



A research in:

PLUTO (*The ninth planet*)



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Pluto

The small (planet)?

Many billion years ago, our world was created in strange conditions that we still do not know.

So the modern scientists are trying to solve this problem by suggesting many theories one of them was the most popular all over the world (THE BIG BANG theory).

This theory described the creation of the world in a sequence of logical scientific operations, which produced the current world with galaxies, stars and planets.

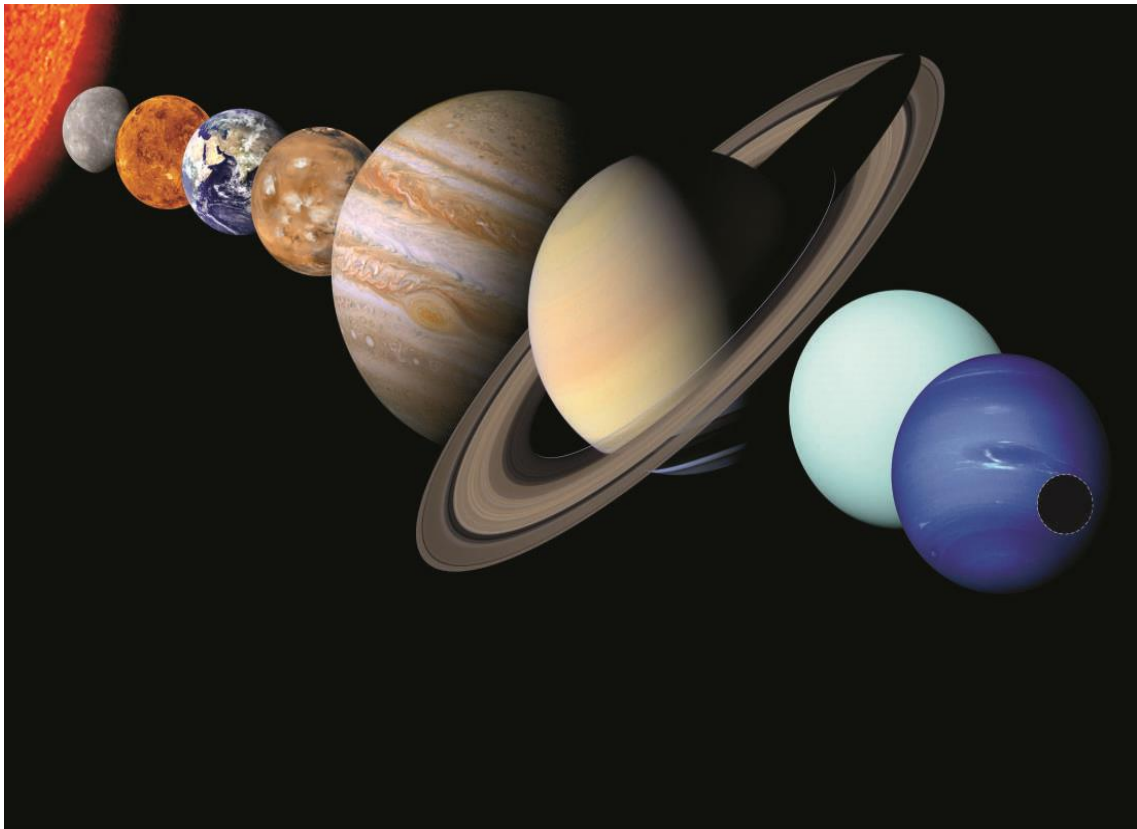
Our galaxy named (MILK WAY) and our planet “The Earth” is one of nine planets in this galaxy. However, we will focus on the **ninth planet (Pluto)** which is the **last planet** in our galaxy and we will discuss the fact if it is planet or not and we will present some questions and try to answer it.

- When was Pluto discovered?
- What is it?
- How many moons does it have?
- How many years does it take to complete one turn around the sun?
- Why is it bright?
- What is the distance between it and the Sun?
- In which belt is it travelling?

1.1 What is Pluto?

In the ancient culture of Rome, Pluto was known as the god of the underworld, But in the twentieth century the scientists discovered Pluto in the spring of 1930 as ***the ninth planet*** in our solar system (Milk Way). Since 1930 till this moment the scientists and astronomers were trying to reach to Pluto and make a wide research about it.

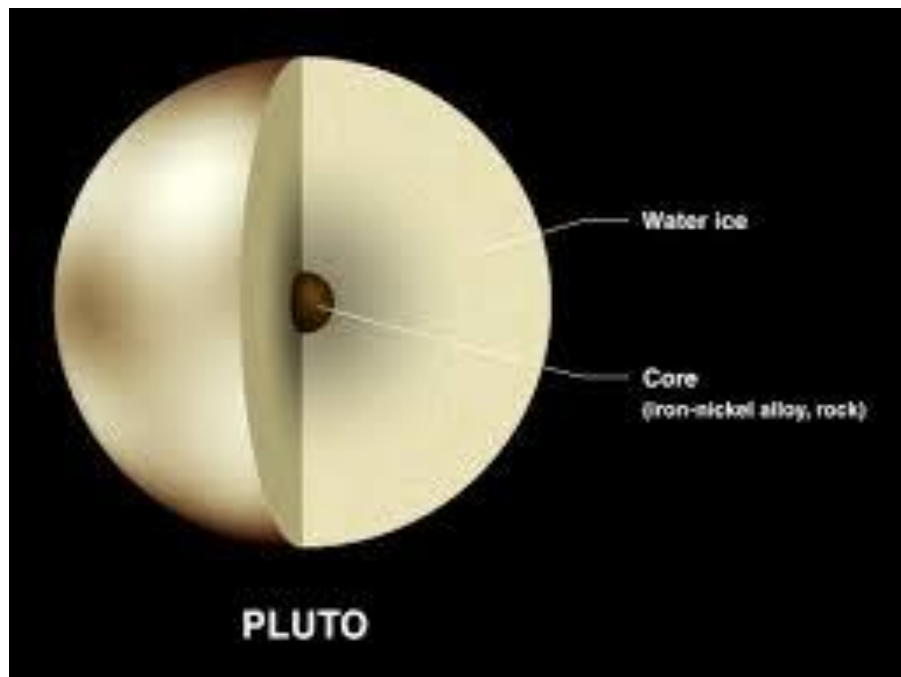
As we know that ***Pluto is the furthest planet*** in our solar system, so the scientists added it to the group of outer planets (Jupiter, Saturn, Uranus, and Neptune).



1. (The planets of solar system and Pluto are in front of the photo)

1.2 Pluto's structure

(Unlike the outer planets, which are large and gaseous, Pluto is small and made of ice and rock. In addition, Pluto has a very elliptical orbit that is unlike his neighboring planets)¹.



2. (Pluto and its structure)

(Pluto is about two-thirds the diameter of Earth's moon.

In addition to his small size and lower density, Pluto's mass is about one-sixth that of Earth's moon)².

¹ Research note, copyright by Holt.Rinehart and Winston. All rights reserved

² www.nasa.gov

(Its density indicates that it is partially composed of ice, not rocky materials. Pluto also is more massive than Ceres – the dwarf planet that resides in the asteroid belt between Mars and Jupiter – by a factor of 20)³.

1.3 Distances with the sun and the Earth

So if we say how many miles is the distance between Pluto and the sun, scientists and astronomers will answer, “The distance between the Sun and Pluto is 5.9 billion kilometers (3.7 billion miles) as average”. And the distance between the Earth and Pluto in July 2015 is 4.77 billion kilometers (2.97 billion miles).

2.1 Pluto’s orbit

Its orbit is elliptical ranging from 4.4 billion kilometers (2.8 billion miles) to 7.4 billion kilometers (4.6 billion miles) from the Sun, So it orbits the sun once every 248 Earth years. As we know that ***Pluto is the furthest planet*** in our solar system but between 1979 and 1999 it was closer to the sun than Neptune and its latest closest approach to the sun was in 1989.

2.2 Moons of Pluto

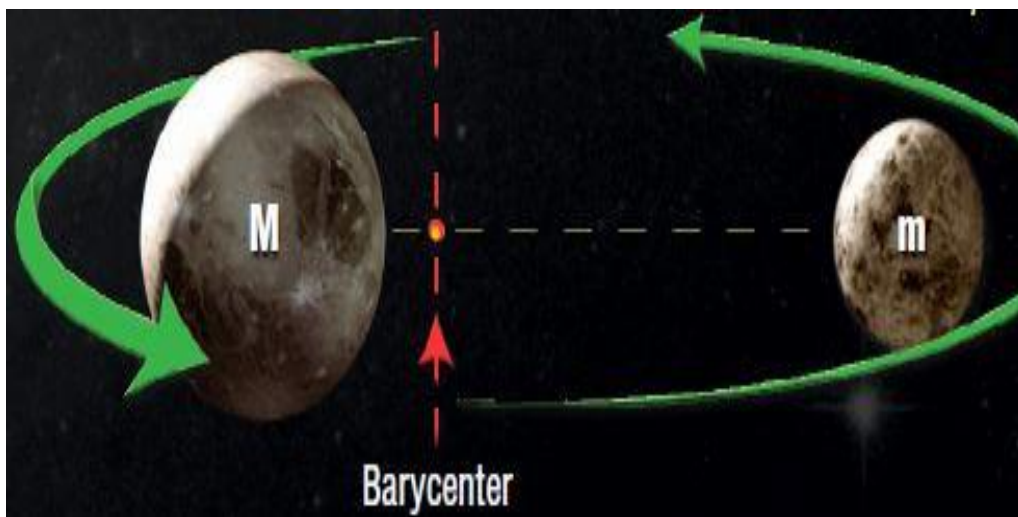
(Pluto is surrounded with swarms of particles; the radius of the swarm is 1–2 million Km. and its mass is about of 10^{-6} Pluto’s mass, but the total mass of material moving outside Pluto’s orbit is about 13 Earth’s masses)⁴, (and there are five moons orbit Pluto (Charon, Styx, Nix, Kerberos and Hydra). In addition, Charon is the biggest one of them,

³ Solarsystem.nasa.gov/Pluto

⁴ Paper. Copyright 2007Bull. Geogr. Natl. Acad. Sci.

it is a dwarf moon just like Pluto, and the both rotate every 6.4 Earth days so Charon orbits Pluto once every 6.4 Earth days from a distance of 19,636 Km; Charon orbits at Pluto's "synchronous" distance, with one side always facing Pluto.

Pluto and Charon are locked in a gravitational resonance where not only does Charon keep the same face to Pluto (just like Earth's moon faces Earth) but also, Pluto sees the same face of Charon)⁵.



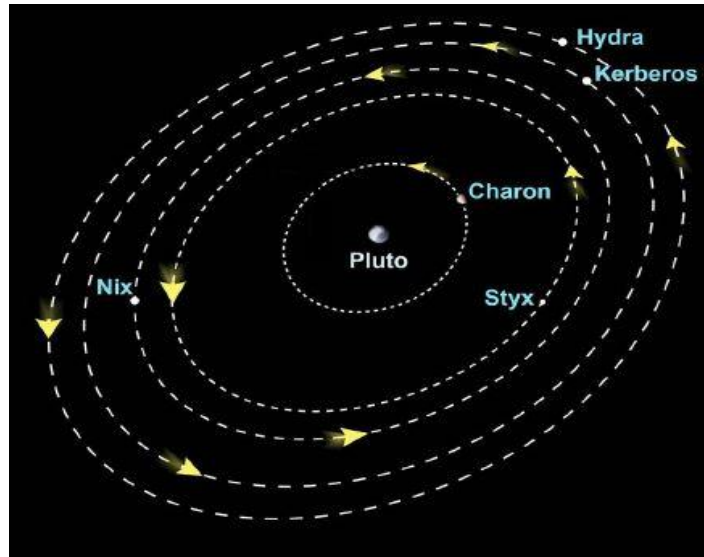
3. (Pluto and Charon face to face)

(Hydra is the outermost known moon, orbiting Pluto every 38 days at a distance of approximately 64,700 kilometers (40,200 miles). Nix orbits every 25 days at a distance of 48,700 kilometers (30,300 miles).

Estimated diameters of Nix and Hydra are between 40–150 kilometers (25–95 miles). Styx circles Pluto every 20 days between the orbits of Charon and Nix, and it is likely just approximately 7 to 21 kilometers (4 to 13 miles) in diameter. Kerberos orbits between Nix and Hydra with a

⁵ www.nasa.gov

32-day period; estimated diameter is approximately 10 to 30 kilometers (6 to 20 miles). Styx and Kerberos are 20 to 30 times fainter than Nix and Hydra)⁶.



4. (Pluto and its five moons)

2.3 The atmosphere of Pluto

(When Pluto is close to the Sun, its surface ices thaw, rise, and temporarily form a thin atmosphere, which contains Nitrogen, carbon monoxide and methane. Pluto's low gravity (about 6 percent of Earth's) causes the atmosphere to be much more extended in altitude than our planet's atmosphere. Because Pluto's orbit is so elliptical, Pluto becomes much colder during the part of each orbit when it is traveling far away from the

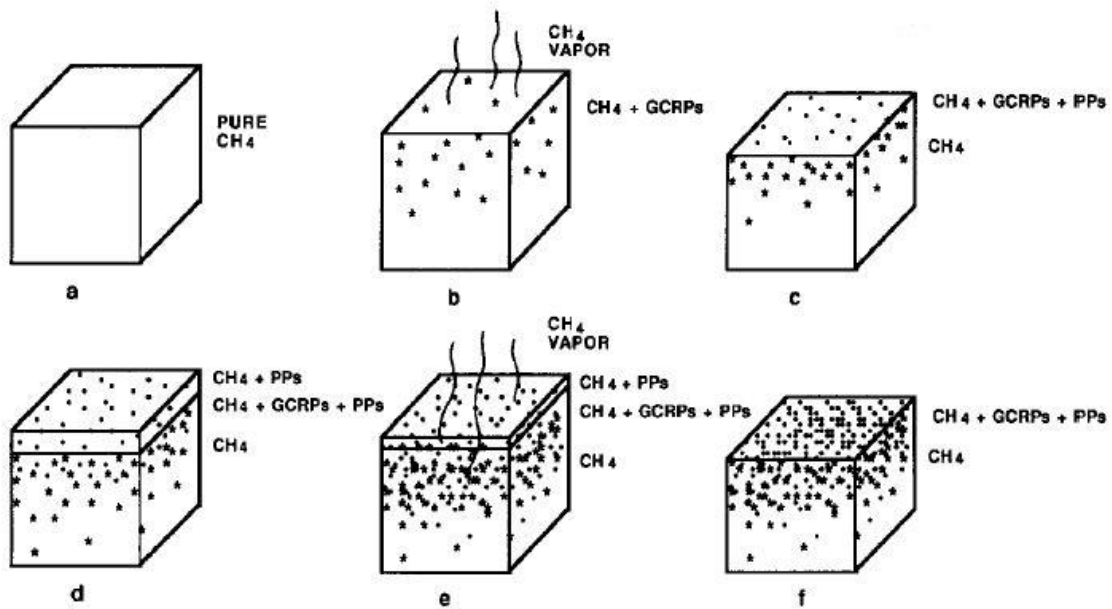
⁶ www.nasa.gov

Sun. During this time, the bulk of the planet's atmosphere is thought to freeze)⁷.

2.4 Why is Pluto bright?

Methane is abundant on Pluto; however, CH₄ rapidly darkens in the plutonian solar insolation and charged particle environment. Therefore, Pluto's high albedo is at odds with the observation of methane frosts on Pluto's surface. A variety of mechanisms exists to resolve this problem, and the result is that Pluto's surface is being replenished with fresh (bright) volatile frosts. This replenishment is directly to orbitally driven sublimation and freeze out of volatiles in the atmosphere. Thus, Pluto's high albedo adds to the case for an atmosphere, and argues for annual volatile transport cycles.

⁷ www.nasa.gov

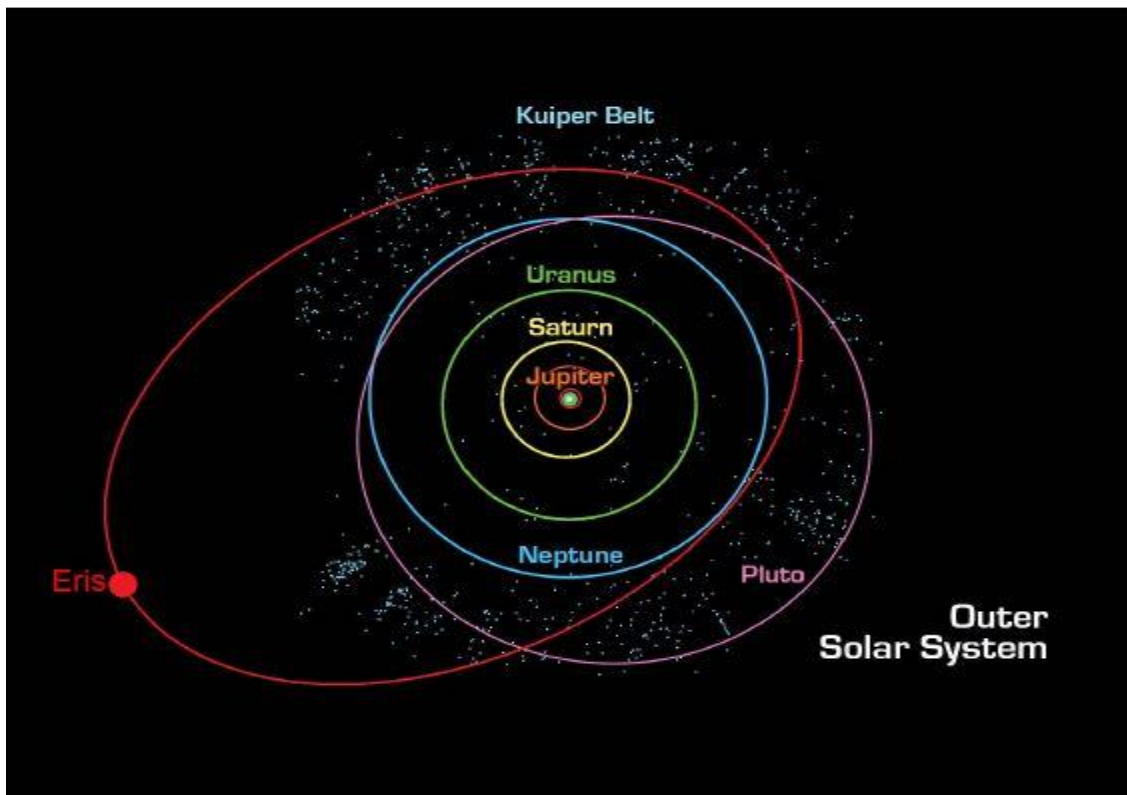


5. (The evolution of Pluto's surface albedo resulting from the surface replenishment model. Here "*"s represent dark polymers created by GCR bombardment (GCRPs) and "•"s represent UV photolysis products (PPs). The six epochs depicted above form a time sequence: (a) the initial "clean" surface, (b) the first approach to atmospheric maximum, (c) the first atmospheric maximum, (d) the following atmospheric minimum, (e) an approach

To atmospheric maximum after many orbits, and (f) an atmospheric maximum after many orbits. Not shown are the mixing effects of micro meteoritic bombardment)

3. Kuiper belt

The region of the solar system immediately beyond Neptune's orbit is densely populated with small bodies. This region, known as the Kuiper Belt, consists of objects that may predate Neptune, the orbits of which provide a fossil record of processes operative in the young solar system. Kuiper Belt contains some of the Solar System's most primitive, least thermally processed matter. It is probably the source of the short-period comets and Centaurs, and may supply collisional generated interplanetary



6. (Kuiper belt)

The bodies in the Kuiper belt approach Pluto in size. Major dwarf-planets such as Haumea, Makemake and Eris (which is almost as large as Pluto) have been identified in the belt.

Conclusion

So we said about Pluto and its structure, moons, orbit and belt but finally in 2006 and (⁸because the big difference between Pluto and other planets in the mass and the orbit), the international astronomical union decided that Pluto not a regular planet but it is a dwarf planet ('dwarf planet' is a celestial body that is in orbit around the Sun has sufficient mass for its self-gravity to overcome rigid body forces. So that it assumes a hydrostatic equilibrium, (nearly round) shape has not cleared the neighborhood around its orbit, and is not a satellite. Nowadays many people think that the number of planets is nine, but actually, there are eight regular planet and thousands of dwarf planet such as (Pluto, Eris...)⁹.

Pluto is a special planet because it is consists of ice mainly.

⁸ Wajnberg.Alexandre. conception et illustration : Mariani, Viviana, et Regalado.Gustavo.

⁹ Swinburne University of Technology, 2010

The End

Here our research is finished with some information about Pluto so I hope that you like this job, but finally:

Thanks for Syrian Arab army who protect us every second in everywhere we are.

Thanks for the president Bashar Al-Assad the first supporter for the science and scientists in Syria.

Thanks for NCD for everything did it for us.

Thanks for Ms. Hiba for her support to me in this research and for every word she said to increase my performance in English language.

PLUTO

References

1. www.nasa.gov
2. Paper. Copyright 2007 Bull. Georg. Natl. Acad. Sci.
3. Research note, copyright by Holt, Rinehart and Winston. All rights reserved
4. Swinburne University of Technology, 2010
5. Wainberg, Alexandre. Conception et illustration : Mariani, Viviana, et Regalado, Gustavo.

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