The eighth planet from the Sun, Neptune, was the first planet located through mathematical predictions rather than through regular observations of the sky. When Uranus didn’t travel exactly as astronomers expected it to, two mathematicians, working independently of each other, proposed the position and mass of another, yet unknown planet that could account for Uranus’ orbit. Although “the establishment” ignored the predictions, a young astronomer decided to look for the predicted planet. Thus, Neptune was discovered in 1846. Seventeen days later, its largest moon, Triton, was also discovered.

Nearly 4.5 billion kilometers from the Sun, Neptune orbits the Sun once every 165 years, and therefore it has not quite made a full circle around the Sun since it was discovered. It is invisible from the Earth for 20 years, so there are 20-year periods out of every 248 Earth years when it cannot be seen. Neptune is the coldest planet in our solar system (75 K at 1-bar pressure level), and it has the smallest diameter of our solar system’s giant gas planets (including Jupiter, Saturn, and Uranus), so called because they have no solid surfaces. Even so, its volume could hold nearly 60 Earths. Neptune’s atmosphere extends to great depths, gradually merging into water and other “melted ices” over a heavier, approximately Earth-sized liquid core.

Neptune’s rotational axis is tilted 30 degrees to the plane of its orbit around the Sun. Its seasons last an incredible 41 years. During the southern summer, the south pole is in constant sunlight for about 41 years, and in northern summer, the north pole is in constant sunlight for about 41 years.

Neptune’s atmosphere is made up of hydrogen, helium, and methane, the last of these giving the planet its blue color (because methane absorbs red light). Despite its great distance from the Sun and lower energy input, Neptune’s winds are three times stronger than Jupiter’s and nine times stronger than Earth’s.

In 1989, Voyager 2 tracked a large oval dark storm in Neptune’s southern hemisphere. This hurricane-like “Great Dark Spot” was large enough to contain the entire Earth, spun counterclockwise, and moved westward at almost 1,200 km per hour. Recent images from the Hubble Space Telescope show no sign of the “Great Dark Spot,” although a comparable spot appeared in 1997 in Neptune’s northern hemisphere.

The planet has several rings of varying width, confirmed by Voyager 2’s observations in 1989. The outermost ring, Adams, contains five distinct arcs (incomplete rings) named Liberté 1, Liberté 2, Egalité, Fraternité, and Gaïeuse. Nébuleuse is an unnumbered co-orbital with the moon Galatée, then Le Verrier, Lassell, Arago, and Gaïeuse. Neptune’s rings are believed to be relatively young and relatively short-lived.

Neptune has eight known moons, six of which were discovered by Voyager 2. The largest, Triton, orbits Neptune in a direction opposite to the planet’s rotation direction, and is gradually getting closer until it will collide with the planet in about 10 to 100 million years. Former vast rings around Neptune that may rival or exceed Saturn’s extensive ringsystem. Triton is the coldest body yet visited in our solar system; temperatures on its surface are about -235 °C. Despite this deep freeze, Voyager 2 discovered geysers of gaseous nitrogen on Triton.

**Fast Facts**

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<tr>
<th>Name/Value</th>
<th>Roman God of the Sea</th>
<th>Roman Distance from Sun</th>
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**Significant Dates**

1845 Mathematics John Adams (Britain) and Jean Le Verrier (France) predict Neptune based on orbital motion of Uranus.
1846 German astronomer Johann Galle discovers Neptune using location predicted by Le Verrier.
1846 British astronomer William Lassell discovers Triton.
1849 American astronomer Gerard Kuiper discovers Nereid.
1985 Astronomers discover Neptune’s rings based on stellar occultations.
1989 Voyager 2 visits Neptune system.

**About the Images**

(Left) Neptune’s blue color is due to methane, which absorbs red light and reflects blue light. In 1989, Voyager 2 tracked these three giant storms—the Great Dark Spot, Scooter, and Dark Spot 2.

(Right, top) Voyager 2 photographed Neptunian clouds that are 50 kilometers above the underlying cloud decks.

(Right, middle) Voyager 2 needed ten-minute exposures to capture images of Neptune’s main rings.

(Right, bottom) Nitrogen frost coats Neptune’s largest moon, Triton. Bright and dark streaks are materials deposited by winds (NASA/Voyager 2).

**References**

1) NASA/Solar System Exploration: http://solarsystem.nasa.gov

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