

BBC **NUCLEAR FUSION:** THE RACE FOR UNLIMITED POWER

Science Focus

Reasons why
PLUTO SHOULD BE A PLANET

Are our
HOMES TOO CLEAN?

Why we need a
HYDROGEN ENERGY NETWORK

DOWN

ALIEN WORLDS, SPACE COLONIES AND SUPERHUMANS
A deep dive into the ideas behind the sci-fi event of the decade



IN THIS ISSUE

Ecology

Insects are disappearing in their millions. Can we save them?

Health

Michael Mosley on tracking your fart rate

Physics

A visitor's guide to Earth's magnetic core

SF
SCIENCEFOCUS.COM
10 >
7 25274 77573 6
USA \$11.50 CAN \$13.99
AUS \$13.50 NZ \$18.90



PAUL BYRNE
Planetary scientist

Comment

Pluto is a planet. Get over it

Planetary scientist **Paul Byrne** argues our official definition of what is and isn't a planet is in need of a long-overdue shake-up

There are some topics that elicit strong opinions from people. Is *Die Hard* a Christmas movie? (Yes.) Does pineapple belong on pizza? (Also yes.) Is Pluto a planet? I say that it is. But this isn't a view that's universally held.

Those of us born in the latter part of the 20th Century grew up learning that there are nine planets: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune and Pluto, in increasing distance from the Sun. But in 2006, the International Astronomical Union (IAU) – the entity charged with, among other things, deciding what to call stuff in space – held a vote that overnight reduced the number of planets in the Solar System to eight.

From its discovery in 1930 until the 1990s, Pluto was the largest known object in a distant region of the Solar System that came to be called the Kuiper Belt. Soon after Pluto was detected, astronomers conjectured that other similarly sized objects might lurk out there in the far reaches of our planetary system. But the first confirmed detection of another Kuiper Belt object wasn't until 1992, with the discovery of a body eventually called 15760 Albion. Since then, more than 2,000 bodies have been identified in this part of space, with the true quantity of worlds greater than

100km in diameter perhaps numbering in the hundreds of thousands.

And herein lies the problem with Pluto's classification as a planet: if Pluto were to retain its status as a planet, then so too would everything else out in the Kuiper Belt and before we know it, we'd have hundreds of planets. Crazy, right? (Never mind that we have hundreds of countries, thousands of languages and 8.7 million known species of animal.)

So, to avoid cluttering up children's bedroom walls with unreasonably huge posters, the IAU held a vote at its General Assembly in Prague in August 2006 at which it was decreed that a planet must meet three criteria:

1. It orbits the Sun (so sorry, planets ejected from the Solar System or in orbit around other stars, you're out).
2. It has attained hydrostatic equilibrium (that is, its gravity has pulled it into a spherical shape, or close enough).
3. It has "cleared its neighbourhood".

Whereupon Pluto stopped being a 'classical planet' and started being a 'dwarf planet'.

That last criterion states that a planet must be the gravitationally dominant object in the area of space in which it orbits. This rule makes sense for

somewhere like Earth, which is far more massive than the Moon and anything else along its orbital path. But out in the Kuiper Belt, where neighbouring bodies are far, far more distant than in the inner Solar System, Earth would not necessarily be able to clear its neighbourhood. In fact, if we were somehow able to drag Earth out past Neptune, our world could become gravitationally dominated by that icy giant and thus lose its own planethood.

LOCATION, NOT CHARACTER

It's this idea of 'neighbourhood clearing' that's the crux of the problem regarding the IAU's definition of a planet. And that's because it's a dynamic criterion: it's a function of where a body is in space and pays no heed to the character of a body beyond the fact that it's big enough to be a ball. It doesn't allow for the geology of a world to be considered.

This argument pre-dates the flyby of Pluto in July 2015 of NASA's New Horizons spacecraft, but the images returned by that spacecraft really help make the case. Pluto is an enigmatic world with towering ice mountains, vast glaciers of nitrogen ice, a tenuous atmosphere, a thick, outer icy carapace and a probably liquid water ocean below, all atop a huge rocky interior. By any geological measure – including



Some dwarf planets (as illustrated here) can have their own moons, but if they can't clear their orbital path they can't be 'classical' planets

names with the ease with which they (and I) list dinosaurs – of which 700 or so species have been documented.

In short, there's more value in being a lumper than a splitter.

There's one more aspect to this issue that troubles me and it's the optics of what happened to Pluto. Proponents of the IAU vote argue that Pluto is still a certain type of planet. Yet the IAU definition explicitly excludes Pluto from the list of 'classical' planets to which it once belonged. In other words, the 'dwarf' in 'dwarf planet' is not the same as 'terrestrial' in 'terrestrial planet' (for example, Venus) or 'giant' in 'giant planet' (for example, Uranus). By every measure, even if the IAU didn't use the term, Pluto was demoted.

And even a quick internet search throws up this word. The public perceives what happened to Pluto as it being demoted; shortly after the IAU vote, the American Dialect Society selected 'plutoed' as its Word of the Year, writing: "To 'pluto' is to demote or devalue someone or something, as happened to the former planet Pluto when the General Assembly of the IAU decided Pluto no longer met its definition of a planet."

Whenever I give a public talk and mention Pluto, the first question I'm asked is whether Pluto is still a planet – not, say, why it's surface looks so damned weird. Fifteen years on, Pluto's demotion gets more attention than the cool things we've learned about it and that's a big science communication fail.

A planet can be whatever we want it to be and there's no reason we can't have hundreds of them in the Solar System. And from this geologist's view, the IAU reclassification of Pluto was a mistake.

PAUL BYRNE

Paul is an associate professor of earth and planetary science at Washington State University in St Louis. His research focuses on what makes planets behave and look the way they do.

“This argument pre-dates the flyby of Pluto in July 2015 of NASA's New Horizons spacecraft, but the images returned by that spacecraft really help make the case”

the fact that there are surface processes acting on Pluto today – Pluto is a planet.

But it's the International Astronomical Union, not the International Geophysical Union. And the people who voted on the new planet classification were overwhelmingly astronomers, even if some proportion were planetary

astronomers. What properties matter to some scientists (where an object is, how massive it is, what its orbit looks like) might be far less important to others. And to those of us who study the surfaces and interiors of bodies across the Solar System, neighbourhood clearing doesn't come close to being important in how we regard them.

THE MORE THE MERRIER

To be fair, this isn't a straightforward issue. Notwithstanding the fact that the IAU definition at present doesn't allow for planets outside the Solar System (the IAU has said it plans to tune up the 'planet' definition to encompass exoplanets, but has yet to do so), nature tends to be more complex than simple categories allow. If we acknowledge Pluto as a planet, then should we consider the Moon a planet? Or Ganymede, Jupiter's largest moon, bigger (though less massive) than Mercury?

As a geologist, my view is: “Yes, why not?” Personally, I don't see any utility in splitting things up into individual categories because the Universe tends not to operate that way. (There's also the fact that Pluto has far more in common with Mars than Mars does with Saturn, say, yet the latter two are indubitably planets.) Several hundred planets? Great! Kids (and I) would recite their