National Aeronautics and
Space Administration

Pluto ♇

NASA artwork by Pat Rawlings

Pluto is unique among the planets. It's the smallest, the coldest, and the farthest from the Sun. Its orbit is the most elliptical and tilted, and it's the only planet that has a moon so close to its own size. Because of its great distance, Pluto remains the only planet that has never been visited by spacecraft.

Pluto wasn't discovered until 1930, when American astronomer Clyde Tombaugh first captured it on photographs. Because of its faintness, several decades elapsed before much was learned about Pluto. However, beginning in the late 1970s, as astronomical instrumentation and telescope technology began to advance rapidly, so did the number of things known about Pluto.

We now know Pluto's diameter is much smaller than was believed at its discovery. In fact, Pluto is only about 2,400 kilometers across, which means that Pluto is smaller than Earth's moon! Pluto's surface, which is slightly reddish, is made up of exotic snows, including methane, nitrogen, and carbon monoxide. Evidence indicates that Pluto's interior consists primarily of rock and water ice. Above the planet's surface lies an atmosphere, which is not very dense; the atmospheric pressure on Pluto is just one millionth that on Earth. Although the atmosphere is much more tenuous than Earth's, Pluto's low gravity (about 6% of Earth's) causes the atmosphere to be much more extended in altitude than our planet's. Because Pluto's orbit is so elliptical, Pluto grows much colder during the part of each orbit when it is far from the Sun. As a result, Pluto's atmosphere is thought to persist only for the part of each orbit when Pluto is closer to the Sun, as it is now.

In 1978, American astronomers James Christy and Robert Harrington discovered that Pluto has a satellite (moon), which they named Charon. Charon, which is almost half the size of Pluto, orbits the planet every 6.4 days, at an altitude of about 18,300 kilometers. Given the rough similarity of Pluto's size to Charon's, most planetary scientists refer to Pluto-Charon as a double, or binary, planet. Charon's surface differs from Pluto's; it is covered with dirty water ice and doesn't reflect as much light as Pluto's surface. Also, Charon's surface is devoid of strong color, and there is no confirmed evidence for an atmosphere on Charon.

In the late 1980s, Pluto and Charon underwent a set of mutual eclipses in which each body passed in front of the other repeatedly for several years. This pattern of events can be seen from Earth every 124 years, and will next begin in 2109 AD. Based on data from these eclipses and sophisticated computer models, it was possible to make crude maps of each body. From these maps it was learned that Pluto has polar caps, as well as large, dark spots nearer its equator. Because Pluto is so small and far away, it is impossible for any telescope on Earth to directly see these features. By getting above Earth's blurring atmosphere, the Hubble Space Telescope is capable of mapping Pluto; in 1994 the newly repaired Hubble will undertake this project.

Today, questions such as "How were Pluto and Charon formed?" and "Why are they so small and different from all the other planets?" still remain. One leading theory suggests that Pluto and Charon are relics of a population of hundreds or thousands of similar bodies that were formed early in solar system history. According to this hypothesis, most of these bodies were ejected to much larger distances from the solar system by the gravitational influence of the giant planets. The recent discovery of several bodies approaching the size of Charon in the region beyond Pluto has bolstered this theory.

Although no spacecraft mission has been sent to Pluto, NASA is presently working with scientists around the United States to discuss and evaluate plans for a mission to explore this strange double planet. According to these plans, one or two small spacecraft would be launched at speeds as high as 160,000 kilometers per hour in 2000 or 2001, so that they could reach Pluto before 2010, when the planet's atmosphere is expected to begin collapsing onto the surface in a planet-wide snow storm.

Fast Facts

Namesake	Roman God of the Underworld
Average Distance from the Sun:	6 Billion Kilometers
Orbit Period	248 Years
Equatorial Diameter	2,400 Kilometers
Atmosphere (Main Constituents)	Nitrogen, Carbon Monoxide, Methane
Inclination of Orbit to Ecliptic	17.2°
Eccentricity of Orbit	0.25
Rotation Period	6.387 Days
Inclination of Axis	~120°
Moon	Charon
Charon's Diameter	1,210 Kilometers

Significant Dates

1930 — Pluto discovered
1955 — Pluto's 6.4 day rotation period discovered
1976 — Methane on Pluto's surface discovered
1978 — Charon discovered
1985 — Onset of Pluto-Charon eclipses (lasted 1985–1991)
1988 — Pluto's atmosphere discovered
1992 — Nitrogen and carbon monoxide on Pluto's surface discovered
1994 — First Hubble Space Telescope maps of Pluto
2010 — Predicted atmospheric collapse

About the Image

This artist's conception of the Pluto-Charon binary planet was conceived and executed by Pat Rawlings of Science Applications International Corporation. Pluto is represented in the background; Charon is in the foreground. The drawing depicts Pluto's true color, bright polar cap, tenuous atmosphere, and dark equatorial band. Notice how much brighter Pluto's surface is than Charon's. The craters and other geological features depicted are based on educated guesses about the kinds of features a flyby spacecraft might detect.