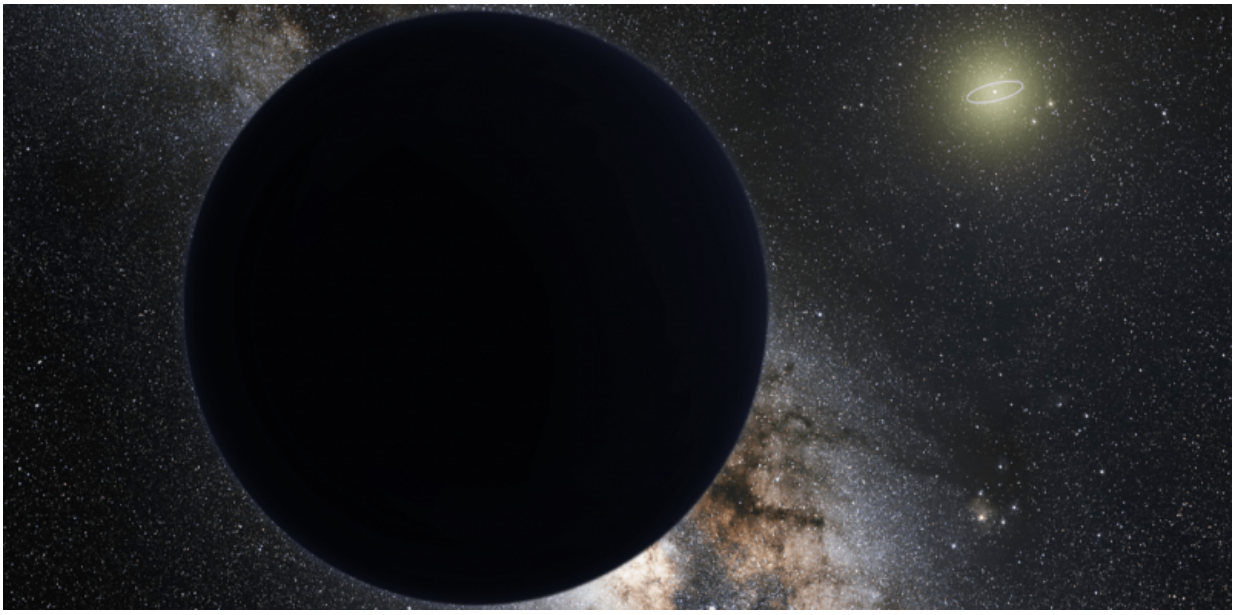
A stolen exoplanet that will kill us all? Here's what we do know about 'Planet Nine'

June 6 2016, by Andrew Coates, Ucl



Artist's impression of Planet Nine. Credit: Tomruen, nagualdesign; background taken from File:ESO , CC BY-SA

Ever since a study suggested that a "Planet Nine" could be lurking in the outskirts of our solar system, astronomers have been busy trying to pin it down.

As nobody has actually observed the planet yet, this research has been largely computational. The existence of the planet was only suggested

after scientists noticed that objects in its vicinity were moving strangely.

Since it was proposed in January, astronomers have modelled Planet Nine's structure, orbit, estimated threat to Earth and possible origin. But with all this data at hand, are we any closer to actually finding it? Let's take a look at some recent results and what they really mean.

It may be an exoplanet

The latest such study has come up with two different possible scenarios for Planet Nine's origin. One is that it may have started as a forming outer planet core from our own early solar system which was expelled to the edge of the solar system by some process, perhaps a collision.

However, another possibility is that our sun may have stolen Planet Nine from a nearby star in the Milky Way 4.5 billion years ago, which would make it our nearest extrasolar planet. As star formation regions are relatively dense with stars – the sun was born in a cluster with perhaps 1,000 other stars – these can indeed interact.

While this is entirely possible, the research assumes that Neptune-sized objects were relatively common in this region – something we simply don't know. The study also suggest that further observations and modelling of the positions and orbits of minor objects in the solar system beyond Neptune now may provide further clues as to the origin of the proposed Planet Nine – whether this is core expulsion as originally proposed or exoplanet capture.

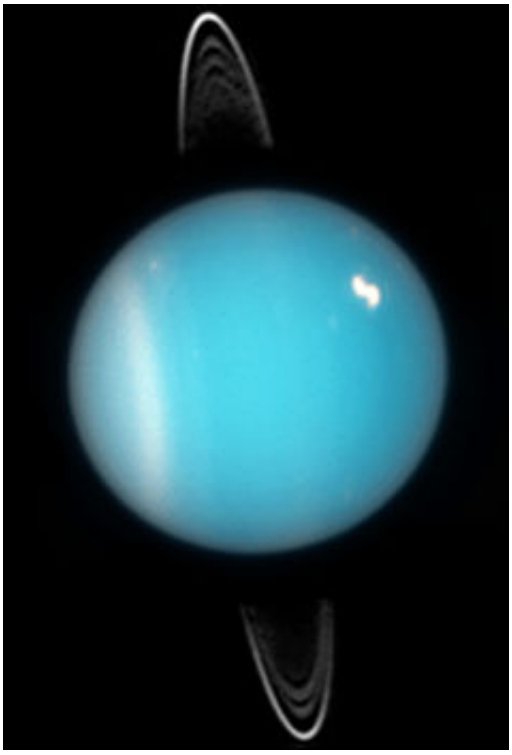
At the moment, the lack of direct observations of Planet Nine and the whole range of objects which may be affected by it mean that the explanations are poorly constrained. In the meantime, this kind of work provides interesting ideas – but ultimately we need proof. Excitingly, if it does exist and turns out to be a captured exoplanet, it is likely to be our

best bet for visiting an exoplanet in the near future.

It could be made up of iron and ice

Other computer simulations assume that Planet Nine was a distant ice giant similar to Neptune and Uranus. They calculate the evolution of the size, temperature, luminosity and colour of such a body, having moved from its possible formation point nearer the sun to its distant position at about 700 AU.

This research suggests Planet Nine is like a "mini-Uranus", with an iron core, silicate mantle, water ice shell and hydrogen/helium outer layers. Its temperature would be about -226°C (or 47 Kelvin) – and most of this would be internal heat rather than absorbed sunlight, which means it would be difficult to see with optical telescopes. In fact, the planet would reflect very little sunlight, which means it would be visible in infrared wavelengths (heat) instead of visible light.



Planet Nine could be similar to Uranus. Credit: NASA, ESA, and M. Showalter

The research is useful for scientists modelling and searching for the planet, as it helps them to know what they should look for.

It may be harder to detect than we thought

The proposers of Planet Nine, and other astronomers, are busy using an array of telescopes to search for their target. These includes further work with data from the WISE survey, as well as Catalina Sky Survey and Pan-STARRS. So far, these searches have been unsuccessful. Current and planned searches are underway and proposed using telescopes including Subaru at Mauna Kea observatory, ALMA, the Dark Energy Survey and the James Webb Space Telescope.

But there may be other ways to spot it. For example, there was a prediction that the orbit of the Cassini spacecraft at Saturn may be affected by Planet Nine's gravitational pull, based on its possible location in Cetus at about 630 AU (1 AU = the distance between the Earth and the sun). However, many scientists are sceptical of this.

So why haven't we seen it? The study that modelled its interior also postulated how easy it would be to detect the object using surveys such as WISE, and estimated that Planet Nine's current size is just 3.7 times Earth. This is considerably less than the 10 times our planet which was initially suggested. They therefore argue that it would be very hard to spot the planet with current instruments, but suggest future telescopes may be able to.

Mauna Kea's Subaru. Credit: Denys/wikimedia

What's more, some suggest that the planet may currently be at aphelion (its farthest point from the sun), which would also make it even more difficult to see. However, one study has managed to make the search area smaller by modelling the orbit and its inclination. The search is narrowing, but slowly.

It probably won't wipe us out

With its suggested orbit between 200 and 1,200-2,000 AU – much further away from us than the sun– it seems we should be safe from Planet Nine. But conspiracy theorists were quick to suggest that, as this may be the first of several such objects, at least one may have our name on it. However, there is no evidence that any known or postulated object poses any threat to Earth. But observers are keeping a careful eye on near-Earth objects for potential problems.

Planet Nine, if it exists, would certainly be a difficult object to detect. We know that the effects on six nearby objects look consistent with its existence, although even this is not universally accepted by astronomers. However, it is certainly strong enough to prompt a detailed search. Thanks to the computational modelling, the search is narrowing. At the same time, technology is developing and observations in this region are improving. If Planet Nine exists, it should be found in the next few years.

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