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The IAU Resolutions on Planet Definition

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Recent discoveries of Trans-Neptunian Objects, some larger than Pluto, triggered the IAU to form a working group on "Definition of a Planet" from its Division III members. The Working Group agreed on scientific issues but failed to reach an agreement on social and cultural issues, such as the status of Pluto. In order to include the broader aspects, the IAU formed a new **Planet Definition Committee** whose membership had backgrounds in history, science publishing, writing and education, as well as in planetary science.

Members of the Committee are:

Dr. Richard Binzel, Professor of Earth, Atmosphere, and Planetary Science at MIT and a specialist on asteroids and outer Solar System small bodies. He is a well known and respected educator and science writer.

Dr. André Brahic, Professor at Université Denis Diderot (Paris VII). He is Directeur d'Equipe Astropysique Interactions Multi-echelles He specializes in planetary rings and has co-discovered rings and arcs of Neptune. For the French speaking public, André Brahic is one of the best known popularizers of astronomy.

Dr. Owen Gingerich (Chair), Professor of Astronomy and History of Science. Emeritus at the Harvard-Smithsonian Center of Astrophysics, is an esteemed historian of astronomy with a broad perspective.

Dava Sabel, author of very successful books *Longitude*, *The Planets*, and *Galileo's Daughter*. She has a solid background in, and knowledge of, history of astronomy.

Dr. Junichi Watanabe, Associate Professor and Director of the Outreach Division of the National Astronomical Observatory of Japan. He is a solar system astronomer, highly appreciated in Japan. He has strong connections with amateur astronomers, science editors, schoolteachers and journalists.

Dr. Iwan Williams, Queen Mary, University of London, expert on dynamics and physical properties of Solar System objects. He is President of IAU Division III on Planetary System Science.

Dr. Catherine Cesarsky, Director General of the European Southern Observatory, President of the IAU. She brought to the Committee the perspective of the IAU and of astronomers at large.

The **terms of reference** of the Committee included:

- Discussing broader social implications of any new definition of a planet,
- Recommending a course of action that balances scientific facts with the need for social acceptance of any change,
- Addressing the status of Pluto and of newly discovered TNO's,
- Considering whether the current naming procedures have exacerbated the problem of definition and recommending possible need for revision,
- Attempting to frame resolutions to be put before the Prague General Assembly in August 2006 for possible adoption.

After long discussions at the IAU General Assembly, resolutions 5A, 5B, 6A, and 6B were put before the General Assembly. According to the statutes of the IAU, all present individual members had voting right. Their number was not officially established. It varied slightly around about 400. In the following the resolutions bearing on the definition of a planet are given as adopted or rejected by the vote:

IAU Resolution: Definition of a Planet in the Solar System

Contemporary observations are changing our understanding of planetary systems, and it is important that our nomenclature for objects reflects our current understanding. This applies., in particular, to the designation "planets". The word "planet" originally described "wanderers" that were known only as moving lights in the sky. Recent discoveries lead us to create a new definition, which we can make using currently available scientific information.

Resolution 5A

(adopted by a large majority of votes)

The IAU therefore resolves that planets and other bodies, except satellites, in our Solar System be defined into three distinct categories in the following way:

(1) A planet[1] is a celestial body that (a) is in orbit around the Sun, (b) has sufficient mass for its self-gravity to overcome the rigid body forces so that it assumes a hydrostatic equilibrium (nearly round) shape[2], and (c) has cleared the neighbourhood around its orbit.

(2) 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 the rigid body forces so that it assumes a hydrostatic equilibrium (nearly round) shape[2], and (c) has not cleared the nighbourhood around its orbit, and (d) is not a satellite.

(3) All other objects[3], except satellites, orbiting the Sun shall be referred to collectively as "Small Solar-System Bodies".

Resolution 5B

(rejected)

Insert the word "classical" before the word "planet" in Resolution 5A, Section 1.

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[1] The eight planets are: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, and Neptune.

[2] An IAU process will be established to assign borderline objects into either "dwarf planet" and other categories.

[3] These currently include most of the Solar System asteroids, most Trans-Neptunian Objects (TNOs), comets, and other small bodies.

Resolution 6A
(adopted by 237 votes yes, 157 no, 30 abstentions)
The IAU further resolves: Pluto is a "dwarf planet" by the above definition and is recognized as the prototype of a new category of Trans-Neptunian objects.

Resolution 6B
(rejected: 186 no, 183 yes)
The category in resolution 6A is to be called "plutonian objects".

Because of rejection of 6B, the name of the category in 6A will be selected by the standard IAU procedure.

The voting was introduced and managed with high competence and aplomb by Ms Jocelyn Bell Burnell, assisted by the IAU officers and by members of the Planet Definition Committee. All questions raised by the audience were satisfactorily answered. Some questions concerning possible future discoveries, of course, remain. As Ms Bell Burnell said, when we come to it, we shall solve it.

Briefly stated, the changes were necessary. Pluto remains a dwarf planet and becomes a prototype of a new category of objects. Its discovery in 1930 was a glorious achievement because it was made 75 years before its due time.