



I bet you didn't know...

Planetary Hide and Seek



Prof. Dudley Shallcross, PSTT CEO, links cutting edge research with the principles of primary science

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Since Pluto was redefined as a dwarf planet there have been eight planets in our solar system, but scientists think that there is a ninth planet further away than Pluto. A recent study by two scientists from the USA, Kathryn Volk and Renu Malhotra, suggests that a ninth planet is hidden in the Kuiper Belt. This research can be used as an interesting discussion point for children.

What do our primary school children know about the solar system? Can they name the planets? Do they know the order that the planets are aligned, in terms of distance from the Sun?

The Kuiper Belt (Figure 1) lies beyond Pluto and extends to about 100 AU (AU is an Astronomical Unit, where 1 AU is the distance between the Earth and the Sun). It is a ring of icy objects such as comets, mostly composed of methane, ammonia and water.

Why might AU be a good unit to use for astronomical studies?

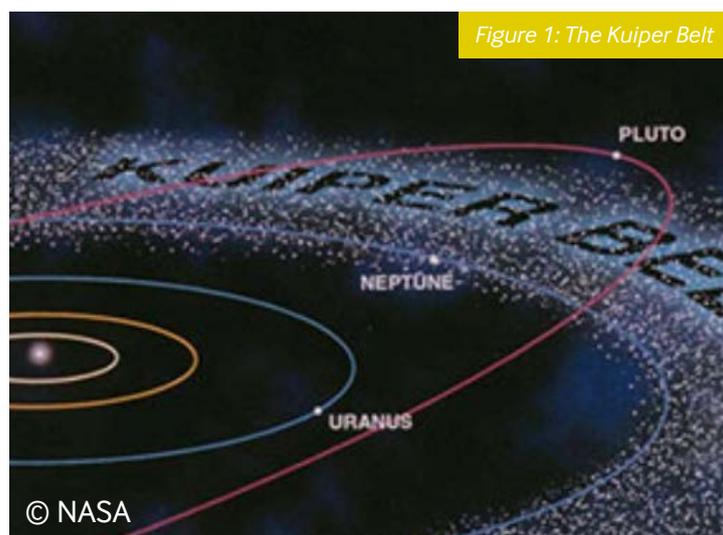


Figure 1: The Kuiper Belt

Why is the planet hidden? Well, it is believed to be in a region of the Kuiper Belt that is hard to see with current telescopes and is also obscured by distant stars.

Why might this be a problem? How hard is it to see something with our own Sun in the background, and why is this?



Figure 2: 'Planet 9'

So why do these scientists think 'planet 9' (Figure 2) is in the Kuiper Belt? They have studied the orbits of a number of so-called Kuiper Belt objects (KBOs), rocks of varying size, using telescopes and noticed that these orbits were different from other KBOs, in fact the inclination (tilt) of their orbits relative to something called the invariable plane is the odd feature. Put simply, these KBOs do not orbit in a similar way to other KBOs in the Kuiper Belt and the scientists wondered why.

What is a telescope and how does it work?



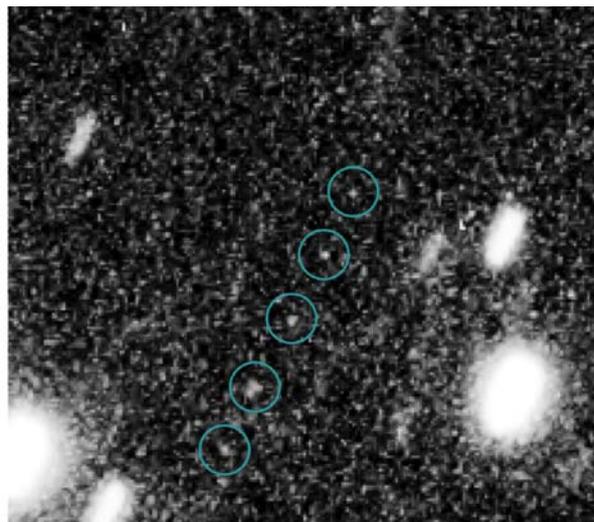
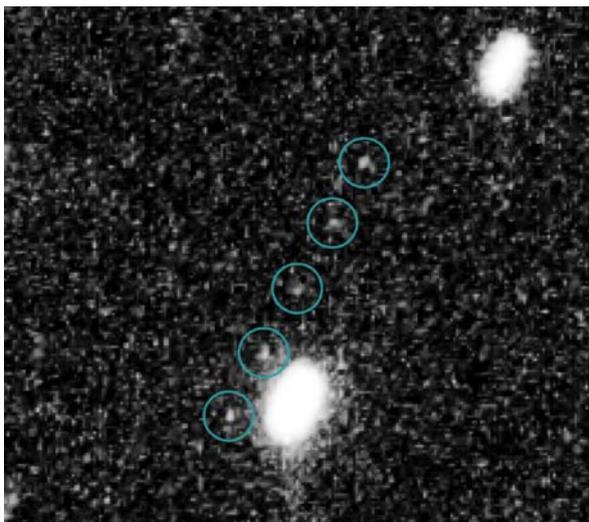
They have tried a range of explanations. It could be just a fluke that these particular KBOs orbit in this way, but their calculations suggest that the likelihood of that is just 1%. Maybe an object passed near this region some time ago? They considered this and calculated that the passing gravitational tug would have stopped by now. What would explain the altered orbits is if a planet roughly the size of Mars was present at about 60 AU from the Sun; such an object would perturb the orbits of these KBOs and be consistent with the observations.

How might we locate an object that we could not see? It would be interesting to ask our primary class how we might do that. Perhaps we could hear the object and detect the sounds that it gives off? Maybe we could smell the object? It may release certain odours that we can detect. Maybe the object vibrates, and we can feel these vibrations as we get closer? Like the hidden planet, the object may change the motions of objects nearby e.g. the flow of water or air nearby may be changed. Maybe the object is magnetic and so magnetic objects would be attracted to it? It may be a fun exercise to conceal some objects and ask the children to use their senses other than sight to

find them. We may also want to discuss with children why one object has a gravitational pull on another. On Earth if we jump up, we come back down to Earth quickly. Would we observe the same rate of return to the surface if we were on the Moon (which is a lot lighter than the Earth)? Or what about jumping on a planet like Jupiter (which is a lot heavier than Earth)?

Will we ever be able to verify this hypothesis? Hopefully the answer is 'yes' and quite soon. A new telescope called the Large Synoptic Survey Telescope (LSST) will come on line circa 2020, and it will be able to survey 20 times the KBOs currently observed. Even though some KBOs will be too far away, or too dim even for the LSST to observe, it should be able to observe planet 9 if it exists. There is also the possibility that there is more than one planet; the scientists cannot rule this out.

You can follow the development and discoveries of the LSST at www.lsst.org and continue to engage your pupils in the latest scientific research.



These two multiple-exposure images from NASA's Hubble Space Telescope show Kuiper Belt objects, or KBOs, against a background of stars in the constellation Sagittarius. The two KBOs are roughly 4 billion miles from Earth. Image Credits: NASA, ESA, SwRI, JHU/APL, New Horizons KBO Search Team

**Did you realise that both scientists are female?
Professor Malhotra has an asteroid named after her and
has had a very distinguished career as an astronomer.**

References

The research paper that generated this work was: The curiously warped mean plane of the Kuiper Belt

By Kathryn Volk¹ and Renu Malhotra¹, The Astronomical Journal, vol. 154, 16 pp. (2017)

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