

Now past Pluto, New Horizons may look to a small, icy object

BY JOEL ACHENBACH

The big encounter with Pluto is over. The void is dead ahead.

NASA's New Horizons spacecraft is hurtling through the Kuiper Belt, a cold, dark realm of tiny, icy objects and the occasional dwarf planet such as Pluto. The spacecraft's science instruments are detecting plasma and dust, but its cameras have been turned off. For the moment, there's nothing to see and not much to do other than measure the loneliness of deep space.

New Horizons has a bit of an existential, or perhaps astronomical, dilemma: After you pass Pluto, there's a whole lot of nothing.

The spacecraft can maneuver slightly, but whatever it is going to look at next has to be more or less directly straight ahead. A couple of weeks ago, the New Horizons team decided to aim the spacecraft at a small object, roughly 28 miles in diameter and known as 2014 MU69. The spacecraft will fly past it on Jan. 1, 2019.

MU69 was discovered last year by the Hubble Space Telescope, which was looking for something, anything, that might be in the path of New Horizons. The Hubble found five objects, but MU69 was the most inviting target, requiring the least amount of fuel.

New Horizons still has to surmount a bureaucratic obstacle. NASA hasn't yet approved an "extended mission" for the spacecraft. The New Horizons team has until spring to put together a proposal that lays out what an extended mission would cost. NASA would consult with the broader science community before signing off on the extension.

In some respects, it seems like an easy decision: New Horizons is a healthy spacecraft. It passed through the Pluto system without any nasty collisions with damaging particles, and it has a radioactive power source that can keep it operational for a couple of dec-

ades at least. It has half a tank of propellant.

"We don't have to buy any rocket, we don't have to fly across 3 billion miles of space, we don't have to build a spacecraft," said the team leader, planetary scientist Alan Stern.

The scientific case for closely studying MU69 is that it's different from Pluto, much smaller, a "cold, classical" Kuiper Belt object that is likely to have formed 4.6 billion years ago, at the birth of the solar system. "It is a completely new family of object," said project scientist Hal Weaver of the Johns Hopkins University Applied Physics Laboratory, the mission headquarters.

On the other hand: This thing isn't Pluto. It's small. It will be hard to obtain images as dramatic as the ones New Horizons got when it buzzed within 7,800 miles of Pluto's surface.

Project manager Glen Fountain said his team, which he says includes the best navigators in the world, can probably get the spacecraft within 15,000 miles of the target — and maybe much closer.

But because MU69 was just discovered, there's almost no data about its orbit. If you're Fountain, the questions are: Where is it, exactly? And where will it be a day from now? This is known as the "ephemeris" data. New Horizons can't be joysticked in real time because it's so far away — a one-way message to the spacecraft, which is 3 billion miles from Earth, currently takes about 4.5 hours even at the speed of light, and MU69 is another billion miles farther.

The location uncertainty was a factor during the Pluto encounter, too.

"We really didn't know where the object was that well, and we only had one chance," Fountain said.

New Horizons skimmed Pluto 90 seconds earlier than expected

and about 50 miles closer to the surface, said Mission Operations manager Alice Bowman. But that was within the margin of error — still a huge success, particularly given a computer glitch 10 days earlier and all the other things that might have derailed the mission.

"I am still amazed and in awe of what we accomplished as a team. In some ways, it's hard to digest it all," Bowman wrote last week in an e-mail. "Maybe it's because taking all those small, continued steps over these past years became a matter of course and when those last steps were taken, it was hard to fully comprehend the magnitude of what we'd done."

After Pluto, a spacecraft learns what space is really like: big and mostly empty.

Mike Brown, the California Institute of Technology astronomer who has discovered a number of dwarf planets in the outer solar system, has to admit that it's a rarefied realm: "Each one of them is further away from the next cool thing than the Earth is from Jupiter. It is a vast, almost completely empty region."

We know, extrapolating from the observations of the planet-hunting Kepler Space Telescope, that there are probably tens of billions of exoplanets orbiting stars in our galaxy (not to mention all the planets in the billions of other galaxies in the known universe). But space is not designed for ease of human travel.

The nearest star to the sun is Proxima Centauri, and it's about 25 trillion miles away. If New Horizons were racing directly toward Proxima Centauri, it wouldn't get there for tens of thousands of years.

The more plausible targets for direct robotic exploration are closer to home. One possibility, someday, is Eris, a dwarf planet discovered by Brown and colleagues in 2005. It's a virtual Pluto

Dopo aver superato Plutone, New Horizons potrebbe puntare a un oggetto piccolo e ghiacciato

twin. New Horizons can't go to Eris, because Eris is on the other side of our solar system; it's also currently three times as far from Earth as Pluto is. This might be a better mission for the next century, when Eris's eccentric orbit will have brought it much closer.

Brown says a better target might be another of his discoveries: Quaoar, a 700-mile-diameter object that's not much farther from the sun than Pluto.

Or perhaps a probe will someday go to an as-yet-undiscovered planet.

"There's probably a lot of objects out there, and I think it's probably just a matter of time before we find something similar in size to Pluto or possibly bigger," said John Grunsfeld, the astronomer-astronaut and Hubble repairman who now is head of science for NASA.

"The idea that there's a large object out there is rattling around the community," Brown said.

New Horizons cannot go search for mystery planets. It's not that kind of probe. Its telescope gives it a narrow gaze — "like looking down a straw," said Fountain, the project manager.

There is, however, one major feat that New Horizons has yet to accomplish, other than taking the plasma and dust measurements and steering itself toward MU69. It still has to tell Earth exactly what it saw at Pluto.

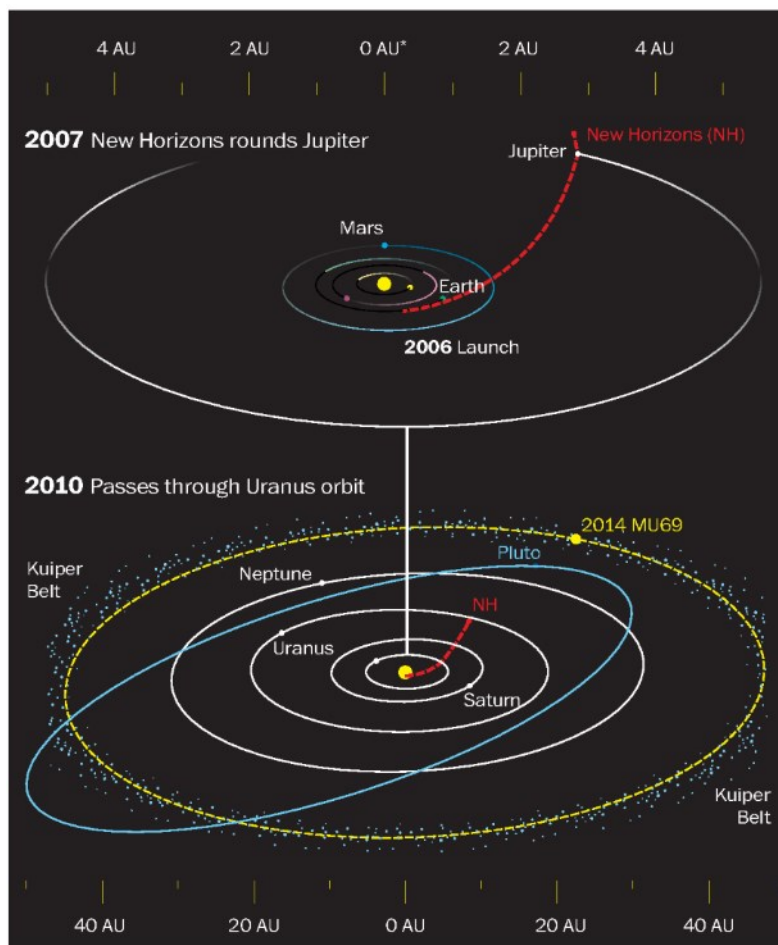
The team leaders keep reminding everyone that New Horizons is carrying a trove of data, including high-resolution imagery, that has yet to return home. The big Pluto download won't be finished until about the end of October 2016. Transmission rates are slow, and will get even slower, as the distant spacecraft gets more distant.

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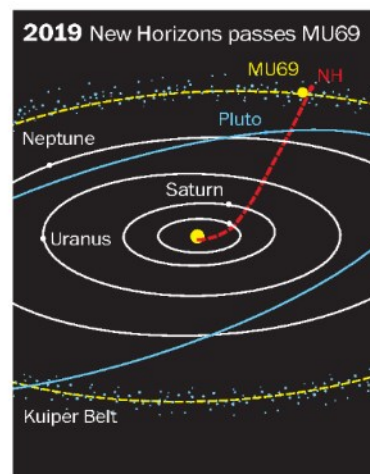
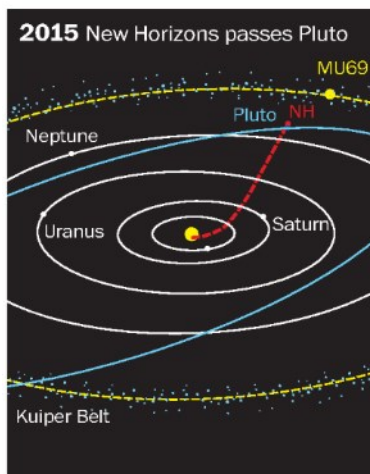
New Horizons aims for Kuiper Belt object

Almost a decade after liftoff from Cape Canaveral, Fla., NASA's New Horizons spacecraft has passed Pluto and is cruising through the Kuiper Belt, a region with millions of small, icy bodies that form a ring around the solar system beyond the orbit of Neptune.

NEW HORIZONS FLIGHT HISTORY AND NEW TARGET



At some point this fall, the spacecraft will fire its hydrazine thrusters and make a slight course adjustment toward an object roughly 28 miles in diameter and known as **2014 MU69**. If NASA approves the extended mission, New Horizons will encounter, and make observations of, MU69 on Jan. 1, 2019. After passing the object, the probe will continue to travel toward interstellar space.



Source: NASA

*Astronomical units (One AU is the distance from Earth to the sun).

THE WASHINGTON POST