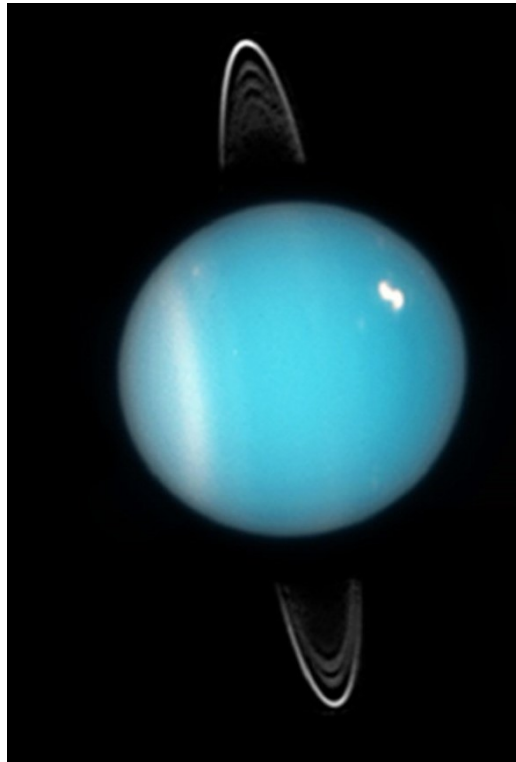


# Uranus



**URANUS** is the 7th planet from the Sun, 19.2 times the distance from the Sun as Earth. It is a gas giant with a diameter 4 times that of Earth. Uranus is 14.5 times more massive and 64 times larger in volume than Earth. This means that Uranus, while larger than Neptune, has less mass and is thus less dense. All this makes Uranus the 3rd largest planet in our Solar System. Uranus and its largest moons are so far away from the Sun that to a 300mm or larger telescope the moons appear as a cluster of small stars. A Uranian year equals 84.01 Earth years, meaning that since its discovery in 1781 by William Herschel, it has only orbited the Sun just over 2.5 times.

Previously believed to be a remarkably smooth featureless world, it took the infrared camera of the Hubble Space telescope to find that Uranus has a system of belts and zones, similar to Jupiter, with a relatively thin hydrogen and helium atmosphere and traces of methane. High altitude haze gives way to clear air underneath with constant moving huge clouds that dwarf the typical cumulus clouds we have on Earth. They are enormous continent sized masses, which circulate around the planet once every 16.5 hours.

Its outer layers are composed of hydrogen and helium with a temperature so low at  $-220^{\circ}\text{C}$  that the methane and water there condense to form clouds of ice crystals. Because methane freezes at a lower temperature than water, it forms clouds at higher altitudes and efficiently absorbs red light giving Uranus its blue-green colour.

Uranus rotates in retrograde motion once every 17 hours 14 minutes on an axis pushed over at 98 degrees, giving it a uniqueness in the Solar System. Planetary scientists have concluded that possibly a catastrophic collision with an Earth-sized object may have knocked Uranus on its side as we see it today. There is conclusive evidence that 5 of the planet's largest moons have been subjected to shattering impacts at least once. Its extreme tilt means that its north and south poles alternately point towards and then away from the Sun so causing exaggerated winter and summer seasons. Summer and winter would be about 35 to 42 years long.

The outer 30% of the planet is made of liquid hydrogen and helium. The next 40% inward is probably highly compressed liquid water with traces of methane and ammonia. The watery layer is deduced by the scarcity of ammonia in the atmosphere. However ammonia easily dissolves in water which points to a storage capacity somewhere. The inner one third is believed to be a rocky core about the size of Earth.

Like the other large gas planets Uranus has a system of rings and moons. Uranus's ring system is currently believed to have 13 distinct rings. Most of the 27 moons (the current number known) and all the rings revolve around the planet in the plane of its equator. Many of these small moons like Miranda have very unusual, even bizarre, topographical features.

Miranda's core of dense rock and outer layers of ice appears to have been blasted apart by an impact and then drifted back together by mutual gravitational attraction in a haphazard fashion. The landscape we see today is the result of huge dense rocks trying to settle toward the centre of mass, forcing blocks of less dense ice upward toward the surface.

One quaint historical feature of Uranus is the naming of its moons. All of them are named after characters from Shakespearean plays, such as Cordelia, Ophelia etc. There are three exceptions, however, being Belinda, Umbriel and Ariel who are characters from Pope's epic poem 'The Rape of the Lock', though it could be argued that Ariel was named after the sprite from Shakespeare's play "The Tempest".

The five largest moons of Uranus are:

Titania (1,578 km dia.)

Oberon (1,523 km dia.)

Umbriel (1,169 km dia.)

Ariel (1,158 km dia.)

Miranda (471.6 km dia.)

The remaining 22 moons are of diameters ranging from 190 km down to 10 km.

## PLANET DATA

Mass  $0.866 \times 10^{26}$  kg (14.5  $M_E$ )

Equatorial Diameter: 51,118 km (4.01  $D_E$ )

Mean density (kg/litre) (water =1): 1.24

Mean distance from Sun: 19.2 AU (2,867,760,000 km)

Rotation period (length of Planet's day): - 0.71833 Earth days (17.23 hours), retrograde

Revolution period (Planet's year): 84.01 Earth years

Obliquity (tilt of axis):  $98^\circ$

Orbit inclination:  $0^\circ 46'$

Orbit eccentricity (deviation from circular): 0.047

Mean surface temperature:  $-220^\circ\text{C}$

Atmospheric components: 83% hydrogen, 15% helium, 1.9% methane and traces of ammonia, ethane, acetylene, carbon monoxide, hydrogen sulphide.

## Observing Uranus

Theoretically, Uranus is visible to the naked eye as it varies in magnitude from 5.7 to 5.9. Obviously, it would be very faint, being near the brightness of the faintest naked eye star. Its apparent angular size varies from 3.3" to 3.7". You would have to know exactly where to look to find it.

To find Uranus, as for Neptune, you need either a planetarium software program or a printed star chart showing its gradually moving position against the background stars in its 'home' constellation. Uranus is currently located in Pisces and will remain in that constellation until 2017 when it will move into Aries.

At mag 5.9, it would be very visible in binoculars (which can see up to mag. 9) and its blue-green colour and non-twinkling appearance should be apparent, especially if you use the defocusing technique to blur the image. In a telescope, it will be even more obvious as a planet as magnifications of more than 80x should show it as a 'disc' (that is, not a twinkling pin-point star) resolvable to the human eye.