Inside the Applied Research Building: Mission operations and state-of-the-art digital fabrication

Research, Innovation & Impact
June 2022

This story is the second part of a two-part series about the Applied Research Building. The first story [1] provided a glimpse into the building, including a laboratory for assembling high-altitude balloons, a chamber that simulates conditions in space, and an echo-free room for testing antennae performance. In this story, learn about a laboratory producing cutting-edge imaging technology for researchers across the world, a center making it possible to lead missions in space right from campus, and a laboratory creating the next generation of strong, lightweight and inexpensive materials.

In January 2023, the Applied Research Building – an $85 million, three-story structure going up at the southeast corner of East Helen Street and North Highland Avenue – is scheduled to open its doors.

The 89,000-square-foot building will provide new research capabilities with state-of-the-art equipment and technology for teams conducting interdisciplinary research that advances applied physical sciences and engineering.

And while research at the Applied Research Building may start in a lab setting or even a conference room, it will be squarely aimed at meeting practical, real-world needs. Those include creating imaging technology that helps meteorologists forecast the weekly weather and producing new materials so strong that they hold up even at speeds exceeding five times the speed of sound.

**ARB’s Imaging Technology Laboratory**

Steward Observatory is home to the Imaging Technology Laboratory. Currently located off campus, ITL is slated to move into the ARB.

Under the direction of research professor and astronomer Michael Lesser, the lab is a world-leading supplier of advanced scientific imaging sensors for visible, ultraviolet and X-ray light detection. In fact, the lab has delivered more than 4,000 sensors to scientific and industrial imaging communities across the globe. 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.

Not only will the ARB move provide higher quality space for the lab, including advanced cleanrooms, but it will also increase the lab's access to collaborative opportunities across campus.

**Mission Operations Center**

After launch, spacecraft and balloons – such as the one carrying the University-led GUSTO [2] airborne observatory – must be carefully monitored by scientists and engineers, from thousands if not millions of miles away. These personnel receive a variety of real-time information, from basic temperature readings to images captured by cameras onboard the craft.

The dedicated facilities for receiving data from and sending commands to spacecraft are called mission operations centers, and they are equipped with all the computers, networks and software needed to direct a mission from the ground.

The University-led Phoenix Mars Lander [3], for example, performed all mission operations from the Michael J. Drake Building on North Sixth Avenue near Drachman Street. For the ongoing and recently extended OSIRIS-REx mission [4], scientists have been monitoring the functioning of and data coming from scientific instruments aboard the spacecraft from the Drake Building, while Lockheed Martin performs mission operations from a facility in Denver.

The mission operations center to be located in the ARB will be used for similar missions. It will also have the unique capacity to host multiple missions simultaneously.

**Laboratory for Advanced and Additive Manufacturing**

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. The lab's new location in the ARB will readily enable 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.

Some of the recent innovations that have emerged from the Laboratory for Advanced and Additive Manufacturing are on-demand 3D-printed specialized parts and structures for next-generation combat vehicles, in situ resource utilization and manufacturing in austere environments (e.g., space), nano-metamaterials for communication and computing, and personalized bioimplants and prosthetics. Another point of focus for the Laboratory for Advanced and Additive Manufacturing is strengthening the hypersonics research infrastructure at the University of Arizona – which is home to two hypersonic facilities and wind tunnels that permit testing from Mach 0 to Mach 5 – and was recently awarded $10 million in federal and state funding for upgrades.

The University’s industry partners in this area include Raytheon, Honeywell, Lockheed Martin, General Electric, Open Additive, PADT, SLM, Optomec and Carbon 3D.

To watch progress at the Applied Research Building construction site in real time, visit the ARB project page on the Planning, Design and Construction website. The page has views from a live webcam, 3-D models showing progress since ground was broken, and drone videos.

Source URL: https://uaatwork.arizona.edu/lqp/inside-applied-research-building-mission-operations-and-state-art-digital-fabrication

Links
[5] https://pdc.arizona.edu/project/18-9386