

# Planet Nine in our Solar System & HD106906 b

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In news

Hubble observed a strange, distant exoplanet similar to 'Planet Nine' that may exist in our solar system

Key findings

- The oddball behaviour of the planet, HD106906 b, provide clues about our own mysterious Planet Nine if it exists.
- Although the exoplanet was discovered in 2013 using the Magellan Telescopes at the Las Campanas Observatory in Chile, researchers were unable to determine its orbit.
- This led them to question if it was orbiting the two stars or if it was a rogue planet traveling away from the system, unattached to any star.
- The Hubble Space Telescope, however, provided accurate measurements of the planet's movements over a 14-year period.

What is exoplanet and what is Planet Nine?

- As we know HD106906 b is not a new discovery: It appears in archival images taken by the Hubble Space Telescope in 2004. But at the time, people did not recognise the object to be a planet.
- Using data on the object's motion over 14 years, astronomers have now precisely calculated its orbit and other key details.
- And the Planet Nine is an elusive, distant planet in our own Solar System. Although it has not been found yet, it has been predicted by a series of studies over the last few years, and has been described by astronomers as "hiding in plain sight".

- If it exists, Planet Nine is 10 times as massive as Earth.

### Reasons to believe about the existence of Planet Nine

- Predictions about Planet Nine arise from the peculiar behaviour and alignment of various objects in the Solar System.
- Astronomers believe all this is (alignment of various objects) happening under the influence of Planet Nine
- Beyond Neptune of our solar system, there is a region called the Kuiper belt, populated by icy debris.
- Some of the objects in this region have been found to be very peculiarly aligned, and Planet Nine is likely responsible for this
- In 2018, astronomers reported the peculiar behaviour of another object in the Solar System, called 2015 BP519. The object orbits our Sun but at an extreme tilt ( $54^\circ$ ) (due to the influence of Planet nine) when compared to the orbits of Earth and the other seven planets.
- Simulations showed that the influence of Planet Nine (if it exists) would explain this tilt

### What is an exoplanet?

Planets that orbit around other stars are called exoplanets. All of the planets in our solar system orbit around the Sun. Exoplanets are very hard to see directly with telescopes. They are hidden by the bright glare of the stars they orbit.

### Comparing the new planet (HD106906 b) with Planet nine

- Both planets (assuming Planet Nine is real) reside far out in their respective stellar systems. Both orbit their respective stars at an extreme tilt.
- And both are massive enough to influence the behaviour of other objects in their respective regions.
- HD106906 b presents a more extreme case in these respects. While Planet Nine is assumed to be 10 times as

massive as Earth, HD106906 b is 11 times the mass of Jupiter.

- HD106906 b is unusually far away from its pair of host stars over 730 times the distance that earth is from the sun.
- That makes its orbit extremely long 15,000 years. Its binary star is relatively young at 15 million years, compared to our Sun which is 4.6 billion years old

#### What clues does HD106906 b offer?

The star of the exoplanet is surrounded by a disc of debris. This outer disc, observations and calculations showed, is out of symmetry with an inner comet ring.

#### What could have disturbed the symmetry?(as proposed by the author)

- The planet formed close to the binary star, then kicked out because of gravitational interactions with the star.
- This stirred up the objects in the debris disc and disturbed its symmetry with the comet ring.
- But when the planet was kicked out, it should normally have been sent out of the system altogether, and become a rouge planet.
- But it still orbits the star, from far away.
- To explain this, the researchers suggest that a passing star interacted with the exoplanet and held it in place.
- Today, it orbits its star at an eccentricity of  $21^\circ$  compared to the rest of the planetary system.

#### How did Planet nine form?

- Author of the paper proposed similar scenario as proposed about **HD106906 b**
- Planet Nine, if it exists, formed early in the Solar System.

- Interactions with our giant planets, such as Jupiter or Saturn, then kicked it out of the inner Solar System.
- After that, passing stars stabilised its orbit.