Pluto's Moon

For many years, Pluto was seen as nothing more than a distant fuzz ball, even through the most powerful telescopes. As technology improved, however, astronomers noticed that Pluto seemed to bulge out on one side. Even more mysterious, the bulge seemed to change position. On June 22, 1978, astronomer James Christy came to a startling conclusion.

Christy, working at the United States Naval Observatory in Flagstaff, Arizona, had been comparing telescope images to measure Pluto's orbit. To do this, he had to track the planet's motion

Astronomer James Christy (foreground), who discovered Pluto's moon, Charon, in 1978, is pictured at the United States Naval Observatory in Flagstaff, Arizona, with fellow USNO astronomer Robert Harrington.

against the background field of stars. As he tracked Pluto, he noticed the strange bump, which appeared to change positions on Pluto's surface. Soon, Christy concluded that the moving bump was actually an orbiting moon. Christy named the moon Charon, which had a mythological tie to Pluto. In Greek mythology, Charon was the boatman who ferried the souls of the dead across the river Styx to the underworld ruled by Pluto. On a more personal note, *Charon* also sounded like *Charlene,* the name of Christy's wife—who was known informally as Char.[1]

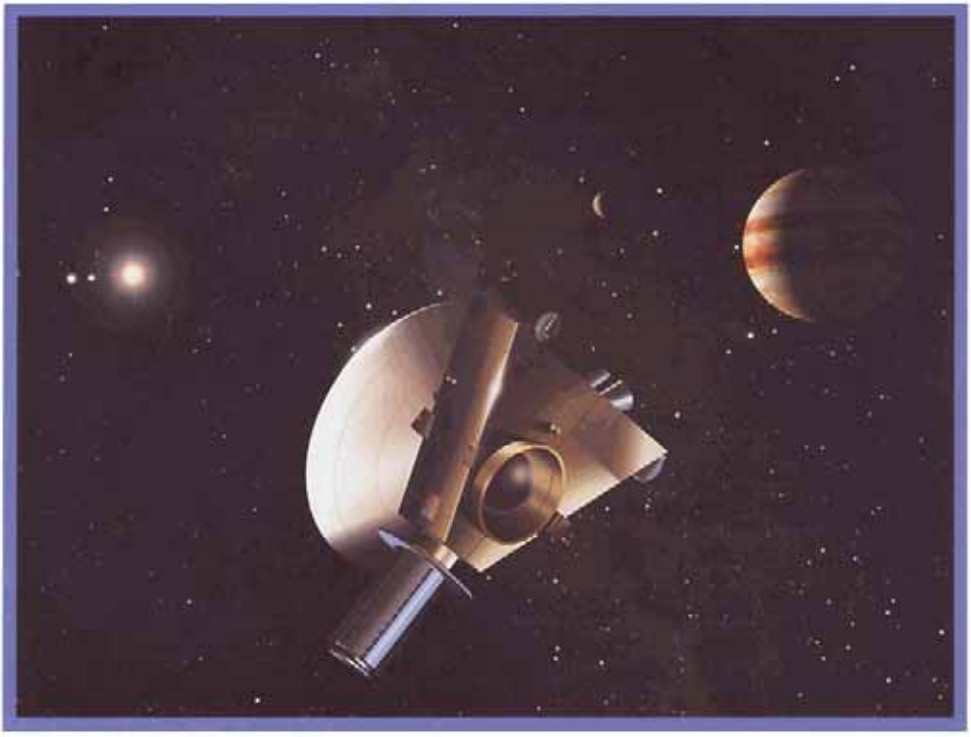
Because no telescopes were powerful enough to show Pluto and Charon as separate bodies, some were skeptical about Christy's discovery. One scientist even wondered whether the bump was just an extremely large mountain on Pluto's surface. It would be years before Charon was officially accepted as a separate moon of Pluto. By then, however, Pluto's very designation as a planet would be questioned.

Charon's Origins

If information about Pluto's origins is sketchy, we know even less about how Charon was formed. Many hold to the belief that Pluto and Charon were created in some interplanetary collision, which also knocked the pair into their present path. Others believe that Pluto, as a rapidly revolving new planet, might have shed enough material to form a moon. Still others think that Pluto and Charon formed together out of the solar nebula as a pair, forever linked in space.

The Largest Satellite

Charon is roughly 740 miles (1,190 kilometers) in diameter, about half the size of Pluto. This makes Charon the largest satellite in proportion to its host planet of any planet in the solar system. Earth's Moon is the second largest, with a diameter one-quarter that of Earth. The giant moons of Jupiter and Saturn, which measure more than 3,000 miles (4,827 kilometers) across, are much larger



An artist's conception of the New Horizons spacecraft, which is scheduled to begin its mission to Pluto in 2006.

than Charon, but they are dwarfed by their giant host planets—the largest planets in the solar system. Regardless of their origins, Pluto and Charon are now so closely linked that the two are often referred to as a binary planet or a double planet.

"Charon is so big, relative to Pluto's size, that the two bodies constitute a double planet," said Alan Stern, a planetary scientist at the Southwest Research Institute in Boulder, Colorado, who will be the principal investigator of New Horizons, a mission to Pluto and Charon scheduled to launch in 2006. "There's no other pair quite like them in the solar system. But we think when we get to study them close up, we'll find parallels to binary stars."[2]

▲ *A rare image of Pluto, top, and Charon, bottom, was captured by the Hubble.*

Astronomers believe that Pluto and Charon exchange material and affect each other's orbital motions. Pluto and Charon, although 12,177 miles (19,593 kilometers) apart, circle each other around a center of gravity located in the space between the two bodies. In most planet-moon systems, such as that of Earth and its Moon, the center of gravity exists in the larger planet.

Rotation and Orbit

Pluto and Charon are locked into an interesting and unchanging formation in space. They rotate on their axes and orbit their hosts at the exact same rate, which is called synchronous rotation and revolution. This means that Pluto and Charon always show the

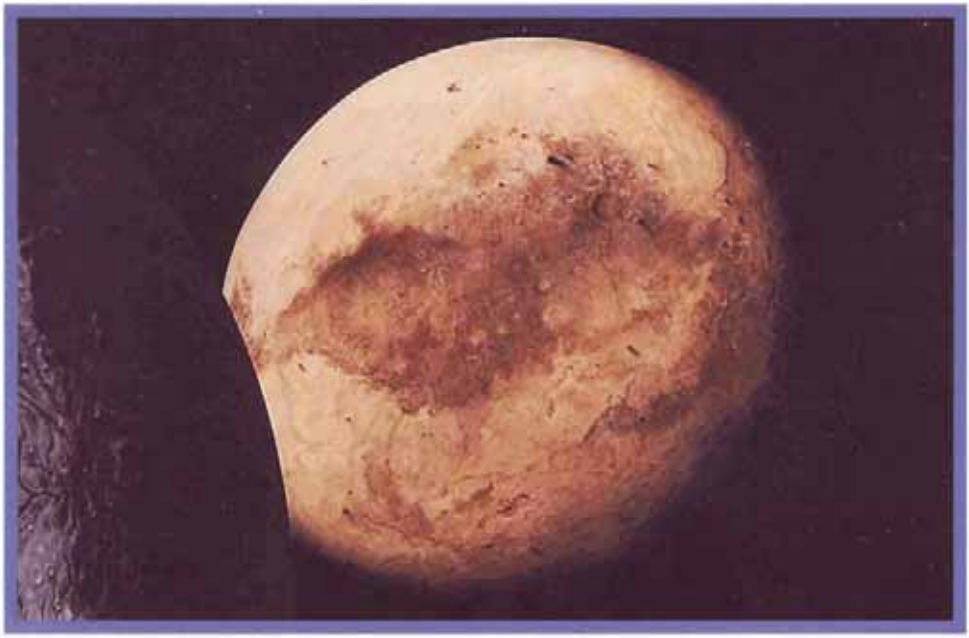
same face toward each other, just as our Moon always shows the same face to Earth. If life-forms could survive on the side of Pluto that never faced Charon, those life-forms would never even know that Pluto had a moon.

To make it easier to understand, some people compare Pluto and Charon to a weight-lifting dumbbell, with the weight on one end twice as large as the other. If this dumbbell were tossed into orbit by a fantasy giant, the two end weights would be forever locked into position. (For this to happen with Earth and its Moon, Earth would have to be pulled into a rhythm with the Moon's orbit, rotating once every 28 days, instead of once every 24 hours. The Moon would have to be much larger and much closer to exert this kind of gravitational pull on Earth—as Charon does with Pluto.)

Recent images captured by the Hubble Space Telescope have revealed a surprising fact about Charon: Charon's orbit is not perfectly circular, as scientists previously thought. Instead, Charon has an elliptical orbit, which astronomers say is surprising, given how perfectly synchronized Pluto and Charon are. Like the common theories about Pluto's orbit, it is believed that a relatively recent collision might have knocked Charon into its slightly off-kilter path.

Surface and Core

Astronomers believe that Charon's structure is very similar to Pluto's, but with a smaller core relative to the moon's size. Charon has a lower density than Pluto, which means that it is likely to have a higher proportion of ice. Unlike Pluto, Charon does not appear to have frozen methane on its surface—only water ice has been found so far. However, scientists are not ruling out that Charon's surface might also contain a small percentage of frozen methane, nitrogen, and carbon monoxide. In addition, some say that Charon's darker color might be due to the presence of some kind of dirt, made of yet-undiscovered organic materials.



An artist's idea of what Pluto, at right, and Charon, its moon, might look like.

Mutual Events

Between 1985 and 1990, astronomers realized they had great luck when it came to studying Charon. During that brief five-year period, Charon and Pluto moved in front of each other when astronomers viewed the pair from Earth. This allowed astronomers to monitor both the combined and individual brightness of the objects, which offered clues to their surface materials, reflectivity, and color. Pluto appears much darker when Charon passes in front of it, a combination of Charon's grayish color and the shadow it casts on Pluto.

Known as "mutual events," these movements occur only twice during Pluto's nearly 249-year orbit around the Sun. If Charon had been discovered only fifteen years later, scientists would have had to wait until the twenty-second century for this phenomenon to occur again.