

# **The IAU Changes our Solar System: Pluto Demoted**

For more than seventy-five years, our solar system has been made up of nine planets: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, and Pluto. However, on August 24<sup>th</sup>, 2006, the International Astronomical Union (IAU) voted to demote Pluto because of the revised qualifications of a planet. Now, Pluto has been removed from the list of planets and is considered a “dwarf planet”. This ruling changes our solar system and demonstrates our expanding knowledge of what lies within our universe.

The purpose for this essay is to merely describe how and why our “ninth planet” was demoted. Some people might have missed the news or forgot to pick up the newspaper that day and deserve to know why their solar system has changed. This paper is not opinionated, but a representation of scientific information. This essay is meant for students who have completed a 6<sup>th</sup> grade Earth/Space Science class. The intent of this paper is to provide a deeper understanding of Pluto for this audience and why it was ejected from the classification of “a planet”.

## **Discovery of Pluto**

Pluto was first discovered at the very edge of our solar system on February 18<sup>th</sup>, 1930 by astronomer Clyde W. Tombaugh. Scientists predicted that an unseen planet was causing irregularities in the orbits of the planets beyond Saturn. Having compared thousands of photographs looking for changing positions of any stars, his discovery has been called a “lucky accident” since the original calculations predicting orbital irregularities were in error. Although the composition of Pluto has not been identified, scientists predict that based on its density it is comprised of 70% rock and the remainder is frozen liquids. Three moons have also been

discovered around Pluto - Charon, Hydra, and Nyx. With an elliptical orbit, Pluto's average distance from the Sun is about 3,670,050,000 miles, 39 times the distance the Earth is from the Sun; a year on Pluto takes 247.7 Earth years. Pluto's surface area is 6,430,000 miles<sup>2</sup> and it has a volume of 1,530,000,000 miles<sup>3</sup>. With these impressive statistics, why was Pluto demoted?



Figure 1: Hubble Telescope Image of Pluto and Charon Credit: NASA

## **Definition of a Planet**

The parameters for the classification of a celestial body as a planet have been defined by the International Astronomical Union (IAU). Founded in 1919, the IAU's mission is "to promote and safeguard the science of astronomy in all its aspects through international cooperation." According to the IAU, its members are professional astronomers who are active in astronomical research and education. During the general assembly of the IAU on August 24, 2006, its members voted on the clear definition of a "planet". Resolution 5A states, "(1) A 'planet' is a celestial body that (a) is in orbit around the Sun, (b) has sufficient mass for its self-gravity to overcome rigid body forces so that it assumes a hydrostatic equilibrium (nearly round) shape, and (c) has cleared the neighbourhood around its orbit." Resolution 5A also defines a dwarf planet, "(2) A 'dwarf planet' is a celestial body that (a) is in orbit around the Sun, (b) has sufficient mass for its self-gravity to overcome rigid body forces so that it assumes a hydrostatic equilibrium (nearly round) shape, (c) has not cleared the neighbourhood around its orbit, and (d) is not a satellite."

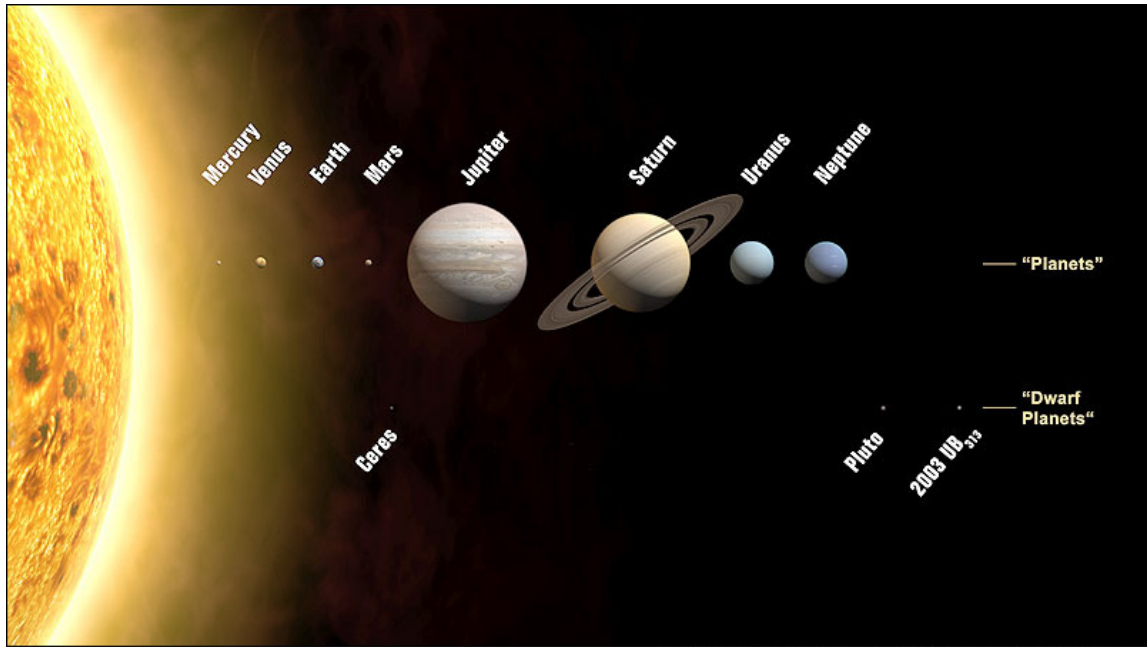


Figure 2: The new solar system as defined by the IAU with Pluto demoted to dwarf planet. Credit: International Astronomical Union/Martin Kornmesser.

## How does Pluto Compare?

Using Resolution 5A, Pluto was reclassified under the definition of a dwarf planet and was officially demoted from planet status. Several characteristics of Pluto led to this conclusion. Although Pluto met the criteria of being in orbit around the Sun, the other requirements caused scientists to question whether Pluto should be deemed a planet or demoted to dwarf planet. For instance, Pluto has the least mass of any planet in our solar system, .002% of Earth’s mass. Another characteristic that was significant was the fact that Pluto’s moon, Charon, is half the size of Pluto. By contrast, all other moons are considerably smaller than their respective planets. In addition, Charon is in synchronous orbit around Pluto, taking exactly one Pluto day to complete its cycle. This behavior had lead many scientists to think of Pluto/Charon as a double planet before the 2006 reclassification. Another observation astronomers have made about Pluto that sets it apart is that it rotates on its axis in the opposite direction of most other planets. Finally,

Pluto's orbit around the Sun is unique compared to the other planets. While most planets rotate around the Sun in a relatively flat plane, Pluto has the largest inclination in its orbit than any other planet at an angle of 17.15°. In addition to the tilt, the shape of Pluto's orbit is exceptionally elliptical and erratic with wide variances in its distance from the Sun during its orbital rotation. In fact, between January 1979 and February 1999, Pluto's orbit was actually within the orbit of Neptune, making Neptune the outermost planet of our solar system for those years. All of these factors lead key astronomers in the International Astronomical Union to classify Pluto as a dwarf planet rather than a planet.

### What Lies Ahead

The best images of Pluto have been taken by the Hubble Space Telescope orbiting the Earth, but these photos are blurry pictures of what the surface of Pluto really looks like. Unlike the other eight planets, no spacecraft has visited Pluto to date. Since 1992, astronomers have discovered many objects beyond the orbit of Neptune and have named them Kuiper Belt Objects (KBO's).

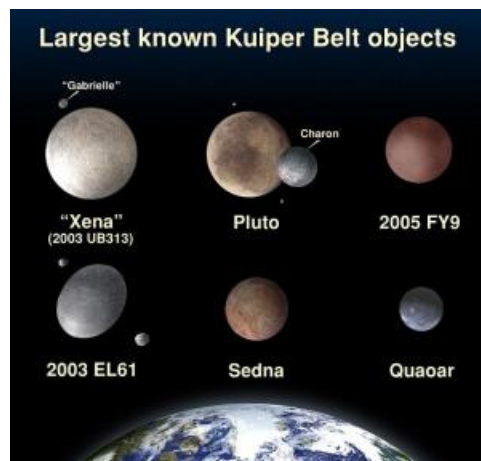


Figure 3: Largest known Kuiper Belt Objects shows Xena slightly larger than Pluto. Credit: NASA, ESA, and A. Field (STScI)

In 2006, the U.S. National Aeronautics and Space Administration (NASA) launched a probe named New Horizons. This probe is expected to fly past Pluto in the summer of 2015 and

gather scientific data about the objects in the Kuiper Belt. As our knowledge of space grows through greater technological advances and our understanding of the celestial elements increases, we can expect further discoveries, changing the landscape of our universe.

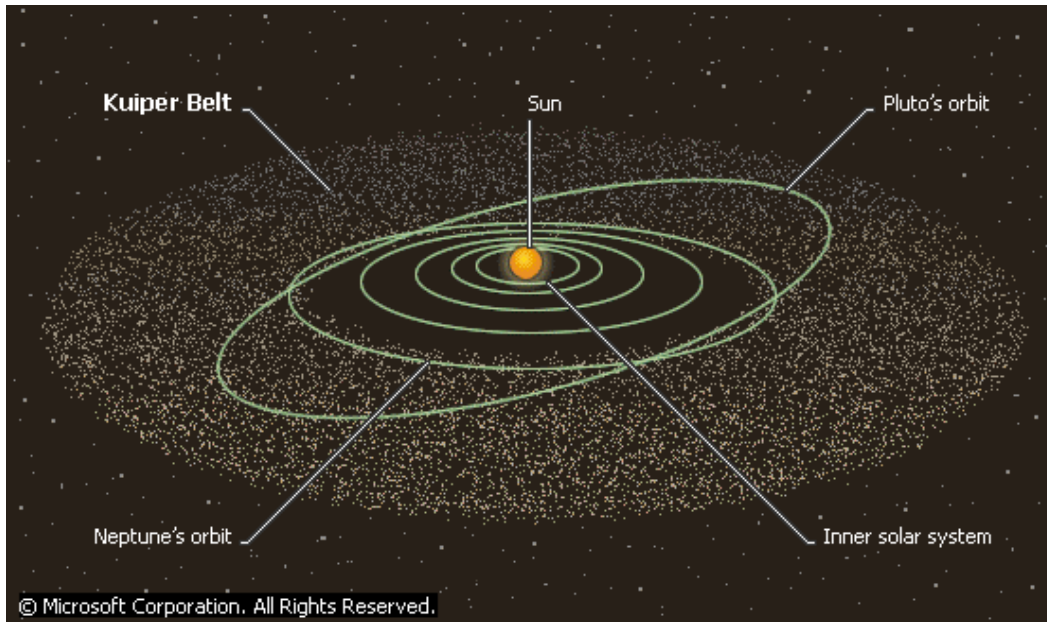


Figure 4: Kuiper Belt Credit: Microsoft © Encarta © 2007. © 1993-2006 Microsoft Corporation. All rights reserved.

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