

## The Case Against Defining "Planet"

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It is unusual for an official scientific society such as the International Astronomical Union (IAU) to redefine a commonly used word such as "planet". The word is already widely understood, and only a relative handful of astronomers and planetary scientists want or need a precise definition. The most important issue for scientists and public alike should be the classification of exoplanets, not the reclassification of objects in the solar system. Within the solar system, there is a long tradition of defining and using subclasses of planets, such as giant planets, terrestrial planets, and minor planets, just as astronomers refer to dwarf galaxies or giant stars -- all without the guidance of the IAU.

It is increasingly recognized that Pluto (and Eris) are in a different class from the 8 "major planets", which leads logically to the acceptance of a class of "dwarf planets" (a term that is consistent with common astronomical nomenclature). The TNOs and KBOs are of increasing interest to scientists, especially the largest members of this group. We would probably not be having this debate if the IAU had accepted the recommendation of its own advisory panel that a "dwarf planet" is a kind of planet, just like a "giant planet". In this case Pluto and other large TNOs would be planets still, just dwarf planets (like dwarf stars or dwarf galaxies). Unfortunately, a popular revolt among some of the astronomers at the IAU General Assembly in Prague (very few of them planetary scientists) led to a vote that a dwarf planet was not a planet (against all normal usage). That is what started us down the road that has now led to the unfortunate term plutoid, which further reduces that credibility of the IAU.

To be useful, the definition of a planet needs to work for exoplanets as well solar system planets. To be useful, also, any definition needs to be based on observable quantities. Aside from the obvious requirement that a planet orbits a star, the simplest criterion is mass, as a proxy for ability to sustain fusion reactions at the upper end and "roundness" or hydrostatic equilibrium at the lower end. Then within the class of planets, we can have many (and changing) subsets: giant planets, terrestrial planets, dwarf planets, super-Earths, ice dwarfs, hot Jupiters, etc. These flexible classes don't need the IAU to define them. In deference to centuries of usage, we should also not try to redefine "satellite", or claim that some satellites are really planets, or that Ceres is a planet rather than an asteroid.

I recommend that the IAU overrule the vote at Prague that a dwarf planet is not a planet - even if you consider this to have been a valid democratic vote, you can't establish an untruth by vote. Then the IAU could incorporate the terminology used for exoplanets at the upper mass limit and by planetary scientists for the lower mass limit. The requirement that any definition be based on observable quantities eliminates the bickering over complicated dynamics-based definitions. From this point the communities of scientists involved can use subclasses like giant planet or dwarf planet, or educators can group Pluto and Eris with the traditional planets, without interference from the IAU.