

Move over, Pluto. Even larger ice worlds exist in the outer solar system.

/// BY FRANCIS REDDY

The tenth planet

“Get out your pens. Start rewriting the textbooks,” said Caltech astronomer Michael Brown in a hastily arranged teleconference late July 29. His team had discovered a new object — temporarily named 2003 UB₃₁₃ — that is, he says, not only the farthest directly observed body

in the solar system and the fourth brightest Kuiper Belt object. It is also our solar system’s tenth planet.

Since beginning a 5-year, all-sky survey with Palomar Observatory’s 48-inch Samuel Oschin Telescope in 2001, Brown and his colleagues Chad Trujillo at the Gemini Observatory on Mauna Kea, Hawaii, and David Rabinowitz at Yale University have found several objects about three-quarters Pluto’s size. These include Quaoar, Orcus, and Sedna. The astronomers first imaged 2003 UB₃₁₃ October 21, 2003 — but the ice world moved so slowly along its orbit it eluded software designed to look for moving targets until the scientists reanalyzed their images January 5, 2005.

“I think it’s cool,” says Alan Stern, an astronomer at the Southwest Research Institute in Boulder, Colorado. He’s also the

principal investigator on NASA’s New Horizons mission to Pluto, set to launch next year. “I don’t think it’s surprising.”

Pluto orbits the Sun with hundreds of other objects in the Kuiper Belt, a region between 30 and 50 AU from the Sun. (One AU, or astronomical unit, equals the average Earth-Sun distance.) For more than a decade, many planetary scientists — Brown and Stern among them — suspected bodies larger than Pluto lurked in the outer solar system’s frigid darkness.

The new object now lies 97 AU from the Sun — more than 9 billion miles (14.5 billion kilometers) away, or 3 times Pluto’s distance — and has reached the farthest part of its 557-year orbit. In 280 years, a little longer than Pluto takes to orbit once, 2003 UB₃₁₃ will reach its closest point to the Sun at a distance of 38 AU.

Brown’s team has proposed a permanent name to the International Astronomical Union (IAU), the organization that approves solar-system nomenclature. He won’t disclose the name pending acceptance, which could take a while. On August 4, the IAU announced 2003 UB₃₁₃ won’t be named until efforts to define a planet’s minimum size — in progress since 1999 — reaches a conclusion. Only then will astronomers be able to classify the body.

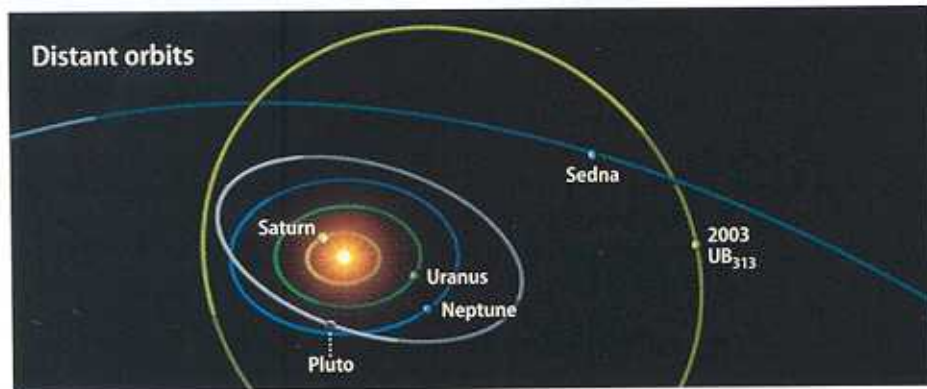
Plus-size Pluto

“It’s definitely bigger than Pluto,” says Brown. Astronomers don’t know if the new object is bright because its surface is especially shiny, or if it’s bright because it’s big. But even if 2003 UB₃₁₃ has a surface that gleams like fresh snow on Earth, reflecting 90 percent of incident sunlight, the icy world can only be as bright as it is if it’s slightly larger than Pluto, or more than 1,413 miles (2,275 km) across.

Brown says his team’s first attempt to detect 2003 UB₃₁₃ with the Spitzer Space Telescope failed due to a technical glitch that pointed the telescope in the wrong place. Another attempt with Spitzer, and planned observations with the 30-meter IRAM Telescope in Spain and the Hubble Space Telescope, should help the scientists determine its maximum size.

On January 25, using the Gemini North Telescope on Mauna Kea, Hawaii, Chad Trujillo studied the object’s near-infrared spectrum, which provides information about surface properties. Preliminary results indicate a surface remarkably similar to Pluto’s, covered in frozen methane.

“Only one other object in the Kuiper Belt has a surface that looks like that,” Brown says. The object, designated 2005



ASTRONOMY: BOB KELLY

THE TENTH PLANET is now slightly more distant than Sedna, which the same team discovered last year. But 2003 UB₃₁₃ now lies near its farthest point from the Sun, while Sedna will cruise out to 10 times its present distance. The new world’s orbit tips a remarkable 44° out of the ecliptic plane — much more so than either Sedna (11.9°) or Pluto (17.2°).

Francis Reddy is an associate editor of *Astronomy*.

**2003 UB₃₁₃****Discovered:** October 21, 2003, by Michael E. Brown, Chad Trujillo, and David L. Rabinowitz**Name:** Proposed, but on hold until planetary status is decided**Constellation:** Cetus**Position:** R.A. 01h37m06s, Dec. -5°36'12" (Nov. 1, 2005)**Magnitude:** 18.8**Current distance from Sun:** 96.9 AU (1 AU is the Earth-Sun distance.)**Light travel time:** 13.3 hours, one-way**Surface temperature:** -405° F (-243° C)**Surface composition:** Methane ice (Pluto-like)**Orbital period:** 557 years**Orbital inclination:** 44.2°**Closest point to Sun:** 37.8 AU**Farthest point from Sun:** 97.6 AU

FRANCIS REDDY

A WHOLE NEW WORLD — temporarily dubbed 2003 UB₃₁₃ — lurks in the outer solar system's frigid reaches. This illustration shows what the tenth planet might look like up close. It bears a striking similarity to Pluto, but it is larger, farther away, and nearly gray.

FY₀, and also announced at the team's July teleconference, is the brightest Kuiper Belt body after Pluto. About three-quarters Pluto's size, 2005 FY₀, also appears to be coated with methane.

"If 2003 UB₃₁₃ ever got close to the Sun, all the methane ice would have boiled off immediately," explains Trujillo. This means the planet probably hasn't been heated significantly since the solar system formed 4.5 billion years ago.

One notable difference between the new object and Pluto, they say, is that while Pluto is somewhat red, 2003 UB₃₁₃ is almost gray. For the moment, they can't explain why two otherwise similar objects have such markedly different colors.

But is it a planet?

No one disputes the new object's size makes it the largest solar system object discovered since Neptune was found in 1846. But Brown's crowning of 2003 UB₃₁₃ as a tenth planet has rankled some astronomers and reinvigorated the simmering debate over how to define a planet — and if any scientifically useful definition can include Pluto.

"It's a great discovery," says Alan Boss, a planet-formation theorist at the Carnegie Institution of Washington. He wouldn't refer to any of these distant ice worlds as

planets without some sort of qualifier. "Call them Kuiper Belt planets, if you want."

During the past few years, many researchers — including Brown — have argued that Pluto itself should be demoted. But, he now reasons, if we're comfortable conferring planetary status on Pluto, it's inconsistent to deny the title to even larger bodies. Brown says the word "planet" is a cultural term, not a scientific one, and culture has embraced Pluto as a planet.

Iwan Williams, president of the IAU's Planetary Systems Sciences Division, thinks along similar lines, but comes to a different conclusion. "The problem is that we are trying to invent a scientific definition for something that is in essence cultural, or social, or even astrological."

Planets, as a collective term, were important in the early days of astronomy, but now, scientists see greater importance in groups of objects that have a common formation process or interesting dynamics. Defining "planet" in a way that roughly matches the existing nine planets doesn't make scientific sense.

"For historical and cultural reasons, we should define a set of bodies called 'historic planets,' which are the nine planets," he says.

Alan Stern is more generous: "I think [asteroid] Ceres should be considered a

planet. I think anything big enough to make itself round due to gravity should be considered a planet."

Stern says we should get used to the idea our solar system has dozens of planets. "The floodgates are open now, and in 10 years we'll have a whole bunch of these little guys." He calls them dwarf planets.

Eight is enough

"Stern's view has a lot of merit because there's a physical principle involved," says Brian Marsden of the Minor Planet Center in Cambridge, Massachusetts. "They could be called dwarf planets, but where do you draw the line?" Asteroids and Kuiper Belt objects are already considered minor planets, and a dwarf-planet class does nothing to eliminate the "fuzzy boundary" between these objects and the eight major planets everyone agrees on.

"We should use this opportunity to put Pluto in its place" as a minor planet, Marsden says. "Quite frankly, I feel that if we call this [2003 UB₃₁₃] a tenth planet, we're in for a lot of trouble in the future."

For Alan Boss, only the most dynamically important bodies merit planetary status, which excludes Pluto. "We're learning something very basic about our solar system," he says. "The fact that we may need to go back and change the textbooks shouldn't be thought of as something bad. It should be thought of as scientific progress." ■