

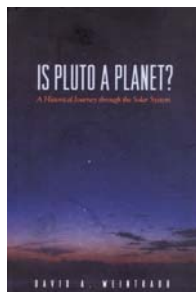
Demotion commotion in outer space

Is Pluto a Planet? A Historical Journey Through the Solar System

David A. Weintraub
Princeton U. Press, Princeton, NJ,
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Reviewed by William F. Bottke

Few topics in planetary science have ignited as much public debate and outright acrimony as the recent decision by the International Astronomical Union (IAU) to revoke Pluto's planetary status. The raw emotion behind that decision is reflected in the fact that being "plutoed," defined as "demoting or devaluing someone or something," was chosen as the 2006 Word of the Year by the American Dialect Society. This kind of fervor makes David A. Weintraub's *Is*



Pluto a Planet?: A Historical Journey Through the Solar System particularly timely in that it provides some much-needed perspective on the battle over the meaning of the term "planet," a battle that, as we

often forget, has been going on as long as astronomy itself.

In *Is Pluto a Planet?* Weintraub, a professor of astronomy at Vanderbilt University in Tennessee, uses historical examples to show that today's debate has much of the same flavor as past astronomical arguments, with observations continually presenting challenges to planetary orthodoxies. The author's approach makes some well-trodden facts, such as the switch from a Ptolemaic geocentric cosmology to a Copernican heliocentric one, considerably fresher than would otherwise be the case.

An important historical theme that resonates in the current debate can be found in the reaction to the early dis-

coveries made using telescopes. The astronomers of antiquity had several opportunities to greatly expand the membership of the planetary club and, in fact, did so after the first few satellites and asteroids were discovered. As their knowledge increased, however, they decided to maintain the cachet of planethood by inventing new classifications for objects that were too small or too numerous, or had orbits that were simply too different from those of the established planets.

That history sets the stage for Pluto's odyssey, which mimics that of Ceres in the asteroid belt. Both were originally designated planets because they were thought to be massive objects in locations predicted by theory. Their planetary status was then questioned when they were found to be low in mass and part of a belt of objects. In the case of Pluto, the IAU debate was triggered by the discovery of multiple large objects beyond Neptune—some nearly Pluto-sized and one, Eris, larger than Pluto. So things could not remain as they were. Astronomers were left with several unpalatable choices: They could create numerous new planets, demote Pluto, or generate a convoluted or arbitrary definition that maintained the status quo.

Regarding the question in the book's title, Weintraub hedges somewhat but ultimately favors the retention of Pluto as a planet. His decision is primarily based on the idea that planets should be objects whose gravity is large enough to crush them into spherical objects. The downside, as acknowledged by Weintraub, is that the "one size fits all" solution is not very robust. Many satellites fit the above criterion, some objects are round because they have been heated by short-lived radiogenic nuclides, and it is difficult to know what to do with objects bordering on a diameter threshold that can be as low as 400 km. For the latter, there may be hundreds of objects on heliocentric orbits that fit the definition.

The IAU's definition of a planet came out too late to be extensively explored in Weintraub's book. That is a pity, given its importance and how unskillfully it was explained to the public

immediately after the tumultuous 2006 IAU meeting in Prague. As a participant in the IAU debates, I can say that although the process was imperfect, the conclusions reached by researchers were similar to those made by their predecessors: There was general reluctance to radically depart from traditional classifications, and a messy problem was cleaned up by the creation of a new category of objects called "dwarf planets."

Dwarf planets, which are not planets, define mid-sized objects like Pluto, Eris, and Ceres. The smallest ones are those that pass the roundness test described above while the largest ones are determined by the effect they have on the surrounding solar system. According to the IAU, a true planet placed among a large number of planetesimals in orbit around the Sun would accrete or eject them within the age of the solar system. That definition includes Mercury through Neptune, which dominate their own regions of space, and excludes Pluto, which is in the Kuiper belt. The reader should note that the IAU's stance is not the conclusion reached by Weintraub.

Putting this dilemma aside, there is much to recommend in *Is Pluto a Planet?* Weintraub's history of the term "planet" is well told and interesting, and the narrative successfully walks readers through many of the pros and cons of different planet definitions. It puts the current debate into context and demonstrates how the acceptance of the new over the old in astronomy is driven or deterred as much by human foibles as by new information; the process is rarely the logical, dispassionate one portrayed in high-school textbooks.

Deep Earthquakes

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ISBN 978-0-521-82869-7

A labor of love by a dedicated researcher with a passion for the topic, *Deep Earthquakes* by Cliff Frohlich is unusual in its combination of breadth, depth, and tone. The intended audience

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