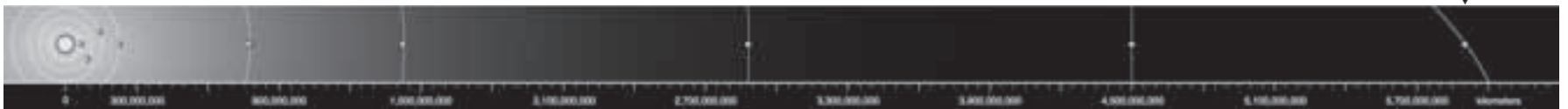
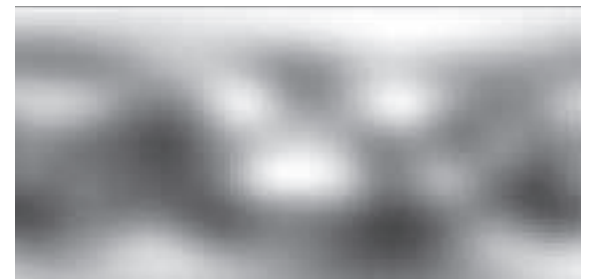
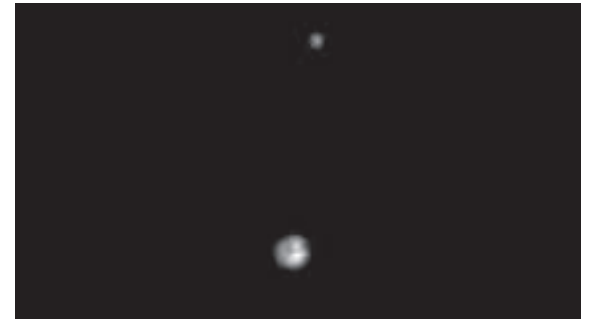
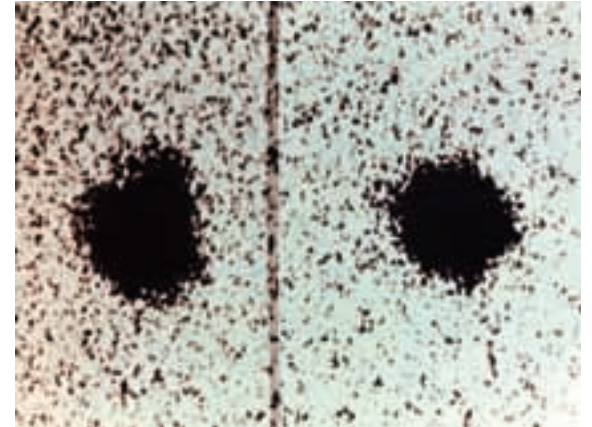
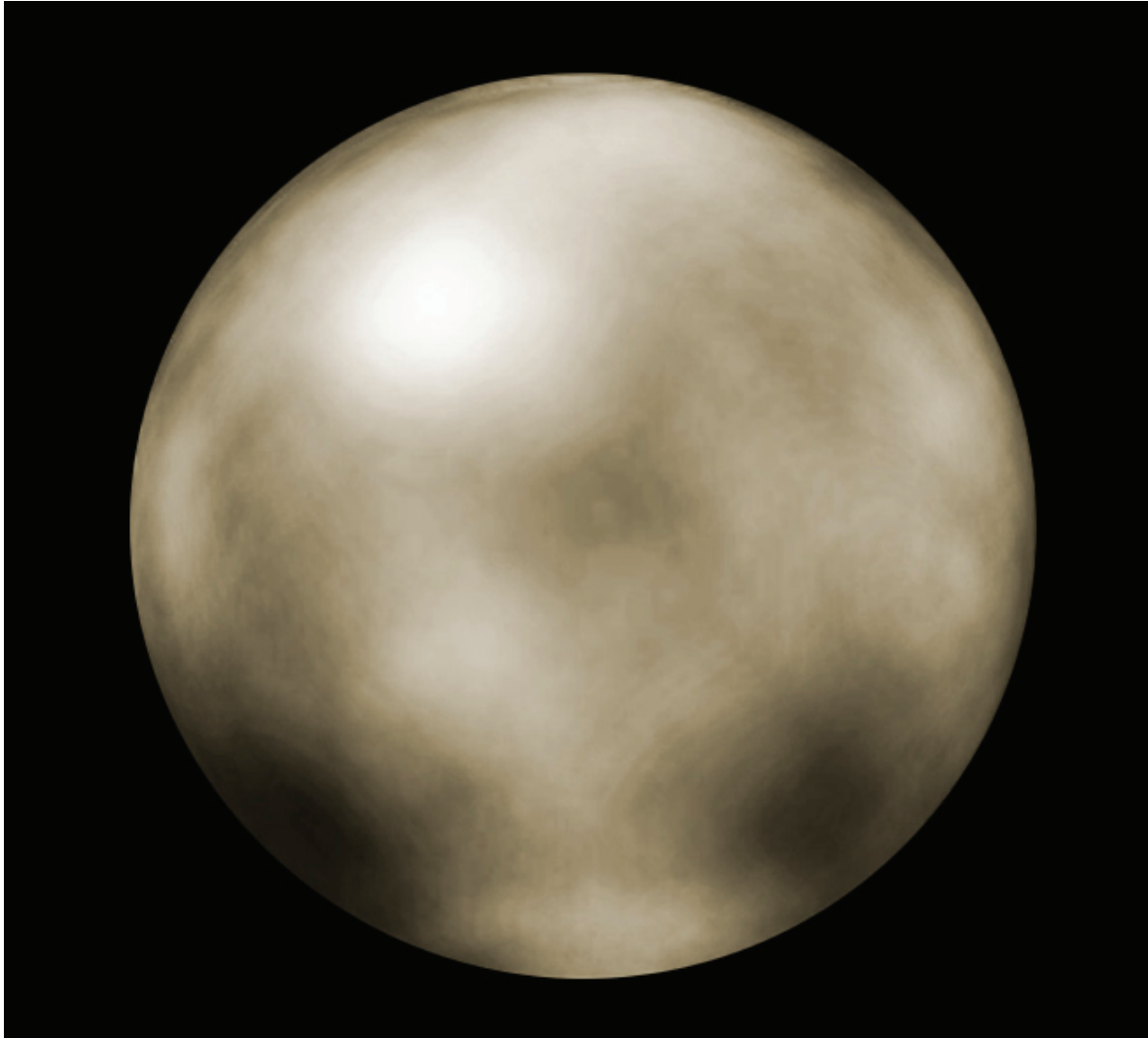


# Pluto and Charon



# Pluto and Charon



The smallest, coldest, and most distant planet from the Sun, Pluto has a dual identity — it is also a member of a group of objects that orbit in a disc-like zone beyond the orbit of Neptune called the Kuiper Belt. Pluto and its companion moon, Charon, orbit the Sun in this region. This distant realm is populated with thousands of miniature icy worlds, which formed early in the history of the solar system. While Pluto retains its position as the only recognized planet beyond Neptune, recent discoveries of a number of icy objects orbiting the Sun in Pluto's realm — at least one of which may be as large or larger than Pluto — have prompted a re-examination of how a planet should be defined.

Discovered by American astronomer Clyde Tombaugh in 1930, Pluto takes 248 years to orbit the Sun in a highly elliptical orbit. Pluto's closest approach to the Sun was in 1989, when its path carried it inward from its usual distance of about 39 astronomical units (AU) to within 29.7 AU of the Sun. (One AU is the mean distance between Earth and the Sun: about 150 million kilometers or 93 million miles.) Between 1979 and 1999, Pluto's orbit brought it closer to the Sun than Neptune (Neptune's mean distance is about 30 AU), providing rare opportunities to study this small, cold, distant world and its moon.

Pluto is about two-thirds the diameter of Earth's Moon and probably has a rocky core surrounded by a mantle of water ice. More exotic ices like methane and nitrogen frost coat its surface. Owing to its lower density, Pluto's mass is about one-sixth that of the Moon. While it is close to the Sun, these ices thaw, rise, and temporarily form a thin atmosphere. Pluto's low gravity (about 6 percent of Earth's) causes the atmosphere to be much more extended in altitude than our planet's atmosphere. Because Pluto's orbit is so elliptical, Pluto becomes much colder during the part of each orbit when it is traveling away from the Sun. During this time, the bulk of the planet's atmosphere may freeze.

In 1978, astronomers discovered that Pluto has a large moon, which was named Charon. Charon is almost half the size of Pluto and shares the same orbit; thus, Pluto and Charon are essentially a double planet system. The distance between the two is 19,640 kilometers (12,200 miles). The Hubble Space Telescope photographed Pluto and Charon in 1994 when Pluto was about 30 AU from Earth. These photos showed that Charon

is bluer than Pluto, indicating that they have different surface compositions and structure. Charon is known to have water ice on its surface.

Charon's orbit around Pluto takes about 6-1/2 Earth days. One Pluto rotation (a Pluto day) takes 6-1/2 Earth days, so Charon neither rises nor sets but "hovers" over the same spot on Pluto's surface, and the same side of Charon always faces Pluto — this is called tidal locking. Compared with most of the planets and moons, the Pluto–Charon system is tipped on its side. Pluto's axis of rotation is highly tilted the planet's rotation is retrograde (Uranus and Venus also have retrograde rotation). It isn't known whether Pluto has a magnetic field, but its small size and slow rotation suggest little or no magnetic field.

Because Pluto and Charon are so small and far away, they are extremely difficult to observe from Earth. In the late 1980s, Pluto and Charon passed in front of each other repeatedly for several years. Observations of these rare events allowed astronomers to make rudimentary maps of each body showing areas of relative brightness and darkness.

No spacecraft has ever visited Pluto, but NASA is preparing a mission called New Horizons that would explore both Pluto and the Kuiper Belt region. Expected to launch in 2006, the spacecraft would reach Pluto about 2015.

## FAST FACTS

Namesake	Roman god of the underworld
Mean Distance from the Sun	5,906.38 million km (3,670.05 million mi)
Orbit Period	247.92 Earth years (90,553 Earth days)
Orbit Eccentricity (Circular Orbit = 0)	0.2488
Orbit Inclination to Ecliptic	17.14 deg
Inclination of Equator to Orbit	119.61 deg
Rotation Period	6.387 Earth days
Equatorial Radius (Pluto)	1,180 km (733 mi)
Equatorial Radius (Charon)	600 km (373 mi)
Mass	0.0022 of Earth's
Density	2.03 g/cm <sup>3</sup>
Gravity	0.65 m/sec <sup>2</sup> (2.1 ft/sec <sup>2</sup> )

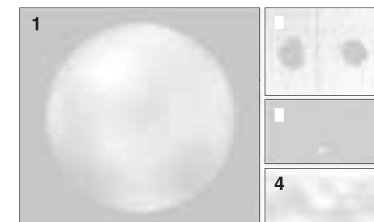
Atmosphere Primary Components	nitrogen, carbon monoxide, methane
Surface Temperature	–233 to –223 deg C (–387 to –369 deg F)
Known Moons*	1
Rings	None known

\*As of November 2005. In late October 2005, NASA announced that scientists using the Hubble Space Telescope had discovered that Pluto may have two additional moons. If the finding is confirmed, Pluto will be the only object beyond Neptune known to have more than one moon.

## SIGNIFICANT DATES

- 1930 — Clyde Tombaugh discovers Pluto.
- 1977–1999 — Pluto's lopsided orbit brings it slightly closer to the Sun than Neptune. It will be at least 230 years before Pluto again gets another 20-year stint as the eighth planet.
- 1978 — American astronomers James Christy and Robert Harrington discover Pluto's only moon, Charon.
- 1988 — Astronomers discover that Pluto has an atmosphere.
- 2010–2025 — Pluto's atmosphere may freeze and collapse as the planet moves farther from the Sun.

## ABOUT THE IMAGES



- 1** Pluto is mostly brown and is probably covered with methane frost.
- 2** Astronomers investigating the sometimes-elongated shape of Pluto in

some images eventually determined that Pluto had a companion — a large moon nearly half Pluto's size.

- 3** The Hubble Space Telescope resolved Pluto and Charon as separate disks, enabling better measurements of both bodies.
- 4** A surface map of Pluto created from four Hubble Space Telescope images, showing distinct areas of brightness.

## FOR MORE INFORMATION

[solarsystem.nasa.gov/planets/profile.cfm?Object=Pluto](http://solarsystem.nasa.gov/planets/profile.cfm?Object=Pluto)