

The Pluto Debate: The International Astronomical Union Defines a Planet

Since its discovery in 1930, Pluto has always been considered an odd planet. It is smaller than the Earth's Moon. Its orbit is highly eccentric and is tilted outside of the orbital plane of the other eight planets. In the mid-1990's, however, astronomers began to find other objects like Pluto, with similar sizes and orbits. Astronomers pondered whether or not these new objects should also be called planets. The fact that they were all slightly smaller than Pluto was used as justification for keeping them out of the *planet* category.

The debate intensified during the construction of a new *Scales of the Universe* exhibit at the American Museum of Natural History. Planetarium director Neil deGrasse Tyson opted to exclude Pluto from this display depicting the relative sizes of the planets. To encourage debate on the topic, on May 24, 1999 Tyson hosted a panel debate between astronomy experts including Michael A'Hearn, David Levy, Jane Luu, and Alan Stern.

Pluto's precarious title as a planet was further challenged when Mike Brown discovered "Xena" (officially called "2003 UB-313" and later renamed "Eris"), an object larger than Pluto. This forced the astronomy community to finally settle on the meaning of the previously undefined term *planet*.

On August 16, 2006, the Planet Definition Committee established by the International Astronomical Union (IAU), and composed largely of plutophiles favoring Pluto's status as a planet, released its first draft definition for the term *planet*.

A planet is a celestial body that (a) has sufficient mass for its self-gravity to overcome rigid body forces so that it assumes a hydrostatic equilibrium (nearly round) shape, and (b) is in orbit around a star, and is neither a star nor a satellite of a planet.

The same committee also proposed that the new sub-class of planets with sizes and orbits like Pluto's be called *plutons*. Several astronomers protested these definitions for ignoring the dynamics of solar system bodies. As a compromise, the Planet Definition Committee revised their proposal into four distinct resolutions: 5A, 5B, 6A, and 6B.

In this game, students will play astronomers arguing over Pluto and the meaning of the word *planet*. They will begin by re-staging the 1999 debate at the American Museum of Natural History. They will then write and circulate short papers using data collected from 2000 to 2006 to convince others that Pluto is or is not a planet. Finally, they will debate and vote on the four IAU Resolutions (5A, 5B, 6A, and 6B; listed on the next page).

THE PLUTOPHILE FACTION

The plutophiles would like to see Pluto retain its status as a planet.

Richard Binzel
David Levy
Alan Stern

THE POPULIST FACTION

The populists see Pluto as just one of a large population of icy bodies orbiting the Sun.

Julio Fernández
Jane Luu
Neil deGrasse Tyson

INDETERMINATE VOTERS

The indeterminate astronomers are undecided.

Michael A'Hearn
Mike Brown
Ronald Ekers

ACT I: 1999 DEBATE IN NEW YORK CITY

On May 24, 1999, Neil deGrasse Tyson hosted an event entitled, *Pluto's Last Stand: A Panel of Experts Discuss and Debate the Classification of the Solar System's Smallest Planet*. Panelists included Michael A'Hearn, David Levy, Jane Luu, and Alan Stern. In class, the student(s) playing Tyson will welcome students playing the panelists (seated at the front of the room). Next, the panelists will each make a short (2-5 minutes) statement arguing their positions. Finally, students in the audience will be allowed to ask questions to the panelists. At the end of the debate, the student(s) playing Tyson will conduct a straw poll to determine if the panelists and the audience feel that Pluto should or should not be classified as a planet. **For this vote, all students (even those sharing a character) vote by a show of hands.**

VOTES FOR "PLANET"	
VOTES FOR "NOT"	

INTERMISSION: 2000 to 2005 DISCOVERIES OF ADDITIONAL TRANS-NEPTUNIAN OBJECTS

After re-staging the 1999 debate in class, students may distribute one-page papers with plots of objects in the solar system, including those discovered between 2000 and 2005. These papers should support their argument that Pluto is a planet or that Pluto is merely another trans-Neptunian object. Graphs can be constructed using the *Planet Data Plotter* on each character's Online Resources web page. These plots and papers may later be cited during the 2006 debate that follows.

ACT II: 2006 VOTE IN PRAGUE

On August 24th, 2006, the IAU Planet Definition Committee presented its revised proposal for defining a planet. It was a compromise between their original draft and the definition put forward by Julio Fernández, leader of the "populist" faction. Student(s) playing Ronald Ekers will preside over the session. This will begin with a presentation by Richard Binzel describing the Planet Definition Committee's final four resolutions. The audience is encouraged to ask questions during Binzel's talk. Once the discussion is over, the student(s) playing Ekers will conduct a vote on each resolution. If Resolution 5A does not pass, there is no need to vote on Resolution 5B. Likewise, if Resolution 6A does not pass, then there is no reason to vote on Resolution 6B. **For these votes, one and only one student playing each character will vote by raising voting sheets provided by Ekers.** Ekers' vote for 5B will be determined by the 1999 debate. If the Plutophiles won, he will vote for 5B. If the Populists won, he will vote against 5B. If the 1999 vote results in a tie, Ekers will decide based on the merits of the arguments presented.

RESOLUTION 5A

Accept the definition put forward by the Julio Fernández.

A "planet" is a celestial body that (a) is in orbit around the Sun, (b) has sufficient mass for its self-gravity to overcome rigid body forces so that it assumes a hydrostatic equilibrium (nearly round) shape, and (c) has cleared the neighborhood around its orbit.

A "dwarf planet" is a celestial body that (a) is in orbit around the Sun, (b) has sufficient mass for its self-gravity to overcome rigid body forces so that it assumes a hydrostatic equilibrium (nearly round) shape [2], (c) has not cleared the neighbourhood around its orbit, and (d) is not a satellite

All other objects [3] orbiting the Sun shall be referred to collectively as "Small Solar System Bodies".

FOR	
AGAINST	

RESOLUTION 5B

Make "planet" an umbrella term for "classical" and "dwarf" planets.

Insert the word "classical" before the word "planet" in Resolution 5A, thus reading: A classical "planet" is a celestial body...

FOR	
AGAINST	

RESOLUTION 6A

Declare Pluto is a prototype of a class of trans-Neptunian objects.

The IAU further resolves: Pluto is a "dwarf planet" and is recognized as the prototype of a new category of trans-Neptunian objects.

FOR	
AGAINST	

RESOLUTION 6B

Agree that the trans-Neptunian objects will be called "plutonian objects."

The following sentence is added to Resolution 6A: This category is to be called "plutonian objects."

FOR	
AGAINST	