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Into the unknown

Ken Tapping, January 15, 2019

On New Year's Day, the New Horizons spacecraft had a close look at the most distant object yet explored, a snowman-shaped lump of ice and rock known as Ultima Thule, which translates as "the edge of the known world", or "the beginning of the unknown". This space mission is showing us amazing, new things and is a monument to engineering achievement and space navigation. Why make this huge effort? Why is it important? Basically, it is part of our quest to understand where we came from - how did we get to be here?

Our Solar System formed some 4.5 billion years ago, from the collapse of a huge cloud of cosmic gas and dust. The Earth and other planets were at first huge balls of molten rock. These eventually cooled, so that by about 3.8 billion years ago, our Earth, and probably Mars, had cooled enough for oceans, lakes and rivers of liquid water to accumulate on its surface. In that water were the organic chemicals that form the basis of life as we know it, and around 3.5 billion years ago, living things had appeared in our oceans, and maybe at other places in the Solar System. Those chemicals cannot survive in molten rock. How did they manage to be here when needed? Where did we get all that water? The history outline given here does not answer those questions.

Looking at our Earth or other planets such as Mars does not help us. Even the oldest rocks on Earth are not the original stuff. Everything here has been affected by plate tectonics, a process which continually recycles the Earth's material. Mars cannot help us here. Even the material of the airless, lifeless Moon is not original. Fortunately, there is still a lot of unused Solar System construction material left over. However, it lies several billion kilometres away, in the dark, cold outer reaches of the Solar System. This is our "deep freeze": too cold for anything to evaporate or to change over time. The material is orbiting the Sun in a great cloud known as the "Kuiper Belt".

We want a close look at some of that material, to see what it is like and what it is made of. However, in at least one case, things are not as cold, dark and quiet as we believed.

The New Horizons space mission started on January 19, 2006, with the launch of the spacecraft from Cape Canaveral. Pluto used to be known as the ninth and outermost planet of the Solar System. However, recently it became clear it was another sort of thing altogether, one of the largest and closest of the bodies making up the Kuiper Belt. The New Horizons space mission was to send a space probe out to Pluto, to give us our first close look at it and its moons, and then to continue outward, for a look at other Kuiper Belt objects.

The mission has proved a stunning success. It passed by Pluto during the summer of 2015 and ended our idea of Pluto and its moons being cratered, icy rock balls having seen no change for billions of years. Instead, Pluto is a geologically active world, with an atmosphere and weather, frozen nitrogen glaciers, collections of organic chemicals, dunes, and features similar to the permafrost structures we see in the Arctic.

Still working well, the spacecraft continued outward, and the next object to visit was selected: a Kuiper Belt object known as Ultima Thule. This one looks more like what was expected, but that impression probably won't last long as the data continues to flow in over the coming months. Moreover, the spacecraft continues to work well, and there is some fuel left, so it will be possible to look at another object or two. Since our explorations now extend beyond Ultima Thule, maybe we will need to rename it.

Mars, fading as it recedes, lies in the south after dark. Venus shines like a searchlight in the eastern sky in the early hours, and Jupiter shines low in the dawn glow. The Moon will be Full on the 13th.

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