

# NASA's New Horizons Mission To Pluto



SciFest Africa  
March 2013

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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.

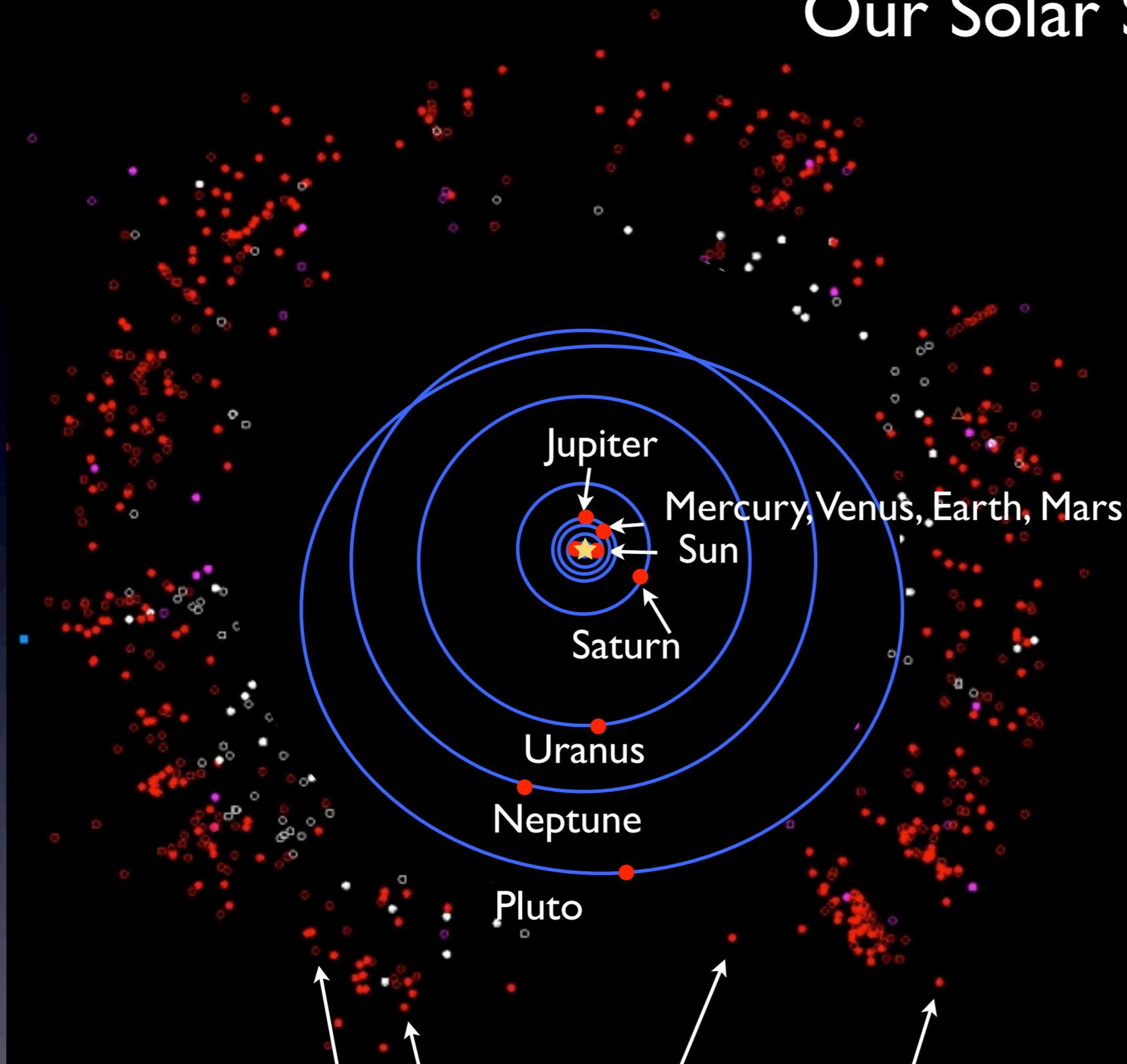


The Sun is just one star in the Galaxy.

# Our Solar System

★ ← Sun

# Our Solar System



Kuiper Belt

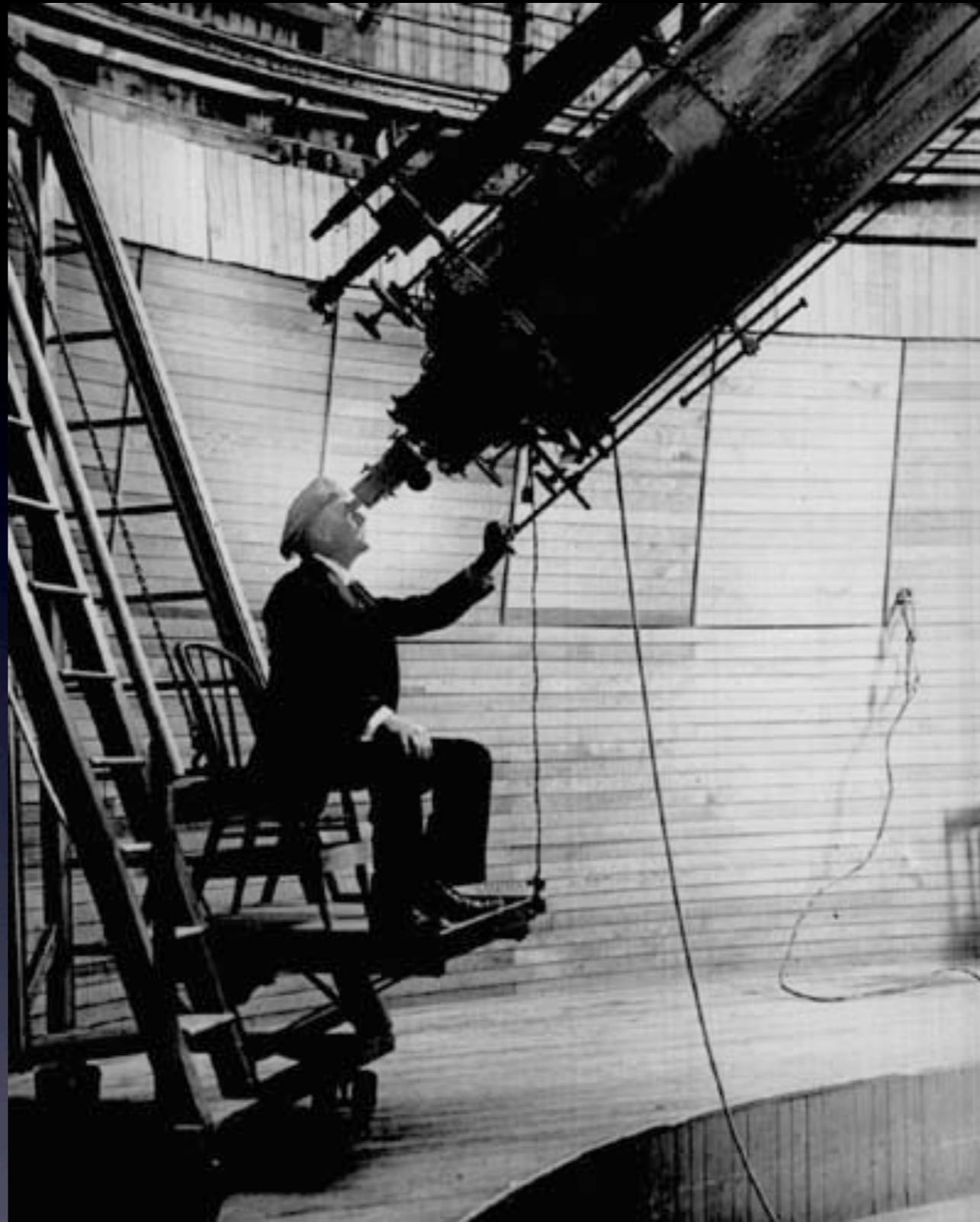


Easy to see:  
Sun  
Moon  
Mercury  
Venus  
Earth  
Mars  
Jupiter  
Saturn

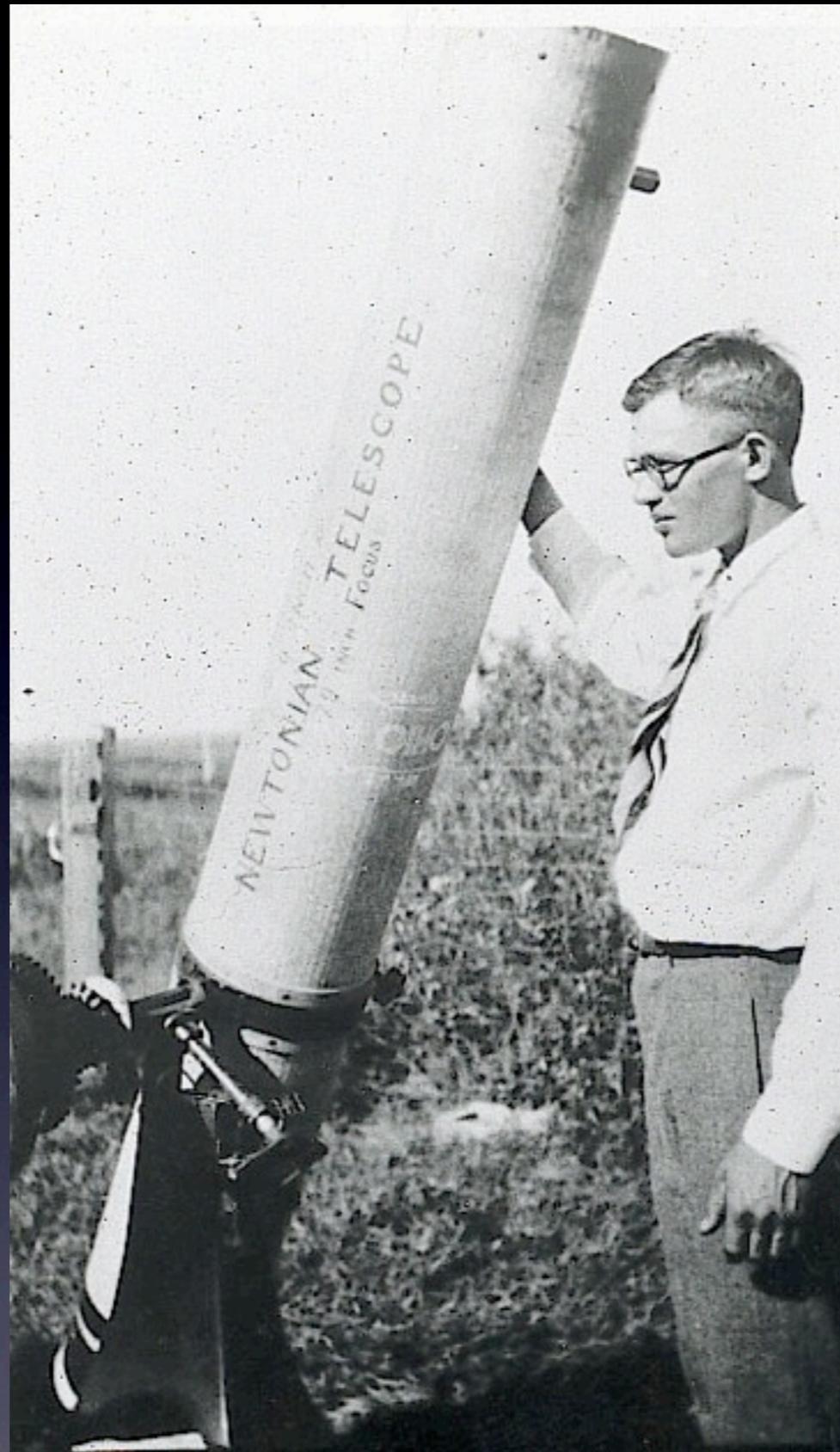
Hard to see:  
Uranus  
Neptune  
Pluto  
Asteroids



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

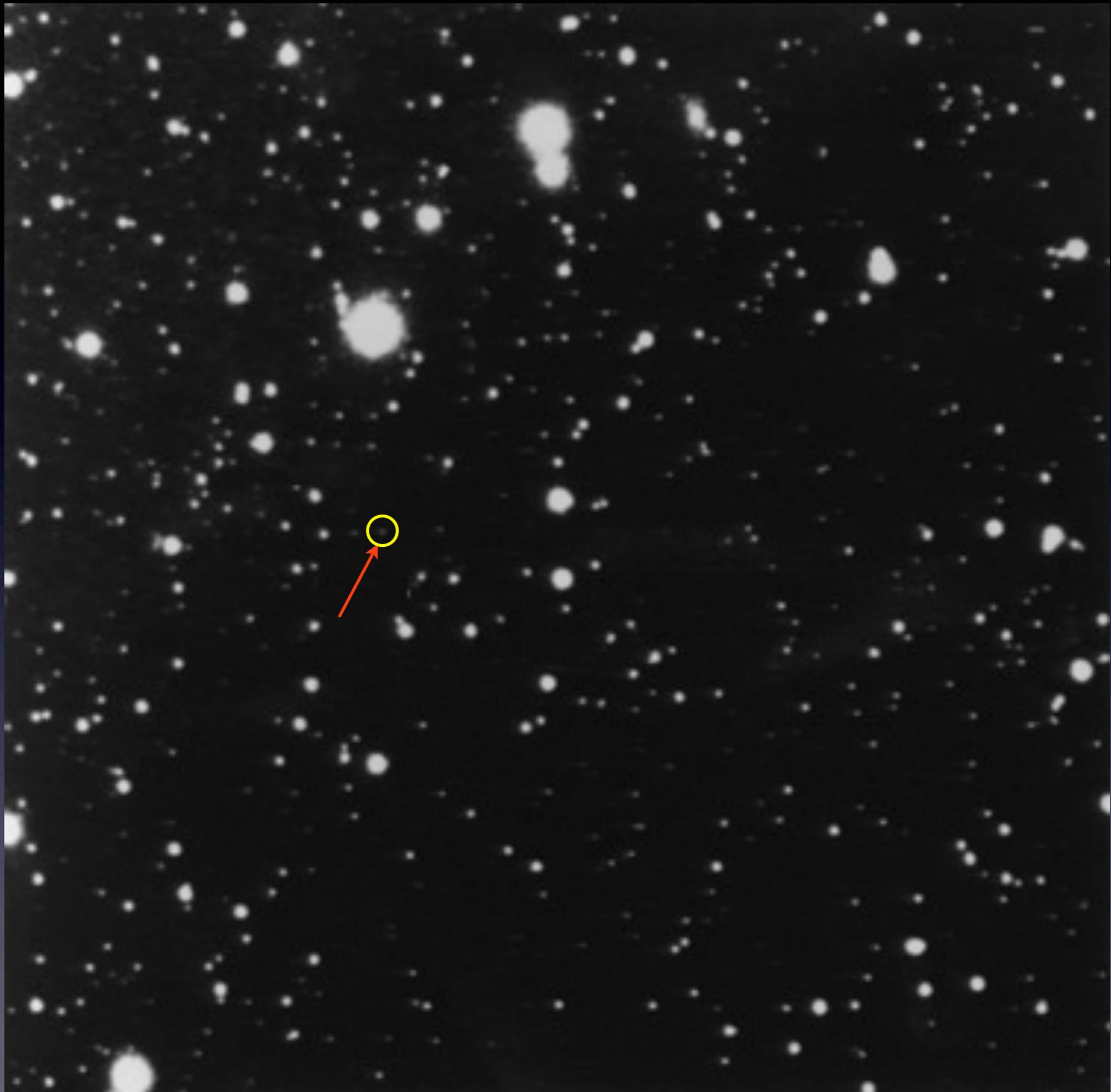


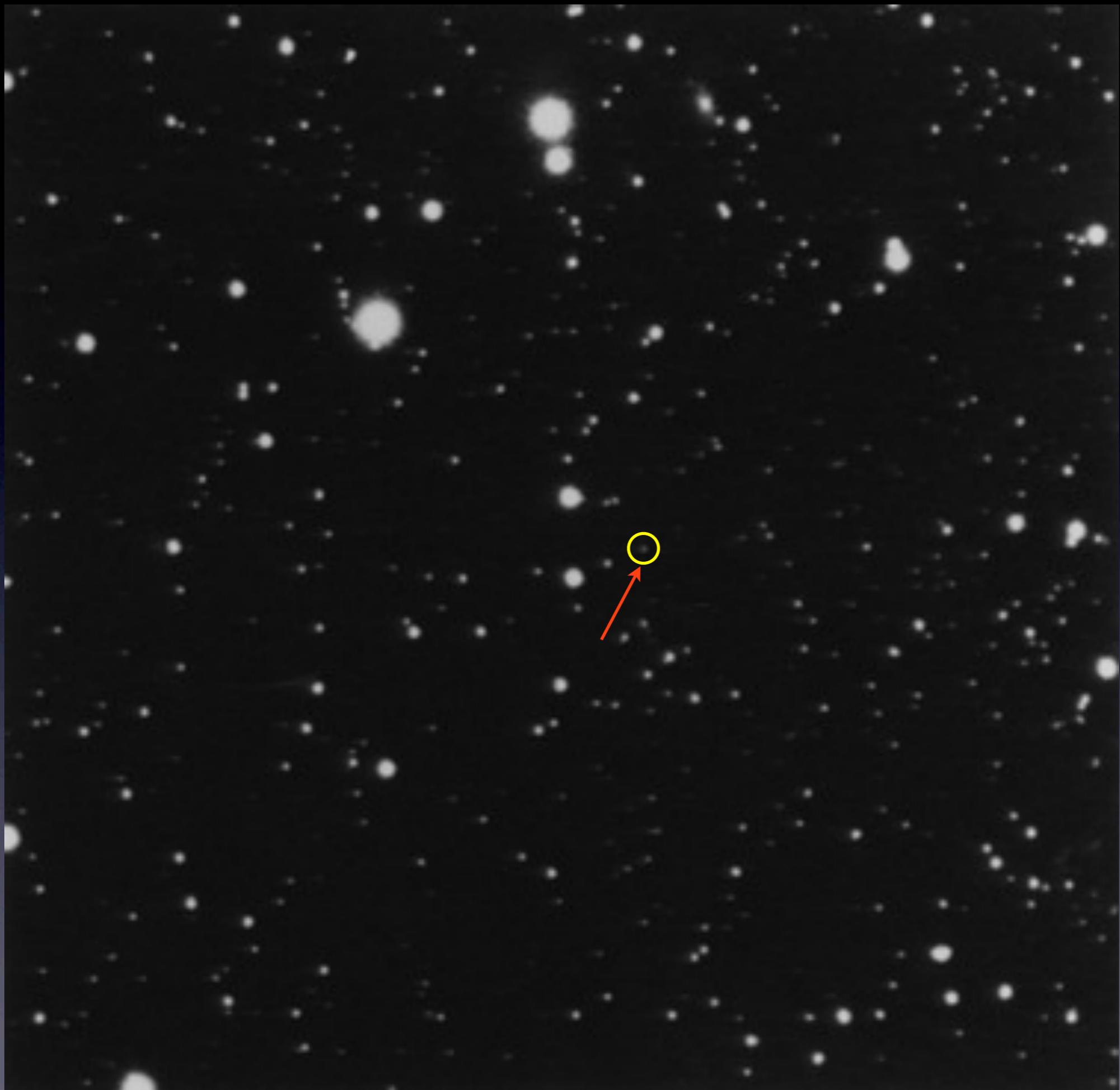
1905: Percival Lowell started the search for 'Planet X' at Lowell Observatory, Arizona, USA.



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



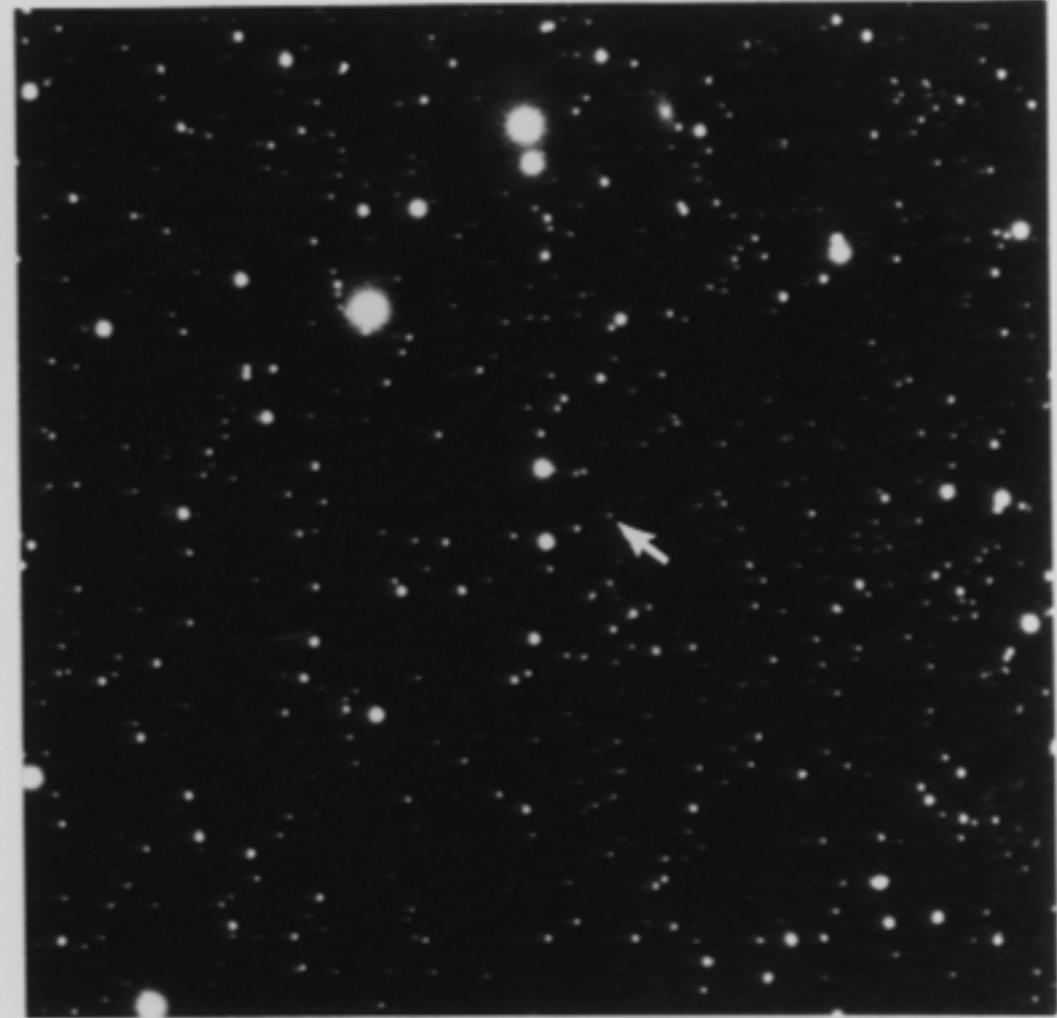




## DISCOVERY OF THE PLANET PLUTO



January 23, 1930

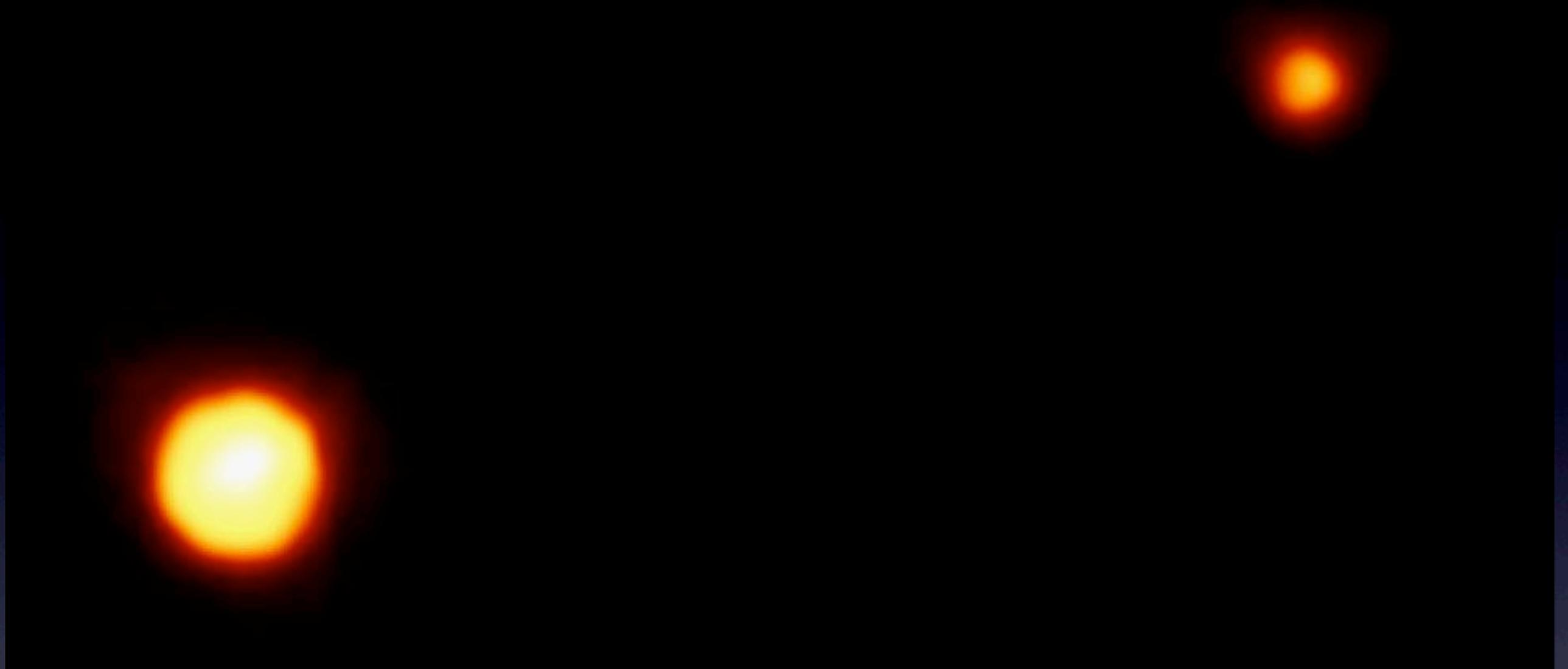


January 29, 1930

1930: Discovery of Pluto

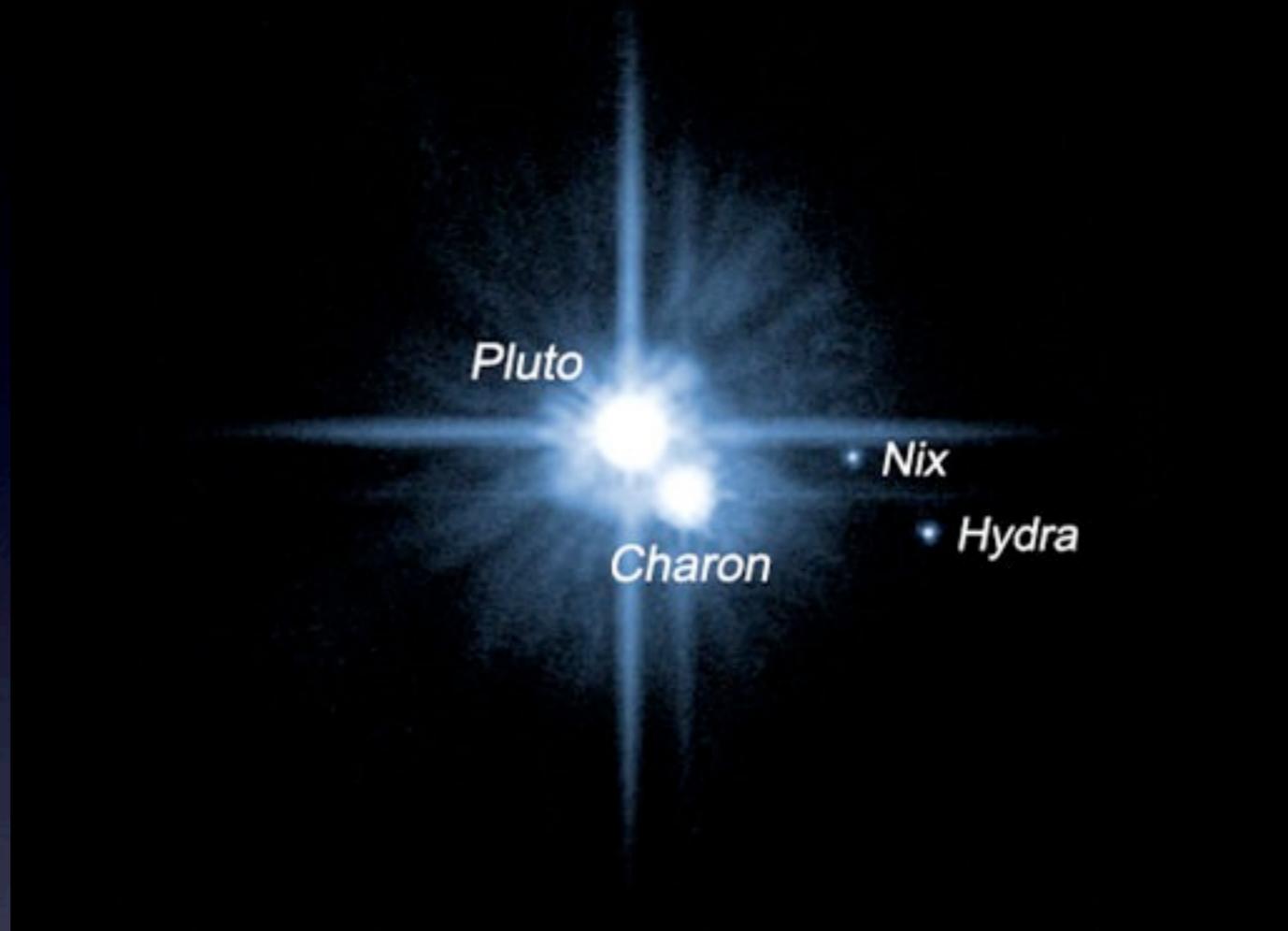


1932:Walt Disney also discovers Pluto



1930: Pluto

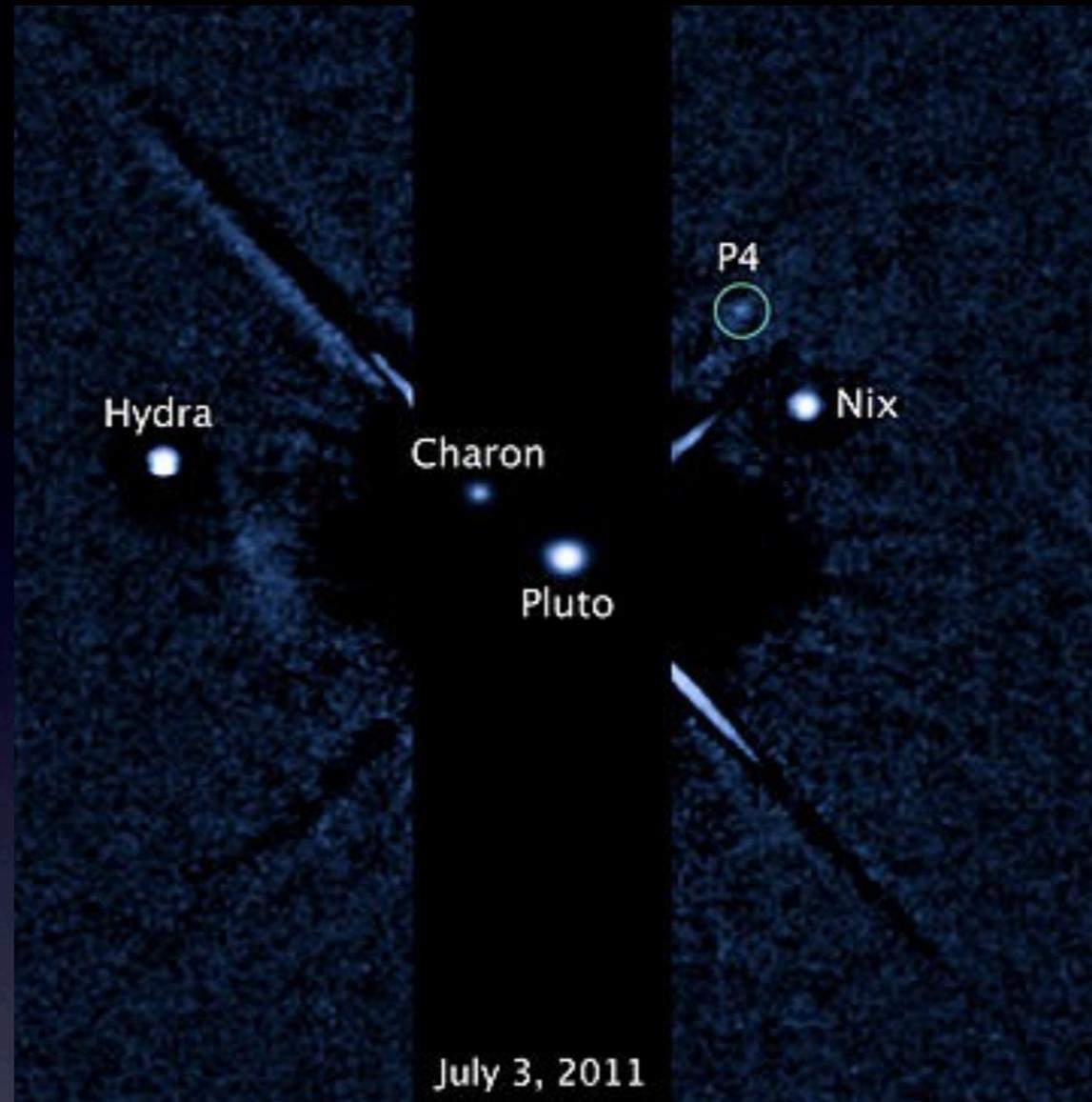
1978: Pluto + Charon Discovered



1930: Pluto

1978: Pluto + Charon

2006: Pluto + Charon + Nix + Hydra Discovered

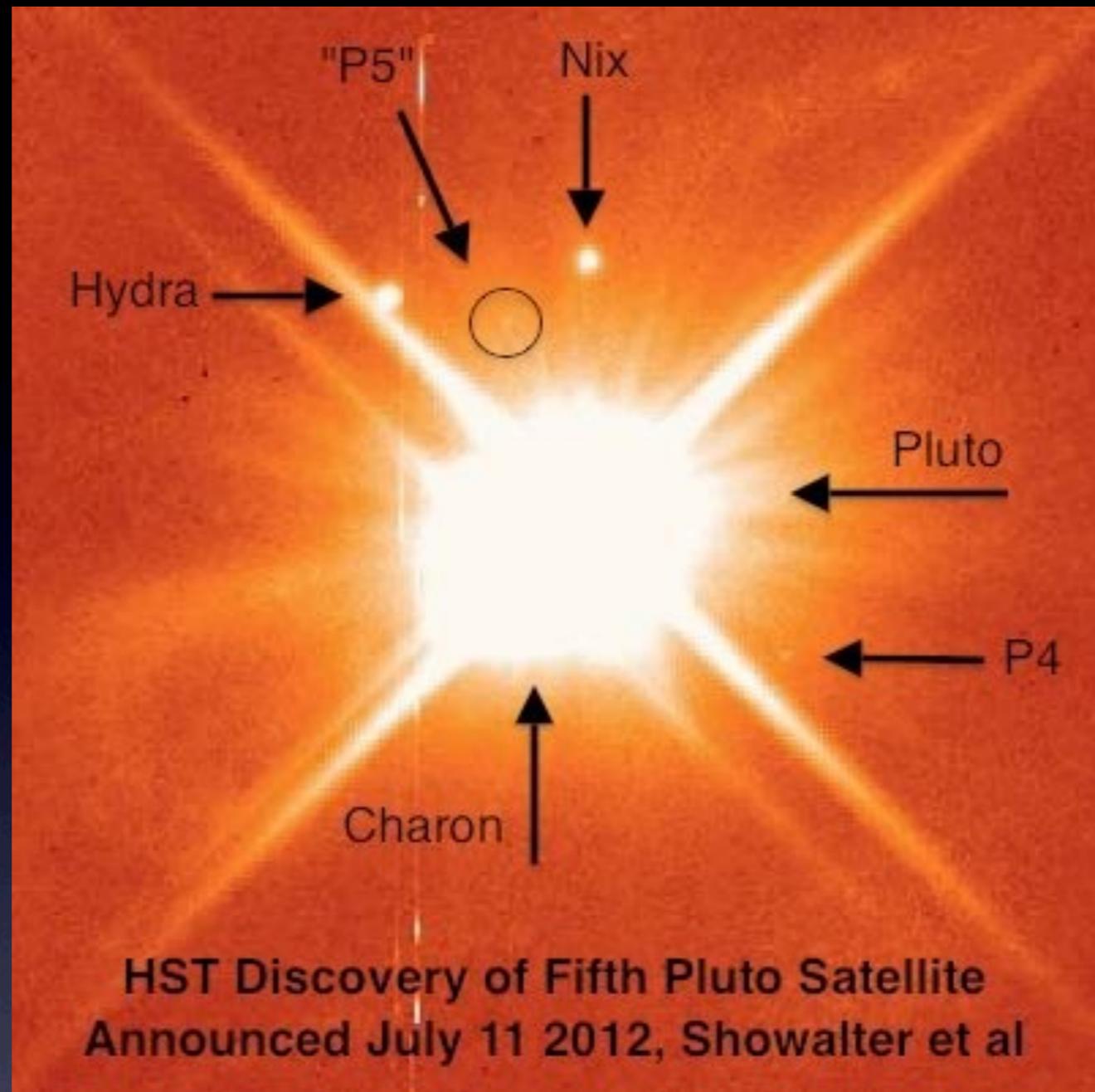


1930: Pluto

1978: Pluto + Charon

2006: Pluto + Charon + Nix + Hydra

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



HST Discovery of Fifth Pluto Satellite  
Announced July 11 2012, Showalter et al

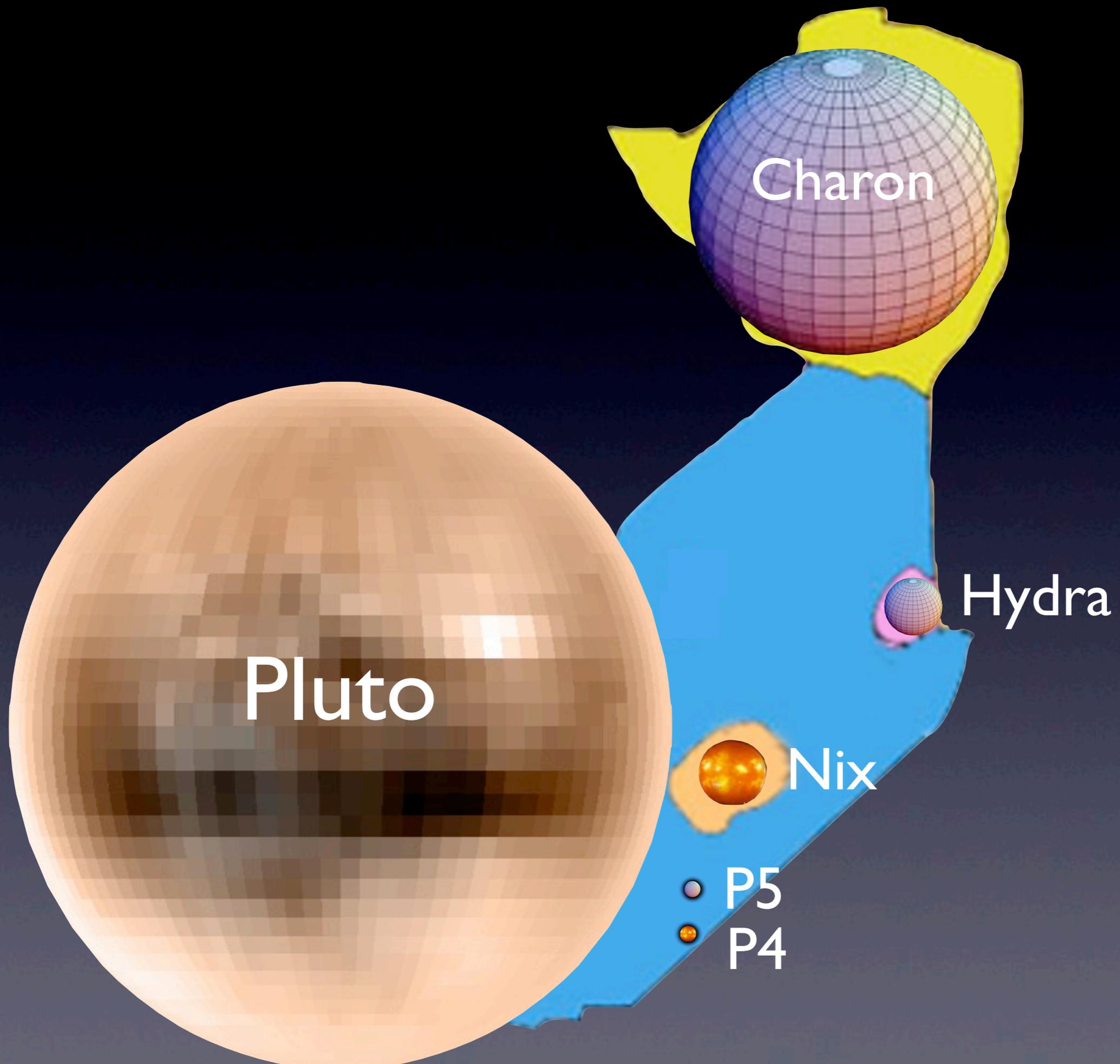
1930: Pluto

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

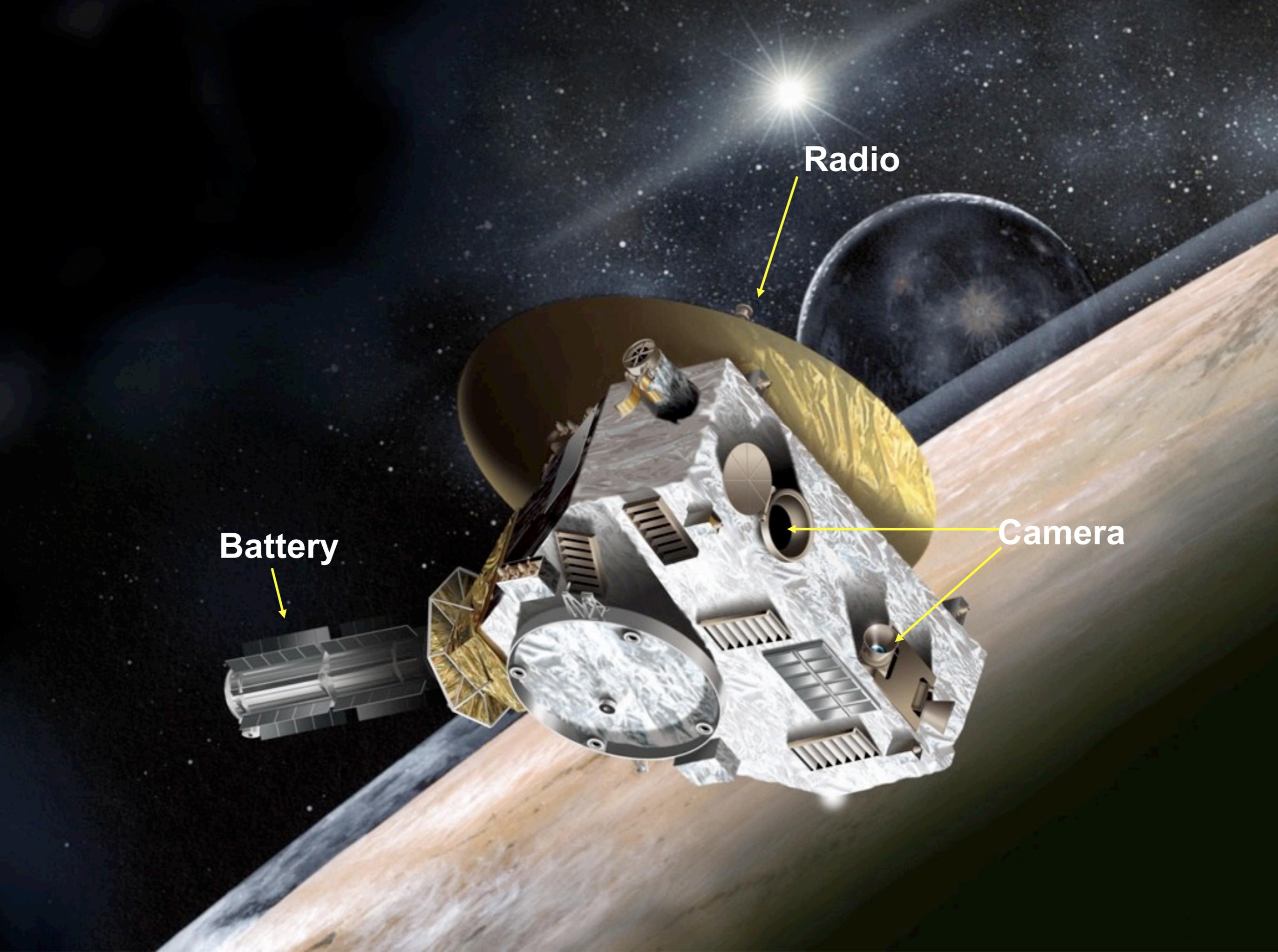


# Why Study Pluto?

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!





**Battery**

**Radio**

**Camera**



Camera

Radio

Battery

# New Horizons Spacecraft

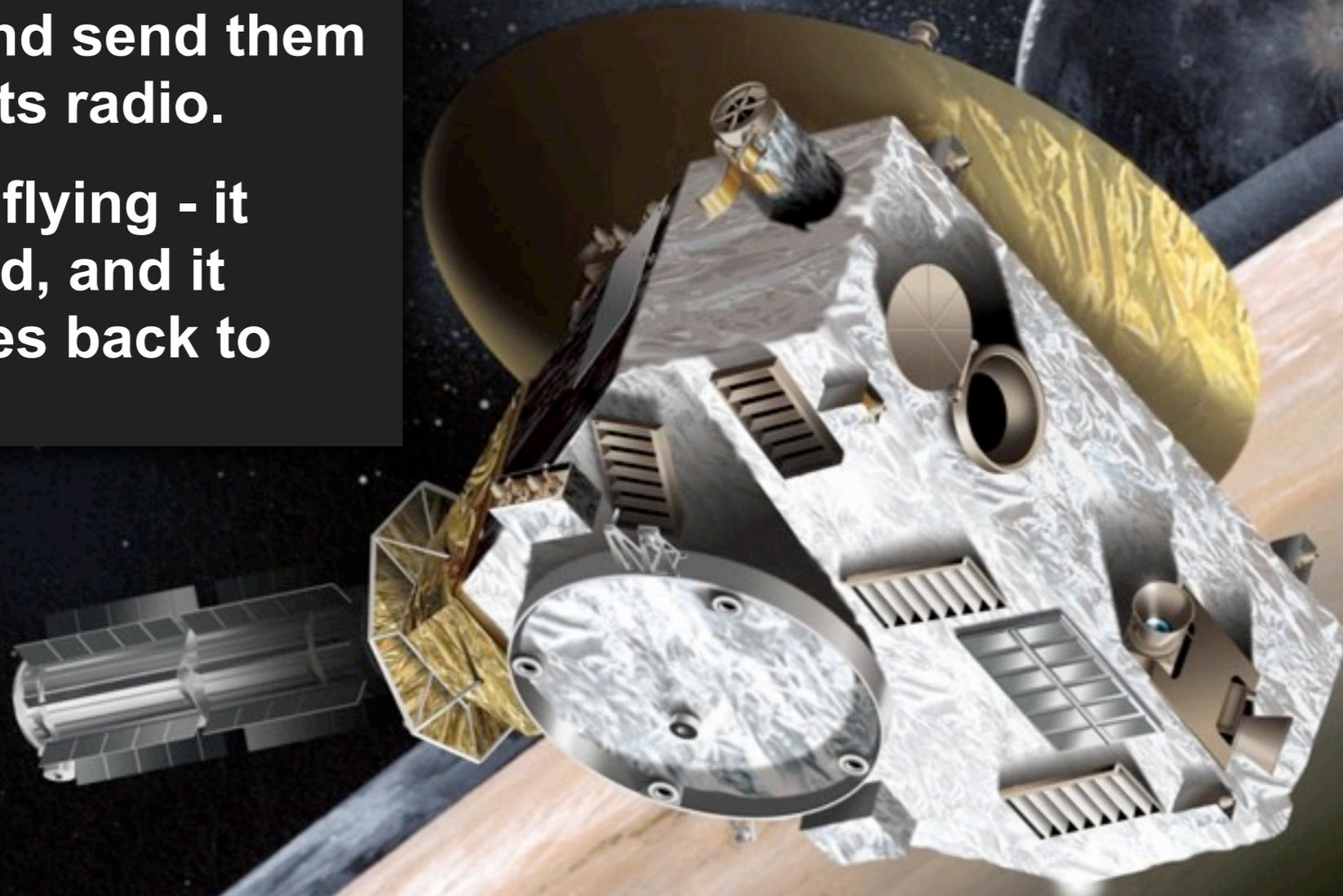
**\$700M USD, from NASA**

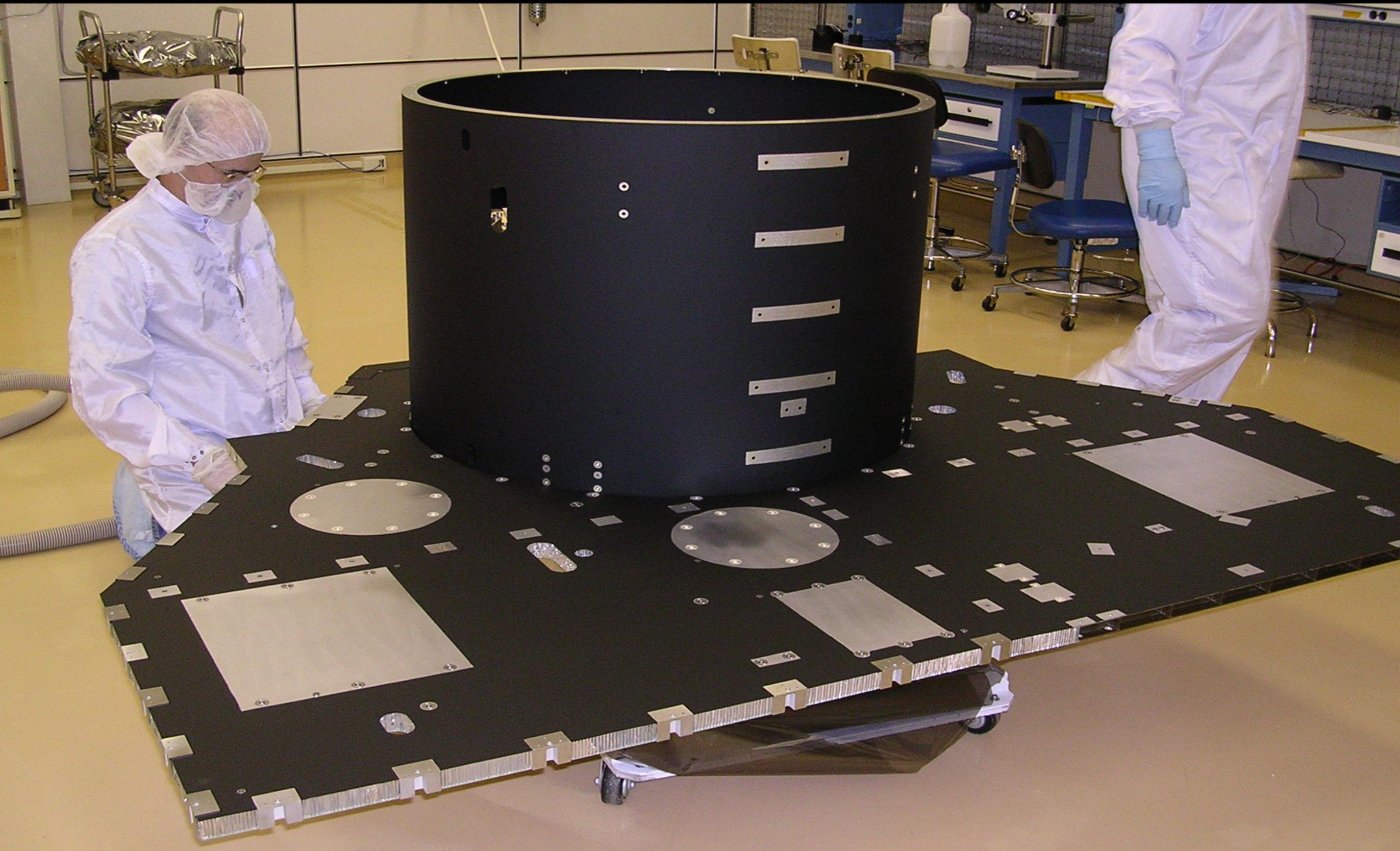
**Size of a very small car**

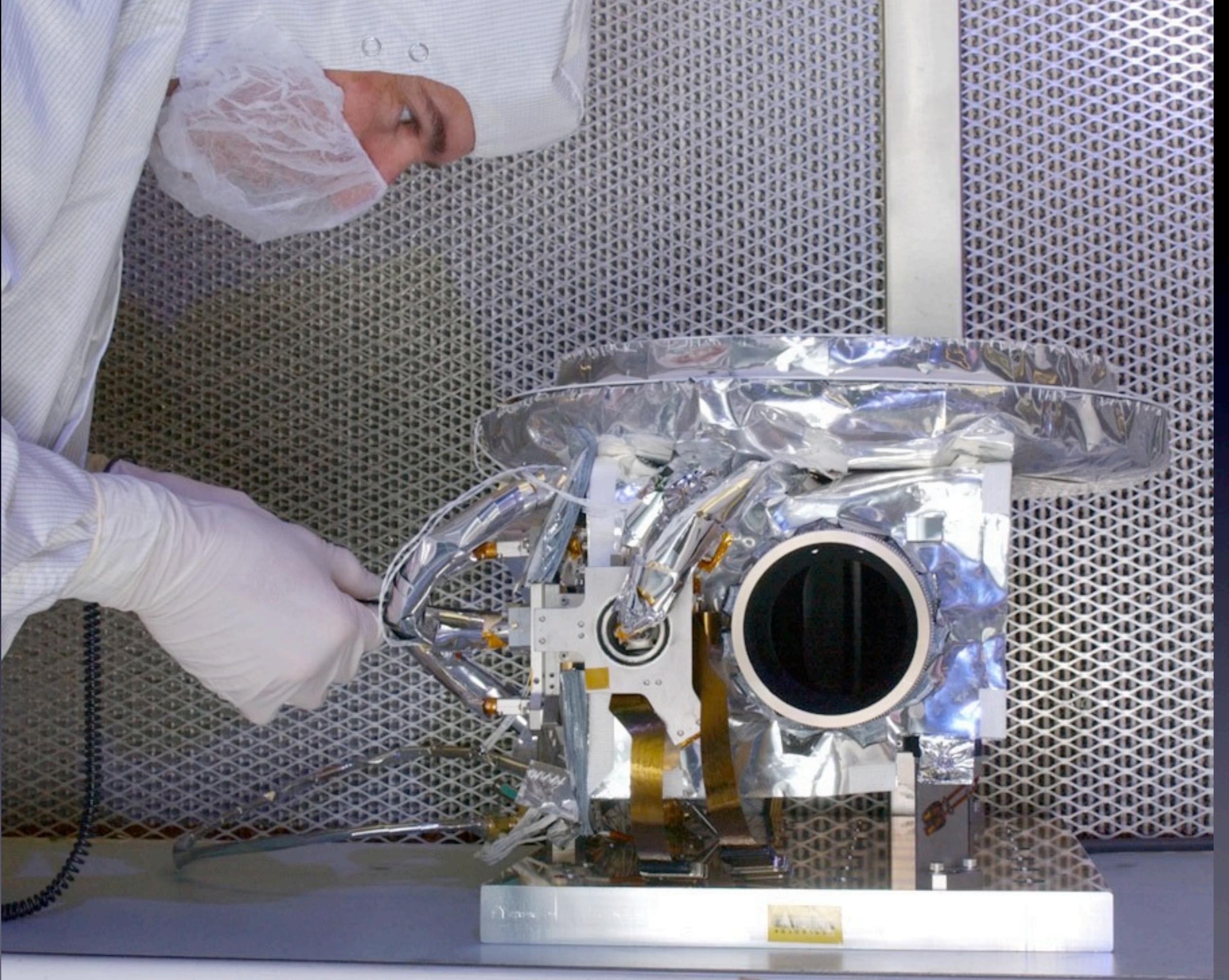
**It is a robot - no people on it!**

**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



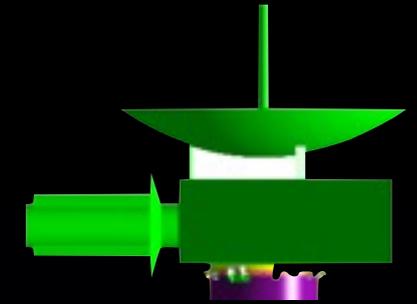






# Lockheed-Martin Atlas V Rocket

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











PLUTO  
OR  
BUST

NEW  
HORIZONS

NEW HORIZONS





**DO NOT FEED THE ALLIGATORS**  
ALLIGATORS BECOME  
AGGRESSIVE TOWARDS  
PEOPLE AND WILL HAVE TO  
BE DESTROYED







NASA







UTO  
HORIZONS

LOCKHEED MARTIN





New Horizons is the *fastest* spacecraft ever launched!

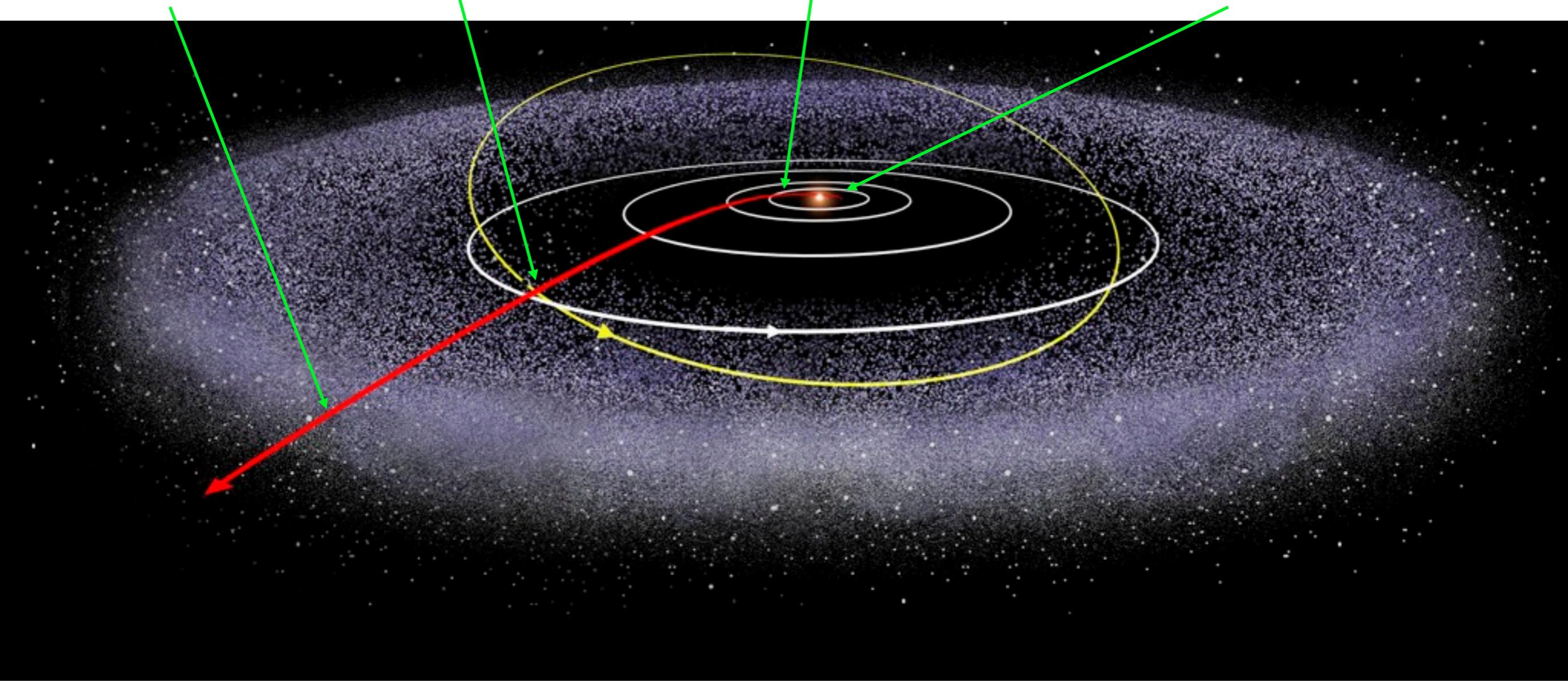
<b>Mission</b>	<b>Time to get to the Moon's distance</b>
New Horizons	6 hours
Apollo 11	96 hours
Bloodhound	251 hours

**Pluto:  
July 2015**

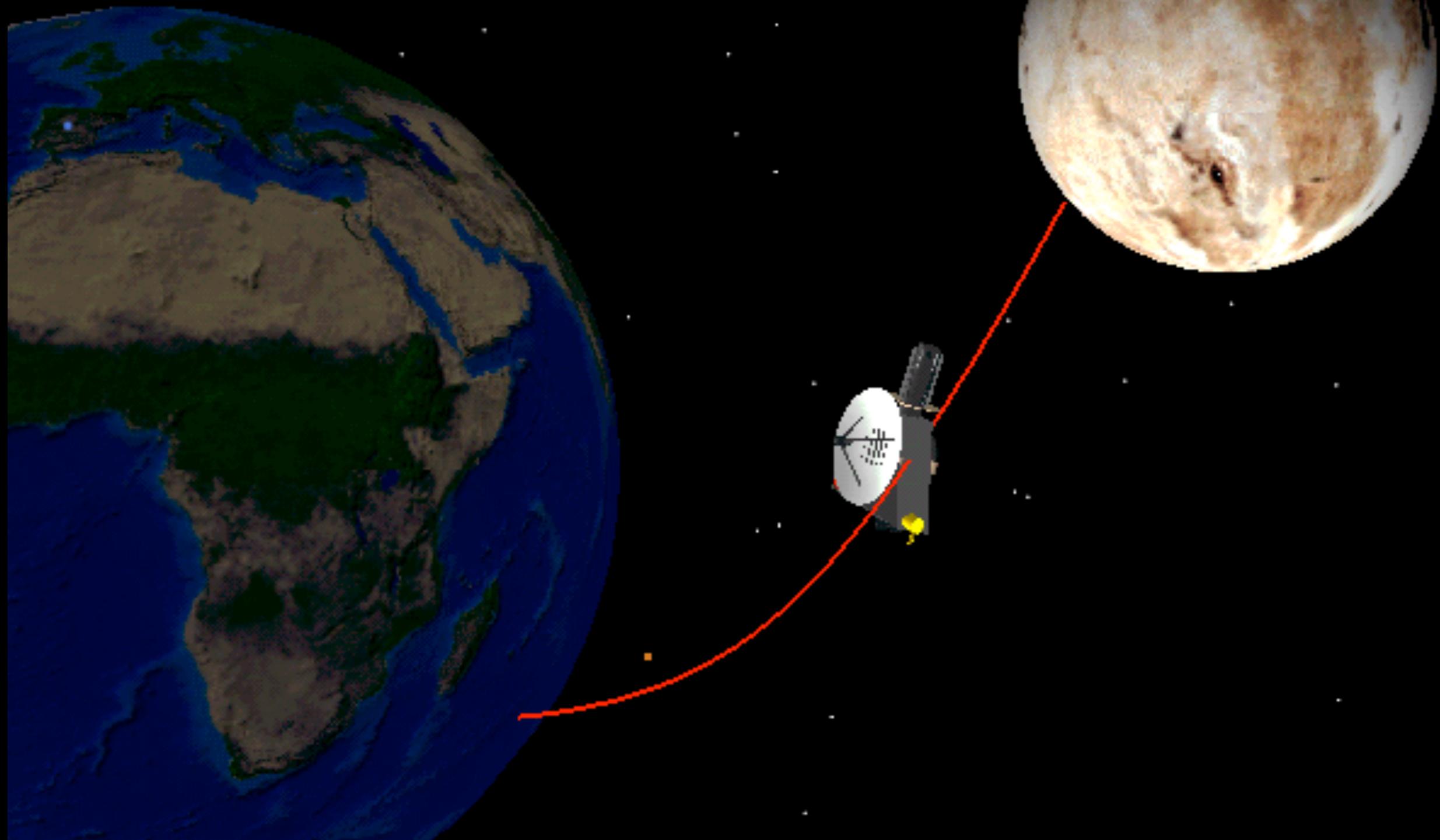
**Jupiter:  
March 2007**

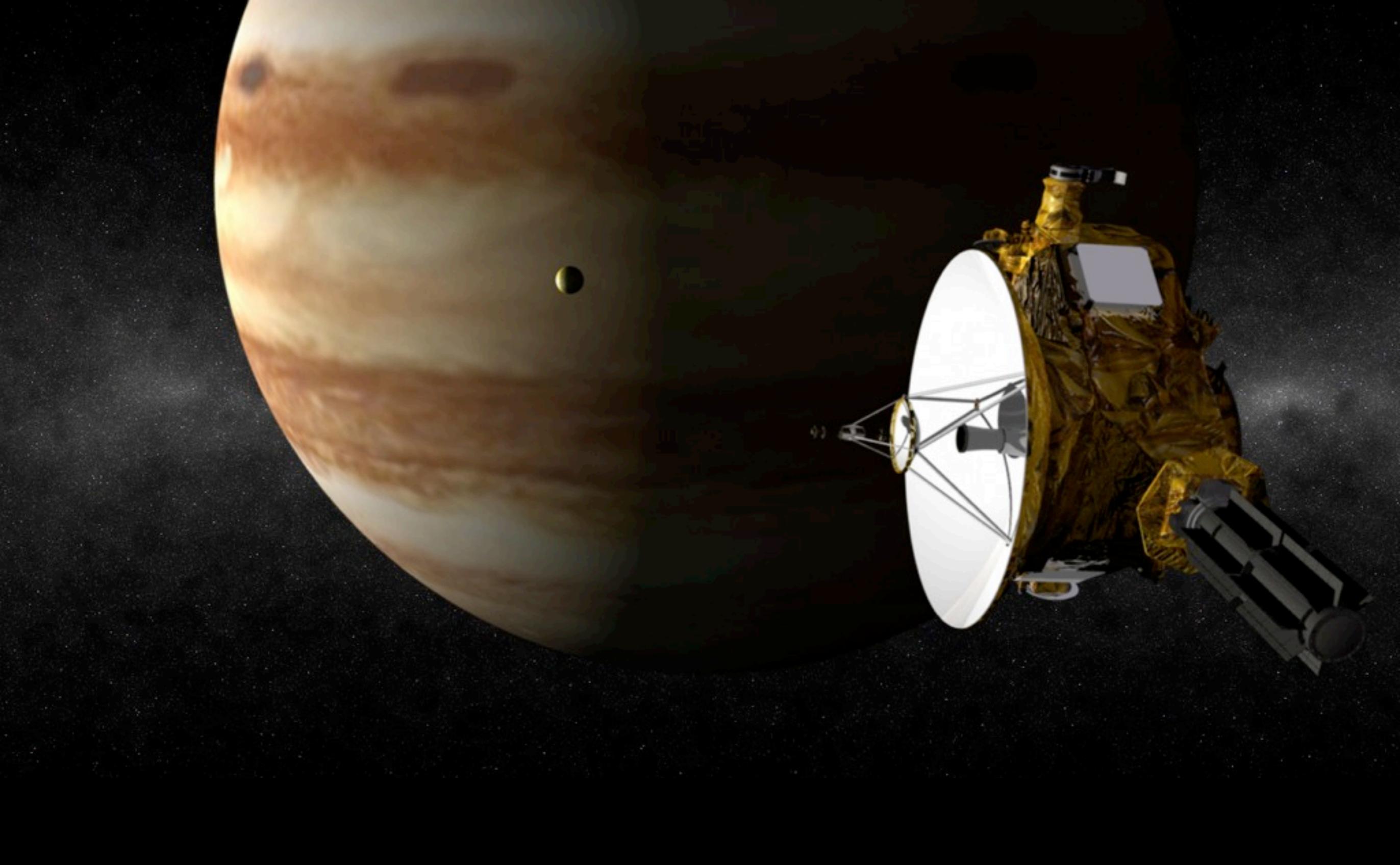
**Kuiper Belt:  
2016-2020**

**Earth:  
January 2006**

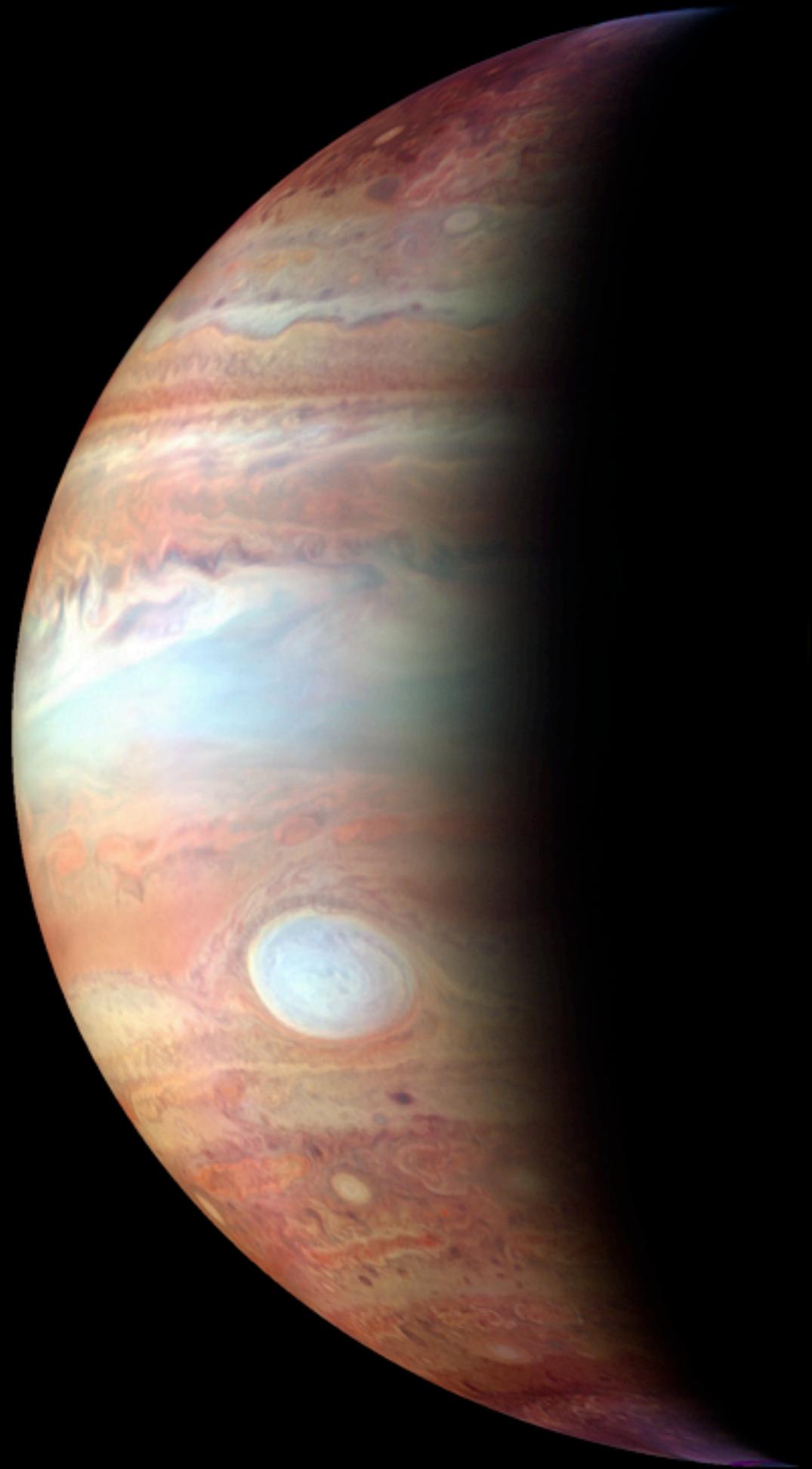


# New Horizons Pluto Kuiper Belt Mission Profile





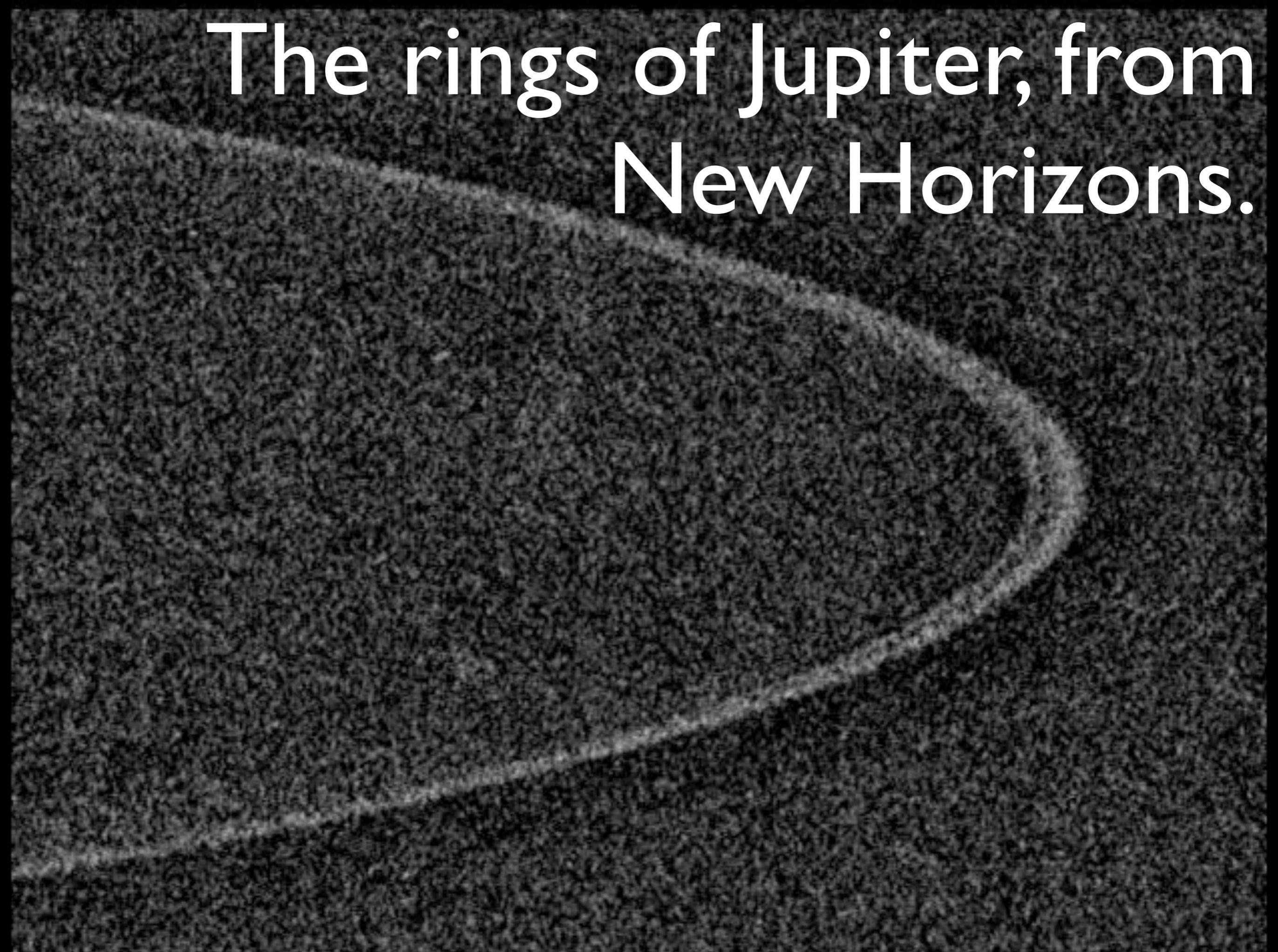
New Horizons at Jupiter: February 28 2007



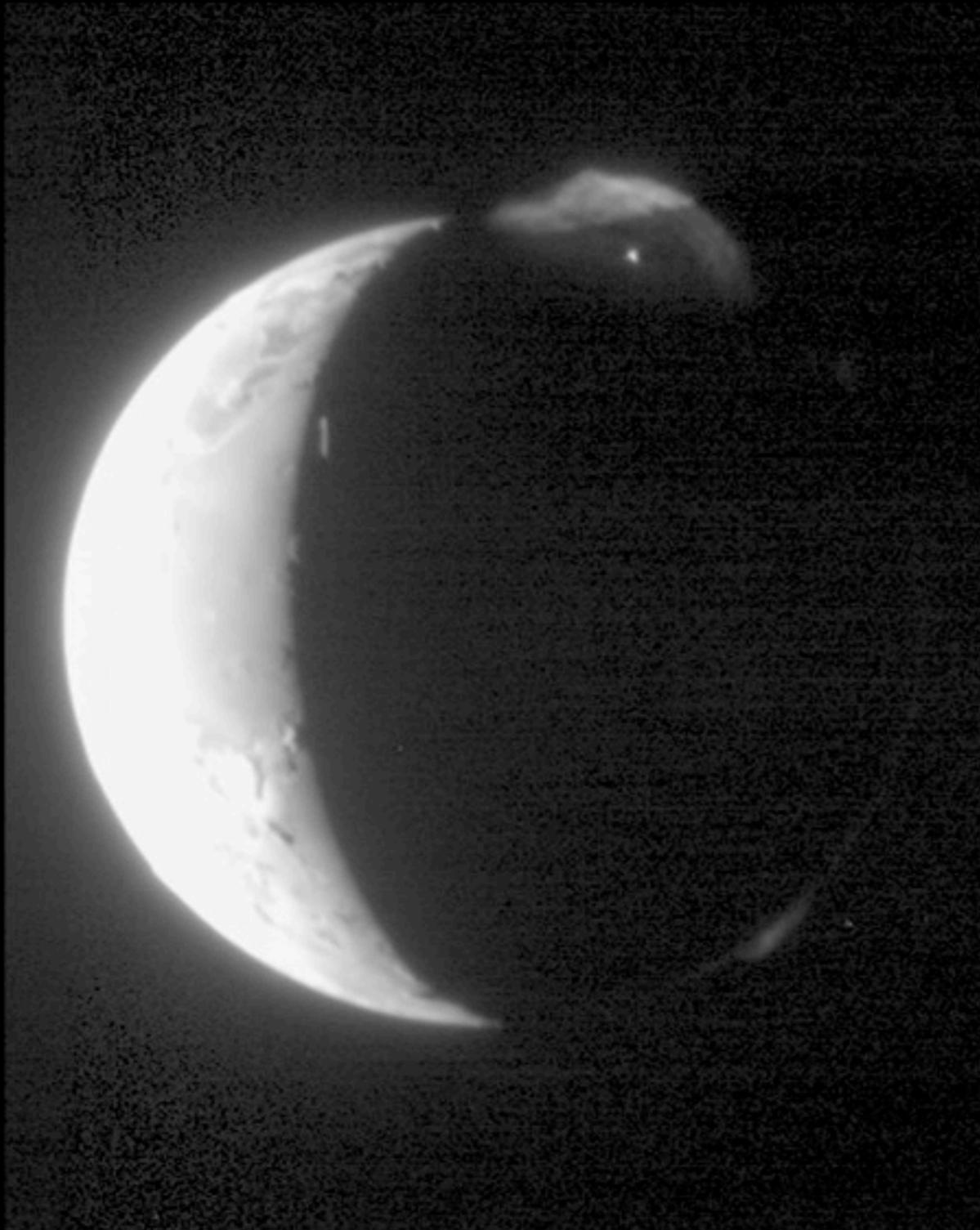
New Horizon at Jupiter

February 28, 2007

The rings of Jupiter, from  
New Horizons.



# Volcanoes on Jupiter's Moon "Io"



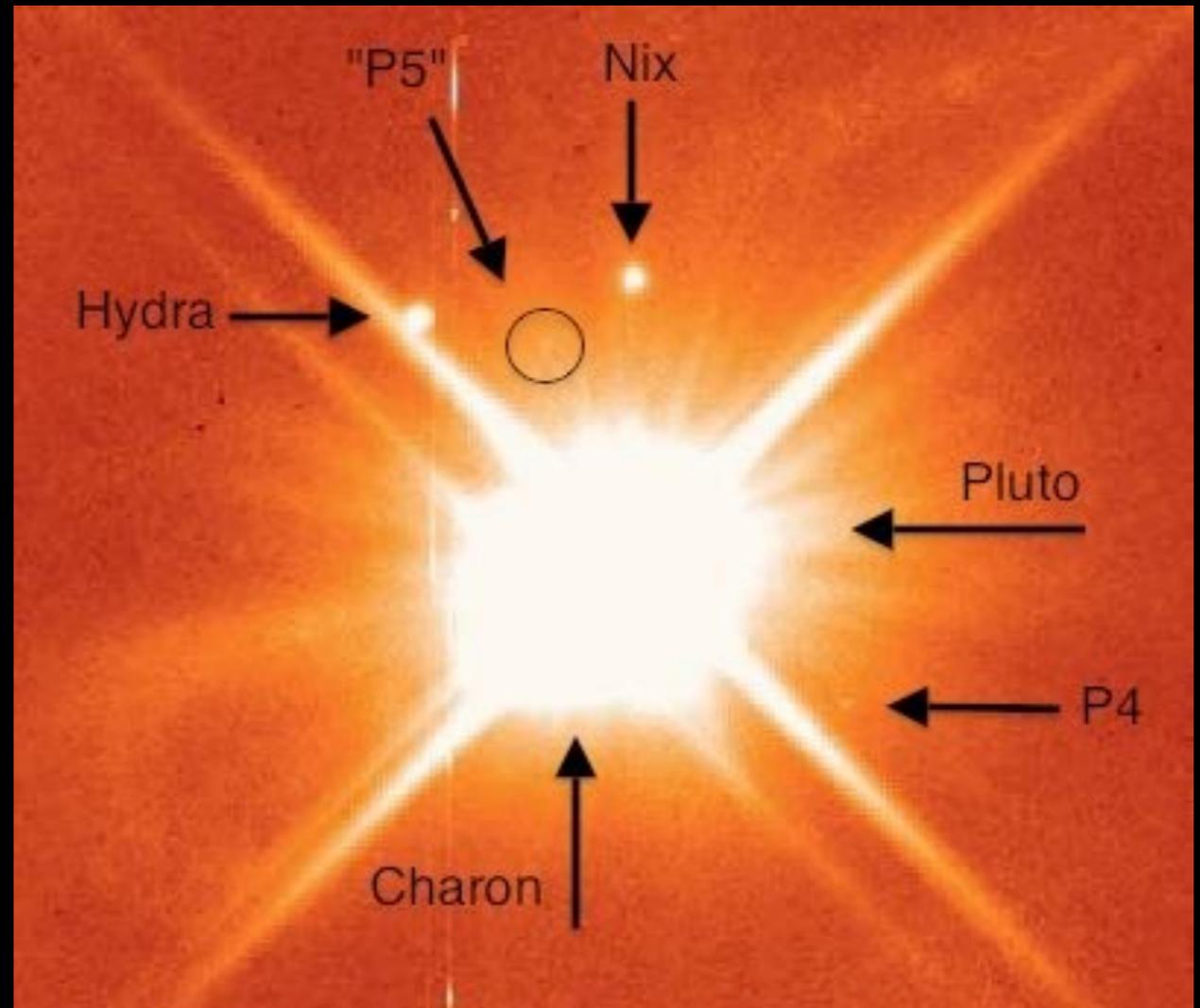
# Volcanoes on Io



# Five Missions for the Price of One

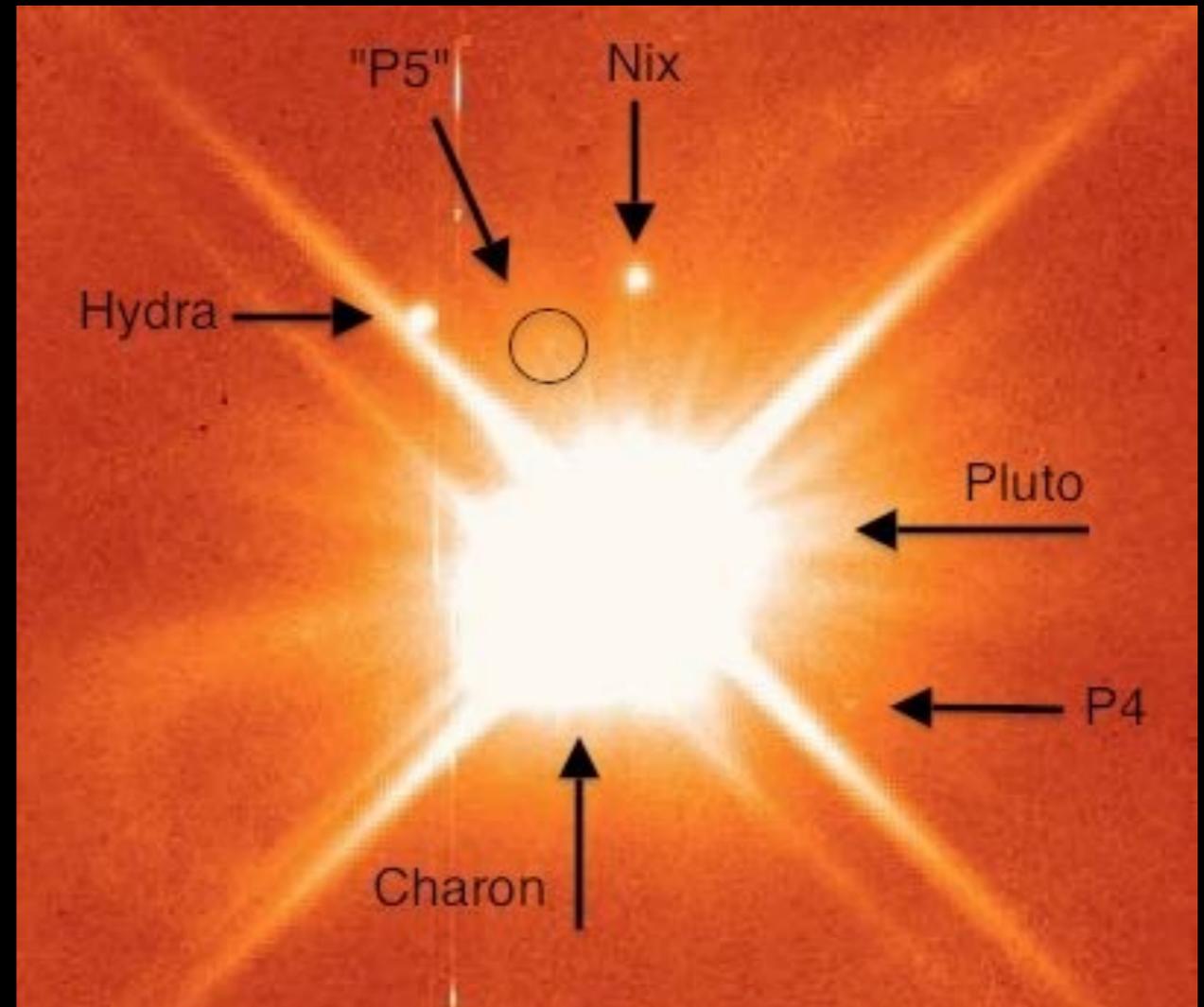
- 2003: When New Horizons was selected by NASA, Pluto had just one known moon, Charon.
- 2005: Two new moons discovered: Nix and Hydra
- 2006: Launch
- 2011: One more moon discovered: P4
- 2012: One more moon moon discovered: P5

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



1. 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...

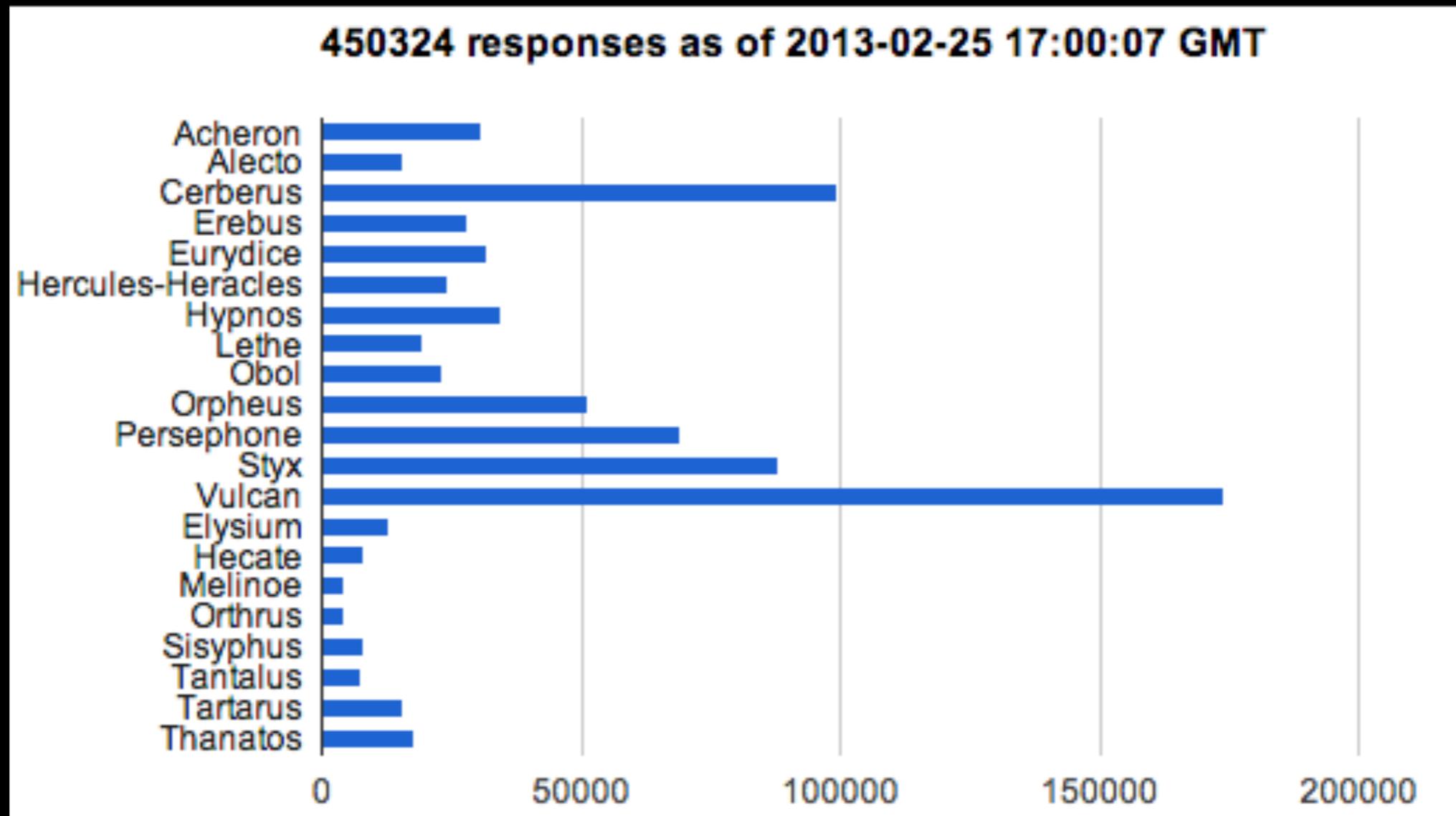


2. What do we call them??



# 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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