LOWELL OBSERVATORY CAPTURES METEORS THROUGH TRU VUE® ULTRAVUE® LAMINATED GLASS

Watching above Arizona's Meteor Crater, a newly installed "fireball camera station" captures video from multiple cameras to create a mosaic of the night sky. The footage contributes to scientific research in detecting and understanding meteors, small particles of planetary debris that impact the Earth at speeds in excess of 20,000 miles per hour.

As part of the Lowell Observatory Cameras for All-Sky Meteor Surveillance (LO-CAMS) project, the station's automated cameras observe the flash of meteors as they plunge into Earth's atmosphere. Tru Vue® UltraVue® Laminated Glass protects the station's 16 mounted cameras as they record and process the images under extreme conditions.

Northern Arizona University undergraduate Astronomy major, Solvay Blomquist, working on the camera station installation. Photo courtesy of Dr. Nick Moskovitz, Lowell Observatory.

Learning with LO-CAMS

Located in Flagstaff, Arizona, the Lowell Observatory is an independent, nonprofit research institution with a mission to explore the cosmos and share its discoveries with everyone – professional peers, the general public and future generations. Founded in 1894 by Percival Lowell, it is among the oldest observatories in the U.S. and a Registered National Historic Landmark. The observatory's current research includes studying small bodies in the solar system, such as comets, asteroids and meteors.

Asteroids and meteors are of particular interest to astronomer Nick Moskovitz, Ph.D. at the Lowell Observatory and project lead for LO-CAMS. He says, "The design and implementation of LO-CAMS is based upon the highly successful CAMS project."

Cameras for All-Sky Meteor Surveillance (CAMS) was conceived and built in 2010 by Peter Jenniskens, Ph.D., of the SETI Institute in Mountain View, California. The network of stations that support CAMS serves to confirm and detect meteor showers, and to link meteor streams to specific parent bodies (e.g. comets and asteroids) in space. Another goal of CAMS is to facilitate meteorite recovery in the rare event of large fireballs, which are any meteors that register as brighter than the planet Venus.

"As a whole, CAMS is a highly successful system with more than half a million meteors detected since 2010," reports Moskovitz. He estimates up to 300 meteors per night may be recorded by the LO-CAMS fireball cameras in northern Arizona, including the Meteor Crater station.

"The multiple camera stations allow us to triangulate the detected meteors so we can measure their speed as they enter our atmosphere, the height at which they burn up, and the angle at which they hit the atmosphere," Moskovitz explains. "This provides a 3-D trajectory of a given meteor's path through the atmosphere, which allows us to back-project where it originated in the solar system, and for those meteors large enough to survive passage through the atmosphere, we can forward-project where any meteorites (i.e. rocks) would land on the ground."

Withstanding the Elements at Meteor Crater

LO-CAMS now operates four of these stations including the new addition at Meteor Crater outside of Winslow, Arizona. Meteor Crater formed 50,000 years ago when an asteroid weighing several hundred thousand tons traveled through space and impacted Earth. This impactor displaced 300-400 million tons of rock to create the 570-foot-deep and 4,100-foot-wide crater. Today, the Visitor Discovery Center at Meteor Crater offers the public one of the world's most extensive interactive displays of meteor impact science, and guided tours of the crater's rim.

"The windiest spot in Arizona is at the corner of the Meteor Crater Visitor Center where the camera station is installed. It can be subject to hurricane force winds, heat, rain and snow. In addition to these harsh conditions, it's also at high elevation where the UV is really intense," describes Moskovitz. "We needed to build the station to hold up to these elements, and we also needed to ensure there would be no internal reflections from the glass, especially at full moon."

Aerial view of the Meteor Crater and Visitor Center that houses indoor viewing, Interactive Discovery Center, a wide screen movie theater, restaurant, and gift shop, located on the crater rim. Image Credit: NASA Earth Observatory/Public Domain.

The LO-CAMS team evaluated numerous materials and construction options to create the weather-tight enclosures that house the mounted cameras. Moskovitz notes, "One of the motivating factors in the design of LO-CAMS has been to use entirely off-the-shelf components that are relatively low cost. We're able to do some very interesting scientific research with fairly standard instrumentation."

Creating the Camera Station

Like most of us today, the LO-CAMS team began its search online. Reaching out to Tru Vue, Moskovitz found Museum and Conservation Liaison Yadin Larochette receptive to the project's unique application. "Yadin was eager to help and she was wonderful to work with," praises Moskovitz.

"The same qualities that make UltraVue Laminated Glass ideal for framing and displaying cultural heritage and fine art collections, led the innovative scientists at the Lowell Observatory to select it for this unique application," says Larochette.

She elaborates, "The proprietary, anti-reflective coating and water white substrate presents crystal clear color and light transmission, while blocking up to 99 percent of UV radiation, for an optimal viewing experience. It also is shatter-resistant for superior safety, protection, and security, safeguarding the cameras if the glazing is broken or damaged, until the glass is replaced." Engineered for performance and durability, UltraVue Laminated Glass is ideal for enclosures that will be used for long periods of time.

"From everything we researched, the UltraVue Laminated glass has the ruggedness and quality we need," reiterates Moskovitz. "Its high optical quality produces essentially no reflections, it blocks the UV and it protects the cameras from the extreme elements."

The UltraVue Laminated Glass provides a sealed window for the 16 cameras and associated electronics mounted within a welded-aluminum housing. To build these, Moskovitz tells of another, creatively sourced supplier: "Flagstaff is the closest major city to the Grand Canyon, where there's a strong interest in river rafting. We partnered with Artisan Metal Works, a local shop that makes very durable boxes to handle river rafting. The cases are weather-tight and water-tight, which works great for our needs, too."

Tru Vue® UltraVue® Laminated Glass protects the newly installed fireball camera station's 16 mounted cameras. Photo courtesy of Dr. Nick Moskovitz, Lowell Observatory.

Combining the rigidity and durability of Tru Vue UltraVue Laminated Glass and Artisan Metal Works' aluminum housing, the heavy-duty, fireball camera station was installed in April 2018 at the Meteor Crater Visitor Center. Programmed to operate autonomously and with minimal maintenance, the cameras record more than 50 gigabytes of data every night. Each morning, the station transmits the footage to the LO-CAMS team helping them to further research and understand meteors, and to ultimately share their discoveries with all.

For more information about the Lowell Observatory, its research and its public program, please see ***www.lowell.edu.*** *To view Meteor Crater, plan a visit by starting at* ***http://meteorcrater.com.*** *To learn more about the LO-CAMS project data, please see* ***http://cams.seti.org/FDL/index-LOCAMS.html.***