

As a NASA spaceship begins a 9-year, 3.5 billion-mile voyage to the outermost planet, new worlds are being discovered.

To Pluto—And Far Beyond

By David H. Levy

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Never before has there been so much interest in the edge of the solar system: For the first time ever, a NASA spacecraft is poised to travel to the distant, frozen realm where Pluto—and at least one newly discovered planet—lies. Sometime between Jan. 17 and Feb. 14, the spacecraft *New Horizons*, equipped with cameras and other instruments, is scheduled to begin a voyage of at least 9 years—past the asteroids that jumble between Mars and Jupiter, past the orbits of Saturn, Uranus and Neptune...until finally, as early as 2015, it passes by icy Pluto and its moon, Charon.

After its encounter with Pluto, *New Horizons*, it is hoped, may sail by a world not yet found—a world like the one discovered a year ago by the astronomers Mike Brown, Chad Trujillo and David Rabinowitz. Last January, using one of the biggest telescopes at Palomar Observatory in California and a sophisticated computer program designed to pick up very slow-moving (and faraway) objects, the astronomers found a world in orbit some 10 billion miles from the Sun (the Earth is a mere 93 million miles), three times farther than Pluto.

Designated 2003 UB313 (it hasn't been officially named yet), this "planet" is slightly larger than Pluto, has a small moon and takes more than 500 Earth years to orbit the Sun.

New Worlds Waiting

It has been 76 years since Clyde Tombaugh discovered Pluto in 1930. But Tombaugh discovered much more than a new planet—he found the door to the outer solar system. We are only now passing through that door to witness a crowd of objects extending billions of miles from a point between Neptune and Pluto, known as the "Kuiper Belt," after the Dutch-American astronomer Gerard Kuiper, who suggested that it may exist.

There probably are thousands of small worlds out there. We know of two large enough to be called planets: Pluto and 2003 UB313. At least four others—all smaller than Pluto—have been discovered in the Kuiper Belt since 2002. There may be many others, some Earth-size or larger. It is these worlds—small and large—that *New Horizons* is set to visit after exploring Pluto.

When *New Horizons* arrives at Pluto, it will find a world 3 billion miles from the Sun that takes two and a half centuries to endure one lonely year and where the temperature remains at hundreds of degrees below zero. In Pluto's sky, the Sun will shine only as a bright star. Its moon, Charon, which circles Pluto every 6.4 Earth days and is nearly half the size of Pluto, will appear as a big ball eight times larger than our own moon appears in our sky!

"We are going to the edge of the solar system," says mission principal investigator Alan Stern, "where no one has gone before." If Pluto is indeed one of the biggest members of a very crowded Kuiper Belt, Stern suggests, this mission might be studying the most common type of planetary body in the solar system. There may be as many as 20,000 such worlds in the Kuiper Belt, most no larger than villages and cities but a few genuine planet-sized worlds that might be 1,000 miles or more across.

The amazing thing about both Pluto and 2003 UB313 is that our solar system has planets so far from the Sun. How did they get there? It is hard to imagine that the large cloud out of which the planets formed almost 5 billion years ago could make planets so far from its center. It is possible that these worlds began much closer to the Sun and that, like cosmic billiards, they passed close to the bigger planets, such as Jupiter, which tossed them into the cold of distant space.

Is this new world the true end of the solar system? No, it is not. Although we have never seen a world out there, we often receive postcards from the edge. They come in the form of comets that travel from the depths of space, swing around the Sun once and return to a great sphere which, astronomers believe, marks the true end of the solar system. How far? As much as a light year, or 6 trillion miles.

David H. Levy, PARADE's Science Editor, has discovered or co-discovered 21 comets, including Comet Shoemaker-Levy 9, which made international headlines when it crashed into Jupiter in 1994. His latest book is "Deep Sky Objects: The Best and Brightest From Four Decades of Comet Chasing." It suggests the best things to see in the night sky.

What Is a Planet Anyway?

On a clear evening in autumn, we can see myriad stars that move across the sky from east to west but stay in the same position relative to each other, like houses on a street.

However, high in the western sky, a bright reddish "star" moves independently among the others, as does another, yellowish one in the east.

These are "wandering" stars, or "planets" (from the Greek word meaning "wanderer"). The red one is Mars, the yellow one Saturn. This definition has nothing to do with what a planet is made of or its size—just that it wanders among the background of stars.

But other things also wander, including comets and very small objects called asteroids. Over time, *planet* has come to mean a large world that orbits a star. The nine historical planets that orbit our Sun are all very different. Earth, Venus, Mars and Mercury are rocky worlds. Jupiter, Saturn, Uranus and Neptune are made mostly of gas. And the worlds of the Kuiper Belt, such as Pluto and the new one, are mostly ice.

We don't have a dictionary definition yet that includes all the contingencies. In the wake of the new discovery, however, the International Astronomical Union has set up a group to develop a workable definition of *planet*. For our part, in consultation with several experienced planetary astronomers, Parade offers this definition:

A planet is a body large enough that, when it formed, it condensed under its own gravity to be shaped like a sphere. It orbits a star directly and is not a moon of another planet.

What is the smallest size world that could be called a planet? Several asteroids, such as Ceres and Vesta, are nearly spherical. To simplify things, some scientists propose that the size of Pluto be designated the smallest size for a planet. If that argument carries the day, we now have 10 planets, since 2003 UB313 meets all the criteria.

Modern astronomy is complex, and nature doesn't make it any easier by arranging itself into neat categories or "little boxes." When does a rise become a hill, and when is a hill a mountain? How we define a planet is essentially up to us. Like many people in planetary science, I feel that we cannot ignore Pluto's historical relevance and that any object the size of Pluto or larger that orbits the Sun is a planet.

—David H. Levy

The First New Planet in 76 Years

Name: Until the International Astronomical Union decides whether this world billions of miles from Pluto qualifies as a planet, we only have its code name: 2003 UB313. (Or we can call it “Goofy,” as Jay Leno suggested.)

Distance from the Sun: 38 to 97 times that of the Earth (3.5 billion to more than 9 billion miles).

Length of its day: Not known.

Moon(s): At least one, about 155 miles across.

Size: Possibly between 1,500 and 2,000 miles in diameter. Larger than Pluto (1,413 miles).

Length of its year: More than 500 Earth years—twice as long as Pluto’s. If Leonardo da Vinci lived there, he would be celebrating his first birthday right about now.

What Its Night Sky Looks Like: Surprisingly, exactly the same as it does from Earth! With one exception: The Sun would appear only as a bright star.

Web Exclusive

Pluto Has Two New Moons!

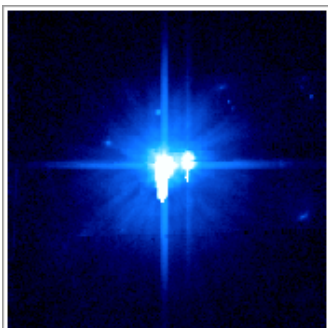


Photo Credit: NASA, ESA, H. Weaver (JHU/APL), A. Stern (SwRI), and the HST Pluto companion Search Team.

The *New Horizons* spacecraft, now poised for its 9-year journey to Pluto, has already made two important discoveries before it even leaves Earth. As part of the preparation for launch, mission team leaders Alan Stern and Hal Weaver used the Hubble Space Telescope to discover two new moons orbiting that distant world.

On May 15, 2005, the mighty telescope turned in the direction of Pluto, the solar system’s outermost planet. The photographs it took that day were repeated three nights later. These images revealed Pluto itself, its moon Charon that has been known since 1978, and two smaller new moons. Max Mutchler, a scientist at the Space Telescope Science Institute, examined the images on June 15 and was the first to see the new moons. The moons are faint—at 23rd magnitude, they are

hundreds of times fainter than Pluto. S/2005 P1, the brighter moon, orbits Pluto in 38 days, and S/2005 P2 circles the planet in 23 days. They are farther from Pluto than Charon.

Pluto was discovered on February 18, 1930, by Clyde Tombaugh. James Christy discovered Charon in 1978.

Correction: Due to an editing error, the wrong number of miles in a light year was printed in the article below. The correct number is 6 trillion miles. This change has been made in the text below.

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Sun from Pluto is a point of light, but much brighter than Earth's moon