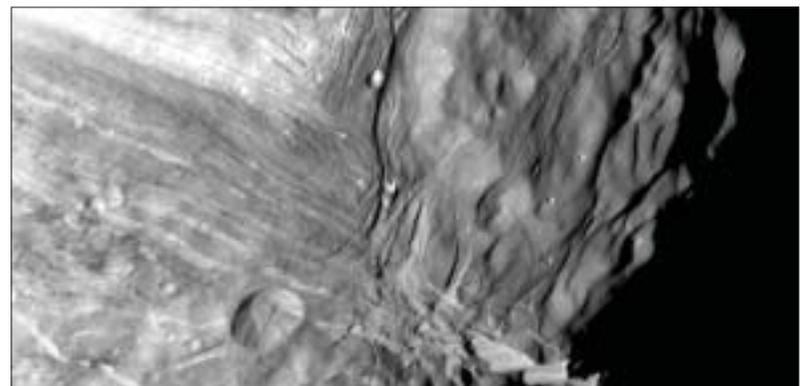
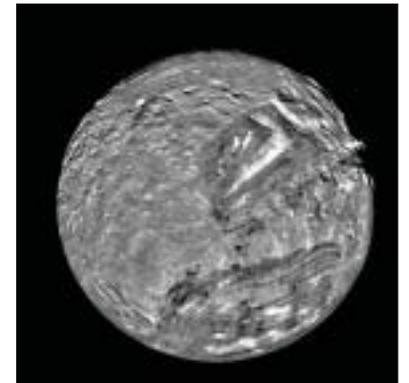
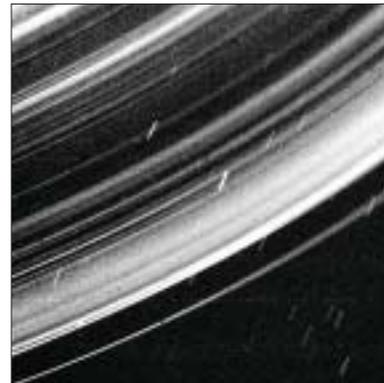
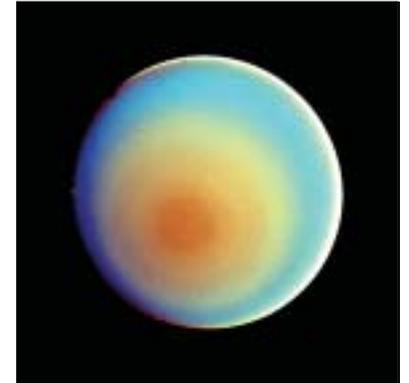
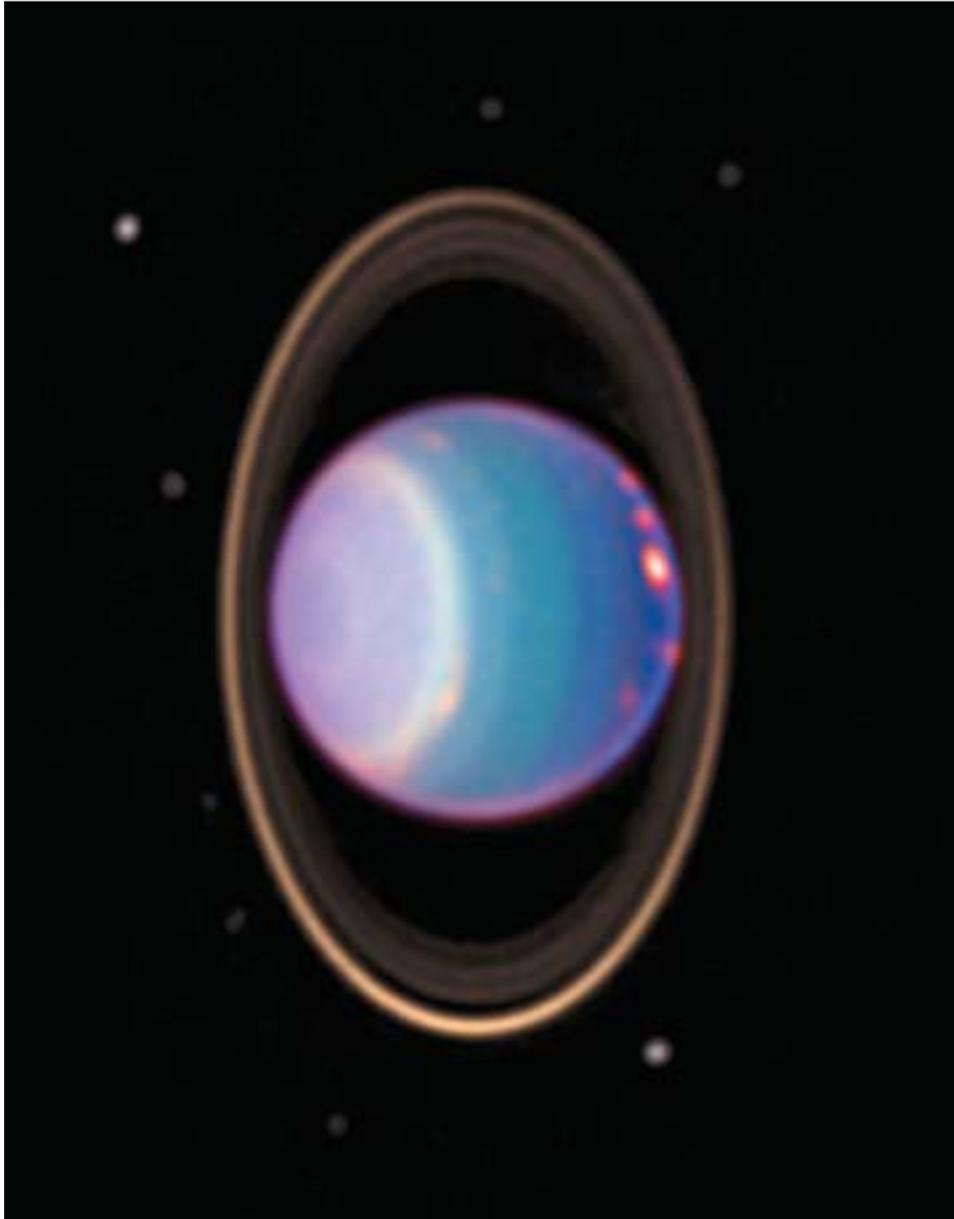




National Aeronautics and
Space Administration

Uranus 





Once considered one of the blander-looking planets, **URANUS** (pronounced YOOR un nus) has been revealed as a dynamic world with some of the brightest clouds in the outer solar system and a fragile ring system that wobbles like an unbalanced wagon wheel. Uranus gets its blue-green color from methane gas above the deeper cloud layers (methane absorbs red light and reflects blue light).

Uranus was discovered in 1781 by astronomer William Herschel, who at first believed it to be a comet. This seventh planet from the Sun is so distant that it takes 84 years to complete an orbit.

The third largest planet in our solar system, Uranus is classified as a “gas giant” planet because it has no solid surface. The atmosphere of Uranus is hydrogen and helium, with a small amount of methane and traces of water and ammonia. The bulk (80 percent or more) of the mass of Uranus is contained in an extended liquid core consisting primarily of “icy” materials (water, methane, and ammonia), with higher-density material at depth.

In 1986, *Voyager 2* observed faint cloud markings in the southern latitudes blowing westward between 100 and 600 km/hr. In 1998, the *Hubble Space Telescope* observed as many as 20 bright clouds at various altitudes in Uranus’s atmosphere. The bright clouds are probably made of crystals of methane, which condense as warm bubbles of gas well up from deep in the atmosphere of Uranus.

Uranus currently moves around the Sun with its rotation axis nearly horizontal with respect to the ecliptic plane. This unusual orientation may be the result of a collision with a planet-sized body early in the planet’s history, which apparently changed Uranus’s rotation radically.

Uranus’s magnetic field is unusual in that the magnetic axis is tilted 60 degrees from the planet’s axis of rotation and is offset from the center of the planet by one-third of the planet’s radius.

Uranus is so far from the Sun that, even though tipped on its side and experiencing seasons that last over twenty years, the temperature differences on the summer and winter sides of the planet do not differ that greatly. Near the cloudtops, the temperature of Uranus is near -215 °C.

Six of Uranus’s rings were discovered in 1977 by scientists aboard NASA’s *Kuiper Airborne Observatory* who were watching a star pass behind Uranus. They noticed the starlight winking on and off as the star first appeared to move toward the planet, and then again as the star moved away from the planet. Perth Observatory found three more rings that same day, and *Voyager 2* found two more rings in 1986, bringing the count to 11. The rings are in the planet’s equatorial plane, perpendicular to its orbit about the Sun. The 10 outer rings are dark, thin, and narrow, while the 11th ring is inside the other ten and is broad and diffuse. The rings of Uranus are very different from those surrounding Jupiter and Saturn. When viewed with the Sun behind the rings, fine dust can be seen scattered throughout all of the rings.

Uranus has at least 21 moons, named mostly for characters from the works of Shakespeare and Alexander Pope. Miranda is the strangest Uranian moon. The high cliffs and winding valleys of the moon may indicate partial melting of the interior, with icy material occasionally drifting to the surface.

Fast Facts

Namesake	Roman God, Father of the Titans
Mean Distance from Sun	2.871 billion km
Orbital Period	83.75 years
Orbital Eccentricity	0.047
Orbital Inclination to Ecliptic	0.76986°
Inclination of Equator to Orbit	82.14°
Rotational Period	17 h 14 m (retrograde)
Diameter	51,118 km
Mass	14.535 times Earth’s mass
Density	1.30 g/cm ³
Gravity	0.889 of Earth’s
Atmosphere	83% hydrogen, 15% helium, 2% methane
Atmospheric temperature at 1 Bar Pressure Level	76 K
Moons (21) in Increasing Distance from Uranus	Cordelia, Ophelia, Bianca, Cressida, Desdemona, Juliet, Portia, Rosalind, Belinda, Puck, Miranda, Ariel, Umbriel, Titania, Oberon, Caliban, Stephano, Sycorax, Prospero, Stebos
Number of Rings	11

Significant Dates

- 1781** Sir William Herschel (England) discovers Uranus.
- 1787** Sir William Herschel discovers Titania and Oberon.
- 1851** William Lassell (England) discovers Ariel and Umbriel.
- 1948** Gerald Kuiper (U.S.) discovers Miranda.
- 1977** James Elliot (U.S.) and others discover six rings; astronomers at Perth Observatory discover three additional rings.
- 1986** *Voyager 2* discovers 10 small moons and 2 more rings, detects magnetic field, and measures length of Uranian day.
- 1998** *Hubble Space Telescope* observes clouds on Uranus and wobble of rings.

About the Images

(Left) False-color image taken in the near-infrared of Uranus, 4 of its major rings, and 10 of its satellites [*Hubble Space Telescope NICMOS*, E. Karkoschka (U. Arizona)].

(Top, center and right) Uranus appears nearly featureless in visible wavelengths, but through blue, orange, and green filters, a dark polar hood and zonal areas in the atmosphere are apparent (*Voyager 2*).

(Left, center) *Voyager 2* revealed a continuous distribution of small particles throughout the Uranus ring system.

(Right, center and bottom) Miranda’s surface consists of two strikingly different major types of terrain. One is an old, heavily cratered, rolling terrain with relatively uniform albedo, or reflectivity. The other is a young, complex terrain characterized by sets of bright and dark bands, scarps and ridges features found in the ovoid regions at the top and bottom, and in the distinctive “chevron” feature above and to the right of center. The ice cliffs at right are 20 km high (*Voyager 2*).

References

- 1) NASA Solar System Exploration: <http://solarsystem.nasa.gov>
- 2) *The New Solar System*, 4th ed., Beatty, Petersen, Chaikin, eds., 1999.
- 3) NASA Planetary Photojournal: <http://photojournal.jpl.nasa.gov>