New Directions for Pluto: From Clyde Tombaugh Beginnings

By Janet Ivey, Janet's Planet, Inc.

March 13th, 2015 marks the 85th anniversary of the official announcement of Clyde Tombaugh's discovery of Pluto on February 18, 1930.

Clyde William Tombaugh, an American astronomer, was born in Streator, Illinois on February 4, 1906. Clyde developed an early love of astronomy after an uncle loaned him a telescope. A graduate of Burdett High School in 1925, he was financially unable to attend college because a devastating hailstorm destroyed his family's farm. Despite his dreams of university being delayed, Clyde Tombaugh pursued his interest in astronomy, and, in 1926, built his first homemade telescope. He built two more telescopes in the next two years, mastering optics, grinding his own lenses and mirrors, and further honing his observational skills.

Using these homemade telescopes, Tombaugh made drawings of the planets Mars and Jupiter and sent them to the Lowell Observatory in Flagstaff, Arizona. The staff there was so impressed by his work that in 1929, Tombaugh was hired to conduct systematic planet-search photography at Lowell. Specifically, he was hired to attempt to find what was called "Planet-X," thought to be on the fringes of our solar system, which had been hypothesized by Percival Lowell and William Pickering.

Tombaugh used the observatory's 13-inch astrograph to take photographs of the same section of the sky several nights apart. He then used a blink comparator to compare the different images. When he shifted between the two images, a moving object, such as a planet, would appear to jump from one position to another, while the more distant objects such as stars would appear stationary. Tombaugh noticed such a moving object in his search, near the place predicted by Lowell, and subsequent observations showed it to have an orbit beyond that of Neptune. This ruled out classification as an asteroid, and the team at the Observatory decided this was the ninth planet that Lowell had predicted. Clyde's discovery was made on Tuesday, February 18, 1930, using images taken the previous month.

Pluto was given its name by Venetia Burney Phair, an 11-year-old from Oxford, England whose "Papa" worked for the Royal Astronomical Union. Venetia's suggestion, "Pluto," won out over numerous other suggestions because it was the name of the Roman god of the underworld who was able to render himself invisible, and because Percival Lowell's initials PL formed the first two letters. The name Pluto was officially adopted on May 1, 1930.

Smaller than Mercury and billions of miles from the Sun, the discovery of Pluto with the technology of the time is an enduring testament to Tombaugh's

dedication and eye for detail. It was discovered that the original calculations given to Tombaugh were incorrect, so that he found Pluto is even more astounding. He was awarded the Jackson-Gwilt Medal and Gift by the Royal Astronomical Society in recognition of his discovery, as well as a scholarship to the University of Kansas. Tombaugh earned a bachelor of science in astronomy in 1936 and completed his masters of science in astronomy in 1939.

When asked later in life about how he discovered Pluto in only 10 months of being at Lowell Observatory with no college education, Tombaugh said, “You have to have an alertness to deal with the unexpected. The history of science is filled with almost-made discoveries, missed by a hairline because they didn’t have the alertness to realize they had a discovery.”

During his fourteen years at the Lowell Observatory, Clyde Tombaugh discovered hundreds of variable stars and asteroids, and two comets. While engaged in the search that yielded Pluto, he also found many previously unknown star clusters, clusters of galaxies, and a nova. He mapped the Great Perseus-Andromeda Stratum of Extra-Galactic Nebulae, one of over 29,000 galaxies he documented. Clyde Tombaugh also discovered hundreds of asteroids in his lifetime as an astronomer.

The asteroid 1604_Tombaugh, discovered in 1931, is named after him. The first Asteroid he discovered in 1929 was called 2839 Annette and came about mostly as a result of his search for Pluto and other celestial objects. Tombaugh named some of the asteroids he discovered after his wife, children, and grandchildren.

By the time Clyde Tombaugh retired, he and his Planetary Patrol researchers had confirmed the daily rotation period of Mercury, determined the vortex nature of Jupiter’s Great Red Spot, and developed a new photographic technique for the small Earth satellites search. Reflecting on his career late in his life, Tombaugh often said: “I’ve really had a tour of the heavens.”

Tombaugh conducted astronomical research long after his 1973 retirement. When the Smithsonian Institute asked if it could display and exhibit the nine-inch telescope he constructed in 1928 with which he made the drawings that impressed the Lowell Observatory staff, he told them he was still using it. Until shortly before his death, Tombaugh used that telescope, built with parts of discarded farm machinery and a shaft from his father’s 1910 Buick, to make observations from his back yard in Mesilla Park, near Las Cruces.

On January 17, 1997, Clyde W. Tombaugh died at his home at the age of ninety-one. After he was cremated, some of his ashes were placed aboard NASA’s New Horizons spacecraft, which was launched on January 19, 2006. New Horizons will reach Pluto in July 2015 and provide the first views of this icy world.

In August of 2006, the International Astronomical Union decided it needed to create a definition of exactly what makes a planet a planet. The IAU downgraded

Pluto's planetary status to dwarf planet because Pluto only meets two of their three criteria:

> 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 has cleared the neighborhood around its orbit.

Of the approximately 10,000 internationally registered members of the IAU in 2006, only 237 voted in favor of the resolution redefining Pluto as a "dwarf planet" while 157 voted against; the other 9,500 members were not present at the closing session of the IAU General Assembly in Prague at which the vote to demote Pluto was taken.

Alan Stern did not like the move then, and he does not like it now. Stern, a planetary scientist at the Southwest Research Institute in Boulder, Colorado, thinks the IAU's definition of "planet" is flawed and unscientific.

Stern, the principal investigator of NASA's New Horizons mission, objects to the "clearing your neighborhood" proviso. Stern says,

> Suppose that in your mind, you created a solar system exactly like ours, except at each of the orbits of the nine classical planets, you put an Earth. As you go further outward in the solar system, you cross a boundary where Earth is no longer able to clear its zone, because the zone is too big. It turns out that this happens around the orbit of Neptune, maybe Uranus. So you would have nine identical objects, six of which you would call a planet and three of which you would not. They're identical in every respect except where they are. In no other branch of science am I familiar with something that absurd. 'We're going to call it a cow, except when it's in a herd.' A river is a river, independent of whether there are other rivers nearby. In science, we call things what they are based on their attributes, not what they're next to.

Stern is adamantly opposed to the IAU's definition of a planet "because it produces different categorizations for identical objects, depending on where they are. Get this — Earth at the same distance from the sun as Pluto would not be a planet by the IAU's measure, because Earth can't clear that zone either. When you produce these awkward definitions, you get these weird consequences."

With much debate about Pluto and its status, planetary scientists and astronomers alike are curious as to what will be revealed by New Horizons.

Scientists have a few guesses about what they might find on Pluto. Observations already hint at a dynamic, shifting surface that varies dramatically in both brightness and color. Some scientists suspect they might find evidence for icy volcanic eruptions.

NASA's New Horizons spacecraft is the culmination of a $700 million, nine-year process that will make its closest fly by on July 14th, 2015 and pass within 8,500 miles of Pluto's surface.

What will be revealed? What will we find out? Will New Horizons find other celestial targets that might reveal themselves as planets? Time will only tell … but there are a few things that we can surmise; the IAU may have to reconvene on the definition of a planet, we may reclaim Pluto and welcome it back as an official planet in our solar system, and Pluto's amazing discovery by Clyde Tombaugh may be honored yet again.

What an amazing astronomical year 2015 will be!

Janet of Janet's Planet would love to hear from you. If you Become part of her "Dear Pluto" Letter Writing Campaign and she will share it with the planetary scientists of the New Horizons mission. Let us know what you think. Write your "Dear Pluto" letter and tell Pluto why you think it should be considered a planet and not just a dwarf planet, what you think New Horizons is going to find, and any other insights you have about this icy world. You can even include an art rendering of this icy world along with your "Dear Pluto" letter. You may send it to janet@janetsplanet.com or

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About the Author: Janet Ivey is committed to enriching the lives of children through education and programming. With over ten years in the media, Ivey has captivated many with her work and she has received 11 Regional Emmys and 5 Gracie Allen awards for her work. Most notably, Janet has been recognized for her PBS children's series Janet's Planet. This series is geared to 6 - 10 year-olds and focuses on scientific and historical facts and events. Buzz Aldrin has chosen Janet to be one of his ShareScience Education Ambassadors for his ShareScience Foundation because of her enthusiasm and dedication for science education.

In addition to Janet's Planet, Ivey is celebrating her ninth year as the co-host of PBS's "Tennessee's Wildside" with Bill Cody, has authored two children's books, *Tell Me About Heaven, I Think I'm Forgetting* (Ideal's Children's Books), and *Something's Different In Samesville* (Self-Published). Janet was tapped to be the Assistant Director of the Mother Goose Club, a literacy program targeted at 3-5 year olds that hit the airwaves and the Internet in June 2009. Janet is also a

producer, writer and host for “Arts Breaks,” a three-minute package featuring local art and artists in the Middle Tennessee area for Nashville Public Television.

Editors’ Notes: The downgrading of Pluto to a dwarf planet attracted international media attention and debate in 2006. Interestingly, Pluto’s eccentric orbit and angle to the ecliptic did not seem to feature prominently in the coverage. Debates about the nature of Pluto and its place in the Solar System will no doubt continue for some time, and this article is an interesting contribution to them. ***Gordon Arthur*****.**