APPLIED RESEARCH BUILDING GRAND OPENING

APRIL 5, 2023

THE UNIVERSITY OF ARIZONA
Research, Innovation & Impact

To access more information about facilities and equipment within the ARB, open the camera app on your phone and hold over the QR code below. When the website address appears, click it to visit the ARB webpage.

RESEARCH.ARIZONA.EDU | SPACE.ARIZONA.EDU

APPLIED RESEARCH BUILDING GRAND OPENING APRIL 5, 2023

5:10pm | Welcome Remarks
Elizabeth "Betsy" Cantwell
Senior Vice President for Research and Innovation

Tim Swindle
Director, University of Arizona Space Institute
Director, Arizona Space Grant Consortium
Director Emeritus, Lunar and Planetary Laboratory

Peter Dourlein
University Architect
Associate Vice President
Planning, Design & Construction

5:40pm | Guided and Self-Guided Tours Begin

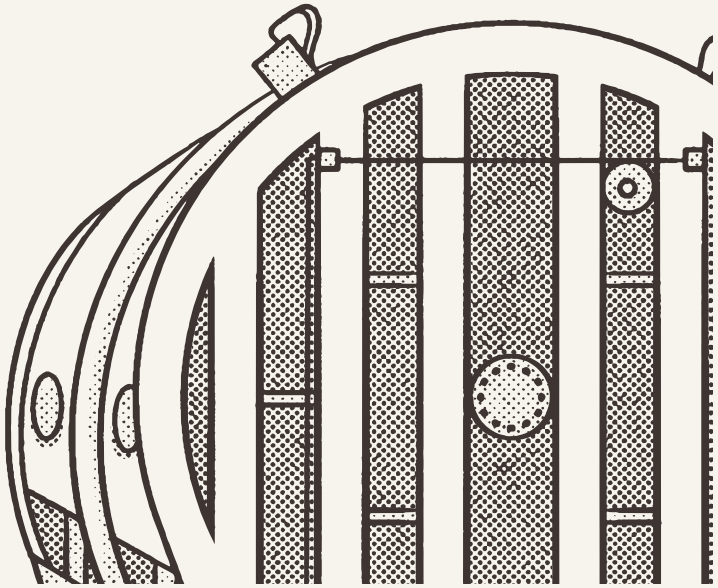
7:00pm | Event Ends

The University of Arizona, a land-grant university with two independently accredited medical schools, is one of the nation's top 50 public universities, according to U.S. News & World Report. Established in 1885, the university is widely recognized as a student-centric university and has been designated as a Hispanic Serving Institution by the U.S. Department of Education. The university ranked in the top 20 in 2022 in research expenditures among all public universities, according to the National Science Foundation, and is a leading Research 1 institution with $824 million in annual research expenditures. The university advances the frontiers of interdisciplinary scholarship and entrepreneurial partnerships as a member of the Association of American Universities, the 66 leading public and private research universities in the U.S. It benefits the state with an estimated economic impact of $4.1 billion annually.

Land Acknowledgement
We respectfully acknowledge the University of Arizona is on the land and territories of Indigenous peoples. Today, Arizona is home to 22 federally recognized tribes, with Tucson being home to the O'odham and the Yaqui. Committed to diversity and inclusion, the University strives to build sustainable relationships with sovereign Native Nations and Indigenous communities through education offerings, partnerships, and community service.

THE UNIVERSITY OF ARIZONA
Research, Innovation & Impact

THERMAL VACUUM CHAMBER



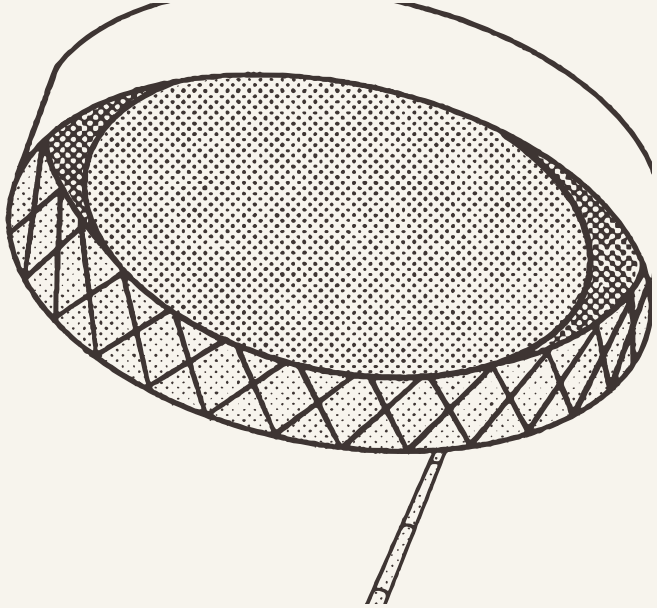
ABOUT

While the average temperature on a typical April day in Tucson is about 81 degrees Fahrenheit, temperatures on Mars average about **minus** 81 degrees. All materials – even aluminum and titanium, both of which are commonly used to fabricate nanosatellites – perform differently under different conditions. Spacecraft and high altitude, balloon-borne, science payloads benefit from testing in the conditions they will operate in after launch. The TV chamber simulates both the pressure and temperature conditions found in space, as well as the near space environment. This facilitates testing the performance of all components and subsystems prior to launch.

FAST FACTS

- The TV chamber can fit objects the size of an entire pickup truck inside of it.
- It weighs 40 tons, or roughly 81,000 pounds.
- It is 30 feet long.
- Normal atmospheric pressure is defined as 1 atmosphere or 760 torr. The TVC can achieve vacuum pressures as low as 5 torr and can cool to the temperature of liquid nitrogen, or -315°F.
- Tests inside the TVC can run from a day to two weeks.

ANECHOIC CHAMBER



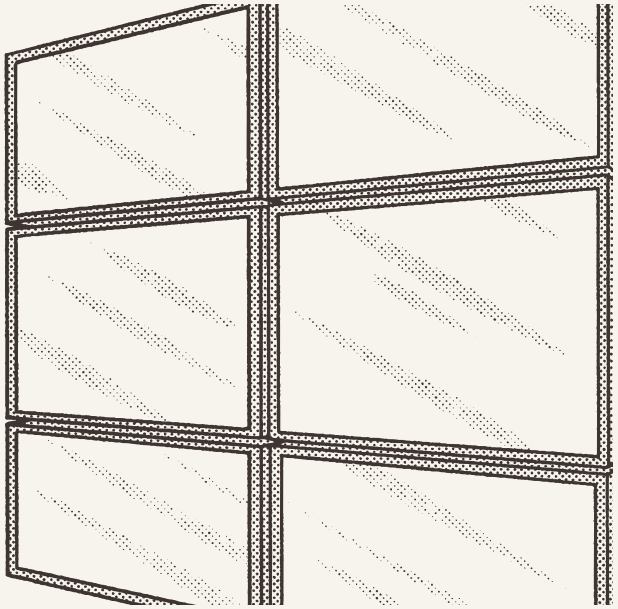
ABOUT

This nonreflective, echo-free room is called an anechoic (a-nih-KOH-ik) chamber. The chamber is built with radio-wave-absorbing material applied to the walls, ceiling, and floor. The absorptive material – a carbon-filled foam – is designed to keep radio waves from bouncing. The conditions of the anechoic chamber allow researchers to test the performance of experimental antennae to potentially use in a wide variety of applications, from deep space communication systems to terrestrial cell phone networks.

FAST FACTS

- The absorptive material lining the walls is a carbon-filled foam designed to keep radio waves from bouncing.
- The anechoic chamber is also lined with metal sheeting forming a Faraday cage to keep radio waves from entering the chamber.
- A control room is located adjacent to the chamber. It is from here that researchers conduct the antenna testing.

MISSION OPERATIONS CENTER



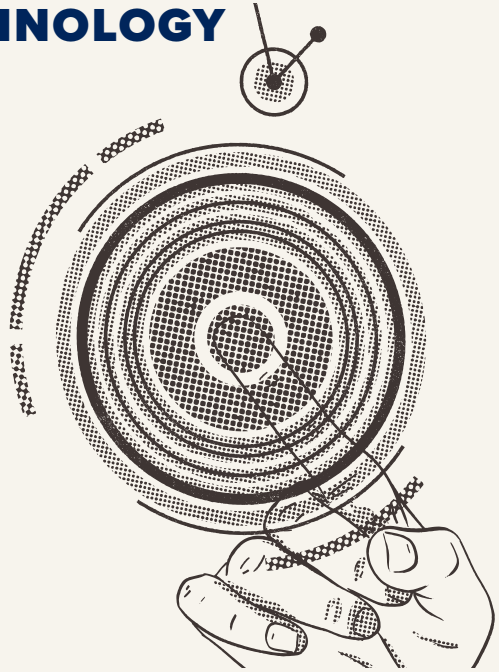
ABOUT

After launch, spacecraft and balloons must be carefully monitored and commanded by scientists and engineers, from thousands if not millions of miles away. A mission operations center performs this work while a science operations center coordinates the distribution and processing of data. Both centers are equipped with all the computers, networks, and software needed to control a mission from the ground. For the ongoing and recently extended OSIRIS-REx mission, the science operations center is hosted at the University of Arizona's Drake Building, while Lockheed Martin provides the mission operations center from a facility near Denver. The Mission Operations Center at ARB is capable of conducting mission operations for NASA Class D missions and balloon-borne missions.

FAST FACTS

- UArizona faculty Marcia Rieke is the principal investigator for the James Webb Space Telescope's Near Infrared Camera (NIRCam), and UArizona's George Rieke is the science team lead for the Mid-Infrared Instrument (MIRI). The Mission Operations Center for the JWST is located at the Space Telescope Science Institute in Baltimore, Maryland.
- Lockheed Martin provides the mission operations center for the UArizona-led NASA mission to retrieve material from the surface of an asteroid, OSIRIS-REx under the direction of the NASA mission manager at Goddard Space Flight Center.
- UArizona is now one of very few American universities with the capability to provide mission operations support for NASA Class D missions.

IMAGING TECHNOLOGY LABORATORY



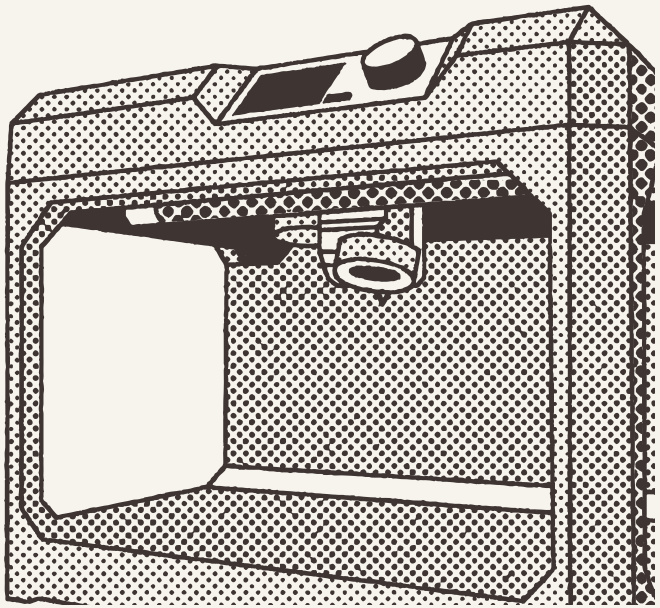
ABOUT

Under the direction of research professor and astronomer Michael Lesser, the ITL is a world-leading supplier of advanced scientific imaging sensors for visible, ultraviolet, and x-ray light detection. The most common applications for its imaging technologies are in the fields of astronomy, satellite imagery such as Earth observations, and the manufacturing of electronic devices. What's more, the lab has developed and supports camera systems used on telescopes owned and operated by the University. The lab's industry partners include Lockheed Martin, Ball Aerospace and the Smithsonian Astrophysical Observatory, while its federal funding agencies include NASA, the National Science Foundation, the Department of Energy and the Department of Defense. The lab at ARB is a clean room, meaning it is designed to filter out airborne particles and pollutants like dust, microbes, and aerosols.

FAST FACTS

- The ITL was located off campus prior to the opening of the Applied Research Building.
- The lab has delivered more than 4,000 sensors to scientific and industrial imaging communities across the globe.
- The lab has developed and supports camera systems used on telescopes owned and operated by the University.
- Although UV waves are invisible to the human eye, some insects, including bumblebees, can see them.

LABORATORY FOR ADVANCED AND ADDITIVE MANUFACTURING



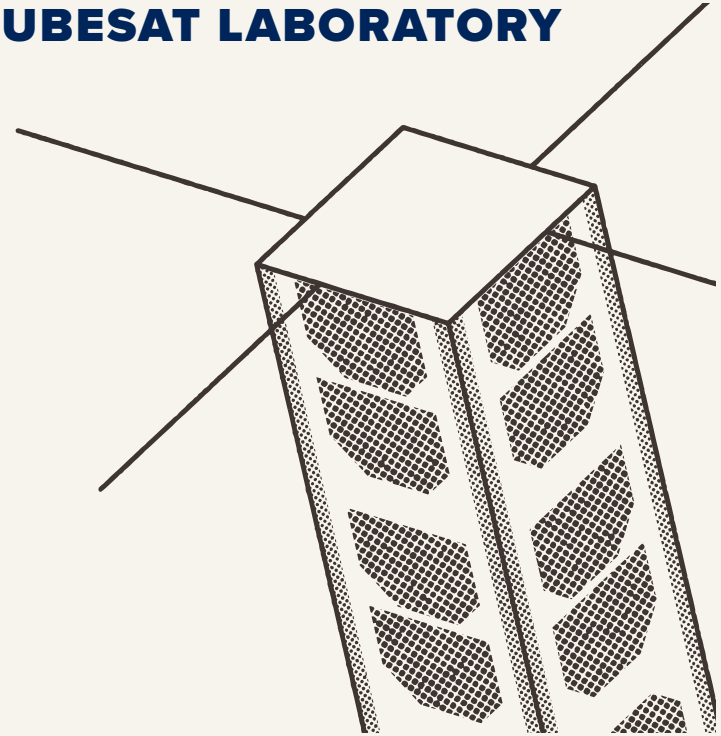
ABOUT

The Laboratory for Advanced and Additive Manufacturing uses state-of-the-art digital fabrication techniques to design and fabricate complex materials with on-demand properties that are not achievable using conventional manufacturing methods. This space enables collaborations among manufacturing experts from the College of Medicine, the James C. Wyant College of Optical Sciences, the College of Engineering, and others to be at the forefront of manufacturing advances that embody the Fourth Industrial Revolution. Advanced manufacturing efforts at the University of Arizona focus on defense, space, aerospace and biomedical and communications technology.

FAST FACTS

- The university's industry partners in this area include Raytheon, Honeywell, Lockheed Martin, and NASA.
- The first printer to create three-dimensional objects appeared in 1983, just a year after the first CD was manufactured.

THE CUBESAT LABORATORY



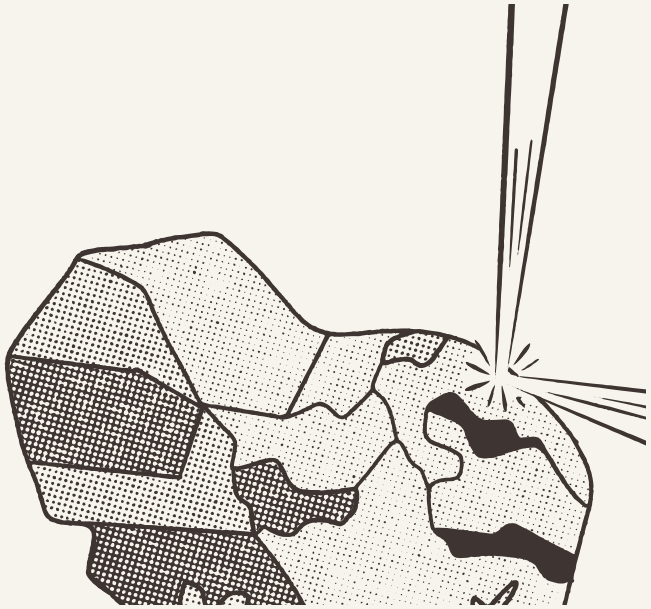
ABOUT

This laboratory is a dedicated space for the fabrication of nanosatellites, often called "CubeSats," and small space instruments, which represent the next generation of technology for space exploration and scientific investigation. The lab is designed to maximize reliability of space hardware by providing a clean environment for assembly. A major benefit of miniaturized satellites is cost and schedule efficiency: they are easier to mass produce and have a standard size and shape, commodifying access to space. They are less expensive to build than traditional satellites and, because of their compact size, they often piggyback on rockets carrying other spacecraft.

FAST FACTS

- A typical CubeSat is about the size of a toaster, though the smallest are 4-inch cubes weighing less than 3 pounds.
- CubeSats have become increasingly popular in space exploration over the last two decades, with NASA launching its first CubeSat, GeneSat, in late 2006 and now hundreds are launched per year.
- UArizona is expected to launch the CatSat CubeSat later this year.

SPACE MATERIALS CURATION FACILITY



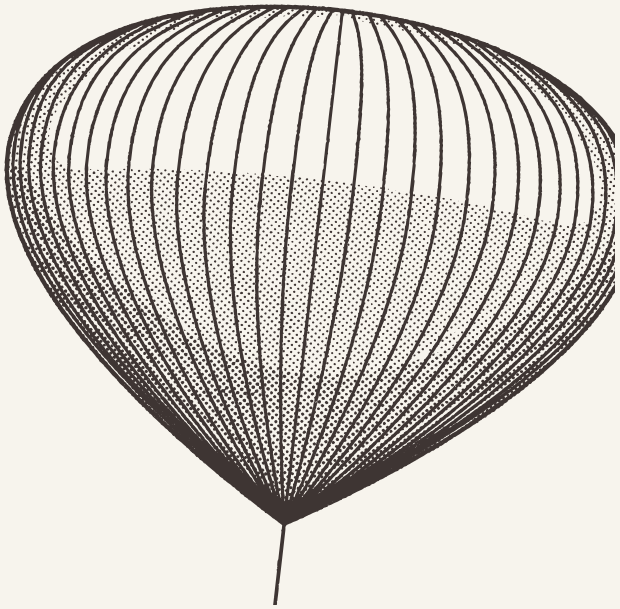
ABOUT

The Space Materials Curation Facility will house materials used to differentiate between artificial and natural objects in the Earth-Moon system. The collections include rocket body paint samples, mylar, metals, kapton, solar cells, and similar items used for building and coating satellites and spacecraft, as well as a small representative set of meteorites. Researchers use telescopes on Earth to capture a space object's spectral signature—the wavelengths of light that bounce off an object's surface. They use that data to identify what it is (artificial versus natural) and where it came from. This work is important to space traffic management and national security. With nearly 100 missions planned to the moon over the next decade, there is an increased risk of collisions with space debris. Samples curated at the facility will help ensure that use of orbital space between the Earth and moon remains safe, secure, and sustainable.

FAST FACTS

- The European Space Agency estimates that there are presently more than 170 million pieces of debris, or "space junk," (over the size of 1 millimeter) orbiting Earth. Any of these objects would have the ability to cause harm to operational spacecraft.
- Even a one-centimeter object could penetrate the shields on the International Space Station.

HIGH BAY FACILITY



ABOUT

With 40-foot ceilings similar to those found in warehouses, the ARB's high-bay payload laboratory will offer teams of scientists and engineers a dedicated space to assemble high-altitude stratospheric balloons such as the University of Arizona-led, NASA-funded GUSTO mission.

These high-altitude balloons are used for critical everyday operations such as providing accurate weather data by measuring and transmitting information on atmospheric pressure, temperature, humidity, and wind speed. They can also be used for more sophisticated scientific exploration, as in the case of GUSTO, which will send a balloon to near-space, carrying a telescope that will study the interstellar medium – the gas and dust between the stars, from which all stars and planets originate.

FAST FACTS

- Balloon-borne astronomy fills an important gap between ground-based observatories and space telescopes by allowing telescopes and other instruments to reach altitudes where they experience less interference from Earth's atmosphere.
- UArizona is home to another high bay facility, located at UA Tech Park at The Bridges, which opened in December 2022.
- Each of the letters of the Hollywood sign overlooking Los Angeles, California is roughly as tall as the high bay facility at the ARB.