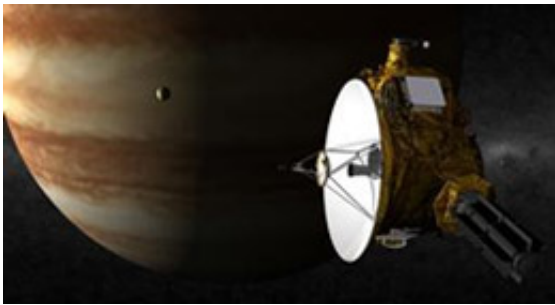


New Horizons mission nearing Pluto after nine years in space

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Artist impression of the New Horizons spacecraft as it approached Jupiter en route to Pluto. Credit: NASA

It took the spacecraft New Horizons, hurtling from Earth faster than any mission before it, a matter of hours to pass the moon's orbit and a year to reach Jupiter's gravity.

Nine years into its journey, it's finally approaching its destination: Pluto.

Much has changed since scientists at the Johns Hopkins Applied Physics Laboratory in Laurel, Md., conceived the mission a decade and a half ago. Astronomers found two more moons orbiting Pluto, observed changes in its thin atmosphere, and determined the distant object wasn't a planet, after all.

But they expect those discoveries to pale compared to the observations

New Horizons will record once they wake it from hibernation Saturday, and as it approaches an encounter with Pluto in July. They organized the mission to learn more about Pluto's composition and characteristics, and how planets formed in the early universe.

Scientists have waited patiently for the data, and they have more waiting ahead: The bulk of the data New Horizons collects in July will take days or weeks to beam back to Earth in chunks - and could yet take years to fully grasp.

"There's been a lot of delayed gratification," said Hal Weaver, the lab's New Horizons project scientist.

But scientists say it will be worth the wait. Relatively little is known about Pluto, an object smaller than Earth's moon and more than 15,000 times farther away. Only in recent years have ground-based telescopes been developed that are powerful enough to see it in any detail.

Since Pluto's discovery in 1930, astronomers have been able to make only tentative hypotheses about it and other objects around it.

"That's where we would be stuck if we didn't have a mission," said Keith Noll, chief of the planetary systems laboratory at NASA's Goddard Space Flight Center. His lab is not directly involved in the mission, but studies Pluto and other objects at the edge of the solar system.

"You're just groping in a dark room, but this is going to be like turning on the light switch."

NASA approved the Hopkins scientists' plans to design, build and operate New Horizons in 2001. The mission was canceled twice, and other initiatives to explore Pluto could not get past fits and starts amid NASA budget cuts.

It launched in January 2006, within a window that would allow it to make the journey from Earth in 9½. When it escaped Earth's gravity, rockets propelled it away at 36,000 mph, and when it passed Jupiter a year later, engineers were able to use the gaseous giant's gravity to increase that speed by 20 percent - cutting its journey by three years.

At that point, it wasn't even a quarter of the way to its target.

Meanwhile, back on Earth, the International Astronomical Union demoted Pluto in 2006 from planet to the newly defined [dwarf planet](#) - an object that orbits the sun and is massive enough to have been rounded by its own gravity, but which has not exerted enough gravitational pull to clear its neighborhood of other objects.

Aside from semiannual checkups and some brief observations of Jupiter - it watched bursts of electrically charged particles spewing from the planet, and eruptions on one volcanic moon - New Horizons has otherwise been idly cruising.

But it is set to spring to life Saturday afternoon, under commands programmed into its computer in August. At about 4:30 p.m., it's expected to send word that it is in "active" mode - a message that, even traveling at the speed of light, will take 4½ hours to reach Earth.

At that point, New Horizons should be 162 million miles from Pluto, less than two astronomical units (the distance between the Earth and the sun).

In mid-January, its payload of seven instruments is to begin observing Pluto from afar. They include sensors to image the dwarf planet's system in infrared and ultraviolet light and two cameras, and should be able to record increasing detail leading up to the planned July 14 fly-by.

Scientists have a long list of goals, Weaver said, including mapping the

composition of Pluto and its largest Moon, Charon, down to a scale in kilometers, as well as the planet's atmosphere, which is somewhere between 100,000 and 1 million times thinner than that of Earth. They know the surface contains frozen ethane, and that the atmosphere contains nitrogen and traces of methane and carbon monoxide, but expect to get a more detailed picture using New Horizons' instruments.

They also plan to get a closer look at Kerberos and Styx, two smaller moons that the Hubble Space Telescope spotted in 2005, and to search for any other moons or rings around Pluto.

But gathering the observations isn't as simple as pointing and shooting a camera. The distance to Pluto is so far that it's difficult to measure with precision, said Mark Holdridge, mission manager of the Pluto encounter. And because 248 years pass on Earth each time Pluto revolves around the sun, scientists haven't observed enough of it to map its orbit with certainty.

Thus, they have an estimate of when New Horizons will pass by, but they need the actual timeline of the fly-by to fall within about 7 minutes of their calculations.

"If we're off by a certain amount, we could get a lot of black space," Holdridge said. "That would be very disappointing for everyone who has worked on this [mission](#) for the last 15 years."

While some data should take the 4{-hour trip back to Earth immediately, it could take days or weeks for researchers to get their hands on a richer set of observations, because New Horizons is equipped with only a six-foot-long antenna with the transmission capability of an old telephone-based modem.

"That's the biggest we could fit and still get to Pluto in nine and a half

years," Weaver said. "Since we've been waiting nine and a half years, we can wait another day before sending down some of the greatest data."

And before that, observations sent as New Horizons approaches Pluto could still be better than anything scientists have seen before. It is expected to be only the fifth space probe to escape the solar system, and the first since Voyager 1, which launched in 1977 and entered interstellar space in 2012.

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