New Horizons deploys global team for rare look at next flyby target

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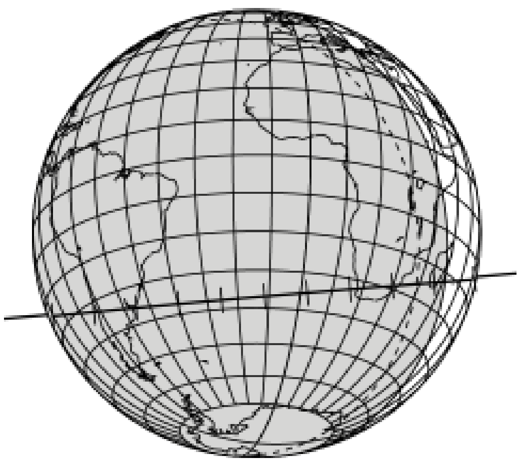


First look: Projected path of the 2014 MU69 occultation shadow, across South America and the southern tip of Africa, on June 3. Credit: Larry Wasserman/Lowell Observatory

On New Year's Day 2019, more than 4 billion miles from home, NASA's New Horizons spacecraft will race past a small Kuiper Belt object known as 2014 MU69 – making this rocky remnant of planetary formation the farthest object ever encountered by any spacecraft.

But over the next six weeks, the New Horizons mission team gets an "MU69" preview of sorts – and a chance to gather some critical encounter-planning information – with a rare look at their target object from Earth.

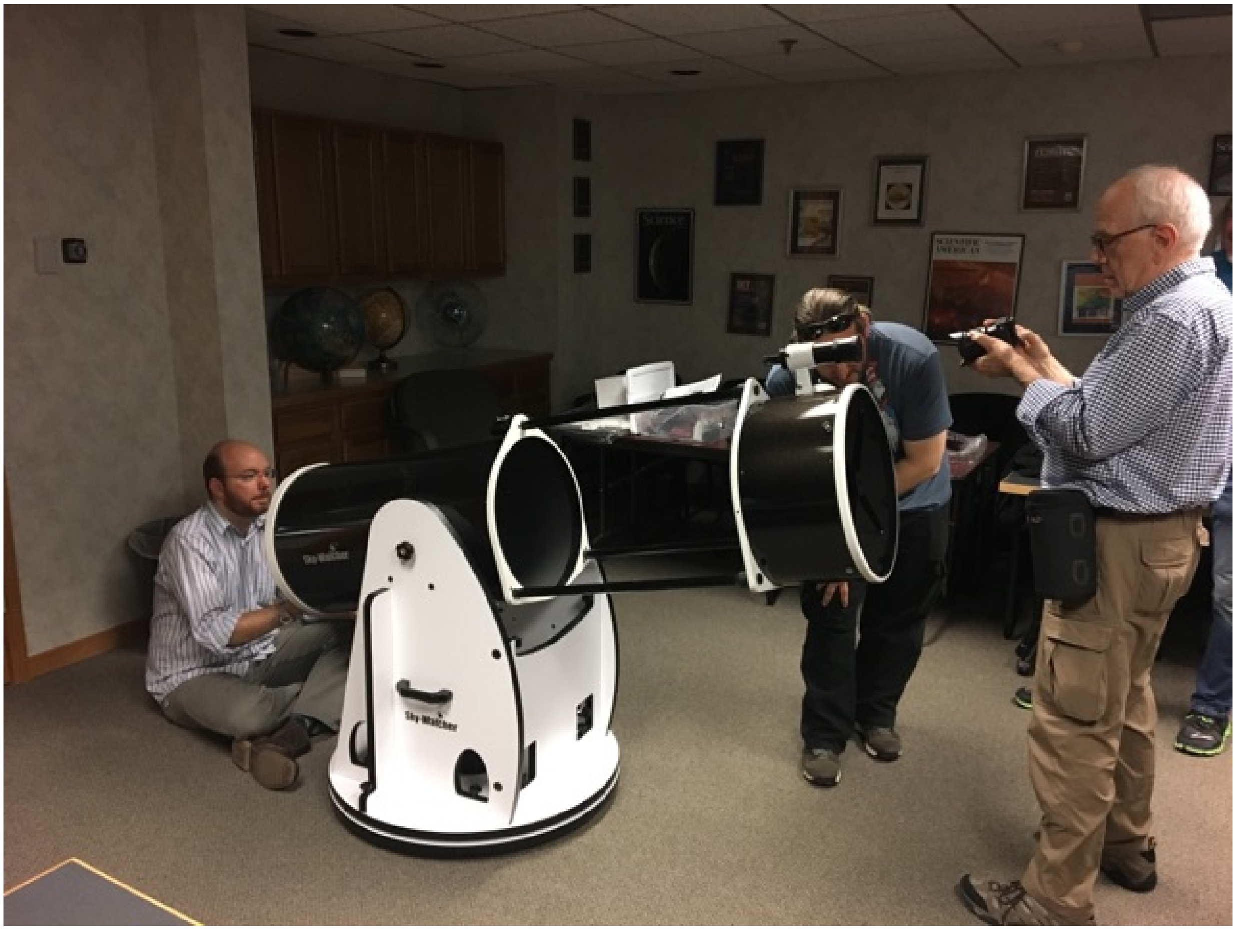
On June 3, and then again on July 10 and July 17, MU69 will occult – or block the light from – three different stars, one on each date. To observe the June 3 "stellar occultation," more than 50 team members and collaborators are deploying along projected viewing paths in Argentina and South Africa. They'll fix camera-equipped portable telescopes on the occultation star and watch for changes in its light that can tell them much about MU69 itself.

"Our primary objective is to determine if there are hazards near MU69 – rings, dust or even satellites – that could affect our flight planning," said New Horizons Principal Investigator Alan Stern, of Southwest Research Institute (SwRI) in Boulder, Colorado. "But we also expect to learn more about its orbit and possibly determine its size and shape. All of that will help feed our flyby planning effort."

What Are They Looking at?

In simplest terms, an astronomical occultation is when something moves in front of, or occults, something else. "When the moon passes in front of the sun and we have a solar eclipse, that's one kind of occultation," said Joel Parker, a New Horizons co-investigator from SwRI. "If you're in the path of an eclipse, it means you're in the path of the shadow on Earth that's created by the moon passing between us and the sun. If you're standing in the right place at the right time, the solar eclipse can last up to a few minutes."

The team will have no such luxury with the MU69 occultations. Marc Buie, the New Horizons co-investigator from SwRI who is leading the occultation observations, said that because MU69 is so small – thought to be about 25 miles (40 kilometers) across – the occultations should only last about two seconds. But scientists can learn a lot from even that, and observations from several telescopes that see different parts of the shadow can reveal information about an object's shape as well as its brightness.



New Horizons team members prepare one of the new 16-inch telescopes for deployment to occultation observation sites in Argentina and South Africa. Credit: Kerri Beisser

A Space Challenge

The mission team has 22 new, portable 16-inch (40-centimeter) telescopes at the ready, along with three others portables and over two-dozen fixed-base telescopes that will be located along the occultation path through Argentina and South Africa. But deciding exactly where to place them was a challenge. This particular Kuiper Belt object was discovered just three years ago, so its orbit is still largely unknown. Without a precise fix on the object's position – or on the exact path its narrow shadow might take across Earth – the team is spacing the telescope teams along "picket fence lines," one every 6 to 18 miles (10 or 25 kilometers), to increase the odds that at least one or more of the portable telescopes will catch the center of the event and help determine the size of MU69.

The other telescopes will provide multiple probes for debris that could be a danger to the fast-moving New Horizons spacecraft when it flies by MU69 at about 35,000 miles per hour (56,000 kilometers per hour), on Jan. 1, 2019.

"Deploying on two different continents also maximizes our chances of having good weather," said New Horizons Deputy Project Scientist Cathy Olkin, from SwRI. "The shadow is predicted to go across both locations and we want observers at both, because we wouldn't want a huge storm system to come through and cloud us out—the event is too important and too fleeting to miss."

The team gets help from above for the July 10 occultation, adding the powerful 100-inch (2.5-meter) telescope on NASA's airborne Stratospheric Observatory for Infrared Astronomy (SOFIA). Enlisting SOFIA, with its vantage point above the clouds, takes the bad weather factor out of the picture. The plane also should be able to improve its measurements by maneuvering into the very center of the occultation shadow.

Insight for Encounter Planning

Any information on MU69, gathered from the skies or on the ground, is welcome. Carly Howett, deputy principal investigator of New Horizons' Ralph instrument, of SwRI, said so little is known about MU69 that the team is planning observations of a target it doesn't fully understand – and time to learn more about the object is short. "We were only able to start planning the MU69 encounter after we flew by Pluto in 2015," she said. "That gives us two years, instead of almost seven years we had to plan the Pluto encounter. So it's a very different and, in many ways, more challenging flyby to plan."

If weather cooperates and predicted targeting proves on track, the upcoming occultation observations could provide the first precise size and reflectivity measurements of MU69. These figures will be key to planning the flyby itself – knowing the size of the object and the reflectivity of its surface, for example, helps the team set exposure times on the spacecraft's cameras and spectrometers.

"Spacecraft flybys are unforgiving," Stern said. "There are no second chances. The upcoming occultations are valuable opportunity to learn something about MU69 before our encounter, and help us plan for a very unique flyby of a scientifically important relic of the solar system's era of formation."

Provided by Johns Hopkins University