ASU Knowledge Enterprise
Arizona State University

2018 Year in review

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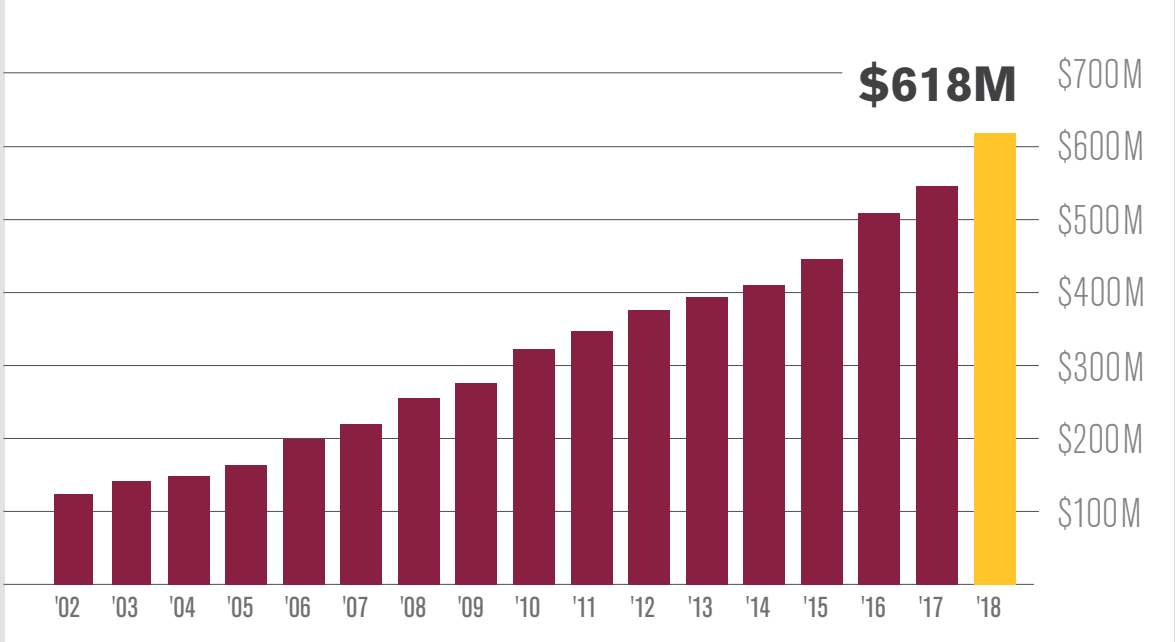
ASU excellence

For the fourth year in a row, Arizona State University has been named the most innovative school in the nation by U.S. News & World Report. This honor is a reflection of ASU's dedication to solutions-focused research, meaningful collaboration and student success.

#1 in the U.S. for innovation
ASU ahead of Stanford and MIT
– U.S. News & World Report 2016, 2017, 2018 and 2019

ASU research expenditures

Our growing research enterprise yields impactful solutions and innovation and provides students with real-world experience.



In FY 2018, ASU innovators:

disclosed **285** inventions

secured **123** patents

signed **78** technology licenses and options

launched **17** startup companies

#1 for DARPA Young Faculty Awards received since 2014, ahead of MIT, Princeton and Stanford

#17 in the world for U.S. patents among universities

Rankings by research expenditures

#8 for **total research expenditures** among institutions without a medical school

#1 for **anthropology**, ahead of University of Michigan, Harvard and Stanford

#2 for **geological and earth sciences**, ahead of MIT, Texas A&M and Virginia Tech

#3 for **transdisciplinary research**, ahead of Northwestern, MIT and Ohio State University

#4 for **social sciences**, ahead of Berkeley, UCLA and Cornell

#5 for **political science and government**, ahead of Duke, Tufts and Penn State

#5 for **humanities**, ahead of Yale, Harvard and Wisconsin

#8 for **NASA-funded expenditures**, ahead of Stanford, University of Washington and UCLA

#8 for **HHS (including NIH)-funded expenditures** among universities without a medical school, ahead of Princeton, Carnegie Mellon and Georgia Tech

#9 for **electrical, electronic and communications engineering**, ahead of Stanford, MIT and Purdue

Source: National Science Foundation HERD Survey 2017

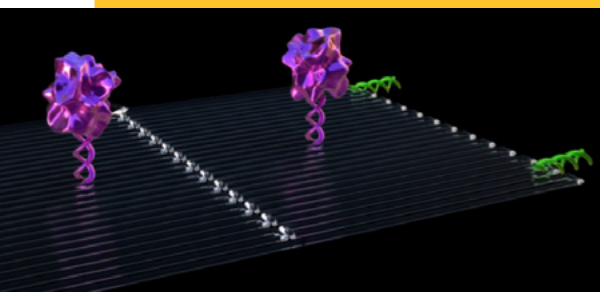
ASU professor awarded Stockholm Water Prize

Bruce Rittmann, an ASU Regents' Professor of environmental engineering and researcher in the Biodesign Institute, was named laureate of the 2018 Stockholm Water Prize, given annually by the Stockholm International Water Institute. Rittmann's research involves microbiological technologies to remove harmful contaminants from water and cut wastewater treatment costs.

Poet wins MacArthur 'genius' grant

Natalie Diaz, an associate professor in ASU's Department of English, won a John D. and Catherine T. MacArthur Foundation fellowship, commonly known as MacArthur "genius" grants. The prestigious honor recognizes people on the verge of a great discovery or game-changing idea. Diaz blends the personal, political and cultural in poems that draw on her experiences as a Mojave woman to challenge the mythological and cultural touchstones underlying American society.

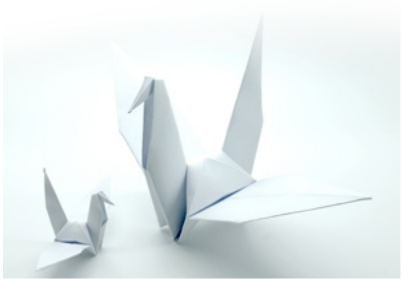
Discovery and innovation



Cancer-fighting nanorobots

A team of researchers from ASU and the Chinese Academy of Sciences successfully programmed nanobots built out of DNA to shrink tumors by cutting off their blood supply.

Origami-inspired structure withstands massive weights



An ASU engineer looked to the eighth century to design a futuristic structure based on the ancient paper-folding art of origami. The simple, collapsible cylinder can withstand massive loads and has potential for applications in anything from spacecraft to stents in medicine.

ASU breaks solar cell record

Last year, ASU engineers set a world record of 23.6 percent efficiency for a tandem solar cell. Working with researchers at the University of Nebraska, they broke their own record in 2018, jumping to 25.4 percent. The cost of solar electricity is largely driven by the efficiency of the panels, so increased efficiency has the potential to lower the cost.

Calorie counting effort discounts race, income

More nutritional information on more menus seems like a sure win, but a new requirement from the Food and Drug Administration may have a reduced benefit. A study from ASU researchers found that exposure to menu-labeling will be limited by income and ethnicity and may widen health disparities.

Discovery may improve battery life, safety

An ASU researcher has used silicone in lithium-metal batteries to avoid the growth of lithium dendrites. These dendrites often hinder the recharging power of the batteries and can lead to fires or explosions.

Urban agriculture worth a lot of green

Analyzing data from Google Earth, a team of researchers from ASU and Google estimated the global value of urban agriculture to be in the neighborhood of $33 billion. In addition, they estimated that existing urban agriculture produces 100 million to 180 million tons of food, saves 14 billion to 15 billion kilowatt hours of energy and avoids storm runoff of 45 billion to 57 billion cubic meters annually.

Dusting for fingerprints of the first stars

An ASU-led team of astronomers detected evidence of the first stars 180 million years after the universe began. They also found that gas in the early universe was probably much colder than expected. The study was named a top 10 breakthrough of 2018 by Physics World magazine.

Radar imaging sees sinking San Francisco shoreline

With radar imaging at the fore, an ASU-led study measured how much the shoreline along the San Francisco Bay has sunken, uncovering gaps in how the Federal Emergency Management Agency assesses the risk of rising sea levels.

Humans in Africa survived super-volcanic eruption

A column of fire, smoke and debris demolished the top of Mount Toba 74,000 years ago, spewing forth rock, gas and microscopic pieces of glass. Despite the incident, humans in Africa thrived throughout the eruption of this super-volcano, according to evidence found at an archaeological site at the southern tip of South Africa.

Super-cooled water forms new liquid

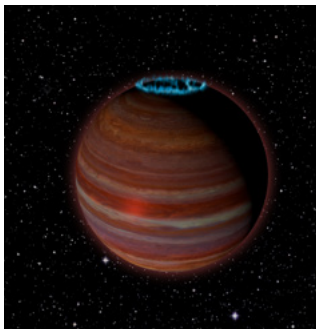
An ASU team super-cooled water under exacting conditions and — voilà! — the water transformed itself into a new liquid. The new liquid is still water but has a lower density. It also has a different arrangement of its hydrogen-bonded molecules, with stronger bonds, making the new liquid more viscous. Scientists predicted that such a transformation would occur, but this team observed it for the first time ever.

Program reduces teen alcohol abuse

ASU researchers developed an 18-hour program that can help prevent teens from developing alcohol abuse disorders. The program, called Bridges, or “Puentes” in Spanish, included Title 1 schools with large Latino populations, as Latino teenagers show a higher risk of alcohol abuse than other adolescents. Participants who reported alcohol use in seventh grade were 2.5 times less likely to meet the criteria for alcohol use disorder by senior year in high school.

Rogue, planet-sized space object discovered

A postdoctoral fellow at ASU led the discovery of a 200-million-year-old planet-sized object beyond our solar system. A dozen times the size of Jupiter with a magnetic field 200 times stronger, the rogue object is traveling through space unaccompanied by a parent star.



Credit: Chuck Carter, Caltech, NRAO/AUI/NSF

Study shows women underestimate their intelligence

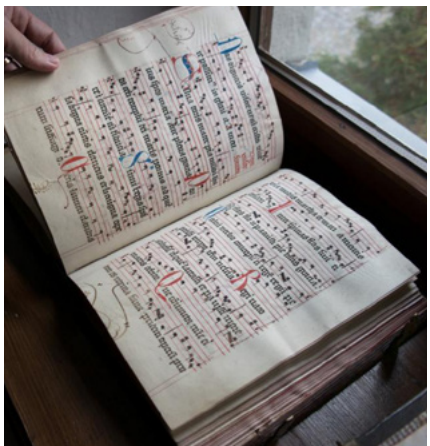
ASU researchers published a study showing that women in an undergraduate biology class were more likely to underestimate their intelligence than men were. What’s more, the men were 3.2 times more likely than women to say they were smarter than the person they worked with.

Calculating canine cuteness

Research from ASU's Canine Science Collaboratory found that people perceive dogs to be at the height of cuteness at about eight weeks old — the same age at which their mothers wean them and leave them to fend for themselves. Additional research found that short-term foster care, or one-night sleepovers, can reduce stress in shelter dogs.

Scholars rescue ancient manuscripts

Left undisturbed for 500 years, a library of thousands of manuscripts was in danger of being lost until a dedicated duo of ASU researchers stepped in. The documents detailed the lives of women in the Brigittine Order of Catholic nuns, one of the few organizations that allowed women autonomy in the Middle Ages. The ASU scholars were granted access to the library after a lengthy battle. They plan to use the texts to create a virtual reconstruction of a medieval church, which will be available to all.



Small quakes may trigger the 'big one'

The movement of tectonic plates along the San Andreas fault has not been as smooth and steady as previously thought, according to an ASU study. Rather, the fault experiences small "slow quakes," which release energy over a period of hours to months, rather than seconds. These slow quakes often go unnoticed, but have the potential to trigger larger, more destructive earthquakes.

A viral connection to Alzheimer's

Research from the ASU-Banner Neurodegenerative Disease Research Center suggests that certain species of herpesvirus may contribute to the development of Alzheimer's disease. If viruses or other infections are confirmed to play a role in the development of Alzheimer's, the knowledge could help researchers develop anti-viral or immune therapies to combat the disease.

Ancient Chinese tomb reveals undiscovered species

Intrepid explorers descend into the tomb of the grandmother of China's first emperor, only to discover… a new species of ape? In fiction, tomb excavations render treasure. But an international team, including an ASU postdoctoral researcher with the Institute of Human Origins, instead discovered fossil remains of the now-extinct species — *Junzi imperialis* — that lived in China as recently as 2,200 years ago.

Justice not blind to gender bias

Pounding the lectern. Raising his voice. In a closing argument, anger can be a lawyer's best friend — if he's a man, that is. An ASU psychology professor published a study showing how gender skews the perception of an attorney's effectiveness in the courtroom when expressing anger. While male attorneys were described as commanding, powerful and competent, female attorneys were perceived as shrill, hysterical and ineffective.

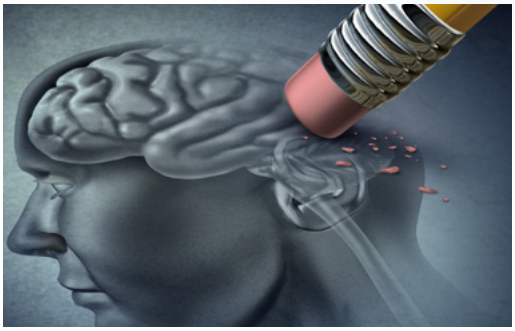
Unraveling the mysteries of spider silk

The properties of spider silk, which is five times stronger than steel, have long eluded scientists. But ASU researchers, in collaboration with San Diego State University and Northwestern University, have developed the first molecular-level model of spider silk protein fiber formation, inching closer to lab production of spider silk protein fibers.

Startup success

Award-winning cybersecurity startup

An ASU computer scientist and a sociologist/anthropologist have transformed their research on hacker ecosystems into the startup CYR3CON. The company uses machine learning, data mining and AI to predict future threats, and it won a TechConnect Defense Innovation Award at the 2018 Defense Innovation Technology Acceleration Challenges Summit.

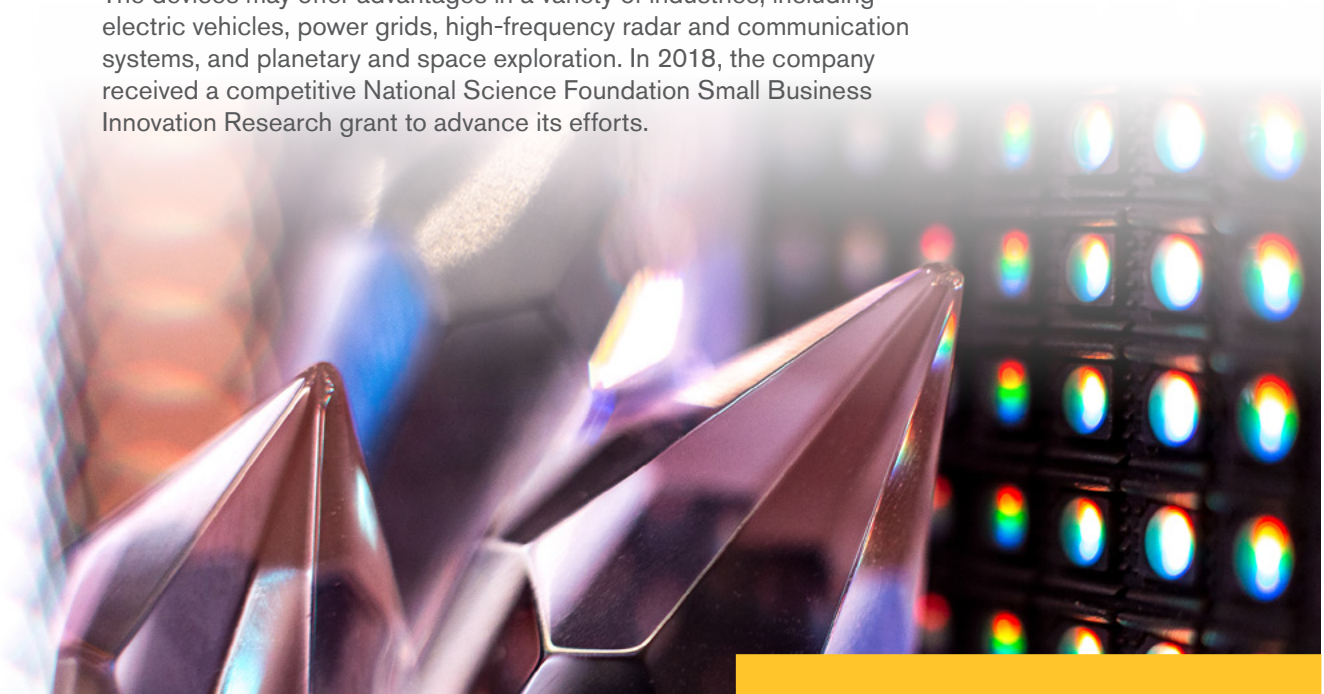


Diagnosing diseases through speech

Two ASU professors and an experienced entrepreneur are working to detect changes in neurological health through speech with a new startup company. Aural Analytics is studying ways to more quickly diagnose Alzheimer's disease, Parkinson's disease, concussions, and other disorders and traumas. In 2018, the company won a prestigious Scrip Award for Best Technological Development in Clinical Trials.

ASU startup is a real gem

Advent Diamond is an ASU spinout company developing single-crystal diamond diodes capable of operating at high temperature and power. The devices may offer advantages in a variety of industries, including electric vehicles, power grids, high-frequency radar and communication systems, and planetary and space exploration. In 2018, the company received a competitive National Science Foundation Small Business Innovation Research grant to advance its efforts.



Empowering entrepreneurs

ASU and Verizon bridging digital divide

Four years ago, ASU Entrepreneurship and Innovation (E+I) joined forces with the Verizon Foundation to increase access to technology for underserved schools, starting with four U.S. high schools. The program trains educators to teach design thinking, innovation, entrepreneurship and STEM skills by collaborating with local businesses to solve real-world challenges through emerging technology. Thanks to a new grant from the Verizon Foundation, the program will expand to include over 300 middle schools across the country.

Prepped perseveres

Prepped, a joint effort from ASU E+I and the College of Health Solutions, is a free, early-stage food business incubator. The program focuses on ventures owned by women and other underrepresented minorities and provides training in operations, food costing and financial literacy, small business marketing strategies, permits and licensing, and more. Prepped has helped launch more than 15 self-sustaining culinary businesses to date and is poised to usher in many more, thanks to new support from a private grant.

Edson gift helps train entrepreneurs

With a $6 million endowed gift from the J. Orin Edson Foundation, ASU Entrepreneurship and Innovation launched the Training and Development Network to serve E+I programs, ASU units and community partners. The network aims to support entrepreneurs at all levels through co-curricular offerings, wayfindings and faculty engagement.

Featured partnerships

City partnerships cultivate an ecosystem of innovation

ASU is partnering with local cities to foster an environment where entrepreneurs, makers and creatives thrive. For example, the Create Phoenix Plan aims to attract 5,000 business creators by 2020, using a framework to grow the entrepreneurial ecosystem with a $2 million fund. The university is also partnering with Peoria to support the city's economic development goals. Peoria Forward aims to strengthen the West Valley startup and entrepreneurial community through events, networking, mentorship and greater peer-to-peer connectivity.

Uber partnership opens road to higher ed

In November, ASU and Uber announced a partnership to provide Uber drivers and their families access to fully funded education from ASU. The program will be available to eligible Uber drivers in eight pilot locations, including Phoenix, and can provide an undergraduate degree through ASU Online or nondegree courses through ASU's Continuing and Professional Education program.

Practice Labs solve industry challenges

In 2018, ASU launched Practice Labs™, connecting students and corporate partners for a one-of-a-kind applied work experience. Top students from across ASU's academic disciplines are mentored by company managers, with oversight from ASU faculty and staff experts, to solve real-world business problems in real time. Verde Solutions, a full-service energy-efficiency consulting firm, partnered with ASU on the first Practice Lab, in which students are working to produce a geographic information system-based, analytical approach for renewable development site evaluation.

Improving education in Arizona

ASU and the Helios Education Foundation are partnering to create the Decision Center for Educational Excellence, funded by a three-year, $2.5 million grant from Helios. They are developing a computational model of Arizona's education system unlike any other to gather real-time feedback on how different interventions might influence the education system.

Accelerating automated innovation

Through an executive order, Arizona Gov. Doug Ducey created the Institute for Automated Mobility to focus on the safety, policy and science behind automated vehicles. The new consortium unites public officials; researchers from ASU, Northern Arizona University and the University of Arizona; and Intel to collaborate on state-of-the-art automated vehicle research and develop a robust testing center in the state. Ducey also appointed Sethuraman Panchanathan, executive vice president of the ASU Knowledge Enterprise and chief research and innovation officer, as his adviser for science and technology.

International development

Energizing Pakistan

The USAID-funded U.S.-Pakistan Centers for Advanced Studies in Energy, a partnership between ASU and two leading Pakistani universities, focuses on producing skilled graduates in the energy field and applied research to meet Pakistan's energy needs. Heading into its final year, the project has met or exceeded a number of its goals, including:

- 12 new degree programs.
- 15+ new labs, two new libraries and two new engineering buildings.
- 750+ master's and PhD students enrolled.
- 48 joint and applied research projects.
- 170 exchange visitors to the U.S.
- $1.6 million in external funding.

ASU awarded for international research and engagement

ASU won the 2018 APLU Gold Award in Internationalization of Research and Engagement from the Association of Public and Land-grant Universities. The award recognizes ASU's investment in international research and efforts to engage globally.

Speeding aid to those in need

In 2018, ASU students in the Frontier Economies Logistics Solutions Lab won a USAID Industry Innovators Award with industry partner Chemonics for developing TransIT, a low-cost, customizable transport management tool that can track the movement of shipments in low-resource environments. TransIT was piloted to monitor shipments of pharmaceuticals in USAID's Global Health Supply Chain project, implemented by Chemonics under the largest award USAID has ever made. Solutions Labs pair ASU researchers and development practitioners to tackle development challenges across the globe.

Nearly a decade of commitment in Vietnam

Since 2010, ASU has worked with USAID, private companies and the Government of Vietnam to modernize and accelerate the competitiveness of Vietnamese engineering education. Building on previous successes, ASU is currently working with USAID in Vietnam through the Building University-Industry Learning and Development through Innovation and Technology (BUILD-IT) program. To date, BUILD-IT has trained nearly 5,000 higher education participants, 40 percent of them women, in partnership with 13 private sector partners.

Looking ahead

Compact X-ray laser promises big discoveries

Scientists at the Biodesign Institute are designing and building a compact version of the world's fastest molecular camera. The compact X-ray free electron laser (CXFEL) can produce movies of proteins in action, illuminating the machinery that drives all life processes. Current X-ray free electron lasers span two miles, but ASU's CXFEL will fit in a single room, giving unprecedented access to this powerful tool. The CXFEL can be used to study molecular processes in cancer, diabetes, infections and other devastating diseases. This camera will accelerate the speed at which scientists deliver lifesaving treatments from the lab bench to the patient's bedside.

Global Futures takes sustainability to the next level

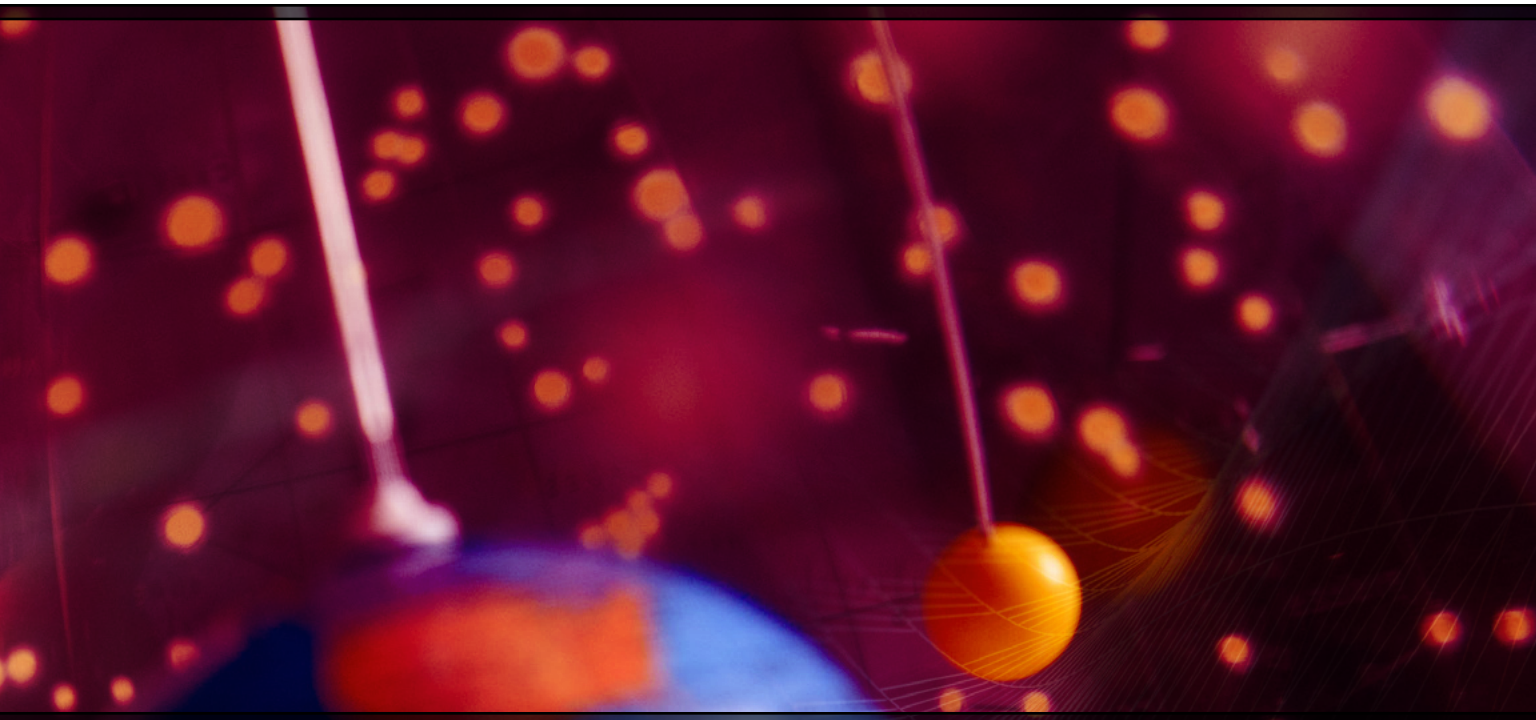
Today's greatest challenges threaten the very habitability of our planet. What if we could proactively plan a future that ensures human well-being? That is the vision of ASU Global Futures, launched in 2018 and led by one of the world's leading earth scientists. Global Futures will advance our knowledge and inform the debate about the future of our planet with regard to energy, water, health, cities and more.

A new model for space science

ASU, Lockheed Martin and GEOshare are pioneering a new way to advance deep space missions with the MILO Space Science Institute. Through a consortium model, universities, industries and space agencies around the globe are able to become members of the institute. The members split the cost of missions, increasing access to space by making it more affordable. The MILO Institute's first mission, slated for a launch in early 2023, will focus on asteroids that come close to the Earth.

Space telescope to launch in 2021

ASU is leading a NASA-funded mission to launch a telescope the size of a cereal box into Earth orbit. The Star-Planet Activity Research CubeSat (SPARCS) will monitor the flares and sunspots of red dwarf stars to assess whether the planets that orbit them could support life.



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