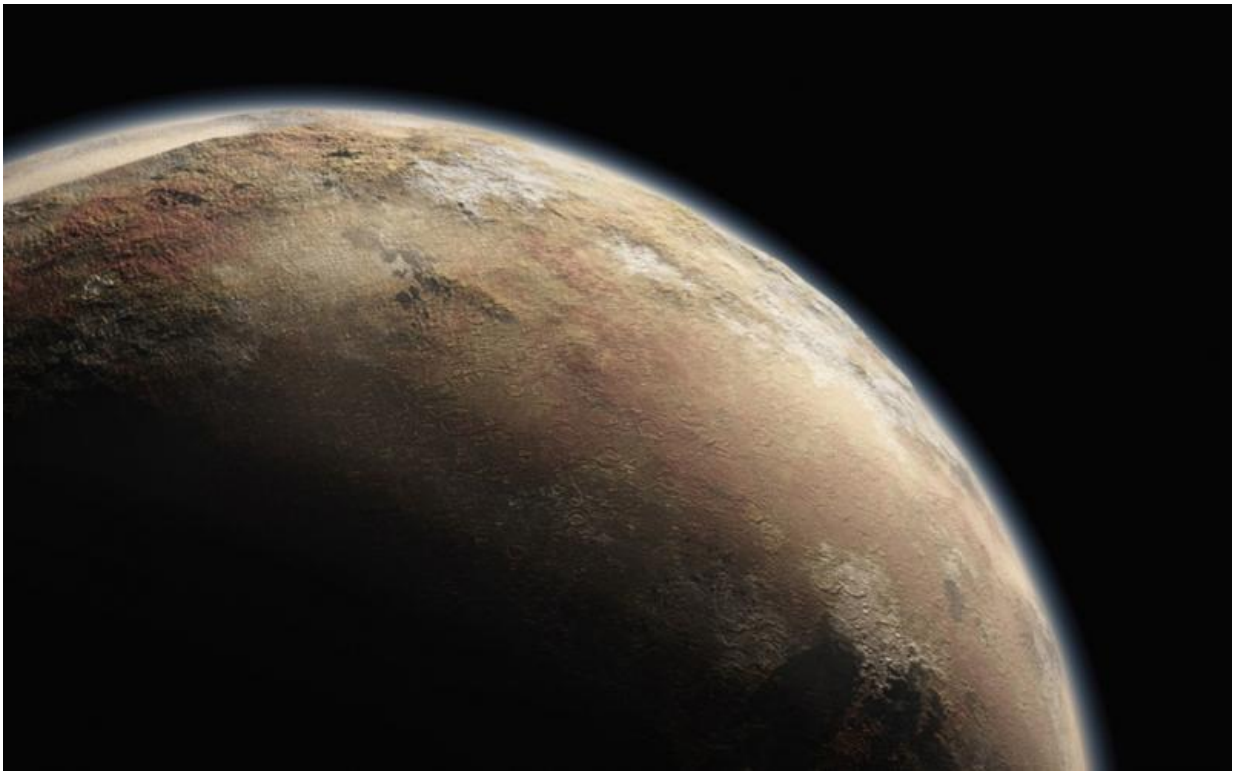
Is there life on Pluto?

July 13 2015, by Matt Williams



Artist's illustration of Pluto, showing the tenuous atmosphere that has so far defied explanations. Credit: NASA/New Horizons

First discovered in 1930, Pluto was considered to be the ninth planet in our Solar System for many decades. And though its status has since been downgraded to that of a dwarf planet, thanks to the discovery of Eris in 2004, Pluto continues to fascinate and intrigue astronomers.

And with the New Horizons mission fast approaching the planet, astronomers are eagerly anticipating the return of photographs and data that will help them answer some burning questions they have about this celestial body – not the least of which is whether or not it supports life!

Surface Conditions:

To be fair, there is virtually no chance that Pluto has life living on its surface. For starters, it orbits our Sun at extreme distances, ranging from 29.657 AU (4,437,000,000 km) at perihelion to 48.871 AU (7,311,000,000 km) at aphelion. At this distance, surface temperatures can reach as low as 33 K (-240 °C or -400 °F).

Not only does water freeze solid at these temperatures, but other liquids and gases that are present on Pluto's surface – such as methane (CH4), nitrogen gas (N^2), and carbon monoxide (CO) – also freeze solid. These compounds have much lower freezing points than water, and so the chance of life surviving under these conditions is slim to nil.

And while Pluto has a thin atmosphere, it consists mainly of nitrogen gas , methane and carbon monoxide, which exist in equilibrium with their ices on the surface. At the same time, the surface pressure ranges from s from 6.5 to 24 ?bar (0.65 to 2.4 Pa), which is roughly one million to 100,000 times less than Earth's atmospheric pressure.

This atmosphere also undergoes transitions as Pluto gets closer and farther away from the Sun. Basically, when Pluto is at perihelion, the atmosphere freezes solid; when it is at aphelion, the surface temperature increases, causing the ices to sublimate.

An artist’s concept of frosty Pluto. Credit: ESO/ L. Calçada

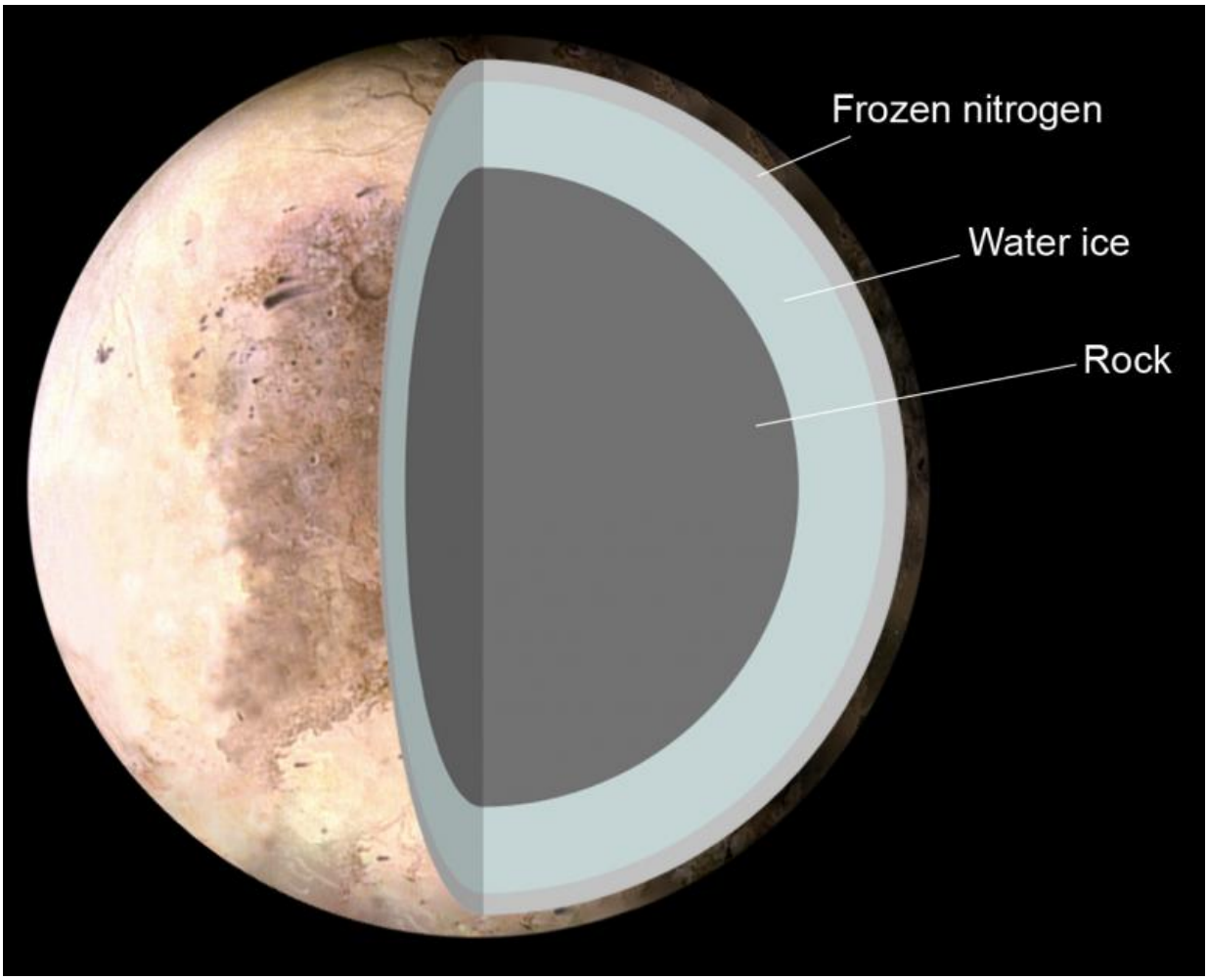
As such, there is simply no way life could survive on the surface of Pluto. Between the extreme cold, low atmospheric pressure, and constant changes in the atmosphere, no known organism could survive. However, that does not rule out the possibility of life being found inside the planet.

Interior:

Like many moons and smaller planetoids in the Outer Solar System, scientists believe that Pluto's internal structure is differentiated, with rocky material having settled into a dense core surrounded by a mantle of ice. The diameter of the core is believed to be approximately 1700 km (accounting for 70% of Pluto's diameter), whereas the ice layer is estimated to be 100 to 180 km thick at the core-mantle boundary.

Because the decay of radioactive elements would eventually heat the ices enough for the rock to separate from them, it is possible Pluto has a liquid water ocean beneath its mantle. In 2011, planetary scientists Guillaume Robuchon and Francis Nimmo of the University of California at Santa Cruz modeled the thermal evolution of Pluto and studied the behavior of the shell to see how the surface would be affected by the presence of an ocean below.

What they determined was that the surface of Pluto would be covered by surface fractures that span the globe, owning to changes in the temperature, tensional stresses and compressional stresses of the liquid ocean below. Though no visual data exists to support the existence of such surface features, the New Horizons mission is scheduled to be providing photographic evidence of the surface shortly.



The Theoretical structure of Pluto, consisting of 1. Frozen nitrogen 2. Water ice 3. Rock. Credit: NASA/Pat Rawlings

Future Possibilities:

Another possibility is that in time, conditions will change that might allow for life to exist on Pluto. While Pluto sits well beyond our Sun's habitable zone, both the size of our Sun, and the reach of that zone, will be subject to change. In the distant future – roughly 5.4 billion years from now – our Sun will expand into a red giant, increasing the amount

of energy it gives off for a period of several million of years.

Once the core hydrogen is exhausted in 5.4 billion years, the Sun will expand into a subgiant phase and slowly double in size over about half a billion years. As it expands in size, it will consume the inner planets (including the Earth), and the habitable zone will move to the outer Solar System. Even before it becomes a red giant, the luminosity of the Sun will have nearly doubled, and Earth will be hotter than Venus is today.

It will then expand more rapidly over about half a billion years until it is over two hundred times larger than it is today, and a couple of thousand times more luminous. This then starts the red-giant-branch (RGB) phase which will last around a billion years, during which time the the Sun will lose around a third of its mass.

This is an artist's concept of a craggy piece of solar system debris that belongs to a class of bodies called trans-Neptunian objects (TNOs). Credit: NASA

During that time, many objects in the Kuiper Belt will warm up significantly, which will include Pluto, Eris, and countless other Trans-Neptunian Objects (TNOs).

However, given the composition of these bodies, and the relatively short window in which they will be warmer and wetter, it is not likely that life will evolve from scratch. Instead, we would probably have to transport it there from Earth, assuming humanity is still living, and seed Pluto and other surviving bodies with vegetation and terrestrial organisms.

In short, the best answer to the question – is there life on Pluto? – is a resounding maybe. Another possible answer is maybe not, with the caveat that there may indeed be life there someday (i.e. us, if we're still around). In the meantime, all we can do is wait for data to begin coming in from New Horizons, and scan it for the telltale signs that life is indeed there right now!

Source: Universe Today