

# NASA's New Horizons Mission To Pluto



SciFest Africa  
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# What an Astronomer Does

- I'm not an astronaut
- I study the planets
- I use telescopes and spacecraft
- We use computers a lot
  - Programming, analyzing data, e-mailing...
- We read and write a lot of papers





# How I Became an Astronomer

- Matric in US
- BSc in Physics (4 years)
- MSc in Astronomy (2 years)
- PhD in Astronomy (3 years)
  - Most MSc and PhD students in the US get a bursary and a salary from the government or the university while they are studying.
  - There are many students from other countries who come to the US for MSc or PhD.



This is a Galaxy. It has 100,000,000,000 stars.



The Sun is just one star in the Galaxy.



# Our Solar System

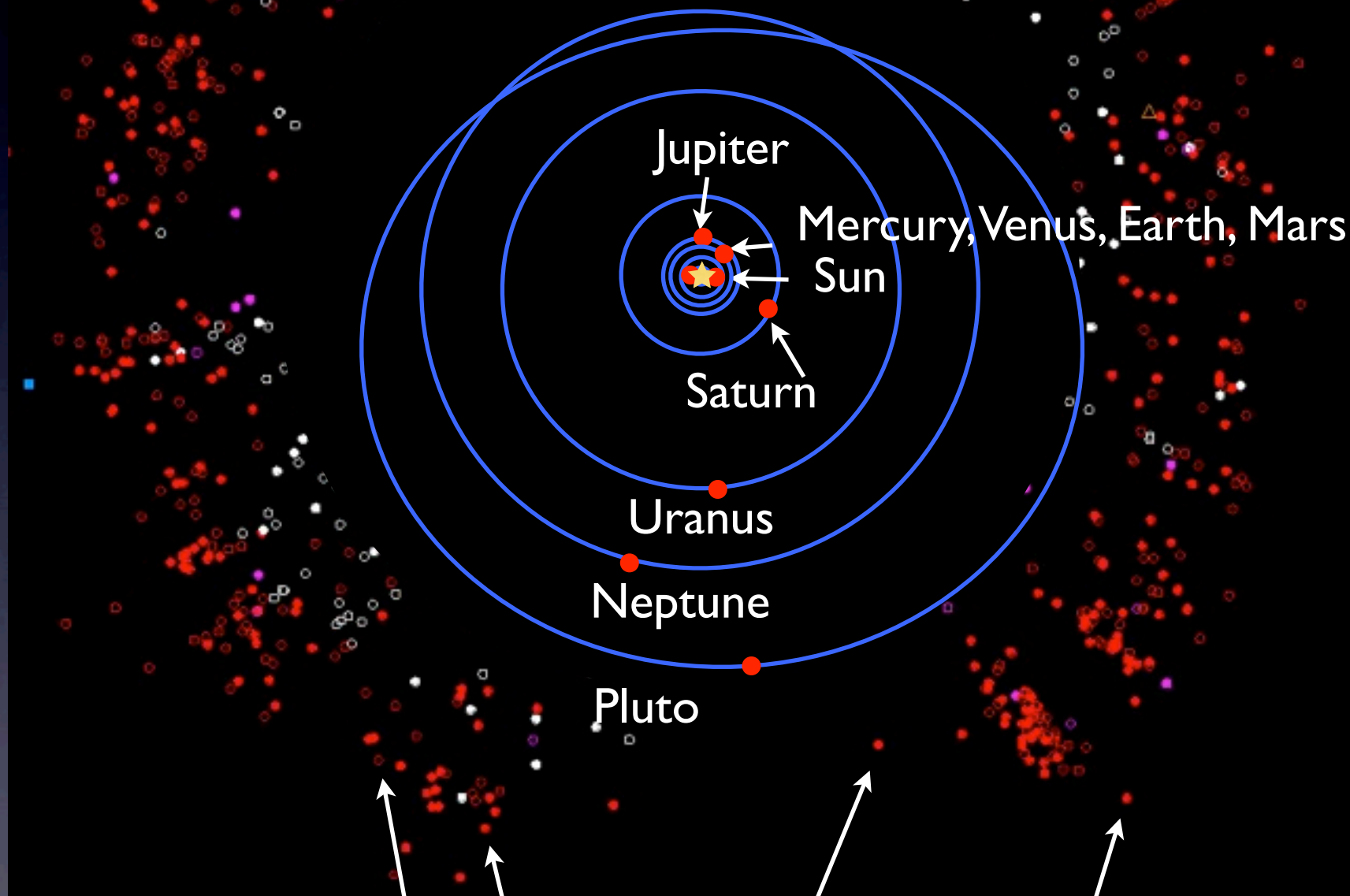


★ ← Sun

The diagram illustrates the solar system with the Sun at the center. Eight planets are shown in elliptical orbits around the Sun. The orbits are represented by thin, light blue lines. The planets are depicted as small circles of varying colors and sizes, arranged in a clockwise direction from the top-left. The Sun is represented by a small yellow star with the label 'Sun' and an arrow pointing to it. The background is a dark blue gradient.



# Our Solar System



Kuiper Belt



Easy to see:

Sun

Moon

Mercury

Venus

Earth

Mars

Jupiter

Saturn

Hard to see:

Uranus

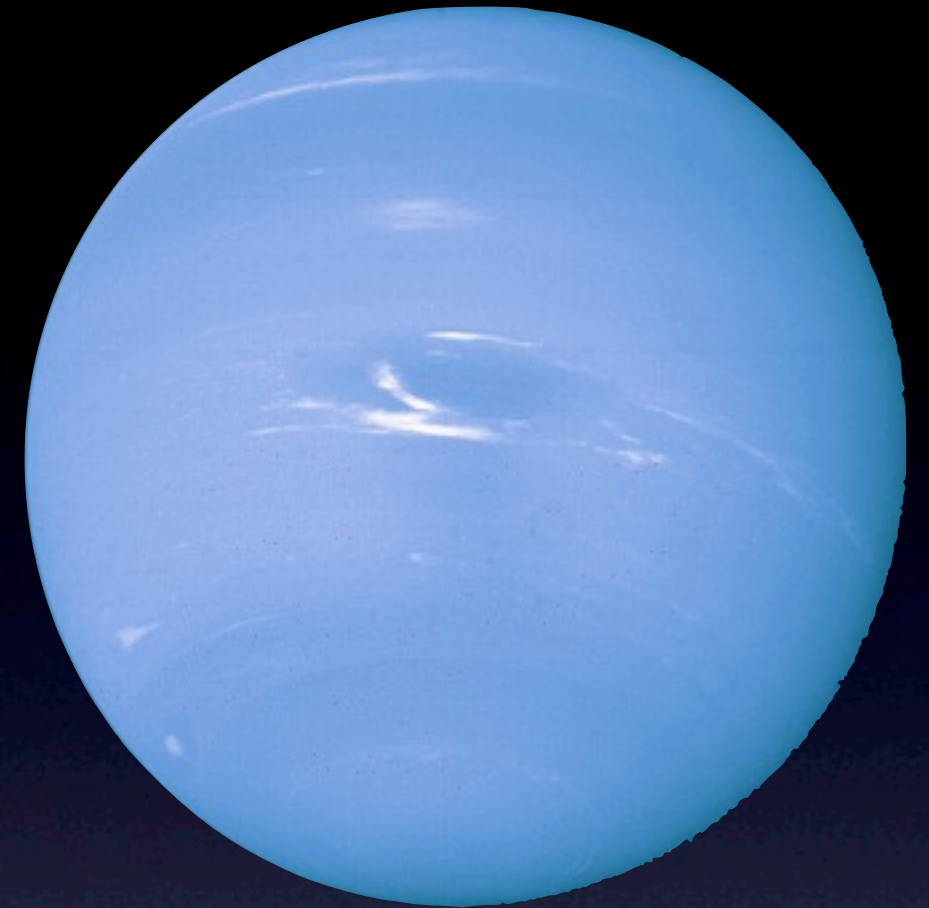
Neptune

Pluto

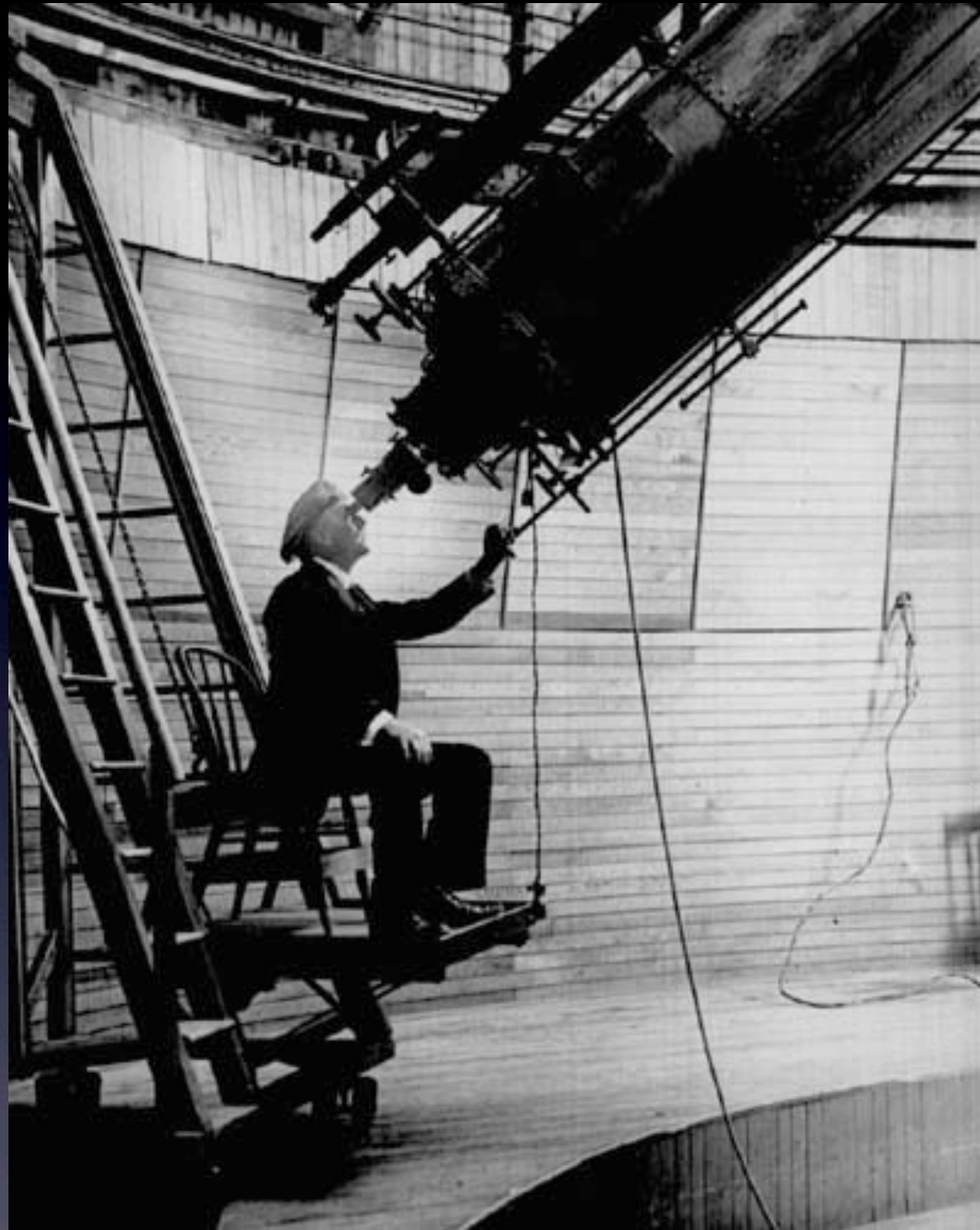
Asteroids





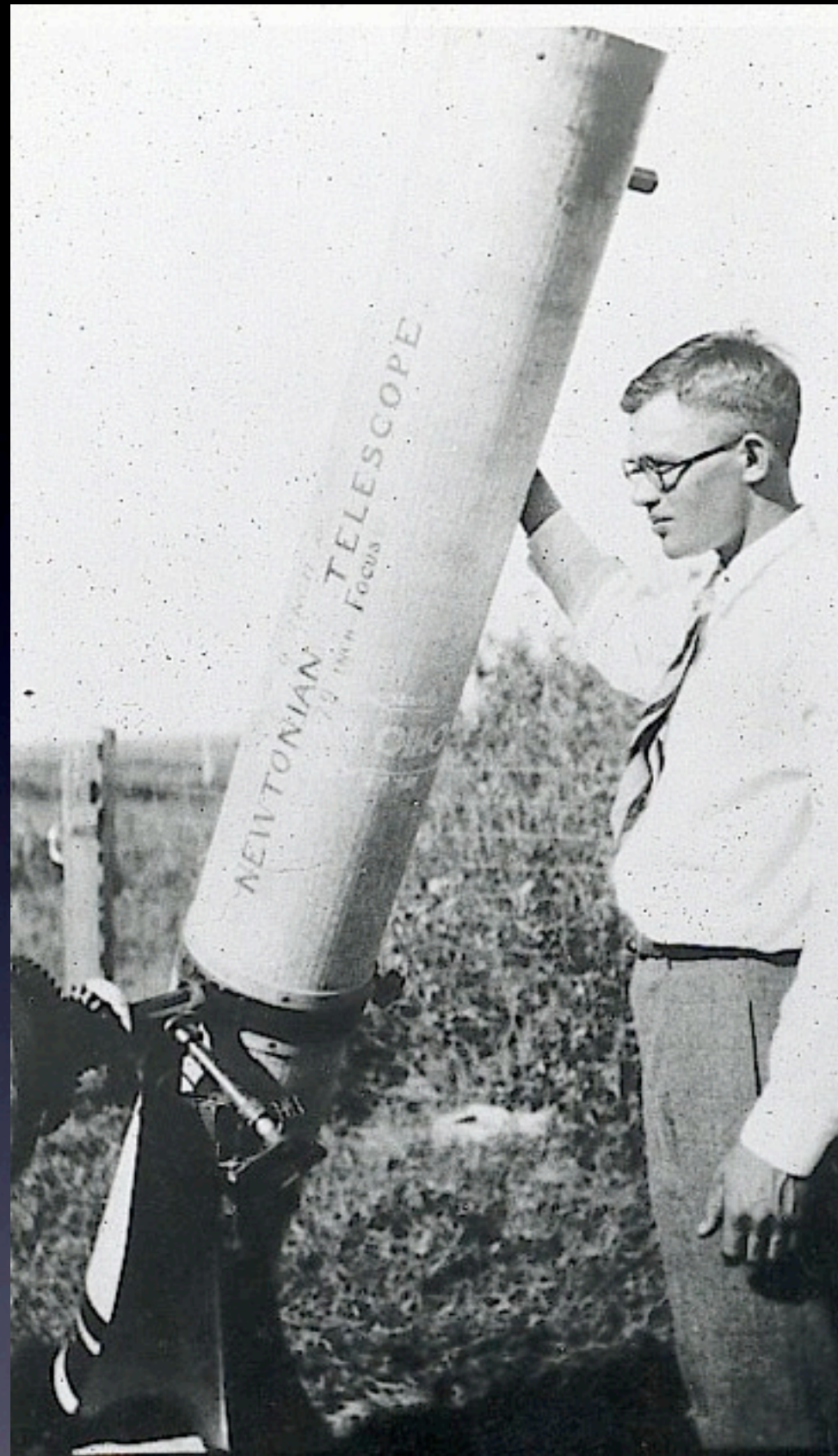


1874: French Astronomer Le Verrier found errors in the position of Uranus, and discovered Neptune the next night.



1905: Percival Lowell started the search for 'Planet X' at Lowell Observatory, Arizona, USA.



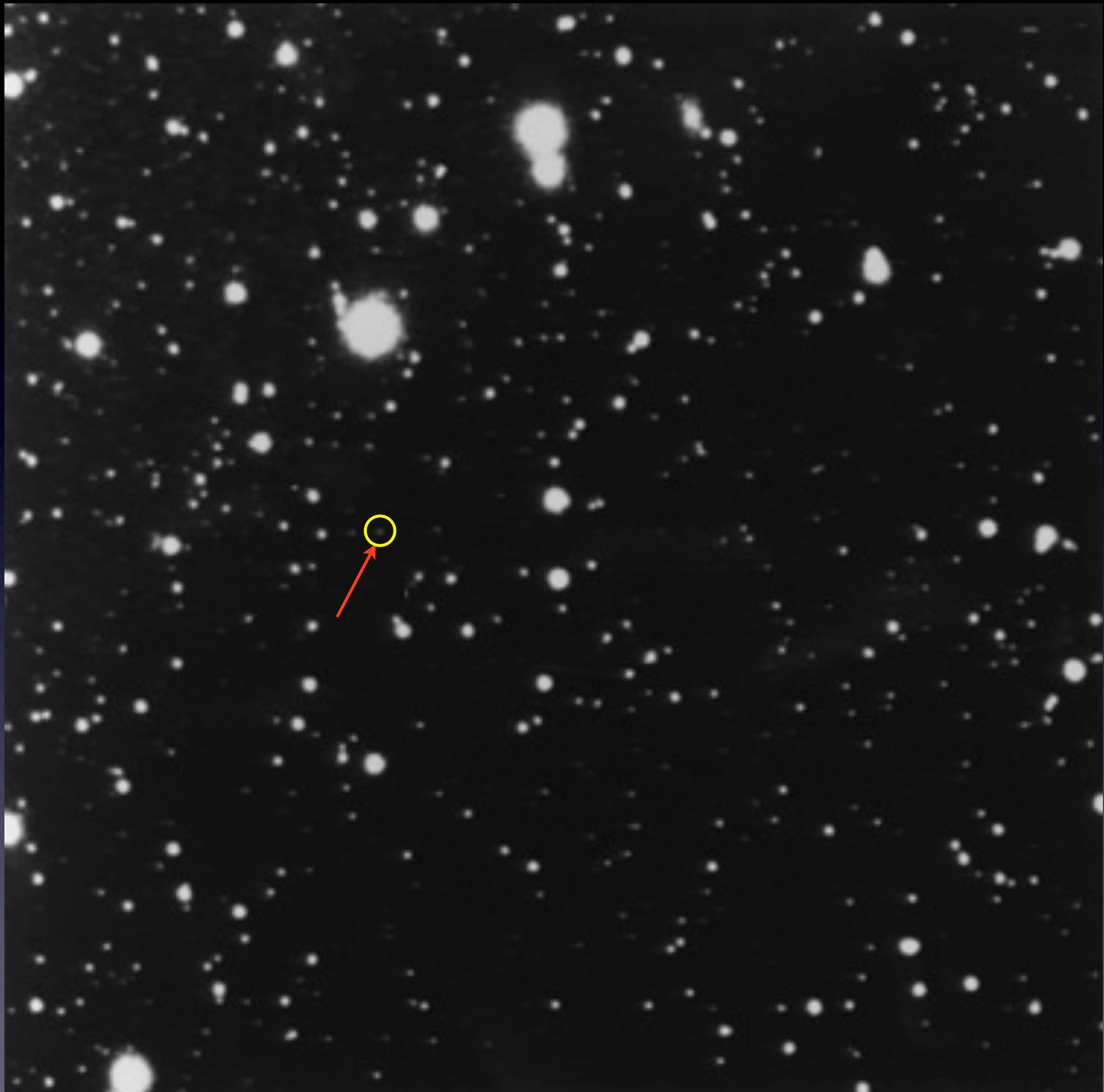


1925: Clyde Tombaugh is hired to search for Planet X at Lowell Observatory in Arizona.







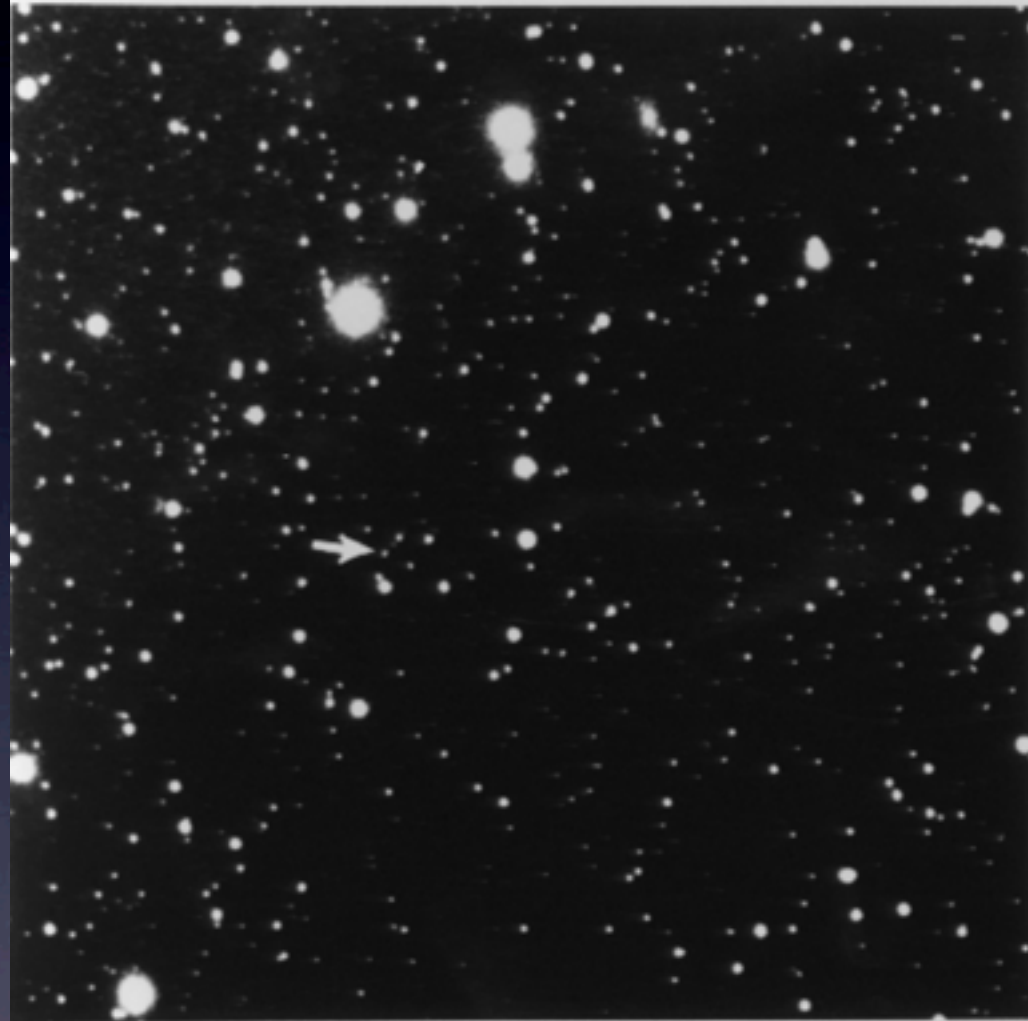




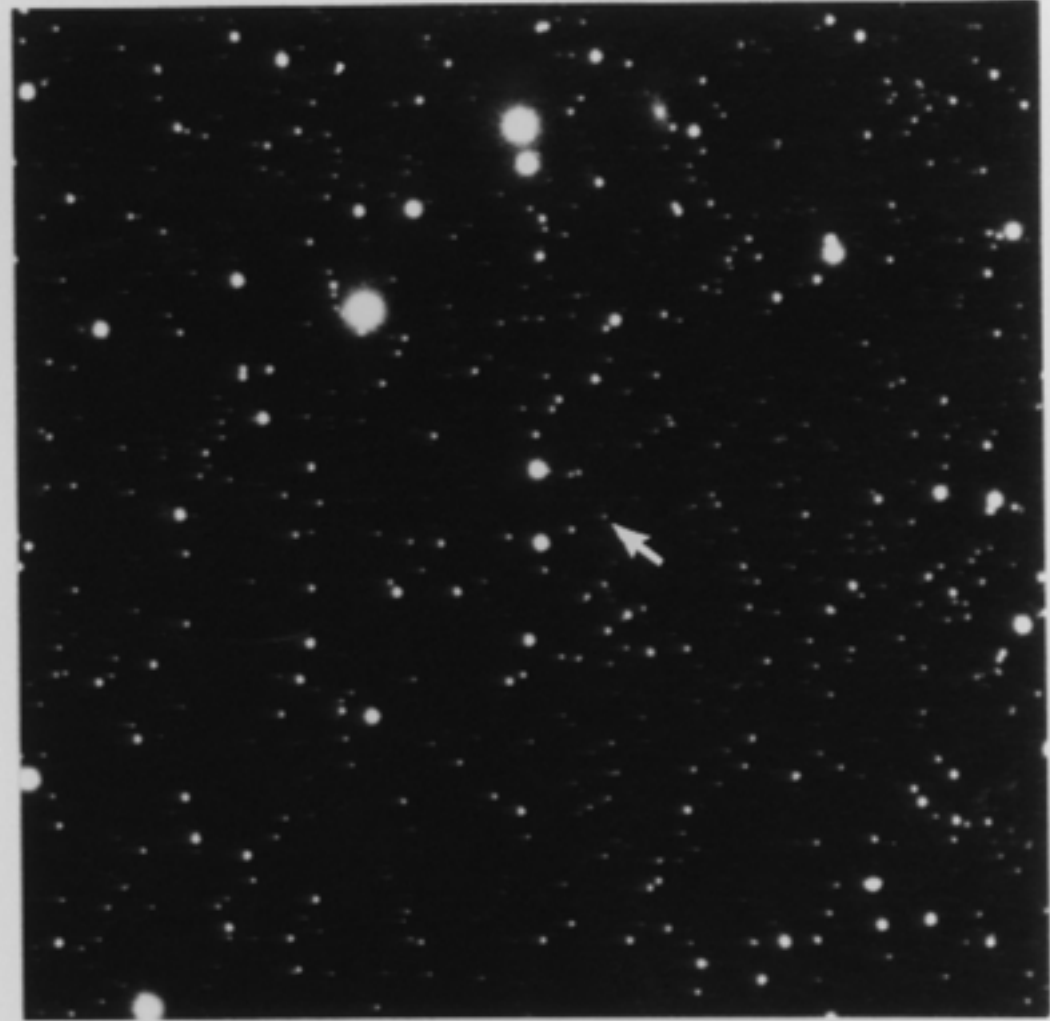




## DISCOVERY OF THE PLANET PLUTO



January 23, 1930



January 29, 1930

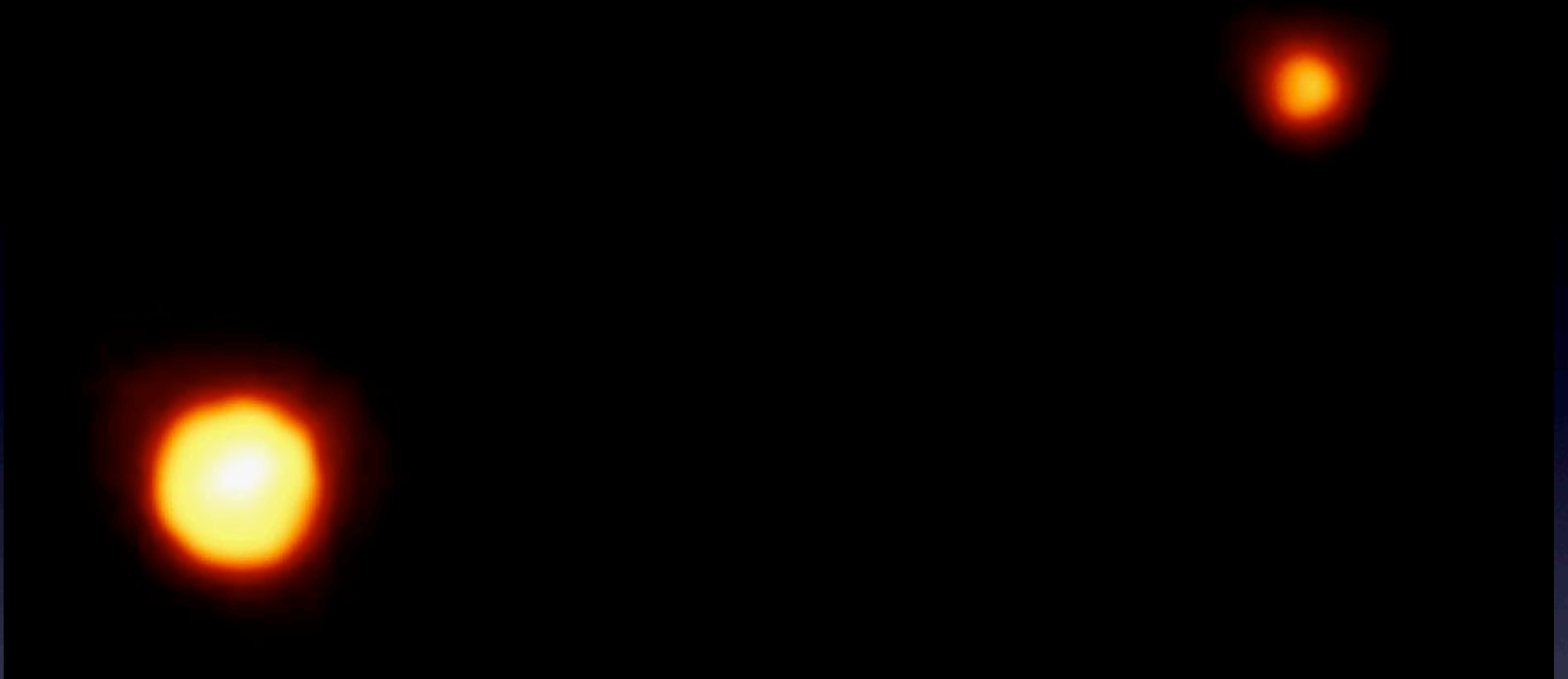
1930: Discovery of Pluto





1932: Walt Disney also discovers Pluto

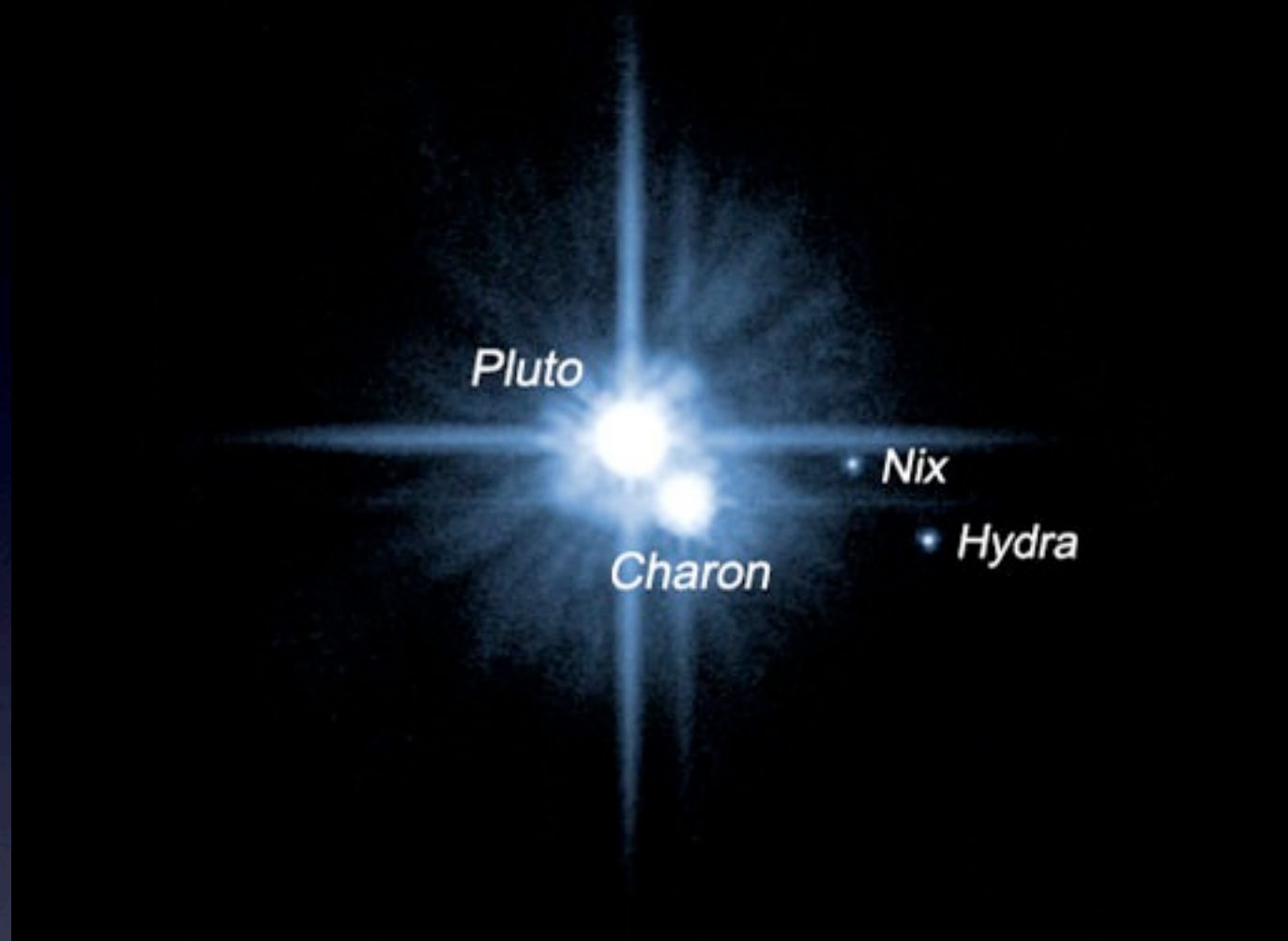




1930: Pluto

1978: Pluto + Charon Discovered



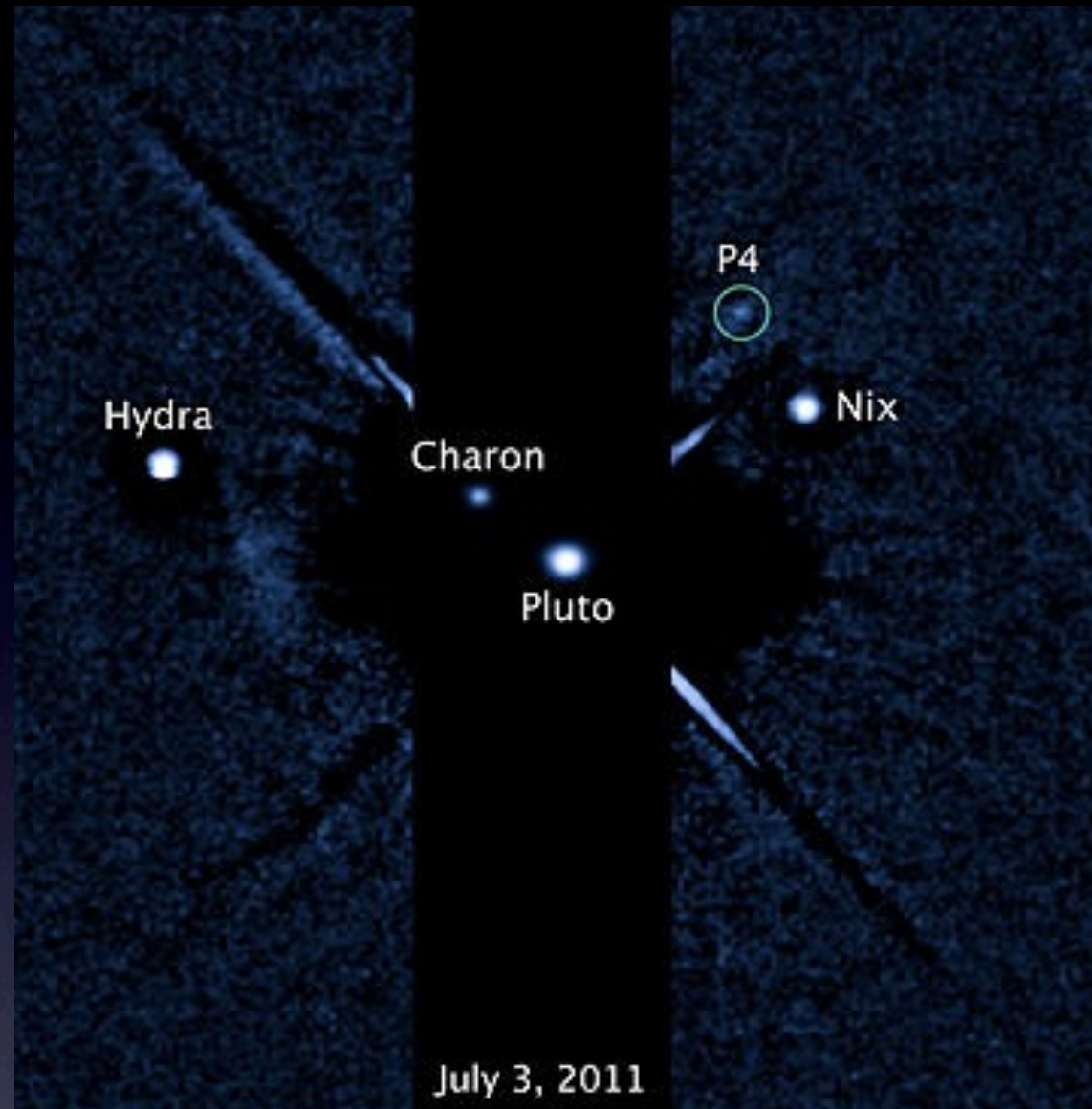


1930: Pluto

1978: Pluto + Charon

2006: Pluto + Charon + Nix + Hydra Discovered



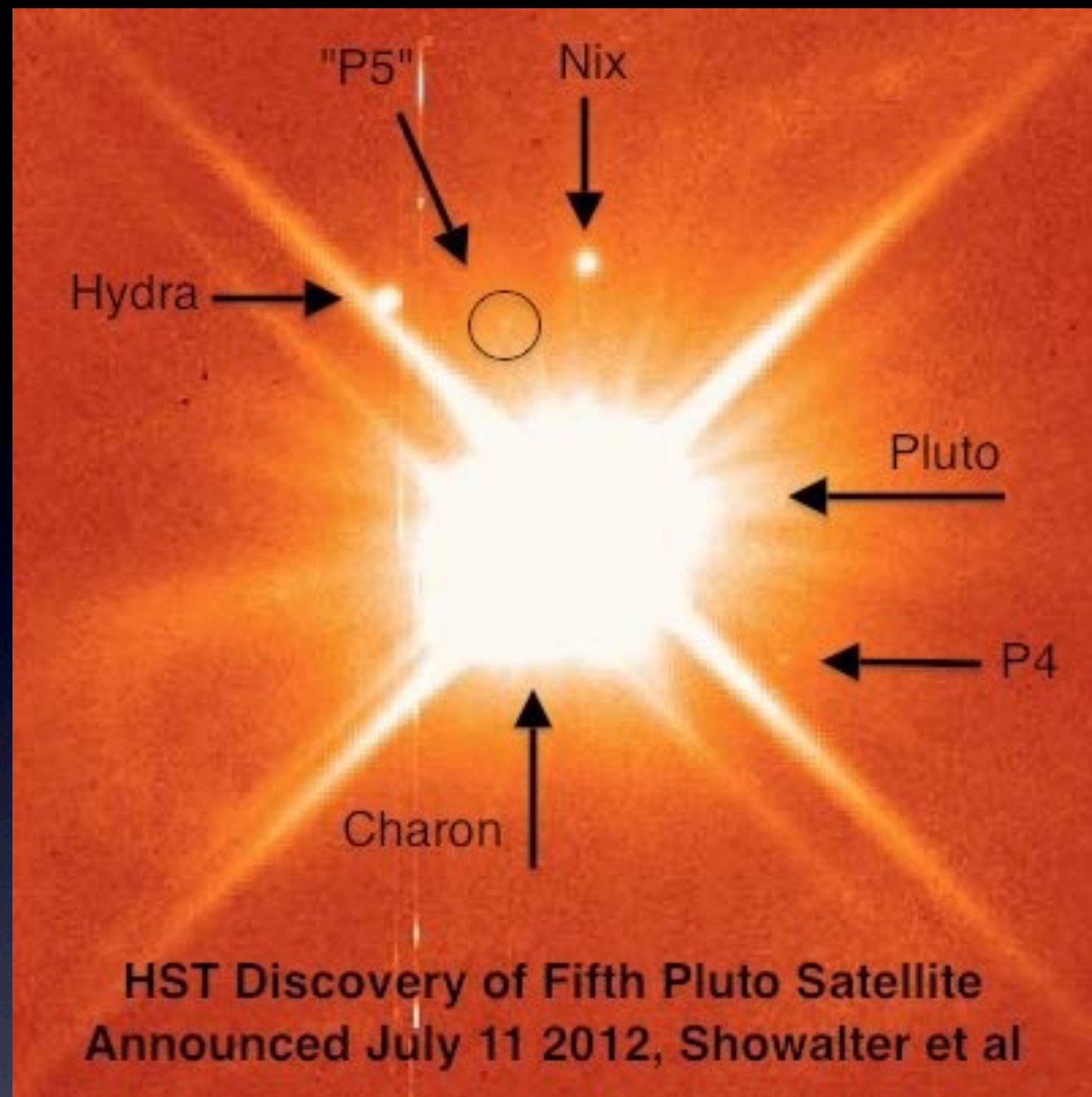


1930: Pluto

1978: Pluto + Charon

2006: Pluto + Charon + Nix + Hydra

2011: Pluto + Charon + Nix + Hydra + P4 Discovered



1930: Pluto

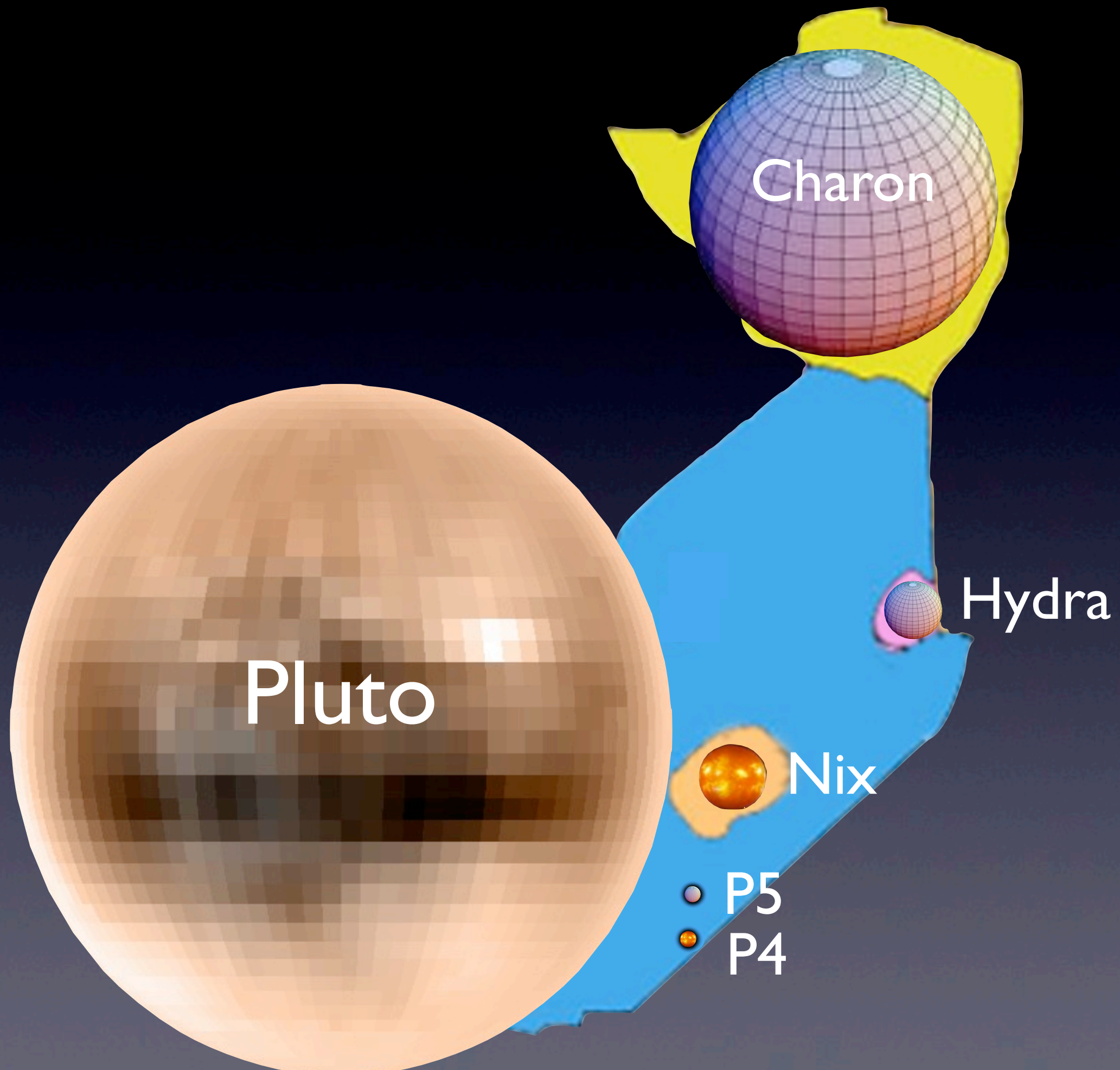
1978: Pluto + Charon

2006: Pluto + Charon + Nix + Hydra

2011: Pluto + Charon + Nix + Hydra + P4

2012: Pluto + Charon + Nix + Hydra + P4 + P5





# Pluto Is...

- Very far away
- Very cold
- Very small
- Very old

... and that is almost all we know!



We know what Earth looks like...  
What will Pluto be like?

























# Meteor Crater, Arizona, USA







Tswaing Impact Crater, South Africa







# Why Study Pluto?

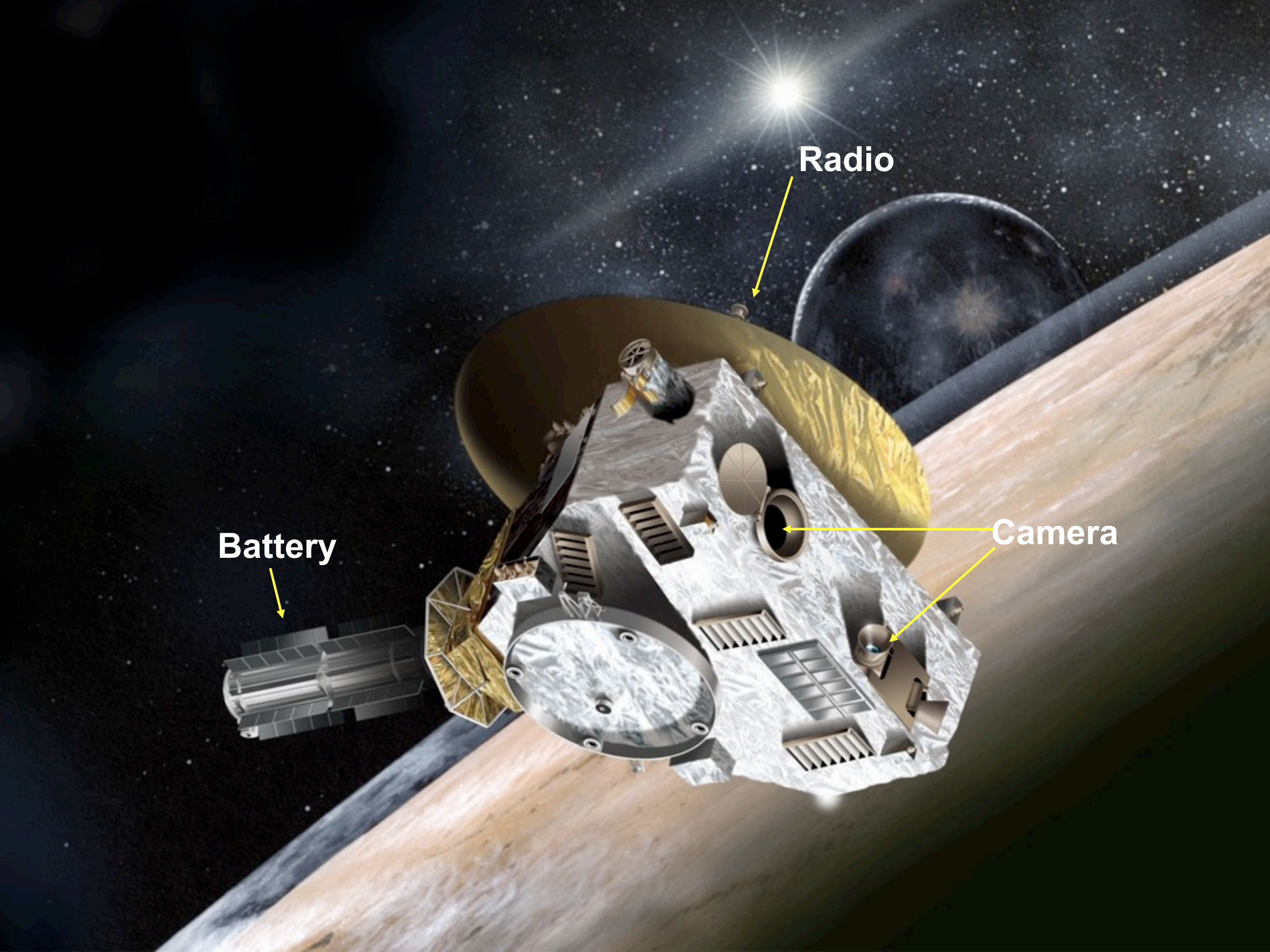
Pluto's surface is probably the oldest in the whole Solar System.

So, studying Pluto tells us what the Solar System was like 5 billion years ago!









**Radio**

**Camera**

**Battery**





Camera

Radio

Battery



# New Horizons Spacecraft

**\$700M USD, from NASA**

**Size of a very small car**

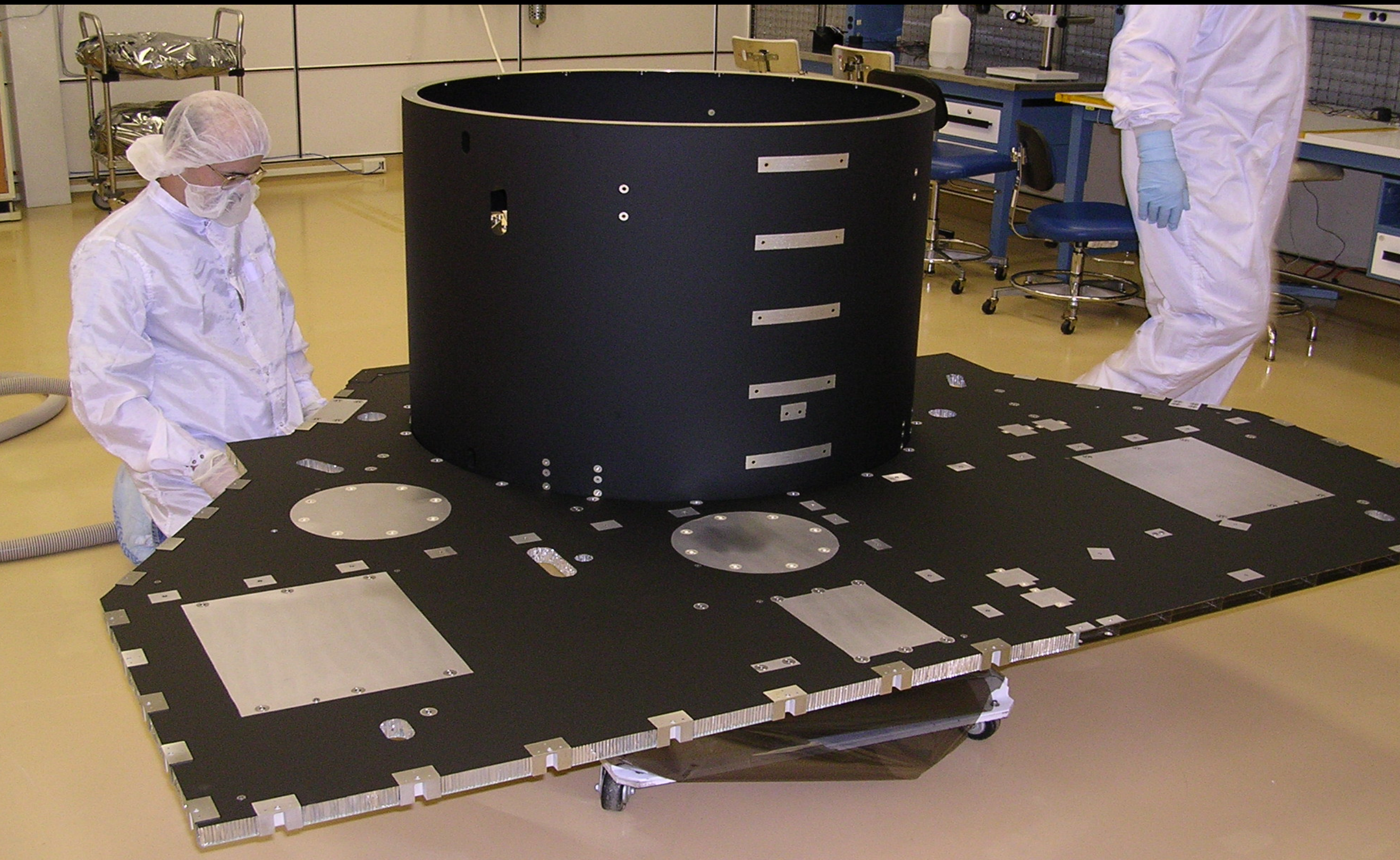
**It is a robot - no people on it!**

**It will fly past Pluto, take pictures, and send them back over its radio.**

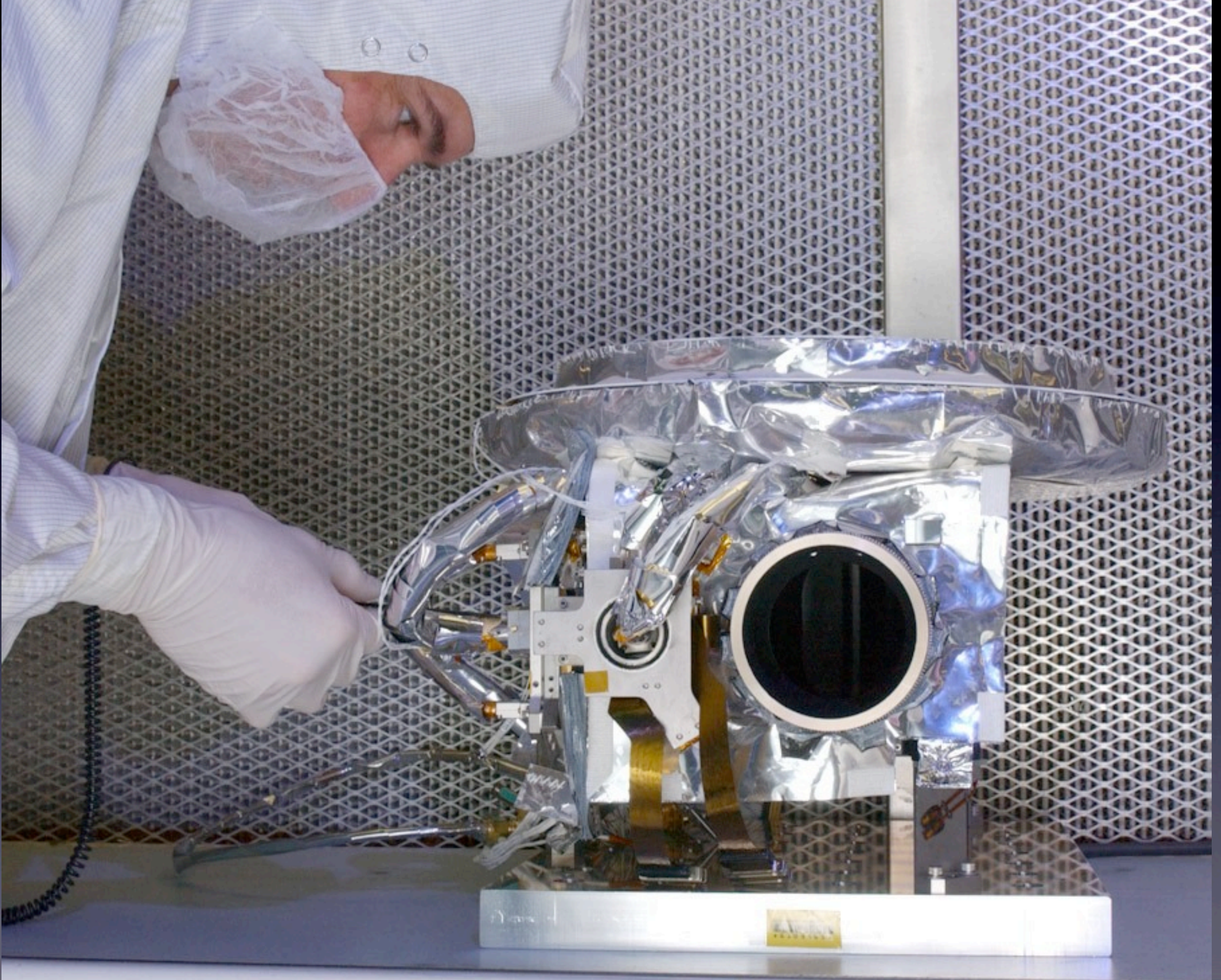
**It will keep flying - it doesn't land, and it never comes back to Earth.**































# New Horizons Team



***New Horizons***  
Shedding Light on Frontier Worlds











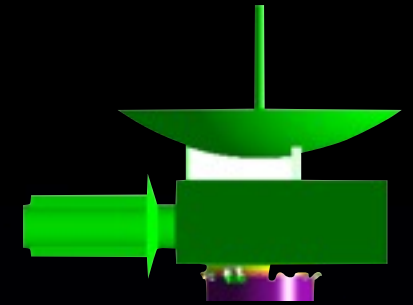






# Lockheed-Martin Atlas V Rocket

Rocket: 575,198 kg  
Spacecraft: 478 kg  
Cameras: 20 kg









































NASA













UTO  
HORIZONS

LOCKHEED MARTIN









New Horizons is the ***fastest*** spacecraft ever launched!

<b>Mission</b>	<b>Time to get to the Moon's distance</b>
New Horizons	6 hours
Apollo 11	96 hours
Bloodhound	251 hours

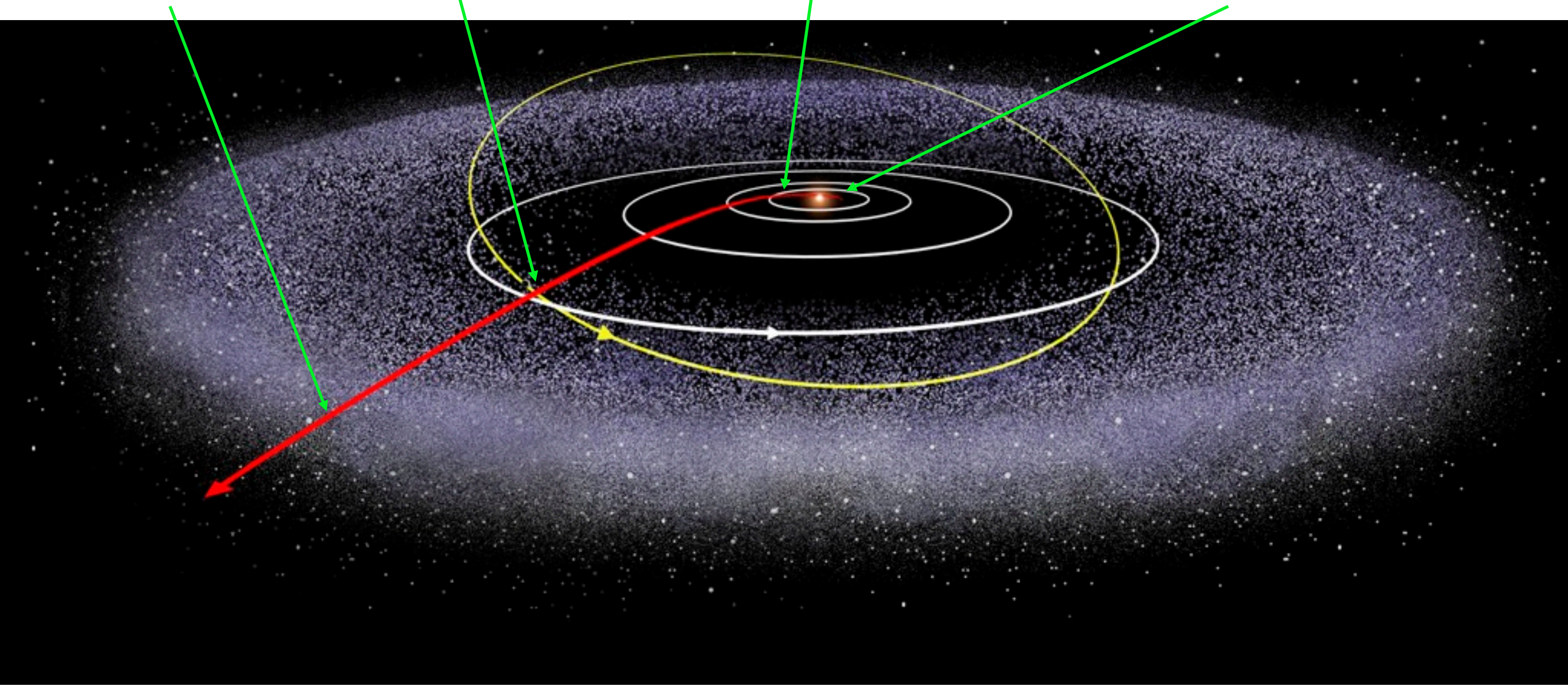


**Pluto:  
July 2015**

**Jupiter:  
March 2007**

**Kuiper Belt:  
2016-2020**

**Earth:  
January 2006**

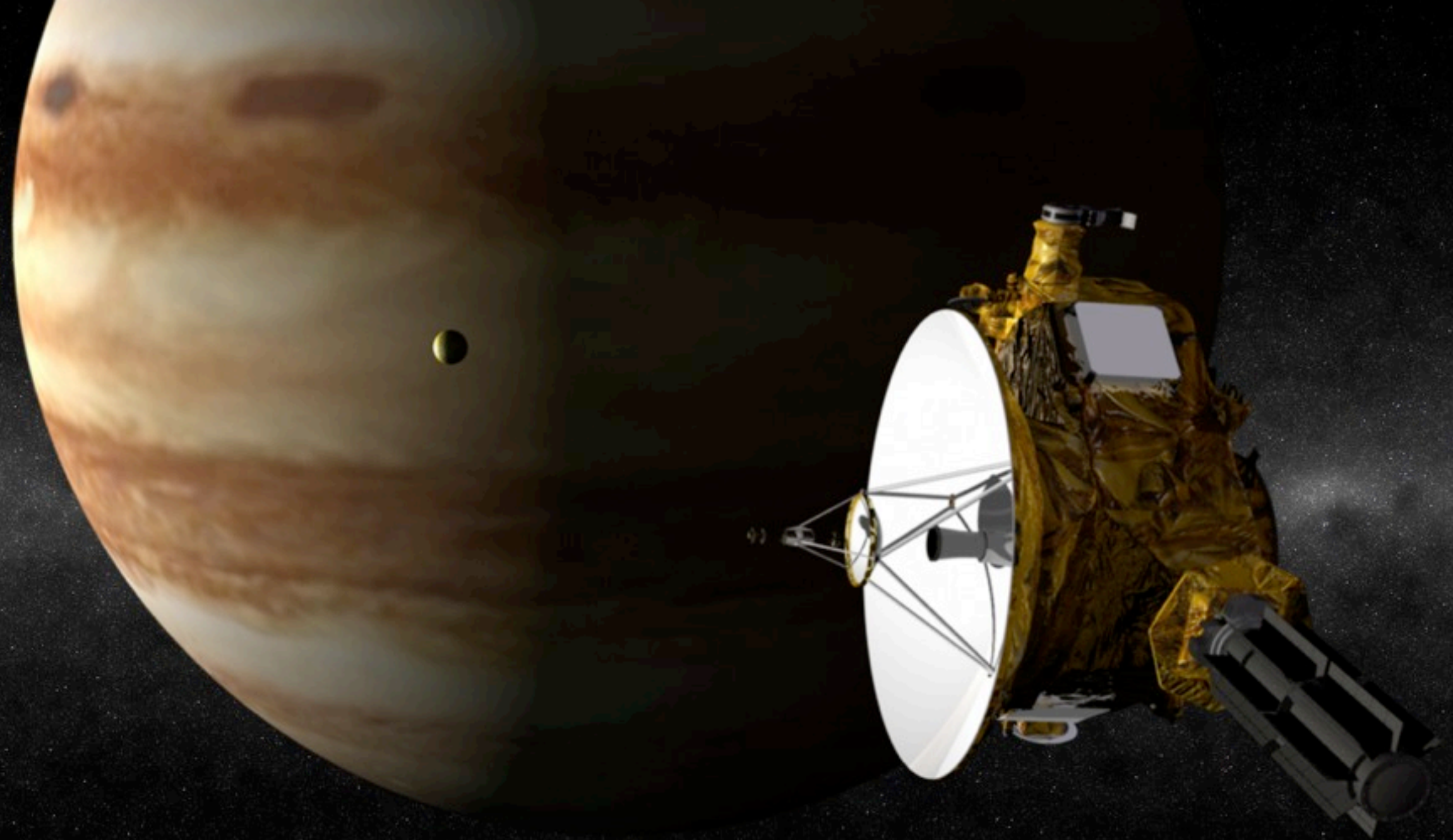




# New Horizons Pluto Kuiper Belt Mission Profile

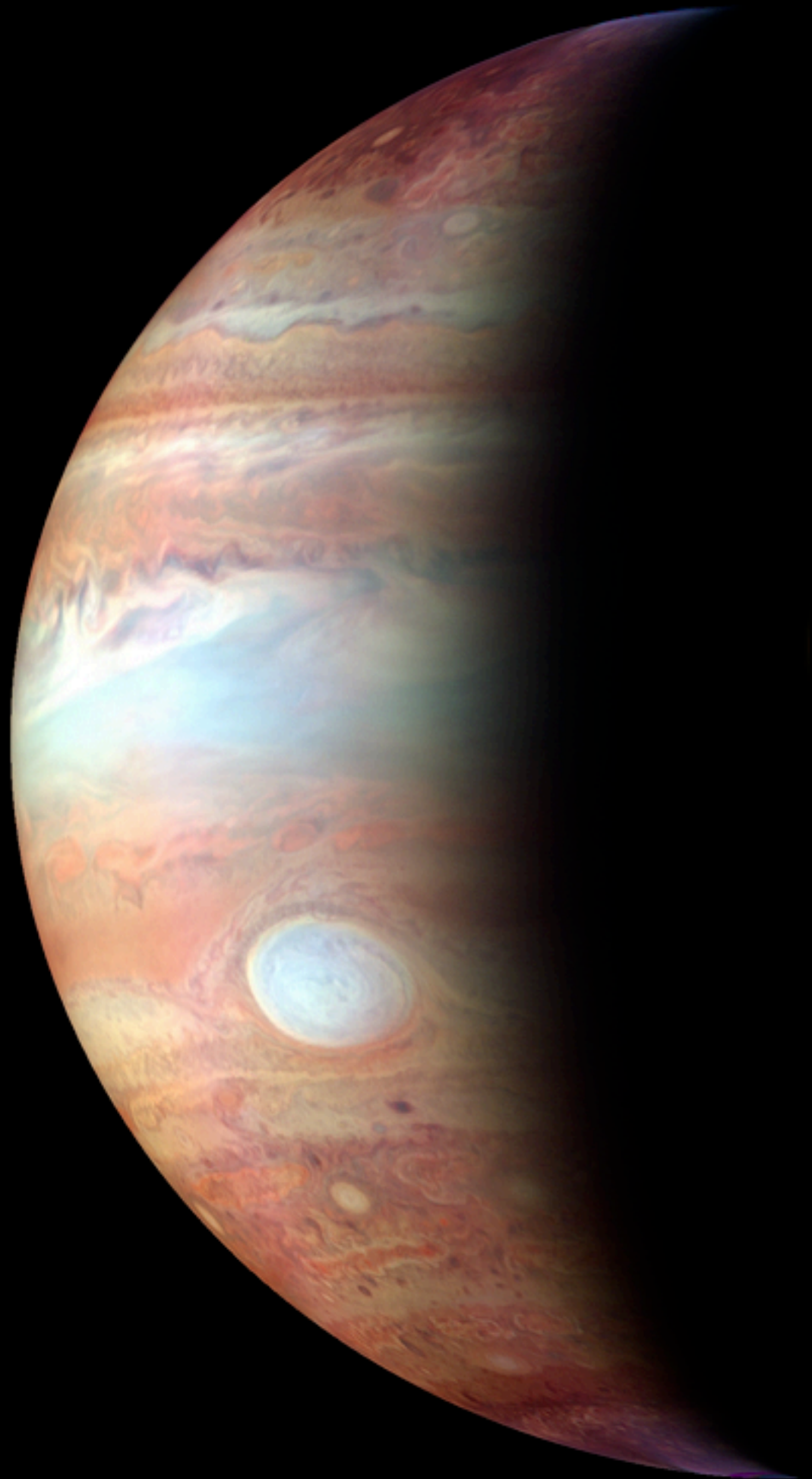






New Horizons at Jupiter: February 28 2007



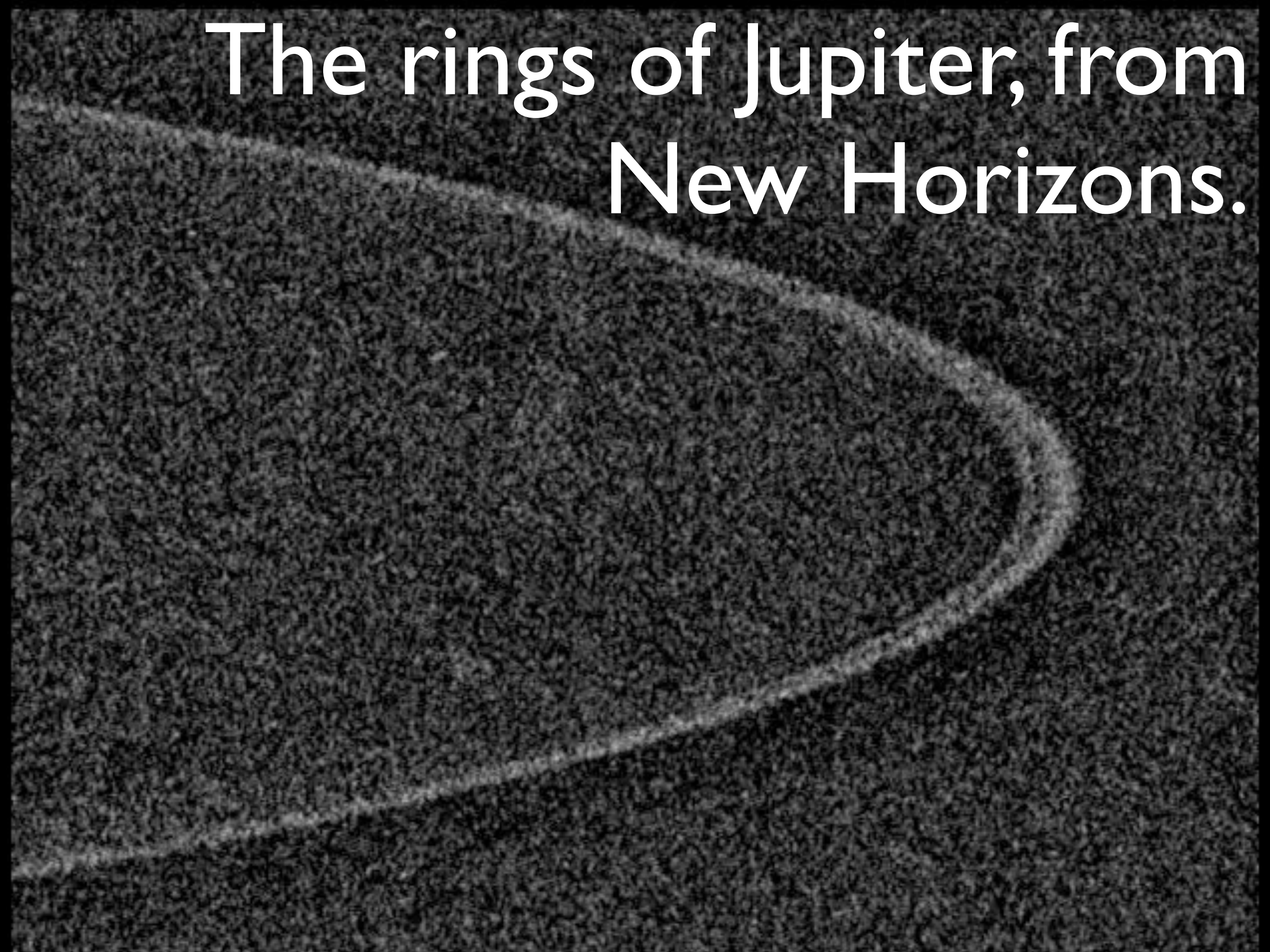


New Horizon at Jupiter

February 28, 2007



# The rings of Jupiter, from New Horizons.





# Volcanoes on Jupiter's Moon "Io"





# Volcanoes on Io



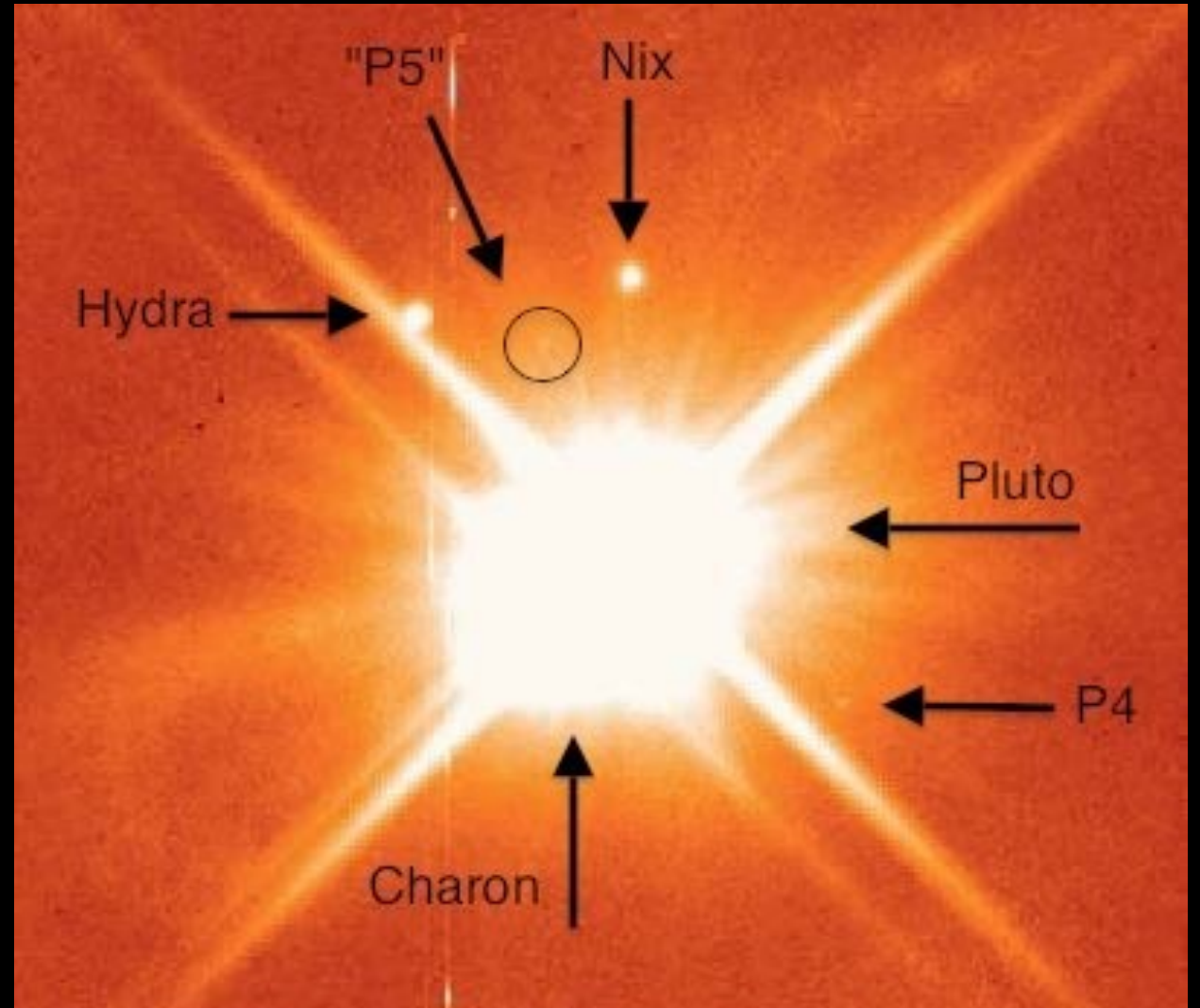


# Five Missions for the Price of One

- 2003: When New Horizons was selected by NASA, Pluto had just one known moon, Charon.
- 2005: Two new moons discovered: Nix and Hydra
- 2006: Launch
- 2011: One more moon discovered: P4
- 2012: One more moon moon discovered: P5



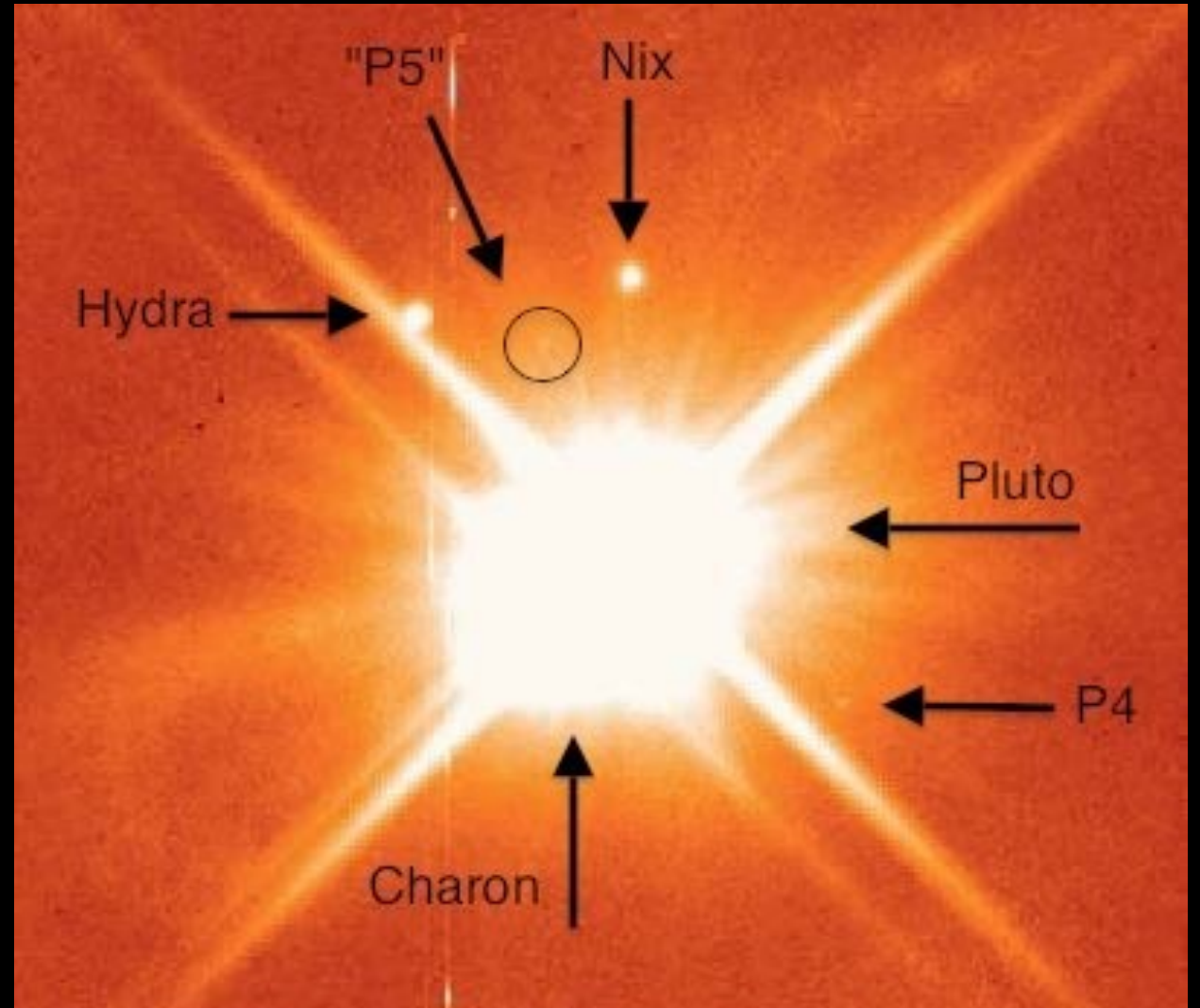
All these new moons are great, but they give us a few problems...



I. If there are five moons, there may be more moons, more rocks, more dust that we cannot see... and *that* could be dangerous.



All these new moons are great, but they give us a few problems...



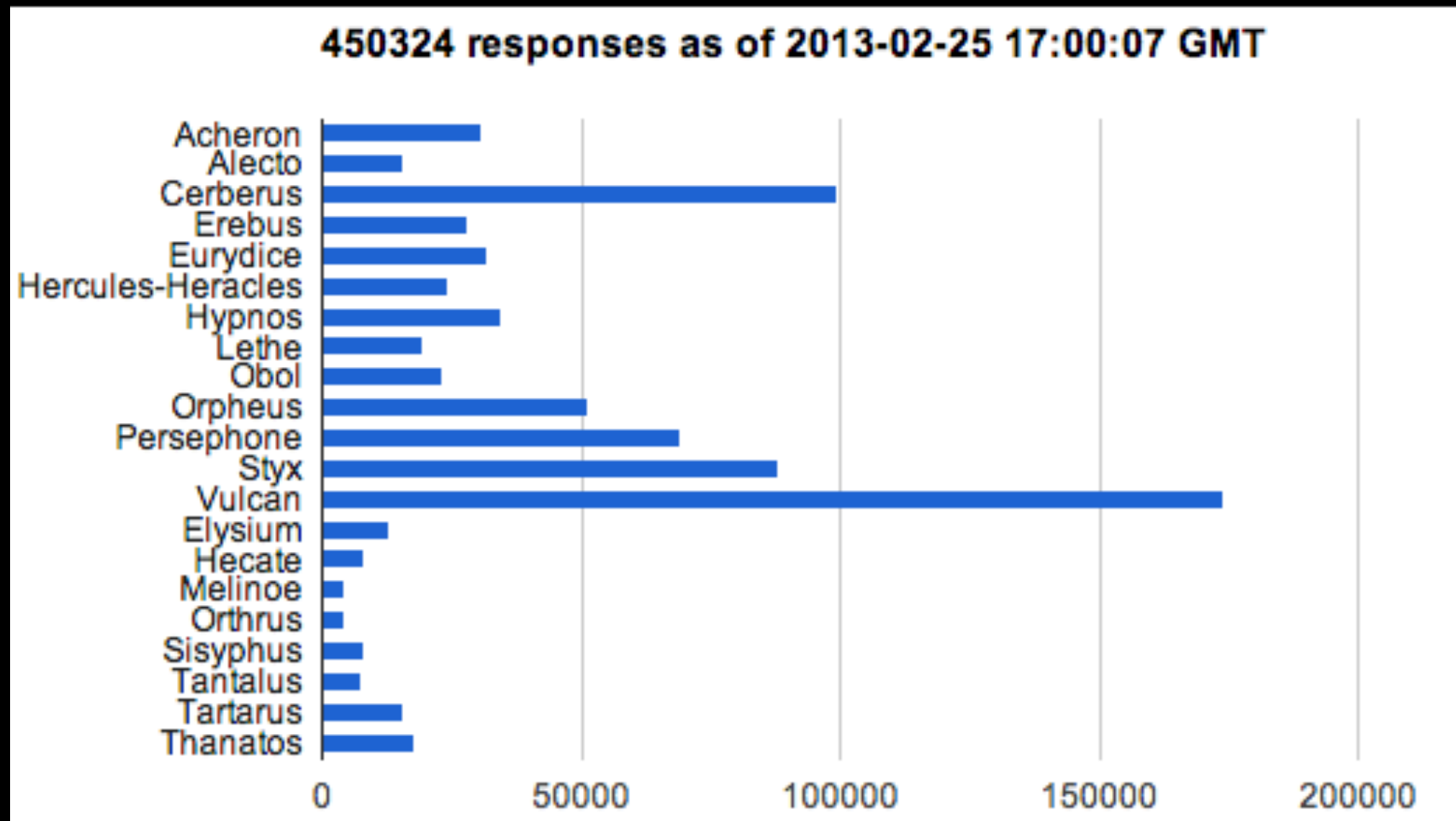
2. What do we call them??





# Pluto Rocks

Help us name the smallest moons of Pluto



How to names Pluto's moons P4 and P5?

- We conducted one of the internet's largest polls ever at PlutoRocks.com
- Two weeks, 450,000 votes
- 180+ countries including South Africa, Zim, Namibia, Botswana, Lesotho...



# Is Pluto a Planet?

## Yes !!!

- It orbits the Sun
- It is big enough so that its own gravity makes it into a round ball
- It has five moons
- It has an atmosphere
- We've always called it a planet

## No !!!

- It's smaller than the other planets
- Its orbit is egg-shaped and tilted
- It's just like the other 500 Kuiper Belt objects, and we don't call them planets
- If it was discovered today, we would not call it a planet



August 2006: International Astronomical Union, Prague



This group voted to call Pluto a 'Dwarf Planet.'  
But not everyone agrees, and this is how science works.



# IAU Definition of Planet

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

(1) 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.

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

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

**Problem I: The 800+ extrasolar planets aren't 'planets'?**

**Problem II: But Jupiter isn't 'rigid'!**

**Problem III: Saturn isn't round!**

**Problem IV: Earth, Jupiter, Moon, etc have not 'cleared their neighborhood'!**



# HELP SUPPORT LOWELL OBSERVATORY

Vote with your wallet  
on the question below

What should Pluto be called?

Planet

Dwarf  
Planet

Other

I don't care!  
I just want  
to support  
Lowell





- What is the difference between a koppie and a hill? It's a fine line...
- Science is a human process and our names will continue to evolve as we learn more about the world around us.

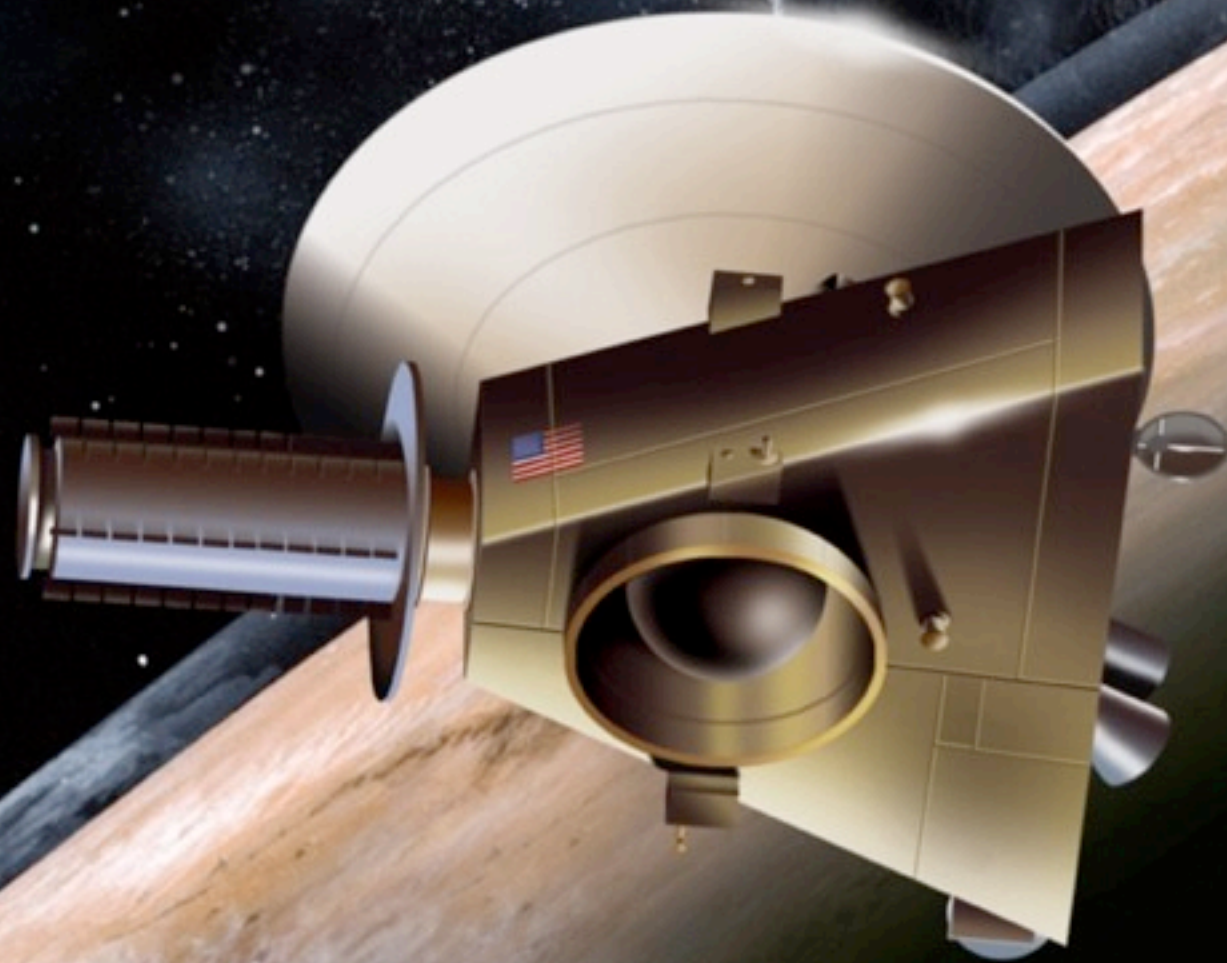
Pluto is a Planet.

Get on with it and Look at the Sky!



You can track New Horizons as it gets  
ready to arrive at Pluto July 14, 2015...

<http://pluto.jhuapl.edu/>



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