READING PASSAGE · LEVEL 3 · ADVANCED

# NEPTUNE: PREDICTED BY MATHEMATICS

*A reading passage for advanced readers (Ages 10–12)*

Neptune is the eighth planet from the Sun and the most distant of the eight major planets. With an orbit averaging 4.5 billion kilometres from the Sun, it is so remote that one Neptunian year — the time it takes to orbit the Sun once — lasts almost 165 Earth years. In fact, since its discovery in 1846, Neptune has only completed one full orbit, in 2011.

Neptune is an ice giant, similar in many ways to Uranus. Its mantle consists of a hot dense slush of water, methane, and ammonia ices around a small rocky core, while its atmosphere is rich in hydrogen, helium, and methane. The methane gives Neptune its striking azure colour — even more vivid than Uranus's pale blue, possibly because Neptune's atmosphere has fewer haze particles.

Despite receiving only about 1/900th of the sunlight that reaches Earth, Neptune is one of the stormiest planets in the solar system. Its winds reach speeds of over 2,100 km/h, faster than the speed of sound on Earth — and well beyond what scientists can fully explain. Some researchers believe Neptune generates its own internal heat, releasing roughly 2.6 times more energy than it receives from the Sun, which may help drive its powerful weather.

The discovery of Neptune is one of the great triumphs of mathematics. After observing wobbles in Uranus's orbit that suggested another planet was tugging on it, the French mathematician Urbain Le Verrier calculated where the unseen planet should be. Within hours of receiving Le Verrier's prediction, the German astronomer Johann Galle pointed his telescope to that exact spot and found Neptune almost immediately. The planet had been predicted before anyone had seen it.

Neptune has 16 known moons, but the most fascinating is Triton. Triton orbits Neptune in retrograde — opposite to the planet's spin — strongly suggesting it formed elsewhere and was later captured by Neptune's gravity. Triton is geologically active, with icy geysers and a thin nitrogen atmosphere. It is also slowly spiralling inward and will eventually be torn apart by Neptune's gravity, perhaps forming a ring system of its own.

## ★ WORDS TO KNOW — 5 TERMS

**mantle**
The thick layer between a planet's outer surface and its core.

**retrograde**
Going in the opposite direction from the usual.

**triumph**
A great success or achievement.

**azure**
A deep, sky-blue colour.

**capture**
In space, when a planet's gravity grabs an object passing by and pulls it into orbit.

## ★ COMPREHENSION QUESTIONS — 6 QUESTIONS

1. Why has Neptune only completed one full orbit since its discovery?

2. How is Neptune similar to Uranus, and how is it different in colour?

3. Why are Neptune's powerful winds surprising, and what may help explain them?

4. Tell the story of how Neptune was discovered. Why is the discovery considered a triumph of mathematics?

5. What is unusual about Triton's orbit, and what does it suggest about Triton's history?

6. What might happen to Triton in the distant future?