

# Discovery of Pluto's Two New Moons Provides Spectacular Prelude to New Horizons Launch

By Barry Davidoff

The outer fringes of the solar system grew by two objects with the discovery of two new moons orbiting Pluto. The two new moons are estimated to be 140 kms. (S/2005 P1) and 125 kms. (S/2005 P2) in diameter and orbit Pluto at distances of 65,000 kms. and 49,000 kms. respectively. The new moons are a small fraction of the size of Charon, the only moon of Pluto that had been discovered, which has a diameter of 1170 kms.

The sighting of the new moons coincides with the 75<sup>th</sup> anniversary of the discovery of Pluto in 1930 by Clyde Tombaugh at the Lowell Observatory. Finding the two moons provides a propitious start to the launch of the New Horizons spacecraft in January, which will be first space probe to fly by Pluto nine years later in July 2015. Pluto is one of the most mysterious objects in the solar system and the discovery of the two new moons will only add to the debate of whether it is a ninth planet or one of the thousands of Kuiper Belt Objects. Although many Kuiper Belt Objects have a single satellite, Pluto becomes the first object at the end of the solar system with multiple moons.

## The Discovery

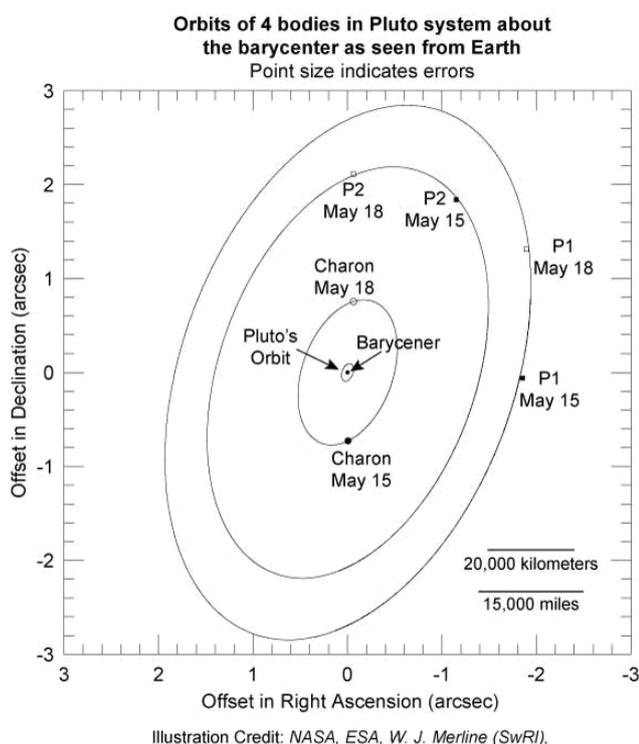
Since Pluto lies in a different orbital plane than the rest of the solar system, it is the only planet that has not been

visited by a space probe to provide detailed information. The New Horizons probe was designed to fill this void. In preparation of the New Horizons mission, a request was made to NASA to use the Hubble Space Telescope to search for other moons that might be orbiting Pluto. Charon had been discovered in 1978 using earth bound telescopes, but it is nearly half the diameter of Pluto itself. The request for time on Hubble had to wait until time was available in spring 2005 and Pluto was in a good position for observation.

Hubble was aligned to take successive photos of Pluto on May 15<sup>th</sup> and 18<sup>th</sup> showing the area out to a diameter of 2 million kms. from the planet. The Hubble photographs were designed to show objects as low as magnitude 27, which is and half a billion times fainter than the human eye can see.



An Atlas V rocket similar to this one will launch the New Horizons probe to Pluto in January.



After examining the photos, which can be seen in Bildgaleriet, the New Horizons team discovered two small objects that circled Pluto in nearly the same plane as Charon. Both moons orbit Pluto in near circular orbits at distances of 65,000 and 49,000 kms. which confirmed their existence as satellites and not Kuiper Belt Objects. Due to the

high resolution of the Hubble photos it is unlikely that other satellites of Pluto will be discovered that are greater than 20 kms. in diameter.

Immediately the team searched for additional evidence and in re-examining photos taken of Pluto on June 14, 2002, the team found other images of the two new moons. The two new moons are both of the 23<sup>rd</sup> magnitude and 100,000 times fainter than Pluto itself. Unfortunately, since Pluto is currently in the glare of the sun additional Hubble photos will have to wait until February 2006. Similarly since Pluto is barely visible over the horizon and sets immediately after twilight, the large earth based telescopes will not be able to provide confirmatory images until the same time.

### Theories of Moon Formation

Naturally little is known about the new moons from the relatively few photos that were taken by Hubble. Charon is the largest satellite in the solar system relative to the planet it circles. Charon has almost half the mass of Pluto. The events forming Charon and the two new satellites provide enticing clues about the early solar system.



*Pluto and Charon to scale with each other and the United States; the new satellites, S/2005 P 1 and S/2005 P 2 are about half as large as the letter that spells "P" in "Pluto."*

One of the team of discoverers, Bill Merline of the Southwest Research Institute in Boulder Colorado, believes that since the two moons are in the same orbital plane as Charon and Pluto's equator, all three moons were formed at the same time. About 4 billion years ago as the solar system was being shaped a large object collided with Pluto as it was forming breaking off nearly half its mass. The largest mass coalesced to form Charon and the remaining debris formed the two new moons. This theory is similar to the events that created our own moon when there was collision with the proto-earth.

Other scientists believe that the two new moons are merely other Kuiper Belt objects that were captured by Pluto's gravity. It is hard, however, to model the gravitational process that would place the two new moons into the same orbital plane as Charon. As more information about the two new moons becomes available there will be changing tides of theories.

### New Horizons Launch

NASA's mission to the outmost planet commences with the scheduled January 11<sup>th</sup> launch of the New Horizons space probe by an Atlas V rocket. New Horizons will revolutionize Plutonology, including its new moons, the Kuiper belt and the outer limits of the solar system on its twenty year mission.

The probe weighs about 450 kg with a thick triangular base and a 2.5 meter diameter radio dish antenna on top. It carries five major scientific instruments including telescopic cameras, CCD imagers and spectrometers which will map Pluto and its three moons with a resolution as high as 25 meters per pixel. Experiments will measure the composition and temperature of Pluto's atmosphere and chart the solar wind as it flows past the planet.



*Artist rendering of the New Horizons space probe flying by Pluto in July 2015*

When New Horizons is launched in January, it will be the first time that the Atlas V is used with five strap-on boosters to provide the additional thrust to propel the probe towards Pluto. Although there was damage to one of the boosters during Hurricane Wilma in October, it is not expected to delay the launch. Another booster has been substituted for the damaged one.

The planned trajectory will direct the probe towards Jupiter where the gravity of the gas giant will sling shot New Horizons and add speed for the trip to Pluto. It will reach Jupiter in March 2007 where it will spend four months imaging the planet. After another 8 years it will reach Pluto on July 14, 2015 providing the first detailed images of the planet and its three moons. Following its encounter with Pluto it will then explore the Kuiper Belt for five to ten years.

It was anticipated when New Horizons was designed that new moons would be discovered so its software is very flexible. The probe can be reconfigured during its long journey to obtain images of asteroids and Kuiper Belt objects that were unknown at its launch.

The New Horizons team already has chartered new territory with the exciting discovery of two new moons of the outermost planet, which can only serve as the opening act of the wealth of information that the probe will provide.