

# *St Aiden's Homeschool*



## *Our Solar System*

**Neptune**

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# Neptune



## Neptune Facts:

- Wind speeds on Neptune can reach 450 meters per second.
- Neptune was discovered because its gravitational field was affecting the orbit of Uranus.
- Neptune is sometimes farther from the Sun than Pluto.
- It is so cold on Neptune that you would need skin thicker than a polar bear's to stay warm.
- In Roman mythology Neptune (Greek: Poseidon) was the god of the Sea.
- Neptune is the eighth planet from the Sun and the fourth largest (by diameter). Neptune is smaller in diameter but larger in mass than Uranus.
- Neptune's winds are the fastest in the solar system, reaching 2000 km/hour.
- Neptune radiates more than twice as much energy as it receives from the Sun.



Neptune is very similar to Uranus in size. Its diameter is only slightly smaller, at 49,528 km wide. It is almost as big as four Earths in length.

### What is its surface like?

The **atmosphere** of Neptune has some dark blue spots. When the Voyager probe went by Neptune in 1989, it saw a large one called the Great Dark Spot. In 1994, it vanished, but later reappeared. There is also a large white cloud nicknamed "Scooter." It goes around Neptune every 16 hours. The winds of Neptune are very fast, blowing at up to 2000 km per hour (the fastest in the entire solar system). That is about four times faster than the fastest recorded tornado on Earth.

### What are its rings like?

Neptune has some faint rings that are dark and hard to see. There are clumps in some parts of the rings where the material is **denser**.

### What are its moons like?

Neptune has 13 moons. There could be more.

## Inner Moons

There are five small potato-shaped moons **orbiting** close to Neptune.

### Proteus

Proteus is a dark moon about 418 km across. It has an irregular shape. In Roman mythology Proteus was a sea-god who could change into any shape he wanted.

### Triton

Triton is the largest moon of Neptune. Scientists think that it is a lot like Pluto. It is 2700 km across. It is made of rock and ice. It has a surface temperature of  $-235^{\circ}\text{C}$ . Triton has a very thin atmosphere made up of **nitrogen** and a little **methane**.

There are volcanoes that have eruptions of liquid nitrogen, dust or methane compounds. The eruptions happen because of the seasons. There are few **craters** because the eruptions cover them up. There are ice caps that change sizes with the seasons. There are also **ridges** and **valleys**. They may have formed because of repeated freezing and thawing.

An interesting thing about Triton's orbit is that it goes around Neptune in the opposite direction that Neptune rotates. Because of this, scientists think that Triton was captured by Neptune long ago. In Roman mythology, Triton was the son of Neptune.

### Nereid

Nereid is an irregularly shaped moon about 340 km across. Its orbit is very eccentric or noncircular. It may have been captured by Neptune or moved into the eccentric orbit by Triton's gravity when Triton got captured. In Roman mythology Nereids were sea nymphs.

## Outer Moons

There are five other known moons. They are small potato-shaped moons far from Neptune. There might be more we haven't seen yet.

## How long is a day on this planet?

A day on Neptune lasts 16 hours and 7 minutes.

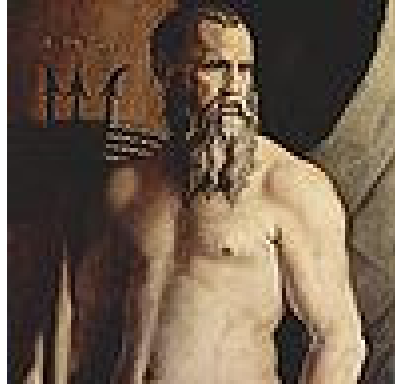
## How long is a year on this planet?

One year on Neptune is about 165 Earth years, or 60,265 days.

## What is it made of?

Neptune is made of rock and metal in the **core**. The core is probably bigger than Uranus's because Neptune weighs more, but is the same size. Around the core is rock, water, **ammonia** and **methane**. The atmosphere is made of **hydrogen** and **helium**. Lower down in the atmosphere, there is methane and ammonia too. The methane makes Neptune look blue-green.

*Artistic impression of Neptune*



## How much would Neptune's gravity pull on me?

If you were floating close to the cloud tops of Neptune, it would pull you down with a force only a little stronger than the force of Earth's gravity. The effects of Neptune's larger **radius** and its **mass** almost cancel out, making the force only a little bigger.

## Who is it named after?

Neptune is named after the Roman god of the seas, also known as Poseidon in ancient Greece.

## Who discovered Neptune?



After the discovery of Uranus, it was noticed that its orbit was not as it should be in accordance with Newton's laws. It was therefore predicted that another more distant planet must be perturbing Uranus' orbit. Neptune was first observed by Galle and d'Arrest on 1846 Sept 23 very near to the locations independently predicted by Adams and Le Verrier from calculations based on the observed positions of Jupiter, Saturn and Uranus. An international dispute arose between the English and French (though not, apparently between Adams and Le Verrier personally)

over priority and the right to name the new planet; they are now jointly credited with Neptune's discovery. Subsequent observations have shown that the orbits calculated by Adams and Le Verrier diverge from Neptune's actual orbit fairly quickly. Had the search for the planet taken place a few years earlier or later it would not have been found anywhere near the predicted location.

More than two centuries earlier, in 1613, Galileo observed Neptune when it happened to be very near Jupiter, but he thought it was just a star. On two successive nights he actually noticed that it moved slightly with respect to another nearby star. But on the subsequent nights it was out of his field of view. Had he seen it on the previous few nights Neptune's motion would have been obvious to him. But, alas, cloudy skies prevented observations on those few critical days.

Neptune has been visited by only one spacecraft, Voyager 2 on Aug 25 1989. Much of what we know about Neptune comes from this single encounter. But fortunately, recent ground-based and HST observations have added a great deal, too.

Because Pluto's orbit is so eccentric, it sometimes crosses the orbit of Neptune making Neptune the most distant planet from the Sun for a few years.



## **Neptune's Satellites**

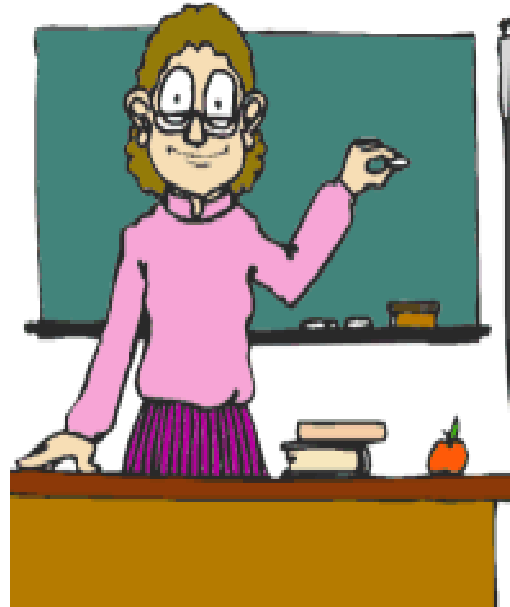
Neptune has 13 known moons; 7 small named ones and Triton plus four discovered in 2002 and one discovered in 2003 which have yet to be named.

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## Parent/Teacher Discussion Ideas



- Neptune's magnetic field is off-center and at a large angle to its rotation axis. What processes in the interior generate this oddly shaped field?
- What accounts for the relative lack of hydrogen and helium in Neptune (and Uranus)?
- Why are Neptune's winds so strong in spite of the fact that it is so far from the Sun and has a relatively weak internal heat source?
- What happened to the Great Dark Spot?
- Can we design a useful Neptune orbiter mission cheap enough to be funded?



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# Fact Sheet

## Orbit

30.06 astronomical units (AU) from the Sun  
Earth is 1 AU from the Sun

## Length of year

59,800 Earth days = 164.8 Earth years

## Length of Day

16.1 Earth hours, or 0.67 Earth days

## Tilt of Rotation Axis

28.3 degrees versus 23.5 degrees for Earth

## Size

**Diameter:** 3.9 times Earth's diameter

## Surface Gravity

1.1 times Earth's gravity

If you weigh 80 pounds on Earth, you would weigh about 91 pounds on Neptune!

## Mass

17.1 times Earth's mass

## Atmosphere

**Primary components:** 79% hydrogen, 18% helium, 3% methane

## Surface

The gas planets do not have solid surfaces; their gaseous material simply gets denser with depth. What we see when looking at these planets are the tops of clouds high in their atmospheres.

Neptune's composition is probably similar to that of Uranus: various ices and rock with about 15 percent hydrogen and a little helium. Like Uranus, but unlike Jupiter and Saturn, it may not have a distinct internal layering, instead being more or less uniform in composition. But there is most likely a small core (about the mass of the Earth) of rocky material.

## Moons

There are 13 known moons: Triton and 7 small named moons, plus 4 discovered in 2002 and 1 discovered in 2003 which have yet to be named (as of July 2004).

## Past Missions

Voyager 2 on August 25, 1989. Recent ground-based and Hubble Space Telescope observations have added a great deal of data.

# Neptune

Eighth planet from the Sun



LS-05-NASA PI A00340

Neptune was the first planet located through mathematical predictions. Johann Galle observed the planet by telescope in 1846. Galle wanted to name the planet for Le Verrier, who had predicted the planet mathematically, but this was not acceptable to the international astronomical community. Neptune is instead named for the Roman god of the sea. Some satellites in the Neptunian system are named for characters from Greek or Roman mythology associated with oceans, seas and rivers.

Wind speeds in Neptune's stormy cloud tops reach hundred of miles per hour. Because of Pluto's irregular orbit, Neptune was thought to be the most distant planet from the Sun between 1979-1999.

# Student Activity ~ Neptune

**Describe Neptune.**

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**How big is it?**

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**What is its surface like?**

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**Why is there no life on Neptune?**

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**How many Moons does Neptune have?**

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**How long is a day and a year on this planet?**

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**What is Neptune made of?**

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**How much would Neptune's gravity pull on me?**

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**Who is Neptune named after?**

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**Discuss who discovered Neptune. Refer to the notes on the previous pages.**

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**What are its rings like?**

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**Discuss its Satellites.**

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**What are its moons like?**

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• **Proteas**

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• **Triton**

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• **Nereid**

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• **Other moons**

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