Pluto: What Does it Mean?

by Marsha Freeman and Benjamin Deniston

July 26—New Horizons' Pluto flyby has opened our eyes to a surprisingly active and dynamic world—shocking the scientific community. What might we make of these surprises, these anomalies? What are we really looking at?

Following the path created by Nicolaus of Cusa's defining and founding modern science,[1], Johannes Kepler discovered that the Earth was a subsumed member of the higher order harmonic organization of the Solar System.[2] Today we look to a further step along that path, to understand the Solar System as a subsumed feature of an even higher order process, our Galaxy.

This challenge was recently elaborated in the LaRouche PAC Scientific Team Research Report, "Towards a Galactic Science Driver."[3] This galactic perspective points towards a new framework to examine otherwise anomalous or unexpected features of our Solar System, as Pluto has provided the most recent provocations, even though we don't yet really know the meaning of what we've seen, or of the much more we are yet to see of Pluto.

Already, the New Horizons spacecraft has disproven much of accepted knowledge. Pluto, it turns out, is not a cold, distant world so small that its arrested planetary evolution created an inert body, with few distinguishing features. New Horizons has shown us a planet with smooth icy plains and mountains and troughs, indicative of a geologically-active body, and an atmosphere that is evolving and in complex interaction with the solar wind.

It will take more than a year for the complete set of data that is currently stored in the memory of New Horizons to be transmitted to Earth (while New Horizons continues to record and send back more data, as it proceeds still further into the outskirts of the Solar System).

1. Nicholas of Cusa, *De Docta Ignorantia,* 1440.
2. Johannes Kepler, *Harmonices Mundi*, 1619.
3. Benjamin Deniston and Meghan Rouillard, "Towards a Galactic Science Driver," *EIR*, July 17, 2015.

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Pluto's place in the Solar System—and a closeup taken by New Horizons just hours before its closest approach.

But already, even with less than 5% of the recorded data now in the hands of scientists, there have been many shocks.

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SWAP (Solar Wind Around Pluto instrument) being installed on the New Horizons spacecraft, on March 8, 2006. It will provide scientists with a picture of the character of the solar wind, three billion miles from the Sun, and its interaction with Pluto's atmosphere.

Pluto's Family and Stellar System Structures

Before 1992, scientists conceived of our Solar System as being divided into two regions, one containing the four solid-bodied terrestrial planets (Mercury, Venus, Earth and Mars), and the other, the four gas giants (Jupiter, Saturn, Uranus and Neptune), separated from them by the asteroid belt. Pluto, since its discovery in 1930, was an anomaly—a very small icy body, with a highly-irregular orbit beyond Neptune, which somehow never made it to full planethood.

In that year (1992), observational proof was obtained for a theory that Dutch-born astronomer, Gerard Kuiper, had put forward in the 1950s—that beyond the orbit of Neptune, there was a belt of small primitive icy bodies, too small to have coalesced into planets billions of years ago. This stunted evolution, it was proposed, would provide scientists with samples from some of the earliest phases in the development of the Solar System. In 1992, astronomers discovered a small body a billion miles beyond Pluto (named 1992 QB1), and since then, more than 1,000 additional objects have been found, defining what we now call the Kuiper Belt. It has been estimated that there could be over 100,000 bodies larger than 100 kilometers in diameter populating this second belt (tens of times wider and tens to hundreds of times more massive than the asteroid belt).

Pluto is now considered to be the largest representative of this outer system, and many interesting questions come with the study of this often-ignored second belt. For example, scientists are still trying to explain the anomaly of the "Kuiper cliff," the outer edge of the Kuiper belt, where the number of bodies suddenly drops off very rapidly. This sharp outer-edge goes against expectations, and the cause for this Kuiper cliff remains a mystery.

Additionally, our Solar System isn't the only known stellar system in our galaxy to have a pair of belts. A January 2013 NASA-JPL press release announced the discovery of a warmer inner belt and a cooler outer belt around the relatively young star Vega.[4] As noted in the release, this was actually the second stellar system discovered with similar features, as the star Fomalhaut (also relatively young) was already known to have its own pair of belts. Perhaps most interesting, in all three cases (our Solar System, Vega, and Fomalhaut) the belts have roughly the same relative spacing—with the distance of the outer belt from its star being about ten times the distance of the inner belt.

So Pluto comes to us as a featured part of a rather interesting region of our Solar System.

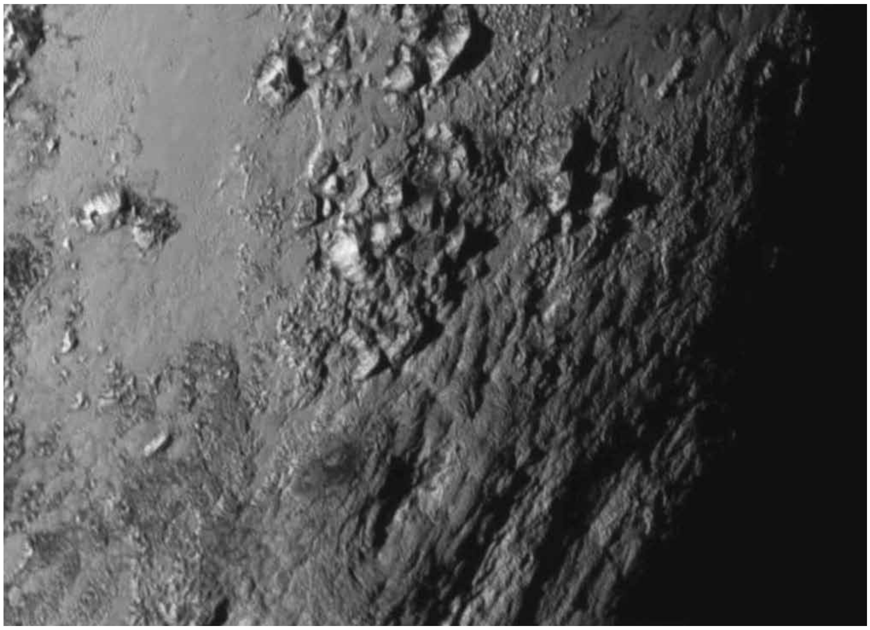
The Pluto System

Before New Horizons, visual images of Pluto, from ground-based telescopes and the Earth-orbiting Hubble Space Telescope, only revealed a fuzzy ball that is highly reflective, indicating fresh snow, and a surface showing markings in shades of red, perhaps from hydrocarbons. It was known that Pluto has an atmosphere, made up of methane, carbon monoxide, and nitrogen,

4. "NASA, ESA Telescopes Find Evidence for Asteroid Belt Around Vega," January 8, 2013.

which exists when Pluto is close to the Sun, but which freezes when Pluto is on its outward path, producing "snow." This lent urgency to the launch of New Horizons, because the 2006 launch meant a 2015 flyby, and by 1989, Pluto's travels in its 248-year orbit had already started it on its path away from the Sun.

Due to its extremely long orbit around the Sun, "the founding fathers had the last opportunity" to study Pluto's atmosphere in 2009, said project scientist Hal Weaver. Pluto's fuzzy visage from afar made it difficult to precisely determine its size, with a round figure used of two-thirds the size of Earth's Moon. It turned out that Pluto, at 1,473 miles in diameter, is a little larger than previously estimated. This change in size means a change in the estimated density of Pluto, indicating a composition consisting of less rock and more ice.



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These icy mountains of Pluto, observed just before its close encounter on July 14, are very young, an estimated 100 million years old. Scientists propose they may still be forming.

Scientists are at a loss to explain the group of moons that are in Pluto's neighborhood. Charon, the largest of Pluto's five moons, which was discovered in 1978, has half the diameter of Pluto—about equal to the width of Texas—and is the largest moon, relative to its planet, in the Solar System. Pluto and Charon are a double planet, or binary system, as they orbit around a common center of gravity. They are also tidally locked, like the Earth and the Moon, with the same face of Pluto always facing Charon. Charon was known to be covered in water ice, but to have no substantial atmosphere. Two smaller moons, Hydra and Nix, were discovered in 2005 using the Hubble Space Telescope, and after the launch of New Horizons, astronomers found the minuscule Styx and Kerberos.

Signs of Geological Activity

From even a distance of 3.3 million miles, the Pluto that was coming into the view of New Horizon's cameras revealed a body with distinct features, some indicating an active geologic past, or even present.

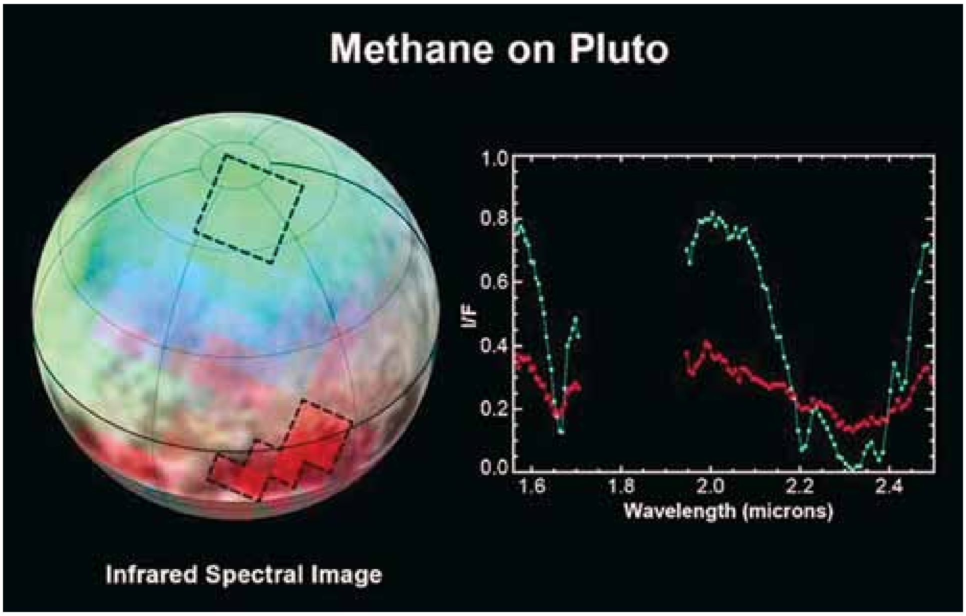
One of these features is what has been described as a "range of youthful mountains," rising as high as 11,000 feet above the surface. The mountain range was named Norgay Mountains, for Tenzing Norgay, one of the first people to reach the summit of Mount Everest. "This may cause us to rethink what powers geological activity on many other icy worlds," said science team member John Spencer. Although methane and nitrogen ice cover much of the surface of Pluto, it is believed they would not be strong enough to support the mountains, and that water ice created the peaks.

On July 21, New Horizon scientists released a new image of Pluto's dominant heart-shaped Tombaugh region, named for Pluto's discoverer, which shows a second mountain range bordering the southern end. This second group of mountains is shorter than the Rocky Mountain-sized Norgay range discovered on July 15th, and, at about a half-mile height, is comparable to the eastern U.S. Appalachian Mountains.

In addition to these impressive mountains, photos have also revealed a dramatic contrast in Pluto's terrain. "There is a pronounced difference in texture between the younger, frozen plains to the east and the dark, heavily-cratered terrain to the west," said Jeffrey Moore, who leads the Geology, Geophysics, and Imaging team. "There's a complex interaction going on between the bright and the dark materials, that we're still trying to understand."

These "younger" frozen plains provide a second feature lending strong evidence to the new conclusion that Pluto has been recently—or is even currently—geologically active.

This large smooth, craterless patch has been named "Sputnik plains." The surface "could be a week old, for all we know," said Jeffrey Moore. Scientists could only describe what was presented as "highly complex." Moore quipped at a July 17th briefing, "When I first saw the images of Sputnik plain, I decided I was going to call it 'not easy to explain terrain.'"



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Although frozen methane was known to be present on the surface of Pluto, before the arrival of New Horizons, the new data indicate it is not evenly distributed.

More detailed images revealed that Sputnik's icy plain contained a surface that is broken up into segments, shaped like irregular polygons. Some of the segments are bordered by what look like shallow troughs, in a complex geology which cannot yet be explained.

These smooth and uninterrupted features are in marked contrast to other minor bodies which don't have the geological activity needed to smooth out the effects of the regular impacts which come with living in the Solar System. Project scientists explained that Pluto's unblemished plains indicate a young, active surface that could still be changing, due to tectonic activity, or erosion. Dr. Alan Stern, Principal Investigator for the mission, reported that although astronomers have seen other geologically active small icy worlds, these are moons of the giant gas planets, and their geologic activity was explained as a result of tidal heating from the planet.

In Pluto's case, he said, there was no body nearby that could be tugging at Pluto, so geologic activity had to be the result of heat generated internally. One possibility is remnant radioactive material in Pluto, and also Charon, but that would require a much higher concentration than is expected for any other planetary body.

Simply stated, no one expected Pluto to be able to be geologically active, and no one knows why or how it is so.

A Galactic Perspective

It is important to look at Pluto's anomalous activity from the standpoint of the recent research report, "Towards a Galactic Science Driver."

A common problem permeating science today is the insistence on investigating these questions from the bottom up. It is assumed that we should start from individual bodies, largely governed by their own internal characteristics, and build up larger systems from the additive accumulation of these self-determined parts. However, we can avoid this bottom-up approach with a renewed focus on the Galaxy as the subsuming, higher order process. In this approach we examine activity and changes in the Solar System as potentially expressing the influence of the subsuming Galaxy.

For example, studies have indicated that periods of intense geophysical activity on Earth correspond with the changing relation of the Solar System to the galaxy.[5] We have additional indications that the most recent periods of volcanic activity on the Moon correspond with the most recent periods of intense volcanic activity on Earth—showing us two supposedly independent bodies coming into and out of volcanic activity simultaneously, as if responding to the same external influence.[6]

Pluto doesn't yet give us any answers; indeed, we don't yet really know what we've been looking at.

5. For example, see "A Vernadskian Reconsideration of Galactic Cycles and Evolution," in "Toward a Galactic Science-Driver," *EIR*, July 17, 2015.

6 See "Earth-Moon Comparative Planetology," in "Toward a Galactic Science-Driver," *EIR*, July 17, 2015.

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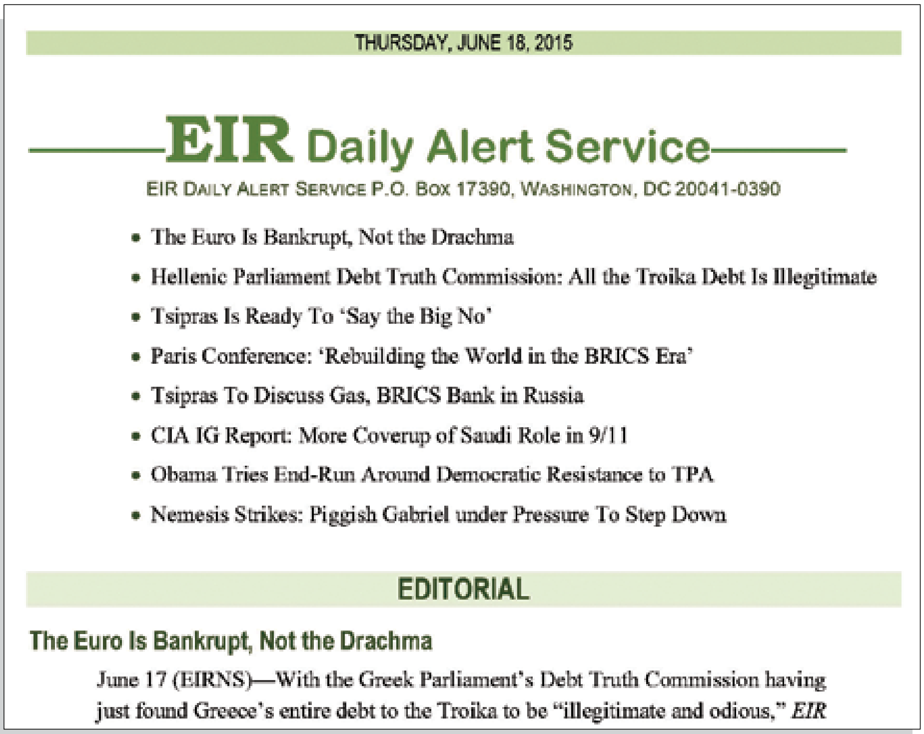

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