

Pluto returns to ninth position

You won't see a full moon this month because January and March both have two full moons this year (see last month's column on blue moons). The phenomenon of two full moons falling within one year occurs only about every 19 years. An even rarer event, however, will take place this February. Everyone who thinks that Pluto is the ninth planet in our solar system will be in the right again, and I'll be thankful that the event will correct a grammatically incorrect mnemonic device for remembering the current order of the planets (**M**y **V**ery **E**ducated **M**other **J**ust **S**erved **U**s **P**izzas **N**ine).

Twenty years ago, on February 7, 1979, Pluto moved from its position as the ninth planet to its current position as the eighth planet in the solar system. On February 11, Pluto will move out farther from the Sun than Neptune, returning to the ninth position. Though first discovered in 1930, it wasn't until Pluto moved into the eighth position in 1979 that scientists were able to gather much information about the planet.

Why Pluto's different

At a distance of 5.9 billion km from Earth, Pluto is too distant to view very clearly, even with the Hubble Space telescope. However, careful observations led to the discovery of Pluto's moon, Charon (pronounced "shahr-en"), in 1978 by astronomer Jim Christy. In Greek mythology, Charon is the ferryman who transports the souls of the dead across the river Styx to the underworld.

The discovery in itself was no small feat, as the distance between the two celestial objects is about 19,640 km, which is miniscule compared with our distance from Pluto. Further observations by Christy led to his calculating the mass and density of both objects. Their similar densi-

ties (2 g/cm^3) suggest that both the planet and its moon consist of a mixture of rock and ice.

Surface temperatures of the two celestial objects are estimated to be between -200 to -250 degrees Celsius. Therefore, neither has much of an atmosphere—at these temperatures most gases are in liquid or solid form. However, Pluto may now have an atmosphere of sorts because it's only ten years past its perihelion, the point in its orbital path when it is closest to the Sun. As a result, the

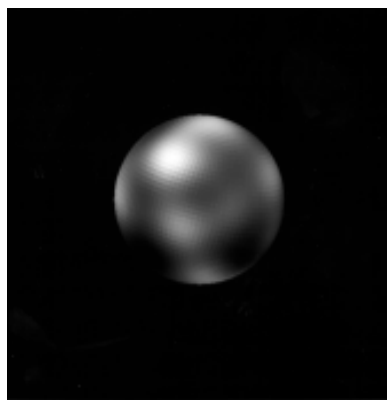


Photo of Pluto taken with the European Space Agency's Faint Object Camera aboard the Hubble Space telescope.

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surface ices may have warmed up enough to release nitrogen and methane into the atmosphere.

Dancing with Charon

Pluto is a small planet—2,274 km in diameter, smaller than the seven moons in our solar system, and only about twice the size of Charon (1,172 km). The size ratio of Pluto to its moon is the smallest of all the planets, including the Earth's four-to-one planet-to-moon ratio. Pluto and Charon orbit each other synchronously. In other words, they rotate around each other at the same rate;

therefore, the same sides of Pluto and its moon always face each other.

Pluto rotates once on its axis about every 6.5 Earth days, and it rotates on its side, just as Uranus does, with its equator at nearly a right angle to the plane of its orbit. Also, Pluto's orbit is retrograde, the opposite of most of the other planets.

Pluto and Charon's orbital path is the most eccentric in our solar system—more like an off-center ellipse than a circle. Although not as elliptical as it's often depicted, Pluto's orbit is eccentric enough that its distance from Earth can vary between 4 billion and 7.5 billion km. Pluto's orbit also has the greatest inclination, at 17.15 degrees from the Earth's orbital plane.

The unvisited planet

Because Pluto's orbit is more eccentric and more inclined from the orbital plane of the other planets, Pluto has been closer to the Sun than Neptune for the past 20 years. However, Pluto never really crossed Neptune's orbital path. Rather, its inclination from the Earth's orbital plane causes Pluto to "tilt" closer to the Sun than Neptune. Pluto and Neptune have no chance of colliding because of the great difference between the two planets' orbital periods (see Pluto's Orbit in the resources list).

Pluto has completed little more than a fourth of its path along its 247.7-Earth-year orbit around the Sun since its discovery in 1930 by Clyde Tombaugh. Although Pluto is the only planet not yet visited by a spacecraft, we have learned quite a lot about the planet from our distant view. Of course, many unanswered questions remain. Is Pluto a planet or a large object that has moved inward from the Kuiper Belt? Could it be a moon that somehow escaped from the gravitational grip of Neptune? Regardless of whether or not we are able to answer these questions immediately, the possibility of visiting our most distant planet is becoming more

and more realistic. Pluto is just past perihelion, the point in its orbital path closest to the Sun. Pluto won't be this close again for another 250 years.

Planetary conjunctions

Venus will move out from east of the Sun toward a conjunction with Jupiter on February 23. (Venus moves more than 1 degree each day along its orbit, while Jupiter takes an entire month to travel as far.) Down to the right from Venus and Jupiter hangs Mercury, while up to the left is Saturn. Watch for the waxing crescent moon to pass by these two planets on the night of February 17.

Web resources

- Pluto—seds.lpl.arizona.edu/nineplanets/nineplanets/pluto.html
- Pluto's Orbit—seds.lpl.arizona.edu/nineplanets/nineplanets/plutodyn.html
- The Kuiper Belt and The Oort Cloud—seds.lpl.arizona.edu/nineplanets/nineplanets/kboc.html
- Pluto-Kuiper Express—seds.lpl.arizona.edu/nineplanets/nineplanets/spacecraft.html#pffb
- Folklore of the "Blue Moon"—www.griffithobs.org/IPSBBlueMoon.html