To be or not to be . . . A planet that is.

Pluto is a planet.
No, it's not a planet.
It depends what you mean by "planet."

In 2014, the Harvard-Smithsonian Center for Astrophysics revisited the repeated debate over how to define a planet—and whether icy little Pluto qualifies. Three accomplished experts weighed in at the event, two pro-planet, one anti-planet.

After those arguments, the audience in Cambridge, Massachusetts that consisted of a mix of scientists, teachers, and the public—voted on their favorite definition of a planet, and whether Pluto is in or out. Planet Pluto won.

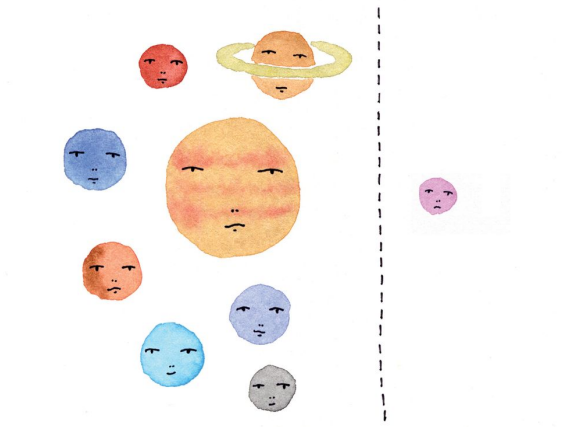
It seems to always wins the popular vote, except for that one time in 2006 when the International Astronomical Union, also known as the IAU, redefined "planet" and stripped Pluto of its planethood. This is similar to an election where a presidential candidate wins the popular vote but looses the presidential election. Like in 2000 when Al Gore won the popular vote but George Bush won the electoral vote.

The committee based the decision to remove Pluto on the following at the time. A number of other worlds had been discovered at the margins of the observable solar system, and Pluto might not even be the largest of these frosted runts. Astronomers suspect there are hundreds more of these icy worlds waiting to be discovered.

How, then, could Pluto alone be called a planet? The IAU needed to figure out how to classify Pluto and its friends, and describe what made them different from the classical eight planets.
So, the assembly voted to call them "dwarf planets," and Pluto became one of the first entries in the new official category. Joining it are Ceres, in the asteroid belt, and Eris, Haumea, and Makemake, which like Pluto live in the icy Kuiper Belt beyond Neptune's orbit.

Now, "dwarf planet" may not sound so objectionable. But it's a classification that, despite how it reads, is not synonymous with "small planet"—and therein lies much of the trouble.

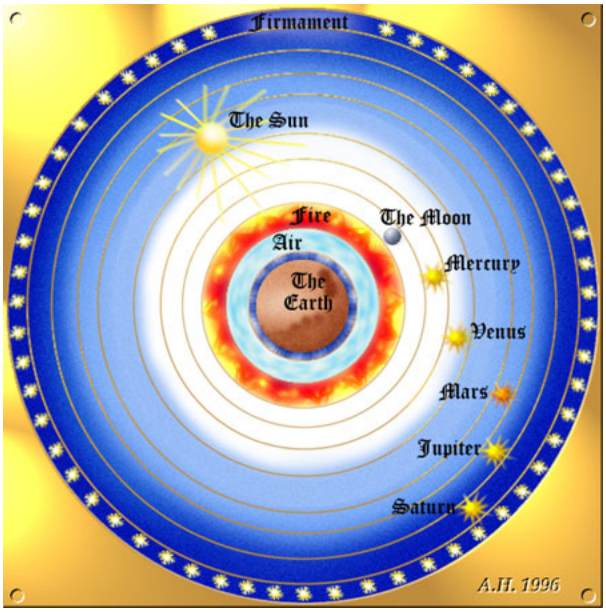
In the same confusing way that king cobras are not actually cobras, dwarf planets are not, in fact, planets. They meet two of the three IAU criteria for a planet: They're round, and they orbit the sun. But unlike every world from Mercury through Neptune, the dwarfs haven't grown massive enough to dominate their orbits and clear those paths of other solar system debris, by either knocking it away or reeling it in with their gravity.



"Jupiter has cleared its neighborhood. Earth has cleared its neighborhood. Ceres, which is in the main asteroid belt, hasn't. Pluto hasn't," said Gareth Williams, associate director of the IAU's Minor Planet Center, who presented the IAU definition at the Harvard debate. "In my world, Pluto is not a planet."

A dwarf planet, according to the IAU definition, is not a type of planet. It is, one could say, just its own thing.

Once Upon a Time, the Sun Was a Planet



But what, exactly, is a planet? The definition has changed as new observations accrued, says Harvard astronomer and historian Owen Gingerich, who chaired the IAU committee charged with defining the word. For some, the definition of a planet is “you know it when you see it.” "'Planet' is a culturally defined word that has changed its meaning over and over again," Gingerich said during the Harvard debate. "My feeling is that in retrospect, the IAU should not have attempted to define the word 'planet.'"

A millennium ago, when the Greeks were staring at the stars and charting the heavens, there were seven planets: Mercury, Venus, Mars, Jupiter, Saturn, the sun, and the moon. Centuries later, after Copernicus redrew the solar system and placed the sun at its center, Earth became a planet, and the sun and moon lost their planethood.

By 1850, when Ceres and its contingent of rocky worlds in the realm between Mars and Jupiter were emerging from the darkness, they, too, were called planets. At the time, astronomy textbooks listed as many as 18 planets, and the tally threatened to grow as more were discovered.

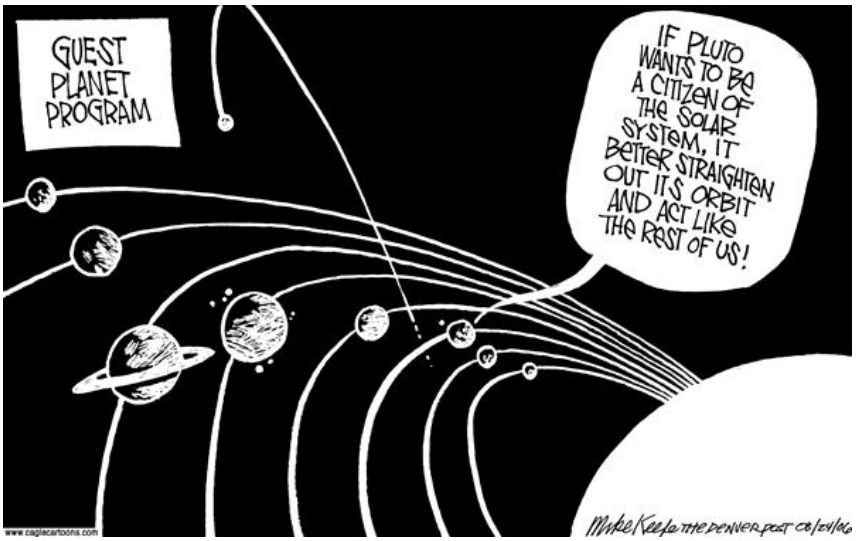
"People said, 'This can't go on. We can't have this many planets. We've got to call them something else,'" Gingerich said. So Ceres and its friends became known as asteroids (meaning "star-like"). More terms followed: Among them, minor planets, plutinos, gas giants, ice giants, Jovian planets, terrestrial planets, ice dwarfs, trans-Neptunian objects, centaurs, and Kuiper Belt objects joined an overflowing list of classes.

And now, there are dwarf planets.

Even though he chaired the IAU committee that redefined planets, Gingerich is not pleased with the outcome. "I thought it was really dumb that the IAU took as a category 'dwarf planet' and then said, 'But they're not planets,'" he said. "I was disappointed that it happened that way."

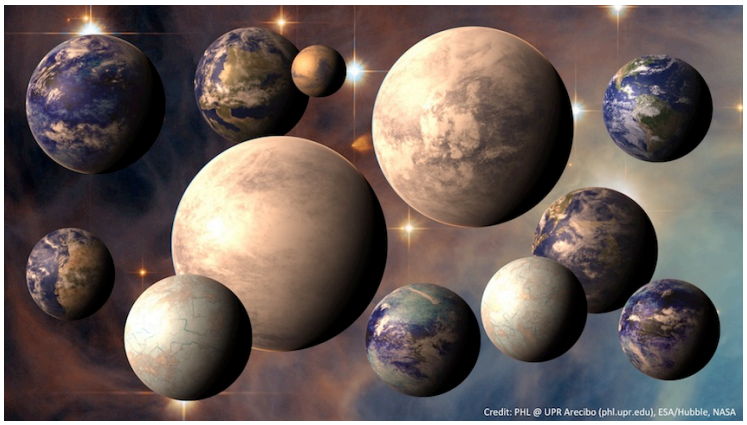
So what do you think? What is a planet, and does Pluto qualify?

- A planet is a spherical lump of matter (Welcome back, Pluto! Bring your friends.)
- Formed around stars or stellar remnants, as part of the evolution of those stars or remnants. (still there!)
- A planet is spherical, orbits the sun, and has cleared its orbit of debris. (Sorry, you're still demoted, Pluto.)



A planet is whatever you want it to be. Now let's get on with the science!

And What About Exoplanets?



Our solar system has been entirely self-centered in defining planets, points out Dimitar Sasselov, an astronomer at Harvard who studies exoplanets—or worlds outside the solar system. According to the IAU definition, these are not planets either, because they don't orbit our Sun. Some of these worlds are similar to the ones in the solar system. Others are very different. Some don't even orbit a star. What should we call those free-floating worlds, adrift in the galaxy with no starry attachments? Are they still planets?

Sasselov argued in the Harvard event for an alternative definition to the IAU's, one that defines a planet as the smallest spherical lump of matter that formed around stars or stellar remnants, as part of the evolution of those stars or remnants.

This definition includes the free-floating, untethered wanderers—assuming they formed around stars and were then booted from their stellar systems—plus pulsar planets (which orbit dead stars), Pluto, and Pluto's small frozen friends. It's this definition the Harvard audience voted overwhelmingly in favor of.

But that definition doesn't address larger questions about planetary system architecture, says Caltech astronomer Mike Brown, who discovered a number of the far-flung worlds that dismantled Pluto's claim to planethood. Brown argues that definitions matter, and they should provoke important questions—which is why he likes the definition producing an eight-planet solar system, without Pluto. "Why has the solar system sorted itself into a small number of dominant bodies and a huge number of tiny ones moving between them? This is the sort of question scientists are actively trying to answer," Brown wrote in an email.

Others argue that it's time to just get on with science and quit arguing over how to define a planet and what to call Pluto.

"[What we call Pluto] doesn't really matter that much unless it becomes a non-scientific distraction (and that's what it's mostly been up to now)," writes astronomer Marc Buie, a member of the New Horizons science team, which will send a spacecraft flying by Pluto next summer, 2015.

"Yes, the New Horizons flyby is going to be awesome, no question," he adds. "Will it be enough to get us back on a reasonable track? I hope so but I doubt it." So what do you think? What is a planet, and does Pluto qualify?