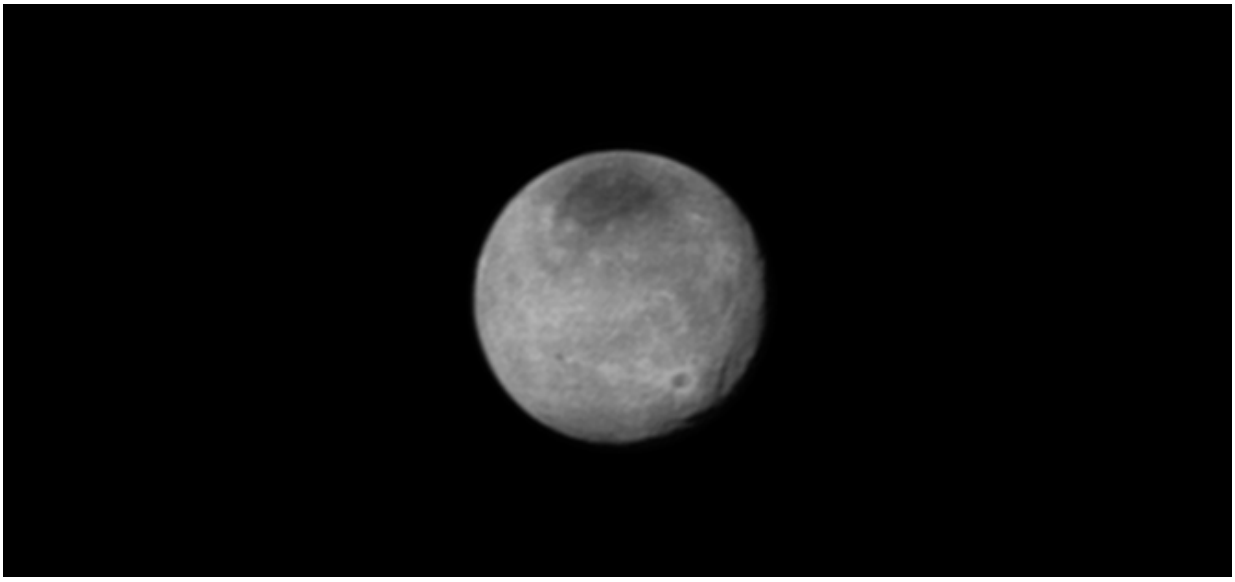
New horizons brings Pluto's mysterious moons into play

July 17 2015, by Geraint Jones



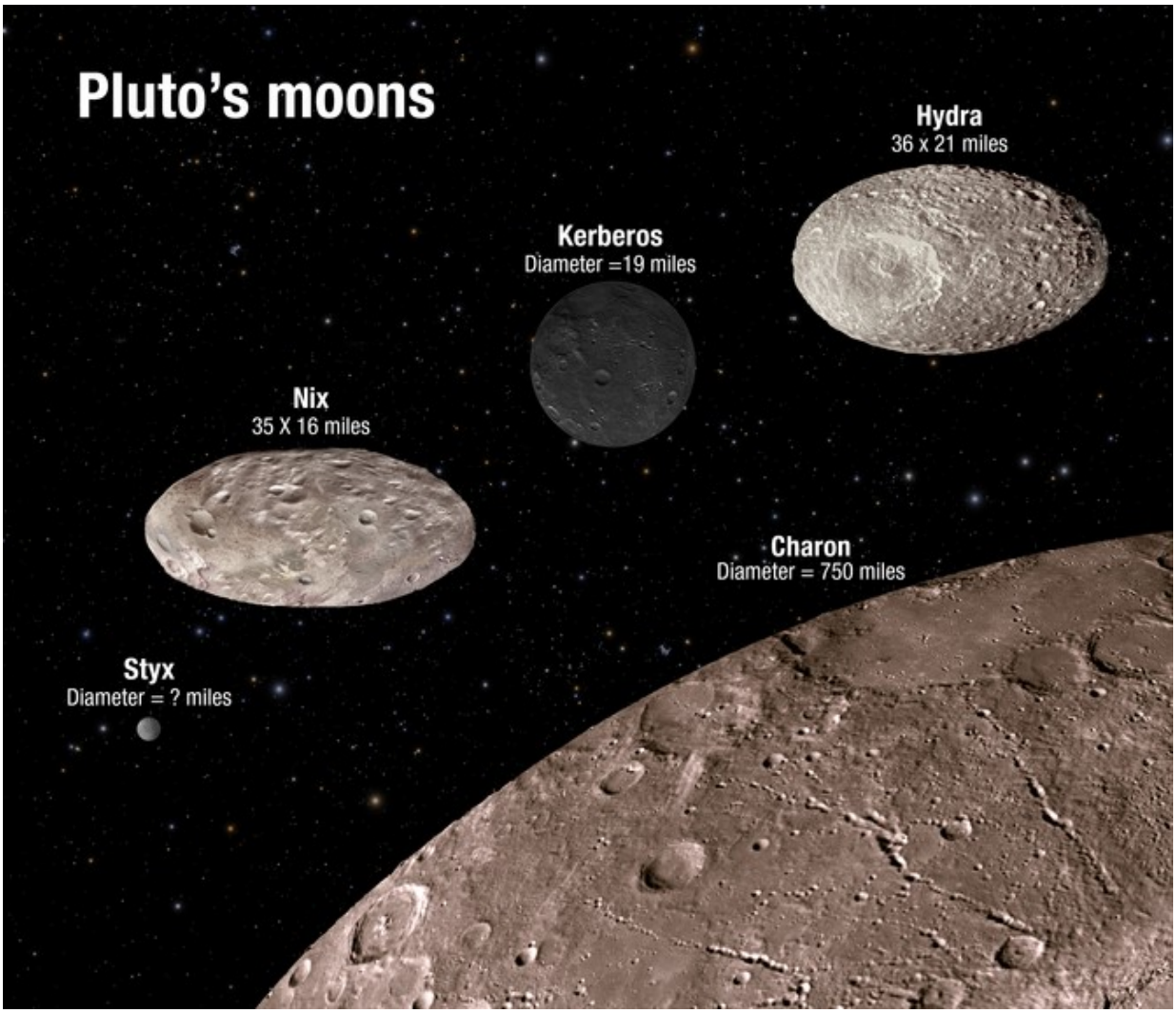
Pluto’s enigmatic companion Charon. Credit: NASA

Drifting along at what for decades was regarded as the outer boundary of our solar system, icy Pluto is far from alone. The dwarf planet has moons – at least five of them – which are all fascinating little worlds in their own right. Detailed views of these icy bodies, captured by the New Horizons spacecraft, have now begun to stream back to Earth as data and will reveal much about the chemistry and physics of the outer solar system.

Decades passed after Pluto's discovery in 1930 before it was realised that the body had a companion. It was in 1978 that American astronomer James Christy noted that many photographic plates of Pluto were marked as being defective. A close look at these plates showed that despite background stars appearing perfectly sharp, images of Pluto almost always had a little bump on one side. Within a few hours of study, Christy came to realise that this bump was actually a moon, which he named Charon.

Compared to Pluto, which has a diameter of 2,370km, Charon is relatively large, measuring about 1,208 km across. Indeed the size difference between the two is so small that they could be regarded as a double planet. The large size of Charon has had a big effect on Pluto: both worlds are tidally locked, meaning that the same hemispheres of the two worlds continually face each other. Charon is never visible from half of Pluto's surface, and Pluto never rises above the horizon on half of Charon.

The similarity in size between the worlds also has a big influence on the dwarf planet's motion. An adult twirling a baby around stays in the same spot, but wobbles about a small circle when trying to do the same with a teenager. The same is true of Pluto: it actually moves in a circle every six days as Charon orbits it, around a point in space well outside Pluto known as the barycentre, which is the pivot point for Pluto and Charon's motion.



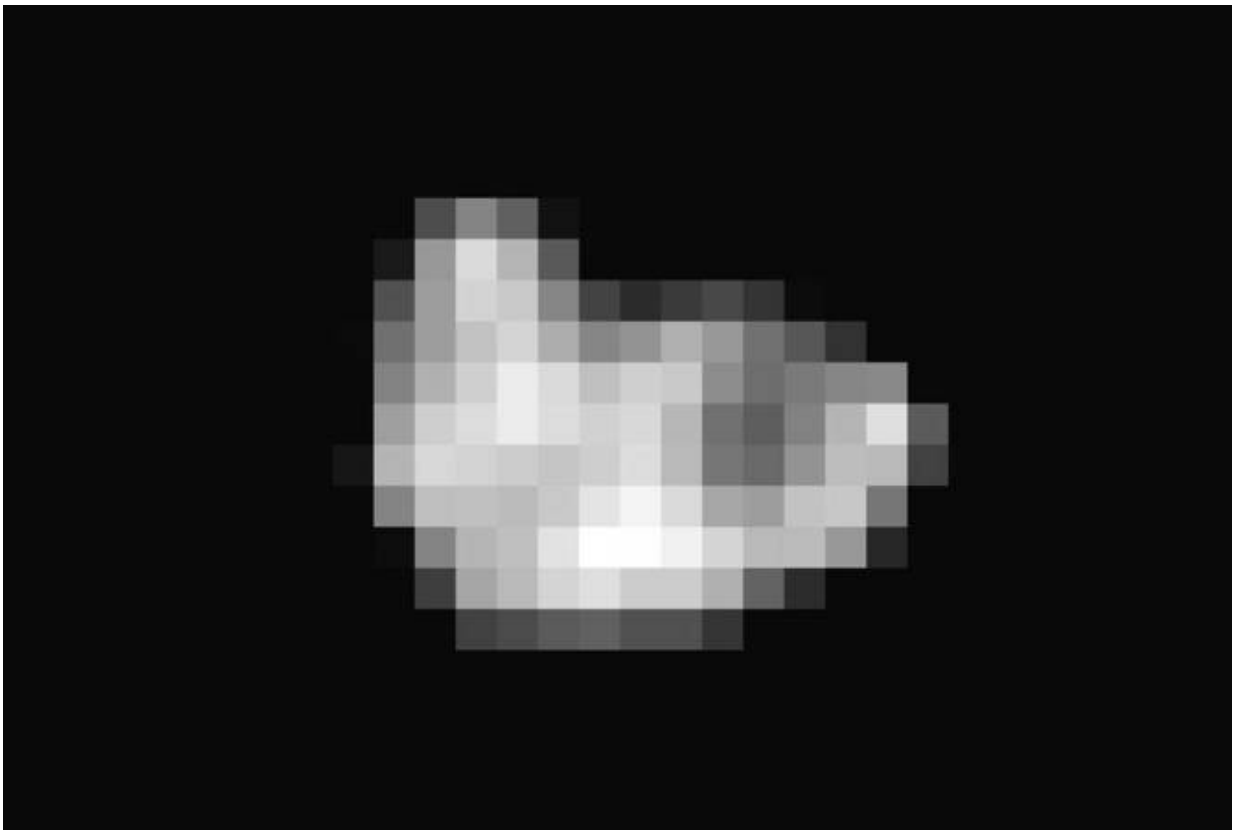
Pluto and its moons. Credit: NASA/ESA/A. Field (STScI)

Two further moons – Nix and Hydra – were discovered in 2005, using the Hubble Space Telescope, and the final two known moons, Kerberos and Styx, were found with the same telescope in 2011 and 2012, respectively. Unlike Charon, these four small bodies measure only a few tens of kilometres across at most, but their orbital paths have recently turned out to be fascinating. The moons' orbits have resonances, so their paths around Pluto follow a fixed pattern.

Complex dance

Guided by their mutual gravitational pull, the moons follow a dance: for every six orbits of Hydra about Pluto, Nix orbits nine times, and Styx 11 times. Rather than being tidally locked like Charon, these moons are almost certainly tumbling erratically due to the complex gravitational effects of the other moons.

Although the New Horizons images of these tiny moons will revolutionise our understanding of them, the amount of detail we will be able to see in the first images to be sent back will be limited. Each moon will occupy no more than two dozen pixels across at best in each picture, surrounded by the blackness of space. We'll however be able to tell their general shapes and we'll see whether there are large impact craters, dark or bright patches present on their surfaces. First images of irregularly-shaped Hydra have revealed that it measures roughly 45km by 30km.



Hydra photographed by New Horizons. Credit: NASA

As well as sharp images, New Horizons's cameras will have caught colour views of the moons. Images of Charon already show it to be a colourful in places, likely influenced greatly by the presence of gases escaping from Pluto's tenuous but extensive atmosphere. New Horizons has revealed already that Charon has a dark, reddish north pole, which may be formed of organic molecules that have escaped from Pluto and are trapped at the extra-frigid poles of the moon. Some areas of Charon are remarkably smooth with few craters, indicating regions that are relatively young, whilst other areas are cut by canyons up to 10 km deep.

Colour images of the smaller moons are also on their way. Will the

moons also be colourful, exhibiting thin layers of ice captured from Pluto, or are they too small to keep hold of such material? All of Pluto's moons may have been formed in a gargantuan collision in Pluto's distant past; the moons' colours will also help us test that scenario.

In the next few days, we'll have big hints as to the nature of these fascinating worlds: more detailed views of Charon, measuring the same distance across as from London to Madrid, and four tiny new worlds. New Horizons is also searching for other moons, and may find some backlit by the Sun as it drifts into the cold depths of space beyond the fascinating Pluto system.

Source: The Conversation