



# THE STAR ★ WITNESS



A PUBLICATION OF NASA'S "AMAZING SPACE" EDUCATION PROGRAM

## Special Feature

# A Pluto-bound Spacecraft Gets a Boost From Jupiter

By NASA's Amazing Space reporters  
February 2007

**F**AR ACROSS OUR SOLAR system lies Pluto, a cold, icy world that has never been explored by any spacecraft. Now, a piano-sized satellite named New Horizons is speeding to Pluto.

The unmanned spacecraft has a limited supply of fuel to help it stay on course to Pluto. Otherwise, it is coasting through space. To get to Pluto even faster, the spacecraft swung by Jupiter on Feb. 27 to get a boost from the planet's powerful gravity, like a rock being released from a slingshot. The energy kick from our solar system's most massive planet will increase the spacecraft's speed by roughly 9,000 miles an hour. The increased speed means the space probe will be cruising at over 50,000 miles an hour after passing near Jupiter.

At that speed, astronauts would arrive at the Moon in just five hours, the typical time it takes a commercial jet to travel across the U.S. But it

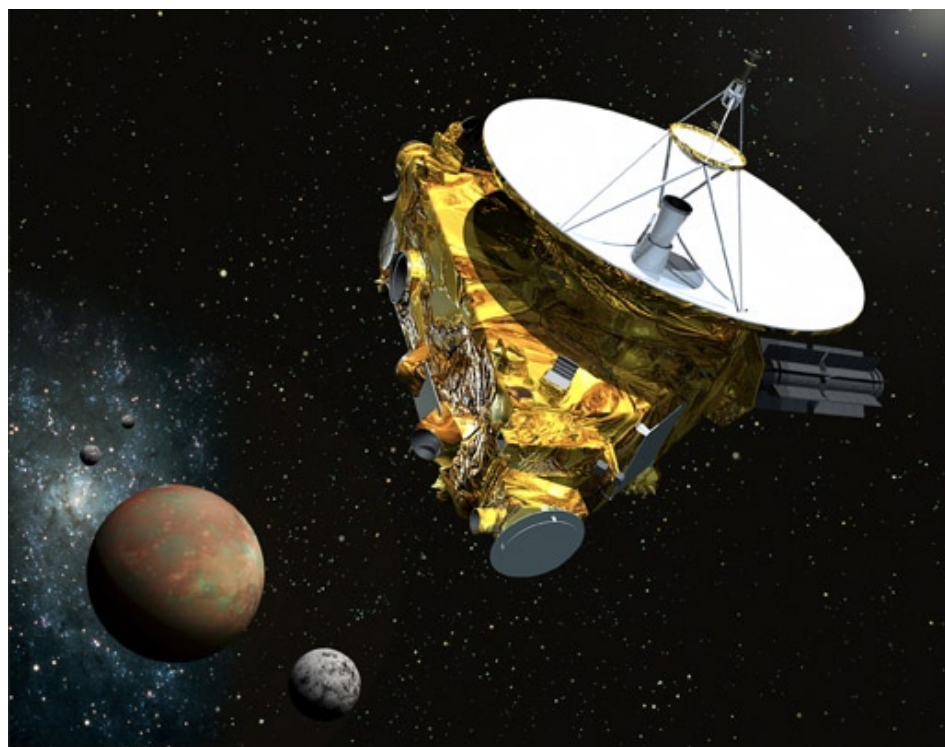


IMAGE: JHAPL/SwRI

**Artist's conception of the New Horizons spacecraft** as it approaches Pluto and its three moons, Charon, Nix, and Hydra, in the summer of 2015.

will take New Horizons another eight years to reach Pluto. Launched in January 2006, New Horizons will arrive at Pluto in 2015. (See New Horizons' timeline, page 4.)

### The vast frontier

Pluto is located on the outskirts of our solar system, where a vast wilderness of icy objects called

*Continued, page 2...*

the Kuiper Belt resides. No other spacecraft has explored this region. Kuiper Belt objects are thought to be leftover material from the creation of our solar system.

New Horizons will explore Pluto, its three moons, and, if an extended mission phase is approved by NASA, the icy worlds in the Kuiper Belt. These frozen bodies have been largely untouched since the birth of our solar system billions of years ago. They therefore could reveal valuable information about the origin and evolution of our solar system planets.

The Hubble Space Telescope has played a supporting role in the New Horizons mission. So far, the telescope has taken the best views of the faraway object. Hubble has mapped Pluto's icy surface and has spotted two new moons. Scientists have used

the Hubble images of Pluto to help plan the New Horizons mission.

### **A cold, cold world**

Pluto is so far from the Sun that its average temperature is a frigid minus 387 degrees Fahrenheit (minus 233 degrees Celsius). Anyone traveling to Pluto would probably find an icy, frosty, dimly lit landscape, perhaps similar to the arctic regions on our planet. The Sun would be a bright point in the sky. Daytime on the distant planet would be much darker than a cloudy, stormy day here at home. But Pluto's sky would be strikingly clear, and in addition to the Sun, thousands of stars would be visible, even in daytime.

### **A tourist's snapshots of Jupiter and its moons**

The New Horizons spacecraft is getting more than a gravity boost from

Jupiter. Like any good tourist, the spacecraft is snapping a few pictures of the planet and four of its largest moons, including Io and Europa (see images, page 3). Jupiter has turbulent air currents in its atmosphere that produce storms as large as Earth. These storms, such as the Great Red Spot, can last for hundreds of years.

Io has more active volcanoes than any solar system body. The volcanoes spew glowing dust and gas into space. Past images of Europa's surface strongly resemble pictures of sea ice on Earth. Beneath Europa's icy surface could be an ocean of liquid water more plentiful than that on Earth.

### **On to Pluto**

New Horizons is the seventh spacecraft to visit Jupiter. Pluto, however, is waiting for its first visiting spacecraft. In 2015, New Horizons will arrive there. ★

## **Hubble's 1996 image and "map" of Pluto**

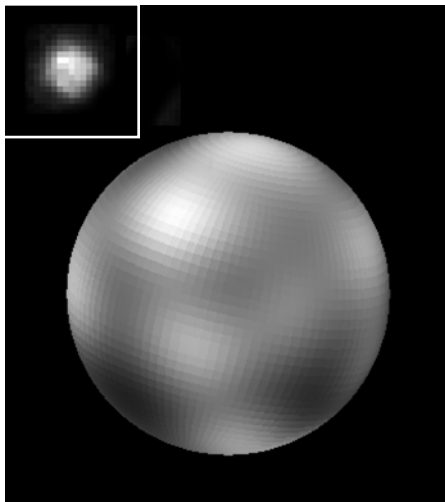
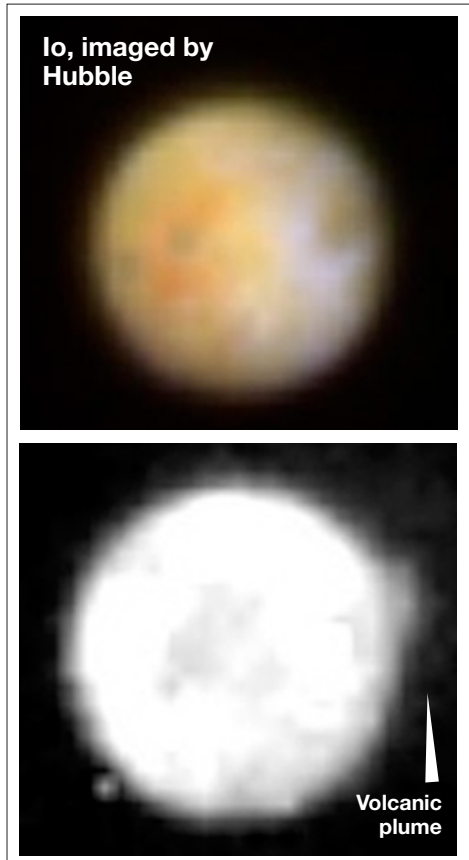
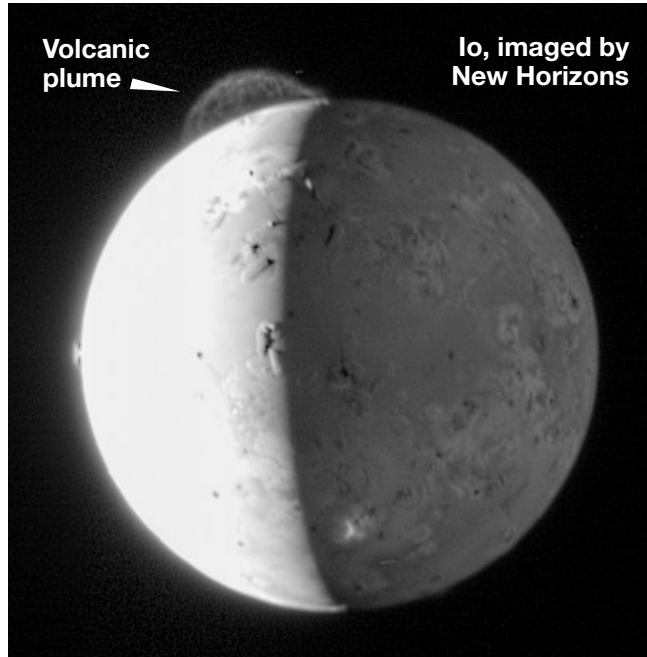


IMAGE: A. Stern (SwRI), M. Buie (Lowell Observatory), NASA, ESA

The Hubble Space Telescope snapped the top left image of Pluto in 1996. Even Hubble's keen eyesight just barely resolves Pluto. Astronomers then turned the image into a map, showing one hemisphere of Pluto. The map, at bottom, reveals some of the light and dark patches on Pluto's surface.

Pluto is only two-thirds the size of Earth's Moon, but 1,200 times farther away. These observations were made when Pluto was 3 billion miles from Earth. They represent our best views of Pluto, so far. The New Horizons spacecraft will give astronomers close-up views of the icy object, revealing more information about this faraway world.

# New Horizons and Hubble witness volcanic eruptions on Jupiter's moon, Io



**Above, left:** This image was taken by the New Horizons spacecraft as it made its closest approach to Jupiter on its long journey to Pluto. The close-up image, taken when the spacecraft was just 1.5 million miles (2.5 kilometers) away, reveals sharp details of Io's surface. The volcanic plume is 180 miles (290 kilometers) high. Io, one of Jupiter's largest moons, has the most active volcanoes in the solar system.

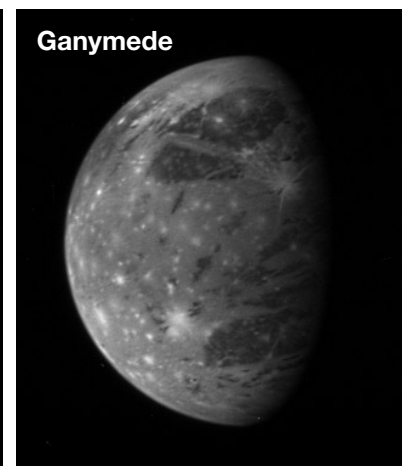
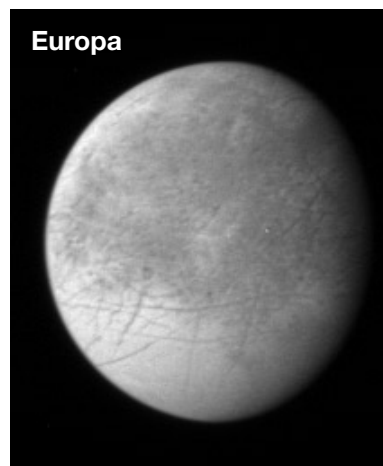
**Above, far right:** These two images were taken by Hubble, which was the first telescope to spy the volcanic outburst. The image at top shows the moon as we would see it if we could travel there. The bottom image was taken in ultraviolet light to capture the volcanic material streaming into space. The Hubble images of Io do not show as much detail because the telescope is much farther away from the moon than New Horizons. The Earth-orbiting telescope is about 500 million miles (800 million kilometers) from Io, nearly 500 times farther away from the moon than New Horizons was when it snapped its image.

IMAGE above, left: NASA/JHUAPL/SwRI  
IMAGES above, right: NASA, ESA, and J. Spencer (SwRI)

## New Horizons snaps other moons of Jupiter

New Horizons took close-up views of two of Jupiter's moons, Europa and Ganymede. Europa, at right, shows breaks on the moon's icy surface, which appear as lines. Astronomers think that an ocean lies beneath the icy surface.

Ganymede, at far right, reveals dark patches of ancient terrain. The icy surface is peppered by more recent impact craters that have splashed fresh, bright ice across the surface. Ganymede is the largest moon in the solar system.

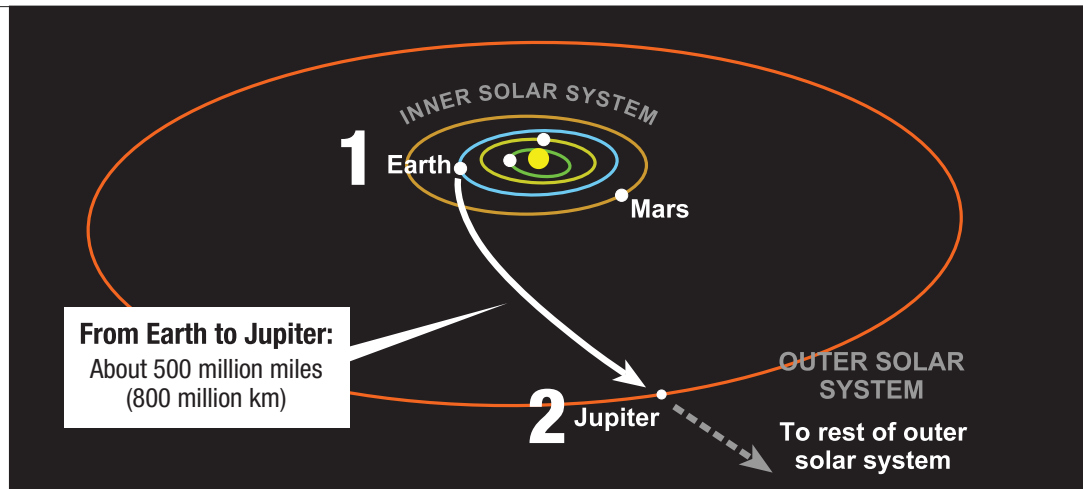


IMAGES: NASA/JHUAPL/SwRI

# Timeline of New Horizons' nine-year journey from Earth to Pluto

## One year from Earth to Jupiter

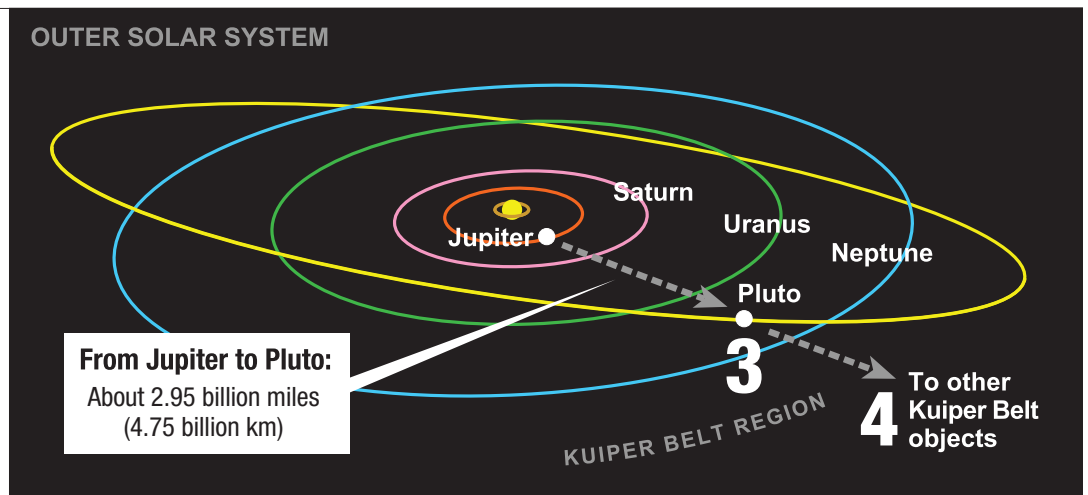
- 1 Jan. 2006**  
Launch
- 2 Feb. 2007**  
Jupiter flyby; observations and gravity boost



## Eight more years to Pluto

Up to 2015: Cruise past the orbits of Saturn, Uranus, and Neptune

- 3 July 2015**  
Encounter with Pluto
- 4 2016 to 2020**  
Observe other Kuiper Belt objects



Space Telescope Science Institute, Graphics Dept.

Notes: Illustration at top shows planets' positions as of Feb. 27, 2007. The paths shown in the two diagrams do not represent the actual trajectory of the spacecraft. The inner and outer solar systems are depicted at two different scales. The inner solar system is not visible on a diagram of the complete outer solar system, because the outer solar system stretches so much farther away from the Sun.

SEE MORE Hubble images and read more Star Witness news stories at Amazing Space, NASA's award-winning educational Web site for K-12 students and teachers.

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