

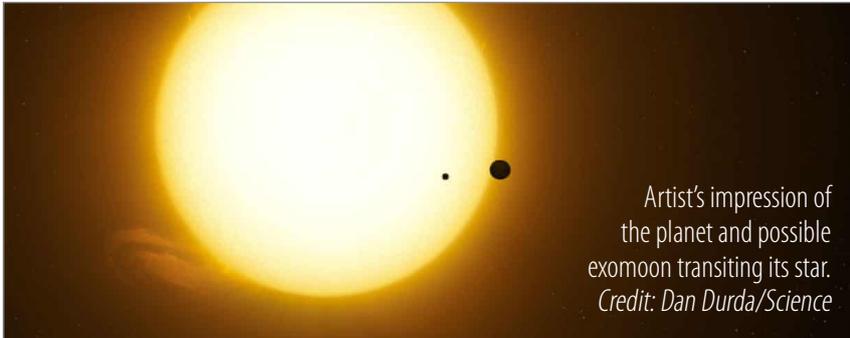


INSTITUTE OF ASTRONOMY PUBLIC OPEN EVENING

— 10 OCTOBER 2018 —



Is this the first 'exomoon'?



Moons are very common in our Solar System, with the current total standing at 194. But outside of our Solar System, moons are more elusive. Out of the nearly 4000 exoplanets discovered so far, none have been found to have 'exomoons'. This is almost certainly because exomoons are hard to find (rather than because they don't exist!). Finding planets around distant stars is difficult enough, requiring astronomers to search for very faint signals buried deep within their observational data. So finding moons – which will be smaller than their planets – is set to be even harder still.

A new study published by astronomers Alex Teachey and David Kipping (using data from Nasa's Kepler space telescope) may now have found the first hints of an exomoon orbiting the planet Kepler-1625b.

Kepler-1625b is a massive gas giant, several times bigger than Jupiter, which was discovered as it passed in front of its parent star (a process known as 'transiting'). Astronomers immediately noticed strange anomalies in the transit data: "We saw little deviations and wobbles in the light curve that caught our attention," Kipping said. Followup observations of the transiting planet revealed a second, smaller dimming of the star, just 3.5 hours after the planet finished its transit, raising the possibility of

Kepler-1625b having a moon. The planet also started its transit earlier than predicted, which could be caused by the unseen moon's gravity affecting the planet's orbit. "An extraterrestrial civilisation watching the Earth and Moon transit the Sun would note similar anomalies" Kipping said.

If confirmed, this discovery could be very important indeed. Some moons in our Solar System are among the best candidates for life outside the Earth – such as Jupiter's moon Europa, with its planet-spanning ocean. And many scientists think that our Moon might have played an important part in the evolution of life on Earth: by creating tides, and tidal pools, for early life to flourish in.

At this point though, the result is far from confirmed. The existence of the moon is theorised based on a small dip in brightness, and the early arrival of the planet's transit – and both of these things could have other causes. "To me, for any discovery but especially the first of its kind, the evidence needs to be compelling" said Hugh Osborn, a planet-hunting astronomer at Marseille University. "I don't think we are there yet with Kepler-1625." In order to try to confirm the exomoon's existence astronomers will have to wait another 287 days until the planet transits again.

TONIGHT'S SPEAKER



Carolin Crawford
Touching the Sun

Our weekly welcome

WELCOME to our weekly public open evenings for the 2018/19 season. Each night there will be a half-hour talk which begins promptly at 7.15pm. Please note that the talk will be recorded and archived for online streaming.

The talk is followed by an opportunity to observe if (and only if!) the weather is clear. The IoA's historical Northumberland and Thorrowgood telescopes, along with our modern 16-inch telescope, will be open for observations. In addition, the [Cambridge Astronomical Association](#) will provide a floorshow outdoors on the Observatory lawns, relaying live images from their telescopes and providing a commentary. If we're unlucky and it's cloudy, we'll offer you a conciliatory cup of tea after the talk (with perhaps some more astro-information in the lecture theatre for those who want to stay on).

If you have any questions, suggestions or comments about the IoA Open Evenings please contact Carolin Crawford at csc@ast.cam.ac.uk or Matt Bothwell at bothwell@ast.cam.ac.uk.

The talk schedule for this term can be viewed at: www.ast.cam.ac.uk/public/public_observing/current

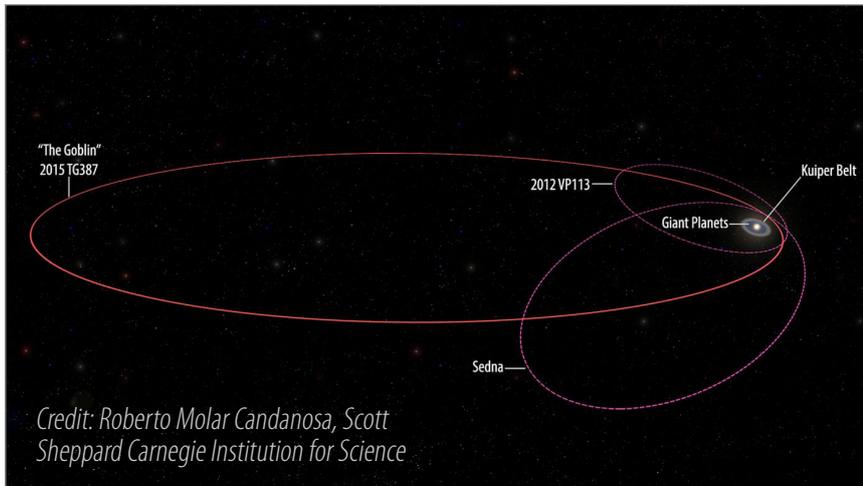


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A goblin in the outer solar system



The orbits of the new extreme dwarf planet 2015 TG387 and its fellow Inner Oort Cloud objects 2012 VP113 and Sedna as compared with the rest of the Solar System. At the most distant point in its orbit, 2015 TG387 is around 2300 times further from the Sun than the Earth.

Out in the distant reaches of the Solar System, far beyond the orbit of Pluto, astronomers have found a new dwarf planet. Officially known as '2015 TG387', the new object has been nicknamed 'The Goblin', for the 'TG' initials in its name – and because it was first spotted near Halloween.

2015 TG387 is the third minor planet found in the cold dark outskirts of the Solar System, joining Sedna (discovered in 2003) and '2012 VP113' (discovered in 2012).

The new dwarf planet is very small indeed, being just 300 km in diameter, and orbits the Sun once every 40,000

years in a very elongated ellipse. Even at its closest approach to the Sun it remains 2.5 times further out than Pluto.

The three distant dwarf planets we have found so far are thought to be just the tip of the iceberg though. "We are only just now uncovering what the very outer solar system might look like and what might be out there" said Scott Sheppard of the Carnegie Institution for Science in Washington DC. "We believe there are thousands of dwarf planets in the distant solar system."

Most intriguingly, the three distant dwarf planets discovered so far all seem to be orbiting as if they are under the influence of a more massive planet, shepherding their orbits into alignment. The discovery of 2015 TG387 could be one step closer to finding 'Planet Nine', a still-hypothetical giant planet that may lurk in the outer solar system. "There are a lot of exotic and extreme objects yet to be found in the outer solar system" Sheppard says. "We are only just now uncovering what the very outer solar system might look like and what might be out there."

Hubble Trouble?

THE Hubble Space Telescope was taken offline and put into 'safe mode' last week, after problems with one of its gyroscopes left it unable to point in the right direction.

Hubble needs three gyroscopes to point around the sky, but actually carries a total of six – so each gyroscope has a backup. The problem came last week – not only did one gyroscope fail, but then its spare was also found to be malfunctioning.

Gyroscope problems are nothing new for Hubble. "The fact that we're having some gyro problems, that's kind of a long tradition with the observatory" said Kenneth Sembach, director of the Space Telescope Science Institute. In 2009, all six gyroscopes were replaced, as part of the final servicing mission with the Space Shuttle.

All is not lost, however. Firstly, the malfunctioning gyro might be able to



Hubble being released from the robotic arm of the Space Shuttle Discovery in 1990.

be repaired. But even if a repair is not possible, Hubble can operate using just one or two gyroscopes. This has been done before, and doesn't have much of an impact on the science it can do. "We'll be fine", said Kenneth Sembach. "I'm sure Hubble has many years of good science ahead of it."

Joke of the Week

Q. What do you do if you see an aggressive alien?

A. Give it some space!