

# On the edge of our solar system – ANOTHER NINTH PLANET?

By Henry M. Holden

**WE HAD nine planets in our solar system until Pluto was downgraded to a dwarf planet a few years ago. Now it seems we have a new candidate (also called Planet 9) for that position.**

Pluto was discovered in 1930, and was known as the smallest planet in our solar system and the ninth planet from the sun. On average, Pluto is more than 3.6-billion miles (5.8-billion km) away from the sun. That is about 40 times as far from the Sun as Earth.

However, "Planet 9," if it exists, lies about 20 times farther from the sun than Neptune does. That places it in the Kuiper Belt, a region of small, icy objects that includes Pluto.

Planet 9 is a monster, 5 000 times bigger than the outcast Pluto, and billions of miles farther away, say scientists who presented "good evidence" for a long-hypothesized Planet X recently.

Planetary scientist, Konstantin Batygin, and astronomer, Mike Brown, believe this new planet is big — 10 times more massive than Earth — and unlike Pluto, dominates its cosmic neighbourhood.

"This is what we mean when we say the word 'planet,'" Brown said.

Batygin and Brown inferred its presence from the peculiar clustering of six previously known objects that orbit beyond Neptune. They say there

is only a 0,007% chance, or about one in 15 000, that the clustering could be a coincidence. Instead, they say, a planet with the mass of 10 Earths has shepherded the six objects into their strange elliptical orbits, tilted out of the plane of the solar system.

"I want to see it," Brown said. "I want to see what it looks like. I want to understand where it is, and I think this will help."

Brown and Batygin feel certain about their prediction, which at first seemed unbelievable to even them.

"We could have stayed quiet spent the next five years searching the skies ourselves and hoping to find it," Brown said. "But I would rather somebody find it sooner, than me find it later."

The two scientists say there is evidence that it is a body nearly the size of Neptune—but as yet unseen. During the solar system's infancy 4.5-billion years ago, they say, the giant planet was knocked out of the planet-forming region near the sun. Slowed down by gas, the planet settled into a distant elliptical orbit, where it still is.

It possibly has rings and moons. It is so distant that it would take a mind-blowing 10 000 to 20 000 years for it to circle the Sun. The scientists base their prediction on mathematical and computer modelling, and anticipate its telescopic discovery in five years or less.

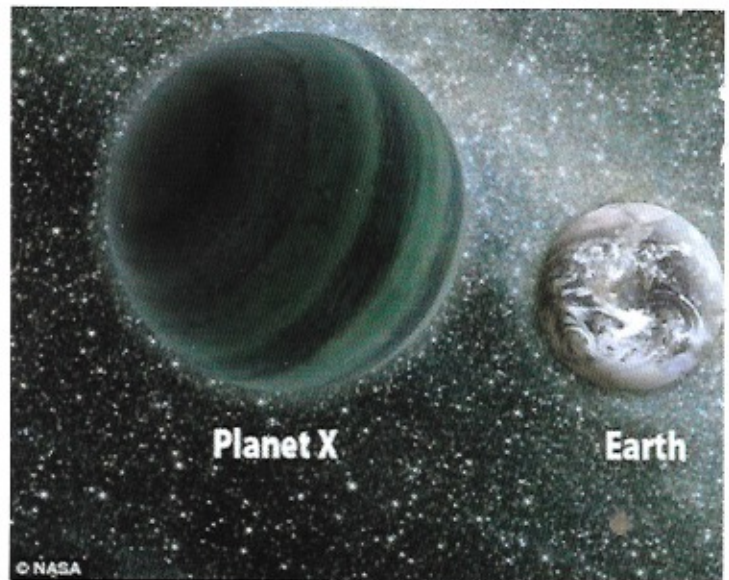
Batygin and Brown published

the result in *The Astronomical Journal*. Alessandro Morbidelli, a planetary dynamicist at the Nice



▲ Caltech professor Mike Brown and assistant professor Konstantin Batygin, have been working together to investigate distant objects in our solar system for more than two years. The two bring very different perspectives to the work: Brown is an observer, used to looking at the sky to try and anchor everything in the reality of what can be seen; Batygin is a theorist who considers how things might work from a physics standpoint.

(Image: Lance Hayashida/Caltech)



Observatory, in France, performed the peer review for the paper. In a statement, he says Batygin and Brown made a "very solid argument" and that he is "quite convinced of the existence of a distant planet."

Assistant Professor Batygin is a 29-year-old whiz kid computer modeller, who went to college at University of California (UC) Santa Cruz because of its nearby beach, and the chance to play in a rock band.

But he made a name there by modelling the fate of the solar system over billions of years, showing that, in rare cases, it

▲ This is a distant view from Planet 9 back towards the sun. The object is thought to be gaseous, similar to Uranus and Neptune. Hypothetical lightning lights up the night side.

(Image: Caltech/R. Hurt (IPAC))

was unstable; Mercury may plunge into the Sun, or collide with Venus.

Professor Brown, 50, is the observational astronomer and has a programme all set to sift for Planet 9 in data from a major telescope the moment they become publicly available later this year.

## CALCULATED PREDICTION

Outside scientists say their calculations stack up and express a mixture of cautious optimism and excitement about the result. "I could not imagine a bigger deal if—and, of course, that's a boldface 'if'—if it turns out to be right," said Gregory Laughlin, a planetary scientist at the UC Santa Cruz.

Unseen yet easy to find—really? Astronomers have said that if this planet exists, it should be fairly easy to find with telescopes like the Subaru Telescope in Hawaii, which has been used to find other distant objects in the solar system. A few months of scanning the sky in the region where the new planet is predicted to be might provide direct observational evidence that it exists.

Brown and Batygin shaped their calculation on the fact that six objects in the icy Kuiper Belt, or Twilight Zone at the far reaches of the solar system, appear to have orbits influenced by only one thing:—a real yet unseen planet.

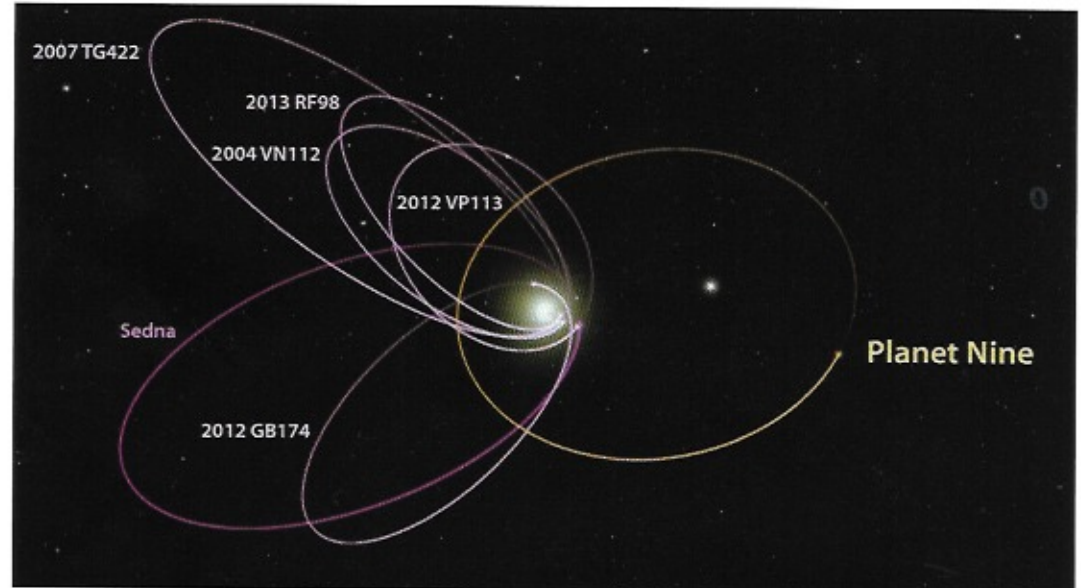
"What we have found is a gravitational signature of Planet 9 lurking in the outskirts of the solar system," Batygin said. "The actual discovery," he noted, "will be era-defining."

Brown, alluding to the recent Star Wars film said: "We have felt a great disturbance in the force."

There is a possibility that Planet 9 does not exist and that some other explanation accounts for the motion of objects that astronomers observe in the Kuiper Belt.

"For the first time in more than 150 years, there is good evidence that the planetary census of the solar system is incomplete," Batygin said, referring to Neptune's discovery as Planet 8.

Supporting a new ninth planet is an ironic role for Brown; his reputation is that of a planet slayer. In 2005, he dis-



covered Eris, a remote icy world nearly the same size as Pluto, revealed that what was seen as the outermost planet was just one of many worlds in the Kuiper belt. Astronomers reclassified Pluto as a dwarf planet—a saga Brown recounted in his book *How I Killed Pluto*.

The allure of Planet X has persisted. In the 1980s, researchers proposed that an unseen brown dwarf star could cause periodic extinctions on Earth by triggering a shower of comets. In the 1990s, scientists invoked a Jupiter-sized planet at the solar system's edge to explain the origin of certain odd comets.

Depending on where this Planet 9 is in its egg-shaped orbit, a space telescope will need to confirm its presence, the researchers said. A good backyard telescope may spot it,

they noted, if the planet is relatively closer to us in its swing around the sun. It's an estimated 20-billion to 100-billion miles away.

"Who knows, there could even be a Planet 10 out there well beyond Number Nine, but there aren't enough data at this point to guess," Brown said.

Well, maybe not

"The possibility of a new planet is certainly an exciting one for me as a planetary scientist and for all of us," said Jim Green, director of NASA's Planetary Science Division. "This is not, however, the detection or discovery of a new planet. It's too early to say with certainty there's a so-called Planet X.

What we're seeing is an early prediction based on modelling from limited observations. It's the start of a process that could lead to an exciting result." →

▲ The six most distant known objects in the solar system with orbits exclusively beyond Neptune (magenta) all mysteriously line up in a single direction. Moreover, when viewed in three dimensions, they are all tilted nearly identically away from the plane of the solar system. Such an orbital alignment can only be maintained by some outside force. In their new paper, Konstantin Batygin and Mike Brown show that a planet with 10 times the mass of the earth in a distant eccentric orbit anti-aligned with the other six objects (orange) is required to maintain this configuration.

(Image: Caltech/R. Hurt IPAC)

▼ A predicted consequence of Planet 9 is that a second set of confined objects should also exist. These objects are forced into positions at right angles to Planet 9 and into orbits that are perpendicular to the plane of the solar system. Five known objects (blue) fit this prediction precisely. (Image: Caltech/R. Hurt IPAC)

