

**Dwarf Planets, NASA's Dawn and New Frontiers Missions: Examples in the evolution of Language.**

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Lucy McFadden, U. Maryland, College Park, MD, Joe Wise, New Roads School, Santa Monica, CA, John Ristvey, McREL, Denver, CO.

The International Astronomical Union's (IAU) resolution on the definition of a planet was very much in the news the summer of 2006. Part of the topic's public appeal and wide media attention is because we can all grasp the concept of the definition of something. Many teachers noted that this was a terrific teaching opportunity where students could discuss the pros and cons of changing the classification of objects in the solar system. Newspaper editorial boards also weighed in, with some taking sides with the IAU, noting that it was time to kick Pluto out of the club of planets. Others cried out against the resolution, claiming that the change would confuse school children, unfairly criticizing students' abilities to cope with change. In much of the discussion, the change in the classification of the object 1 Ceres received little attention. NASA's Dawn mission spacecraft launched at the end of September 2007, on an eight-year journey taking it to two of the largest bodies in the Main Belt of the asteroids, Vesta and Ceres. The IAU resolution changes the classification of Ceres from an asteroid, or minor planet, to a dwarf planet, the same classification as Pluto. Pluto is almost 2400 km in diameter, while Ceres is 952 km in diameter. Pluto has an atmosphere of nitrogen, carbon monoxide and methane, while there is no evidence of an atmosphere surrounding Ceres, only a hint of vaporization of water at one of its poles. And given their location in the solar system, Pluto travels inside of Neptune's orbit to millions of miles beyond it, and Ceres is in the middle of the asteroid belt; their evolution is different because of their different distances from the sun. Why are these objects classified in the same category? According to the IAU's resolution, they have common characteristics: 1) both orbit the sun; 2) both are big enough to be shaped by gravitational forces; 3) they are not massive enough to have cleared the neighborhood around their orbits, and 4) they are not a satellite of a planet. In this definition, they are the same. But when I think about speaking of Ceres and Pluto as the same type of object, I can't image doing so, as they formed in different parts of the solar system where the conditions were vastly different, mostly in terms of temperature.

At present, we really don't know much about either of these two dwarf planets. The Dawn mission (<http://dawn.jpl.nasa.gov>) will take us to the world of Vesta and Ceres, where imaging cameras, a visible and infrared spectrometer, and a neutron and gamma-ray spectrometer, will tell us about the similarities and differences between the processes that formed Ceres and Vesta compared to those of the terrestrial planets, Mars, Earth, Venus and Mercury. Pluto formed beyond Neptune, and it is part of the Kuiper Belt. The New Horizons spacecraft is on its way to Pluto, and we will know much more about it when it gets there (<http://pluto.jhuapl.edu>). Language evolves with time and usage; that we know for sure. The words we use to communicate with each other depend on what we know. Ceres was considered a planet for nearly fifty years before it was demoted to an asteroid or minor planet. And it was indeed new knowledge about the number and size of icy bodies beyond Neptune that led to the new definition of a planet provided by the IAU. The words we will use to discuss Ceres and Pluto 10 years from now will, in all likelihood, be something other than asteroid or dwarf

planet because we will know so much more after the completion of Dawn's eight-year journey into the asteroid frontier, and New Horizon's travels to Pluto and beyond.