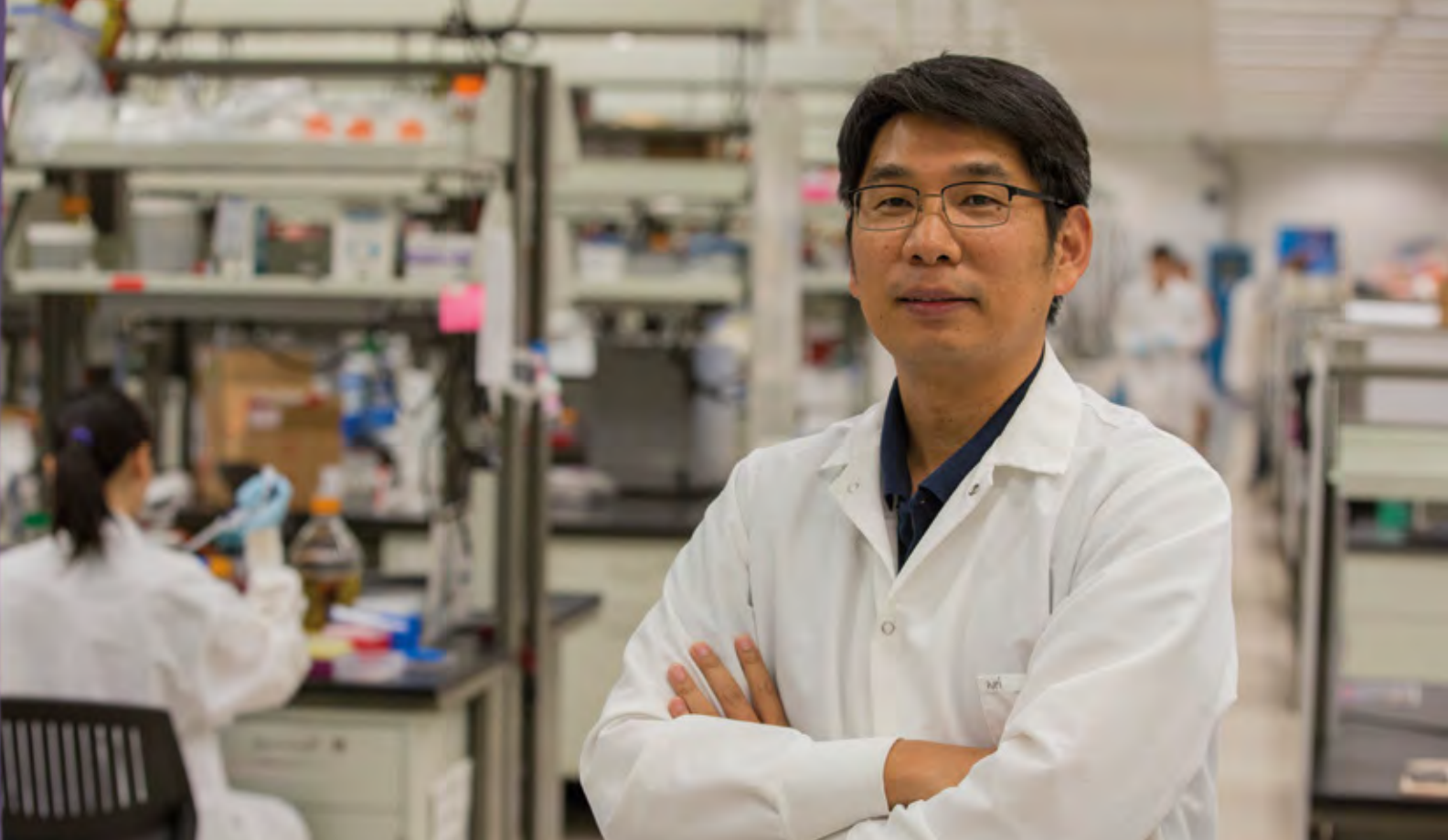
Laureates molecular biologist Sidney Altman and physicist Frank Wilczek, conduct original scholarship that shapes the future of their fields, invigorates classroom learning and elevates the university's reputation. Their work attracts research and grant funding, drawing other notable researchers and promising graduate and undergraduate students to ASU.

Recruiting and retaining such faculty are challenging, however; natural sciences faculty can command substantially higher salaries in private industry and at private universities. Endowed professorships help provide a competitive edge through additional funding to help advance faculty research. Such named chairs carry with them a level of prestige among the wider academic world that allows ASU to attract and retain faculty of the highest level of achievement and teaching. Through the campaign, our goal is to add a minimum of 10 new endowed chairs or professorships, helping draw and retain luminary faculty members to ASU.



The natural sciences at ASU draw on the expertise of six schools and departments:

- Department of Physics
- Department of Psychology
- School of Earth and Space Exploration
- School of Life Sciences
- School of Mathematical and Statistical Sciences
- School of Molecular Sciences



HAO YAN MILTON D. GLICK DISTINGUISHED CHAIR OF CHEMISTRY AND BIOCHEMISTRY

"I was drawn to ASU by the vision of transdisciplinary research and the Biodesign Institute," says Hao Yan, the Milton D. Glick Distinguished Chair of Chemistry and Biochemistry, a recognized leader in the fast-moving field known as structural DNA nanotechnology, or DNA origami. His research team at ASU's Biodesign Institute was the first to successfully construct closed 3-D DNA nanoforms. This programmable technology holds promise to encapsulate drugs to target a disease or trigger an immune-system response against abnormal cells, such as cancer.

Since arriving at ASU in 2004, Yan has been a blur of activity, producing 80 publications and five book chapters. His research is externally funded at a rate of \$1.6 million a year and has been cited more than 4,000 times. After Yan had been an ASU assistant professor for just four years, President Michael Crow

promoted him to full professor with tenure — a feat almost unheard of in academia.

"We have a talented group of faculty, graduate students and postdoc researchers," says Yan. "We also collaborate with researchers across the university and outside ASU." Yan is currently leading a multidisciplinary team at four universities — ASU, Harvard, MIT and Michigan — in research funded by the Department of Defense and the National Institutes of Health.

"In everything we do, we're looking to see what impact it has on society," Yan concludes. "ASU provides the right environment for transdisciplinary research: bringing different scientists from different schools together to achieve bigger things."





FUEL DISCOVERY, CREATIVITY AND INNOVATION

Our talented researchers push the frontiers of knowledge and advance research and discovery, exploring the scientific grand challenges of our century. Support in this area will help transform our community, our nation and our world.

EXPLORATION@ASU

Exploration is a search into the unknown, creating questions and providing answers both by design and through surprise. Exploration requires a team. It teaches persistence in struggling toward a goal, patience in understanding a different point of view and tolerance of partial answers. Natural sciences faculty and students are breaking new ground in frontiers from the vast — exploring the universe through the School of Earth and Space Exploration — to the minute — unlocking the mystery of communities of microbiomes through the Center for Fundamental and Applied Microbiomics. We seek alumni and friends to fund priorities to catapult this

exploration and discovery. Among the opportunities for philanthropic support are such initiatives as:

- ASU New Space
- ASU Origins Project
- Beyond: Center for Fundamental Concepts in Science
- Center for Applied Structural Discovery
- Center for Biology and Society
- Center for Fundamental and Applied Microbiomics
- Center for Meteorite Studies
- Center for Social Dynamics and Complexity
- LeRoy Eyring Center for Solid State Science
- PlanetWorks



CONSERVATION@ASU

As an institution embedded in the core of North American dry lands and the growing population centers they sustain, ASU seeks to leverage this unique place through the Center for Climate Change in Drylands, which will focus on both sustainability and conservation for arid areas. With its breadth and depth in the natural and social sciences, ASU also has the human, institutional and interdisciplinary resources to become the world leader in biodiversity through increased research, education and management in critical topics like water sustainability. Campaign support will advance transformational and innovative enterprises that promise to turn the tide on global conservation issues. Opportunities for donor investment include:

- Biodiversity Knowledge Integration Center
- Biomimicry Center
- Center for Biodiversity Outcomes
- Center for Climate Change in Drylands
- Future H₂O Initiative
- Natural History Collections

FRONTIERS IN HEALTH AND MEDICINE

Natural sciences faculty and students at ASU are on the forefront of discovery in health and medicine, using science to innovate early detection and treatment for our world's deadliest diseases. Using ASU's interdisciplinary approach and partnering with Arizona's best medical facilities, our researchers are developing novel techniques and technologies to produce new vaccines; uncover new weapons in the fight against antibiotic-resistant bacteria; drive the discovery and development of biomarkers for the early detection of cancer, Alzheimer's and other deadly diseases; and develop methodologies to treat oncoming illness before symptoms appear. And, as leaders in prevention science for behavioral and mental health interventions, natural and social scientists and students at ASU conduct translational research that leads to innovations in child and family interventions. Alumni and friends can invest in these advances, destined to transform health and save lives here in Arizona and around the world.

HEATHER BIMONTE-NELSON

PROFESSOR AND BEHAVIORAL NEUROSCIENCE PROGRAM DIRECTOR



“My research evaluates basic science questions important for optimizing women’s health throughout the lifespan. Our science aims to understand how hormones — both naturally occurring and those women take — affect cognitive and brain aging. At ASU, I’m surrounded by amazing, collaborative scientists, and this challenges me to step outside my comfort zone and ask questions I may not otherwise have. The support I have here makes me feel like I can ask bolder research questions, because even if my ideas fail, I will have support to keep moving forward with new initiatives. That ‘go for it’ sense trickles down to the students in my lab. In fact, it’s pervasive throughout ASU.”

Campaign support can help drive critical research through the following centers:

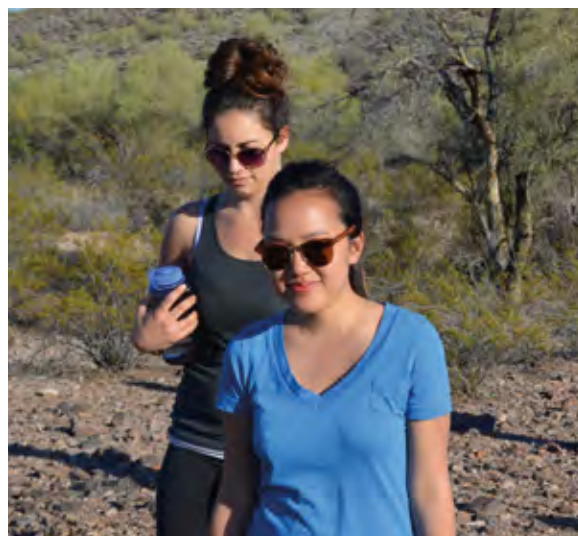
- Center for Biological Physics
- Center for Convergence of Physical Science and Cancer Biology
- Center for Evolution and Medicine
- Center for Global Health
- Center for Infectious Disease and Vaccinology
- Center for Personalized Diagnostics
- REACH Institute
- Simon A. Levin Mathematical, Computational and Modeling Sciences Center

INNOVATIONS IN TEACHING AND LEARNING

The Information Age has ushered in a whole new way of teaching and learning. The emphasis is no longer on memorizing facts — students can find those answers right from their smartphones. Rather, students must learn to synthesize information from disparate sources, honing their critical-thinking

and creative problem-solving skills. Campaign gifts will help advance these next-generation methods, which actively engage the College of Liberal Arts and Sciences natural sciences students with course content and inspire them to think in different ways. Opportunities for investment include:

- Active learning and outdoor learning spaces
- Center for Education Through Exploration
- Physics Modeling Instruction





HELP US TRANSFORM SCIENCE

Throughout ASU's history, the spirit and generosity of donors have reflected the strong belief in higher education's contributions to our society, our health and our world. With Campaign ASU 2020, the natural sciences at the College of Liberal Arts and Sciences have the opportunity to significantly expand our impact. Whether alumni and friends choose to support scholarships, faculty, research

or big ideas, all can be assured that they are expressing their values and passions in one of the most powerful ways possible.

There has never been a greater opportunity for donors to make a difference. By supporting the natural sciences in Campaign ASU 2020, alumni and friends can help push the boundaries of space exploration, push the boundaries of medical discovery and push the boundaries of science education. Donor support will make it possible for more students to achieve their dreams, more faculty to accelerate discoveries to solve society's most pressing problems and more programs to innovate science exploration, driving knowledge forward. **Join us.**

\$93M more than
\$93 million in
annual research
expenditures

$$-\nabla \cdot (\rho \vec{u}) = f_i (\rho_1, \rho_2, \dots, \rho_N) \quad \rho = \sum_i \rho_i, \quad \sum_i f_i = 0$$

$$-\nabla \cdot (\rho \vec{u} \otimes \vec{u} + P + \frac{1}{2} B^2 - B \otimes B) = \rho \vec{g}$$

$$+\nabla \cdot ((E+P)\vec{u} - \vec{u}(\vec{u} \cdot \vec{B})) = -n^2 \Delta(T) + \rho \vec{u} \cdot \vec{g}$$

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With your generous support, Arizona State University has reinvented the public research university. We are both more inclusive and more accomplished than ever, with ASU students and faculty earning unprecedented levels of recognition for their achievements. Our graduates leave here as master learners who are capable of rising to meet any new and unfamiliar challenge. ASU students, faculty and graduates also are firmly rooted in their communities and committed to advancing the common good. Together, we have created a model for other universities to follow. Your support during Campaign ASU 2020 will help us break more new ground by raising \$1.5 billion to propel our vision for higher education into the next decade and beyond.

ARIZONA STATE UNIVERSITY is a comprehensive public research university, measured not by whom we exclude, but rather by whom we include and how they succeed; advancing research and discovery of public value; and assuming fundamental responsibility for the economic, social, cultural and overall health of the communities it serves.

 **College of Liberal
Arts and Sciences**
Arizona State University

300 E. University Drive
Tempe, AZ 85281-2061
480-965-3759
give.asu.edu
CLAS@asufoundation.org