

## Blind Mice go to Pluto



### Overview

Students view a strange new planet in our Milky Way Galaxy to determine what it is like. They will observe it using a make-believe ground-based telescope, the Hubble telescope, and via a flyby spacecraft mission. They will compare these observations to actual images of Pluto taken from the New Horizons spacecraft during its July 2015 fly-by.

### What's the point?

Robots gather different information (data) depending on their design and use. Combining the information (data) gathered by a variety of robots gives us a broader and more in-depth understanding of our Earth and Solar System. Our knowledge and understanding of our Solar System changes and expands as new discoveries are made.

### Learning goals

After doing this activity, students will be able to:

- Explain the difference between a ground based, space based and flyby mission.
- Explain how a flyby mission gives us more information about a planetary object than a ground based mission or observations from a spacecraft orbiting Earth.
- Explain how our knowledge of Pluto has improved over time by using different technologies and methods.

### Time

1 hour

### Materials

- Suggested reading: Seven Blind Mice by Ed Young, ISBN 0-698-11895-2
- Viewers (one per pair of students):
  - paper towel tubes
  - 3 x 3 inch (7.6 x 7.6 cm) blue cellophane squares attached to the end with rubber bands
- One or more “planet(s)” formed out of different colors of play dough. Create land formations (volcanoes, riverbeds, and craters) and add decorations (glitter, pipe cleaners, beads, stickers, etc.) to simulate

geologic and inhabitant features.

- Alternately, a 12” (30.5 cm) Styrofoam ball may be used instead of play dough. This may be painted or colored with markers or covered with cellophane, plastic wrap, tissue/wrapping paper etc., and objects can be attached by inserting into the foam.
- A towel or paper grocery bag to cover each of the planets
- A projector to display Pluto Then and Now slides (.pdf, click on “View” and “Full Screen Mode”)
- Optional but recommended: Internet access to display “The Blink Comparator—Discovery of Pluto” website:  
<http://pluto.jhuapl.edu/common/content/BlinkComparator/blinkComparator.html>
- Optional but recommended: Internet access to display Pluto & System: Family Album: <http://pluto.jhuapl.edu/Participate/teach/What-We-Know.php?link=Pluto-and-System-Family-Album>

### Preparation

- Create one or more planets (groups larger than 15 students may require two planets)
- Gather paper towel tubes and attach blue cellophane to the ends with rubber bands.
- Ready projector and PDF slideshow of Pluto Then and Now
- Ready optional/recommended websites

### Procedure

- Read Seven Blind Mice to the students.
- Discuss what each mouse thought and why the combined opinion was more accurate.
- Extend the discussion to our exploration of other worlds and the concept of combining a variety of information (data) to achieve a better idea of what a planet is like.
- Explain: In 1930, Clyde Tombaugh discovered Pluto using a telescope. He needed to take photos of the sky every night, and compare the photos to see if anything moved over time. The stars do not move much from night to night because they are so far away, but a planet moves much quicker, so will appear to move against a background of fixed stars.

Pluto looked like a very small dot, so it was amazing that it was discovered at all!

- Load the “The Blink Comparator—Discovery of Pluto” website:  
<http://pluto.jhuapl.edu/common/content/BlinkComparator/blinkComparator.html>
- In the lower left hand corner of the Blink Comparator, click on “Manual.” Then, manually click on the “Blink” button at the bottom center. Note: You will see the small white dot of Pluto move from right to left near the center of the screen.
- Explain: This was the best we could do by using a telescope on Earth. We call this a “ground based observation”. Note: Tie this discussion into the story of the Seven Blind Mice.
- Explain: You are astronomers who have just discovered a new planet! Using your telescopes (paper towel tubes with cellophane) you have just gotten permission observe your new planet for 15 seconds!
- In groups of two, have one student be the observer and the other the recorder.
- The recorder should be facing away from the planet while the other student, the observer, closes one eye and looks through the tube.
- The observer will tell the recorder what he/she sees and the recorder will write it down.
- When the students are ready, uncover the planet. If you have multiple planets make sure students have chosen to look at just one of the planets and not both.
- Cover the planet after 15 seconds pass.
- Allow student teams to discuss their findings, and ask students to share their observations.
- Explain: Many spacecraft have observed Pluto in more recent history, but it is so far away. Only one spacecraft has ever visited Pluto, and that was the New Horizons mission in July of 2015. Before New Horizons, the best picture we had of Pluto was from the Hubble Space Telescope (show Hubble Space Telescope slide from the Pluto Then and Now slideshow). Optional/recommended, show other views of Pluto through ground and space telescopes using the Pluto & System Family Album website, here: <http://pluto.jhuapl.edu/Participate/teach/What-We-Know.php?link=Pluto-and-System-Family-Album>
- Explain: It’s hard to look at any space object from a telescope on Earth because our atmosphere blocks out a LOT of light. In order to see better, we need to get above the Earth’s atmosphere. Congratulations! Your

team has won a proposal to view the new planet with the Hubble Space Telescope for 15 seconds!

- Have students view in the same way they did previously, but allow them to switch roles so that the student who was recording is now observing.
- Have students remove the cellophane from the end of their paper towel roll telescopes.
- Have them view and record for 15 seconds as before, and share their new observations. Ask: How did your observations change by using a space telescope?
- Explain: The New Horizons spacecraft gathered never-before-seen images of Pluto. The Hubble Space Telescope's images of the planet were the best we could do before.
- Show: Pluto Then and Now starting with the Hubble Space Telescope image. Flip to the next slide, titled "Example 1." Explain: That's the best picture Hubble could take of Pluto because it is so far away! If we looked at other objects with the same resolution, could you guess what this object is? Note: Resolution is the ability of a telescope to "resolve" or "see" features.
- Flip through and have students guess for Examples 1-4.
- Explain: In order to get a good view of Pluto, we had to go visit with the New Horizons spacecraft. Pluto is nearly 5 billion kilometers (3 billion miles) away from Earth! It took nine years to reach Pluto traveling up to 80,000 Kilometers per hour (50,000 miles per hour), the fastest spacecraft in history!
- At this time, keeping the planet covered, position the planet so students can walk around it.
- Explain: Good news! Your team has won a flyby mission of your newly discovered planet! You will flyby and collect data. Don't forget to send the data home!
- With the recorder students facing away from the planet, have the students doing the observing "flyby" the planet in an orderly fashion, using their paper towel tube telescopes as their viewer.
- Students should return and explain what the planet looked like to the recorder to record ideas.
- Ask students: How much more information could you get from the flyby than you could from the Earth? What did you learn?
- Show images of Pluto using the Pluto Then and Now slideshow. Explain: Pluto shows us many surprises including mountains, glaciers, and fields of ice, dark and light areas (terrain), and still has many many mysteries.

What do you think we would need to do next in order to solve those mysteries if we could (Encourage students to throw out wild ideas. Some may say: additional flybys, visit the planet ourselves, land on the planet with robots etc.)?

### *Alternate ideas*

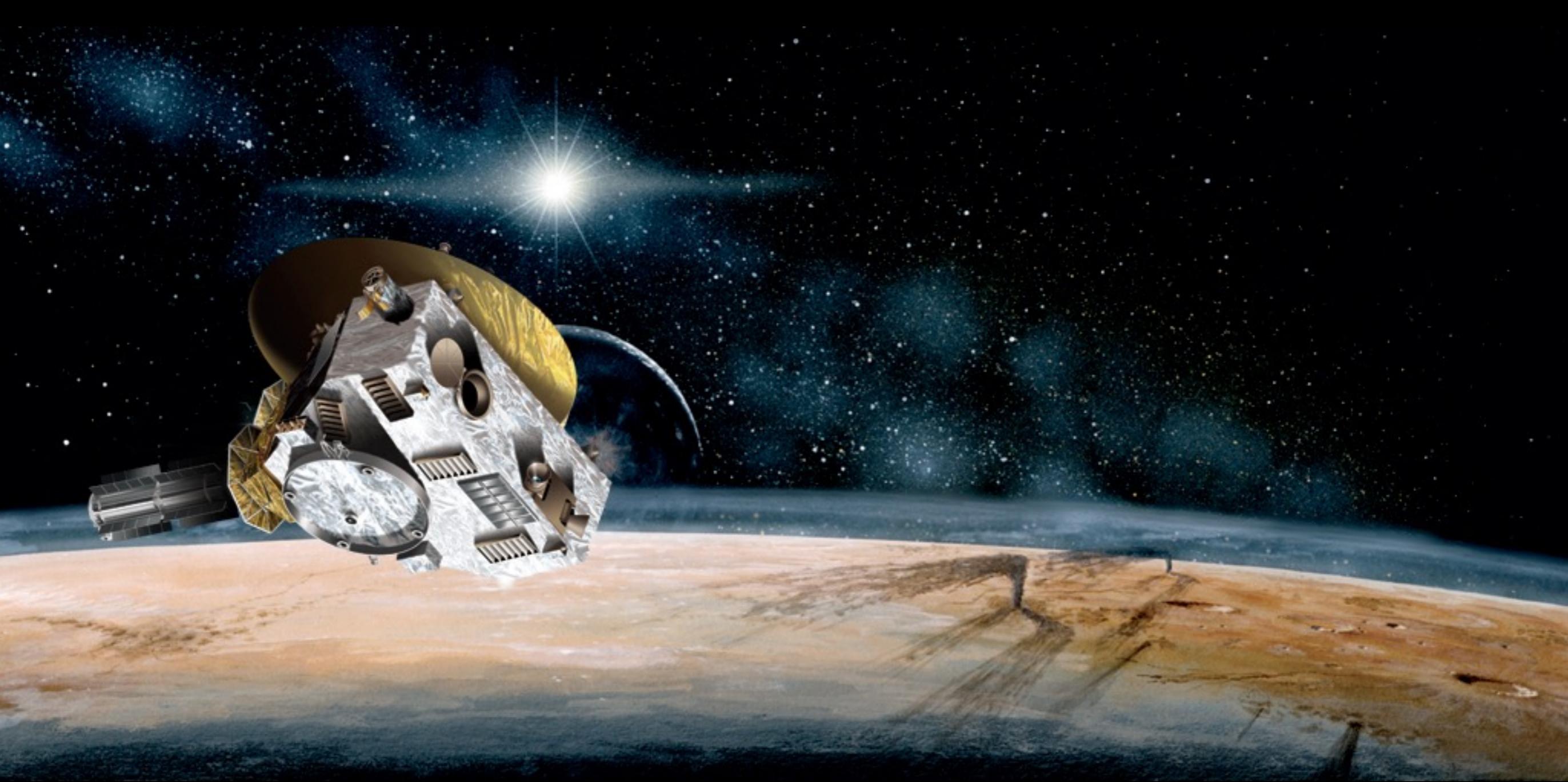
- Explore additional Pluto images and discuss what is visible in the images using the multimedia area of the New Horizons website:  
<http://pluto.jhuapl.edu/Multimedia/>
- Design a lander mission to the new planet as a next-step. Students can take photos using their phones (they will need to hold their paper towel roll a couple of inches away to make sure there is enough light).

Credits and Inspiration:

Sanlyn Buxner provided permission to modify the Blind Mice lesson, created by the Arizona State University.

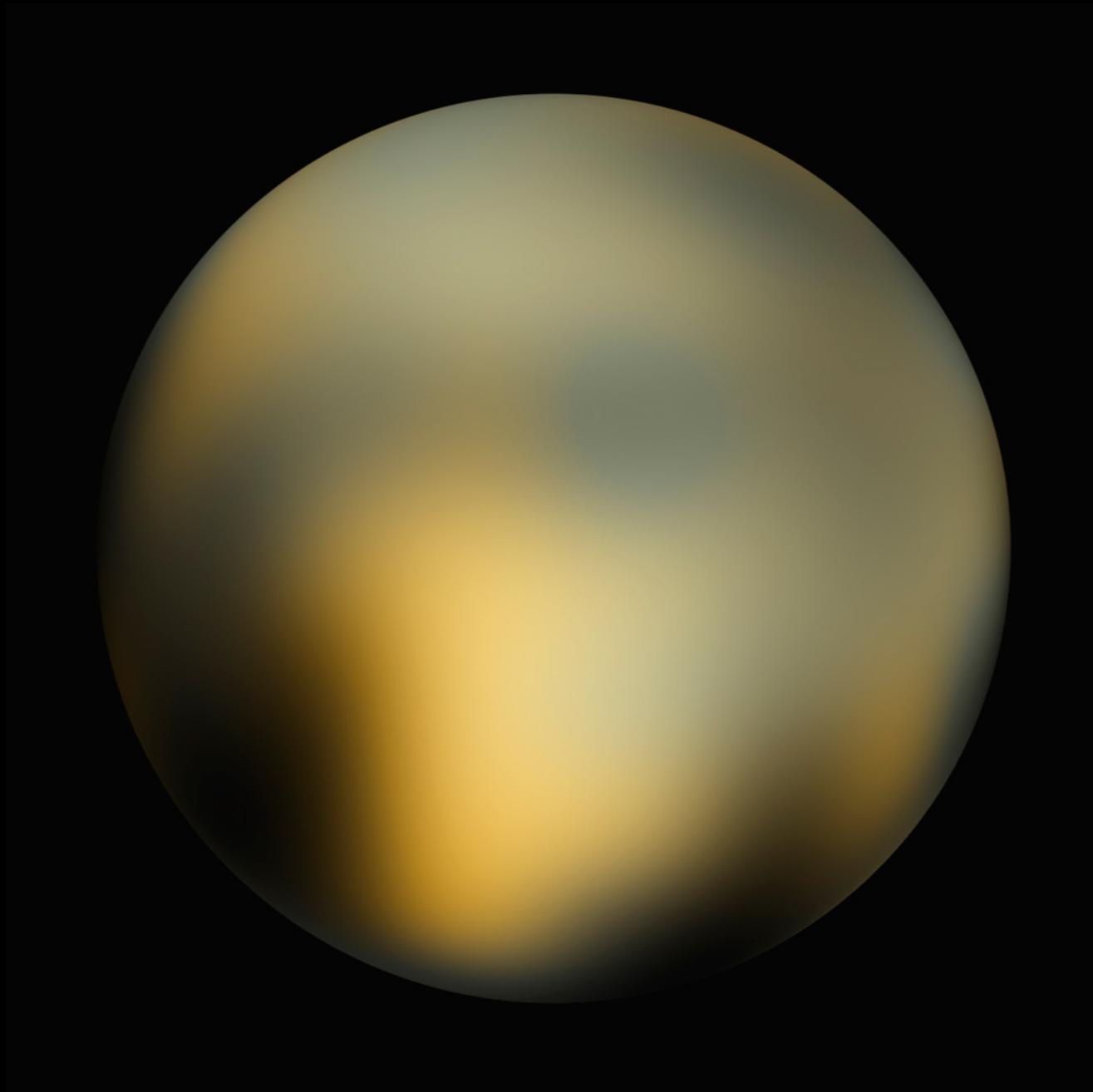
<http://nasawavelength.org/resource/nw-000-000-002-112/>

# New Horizons

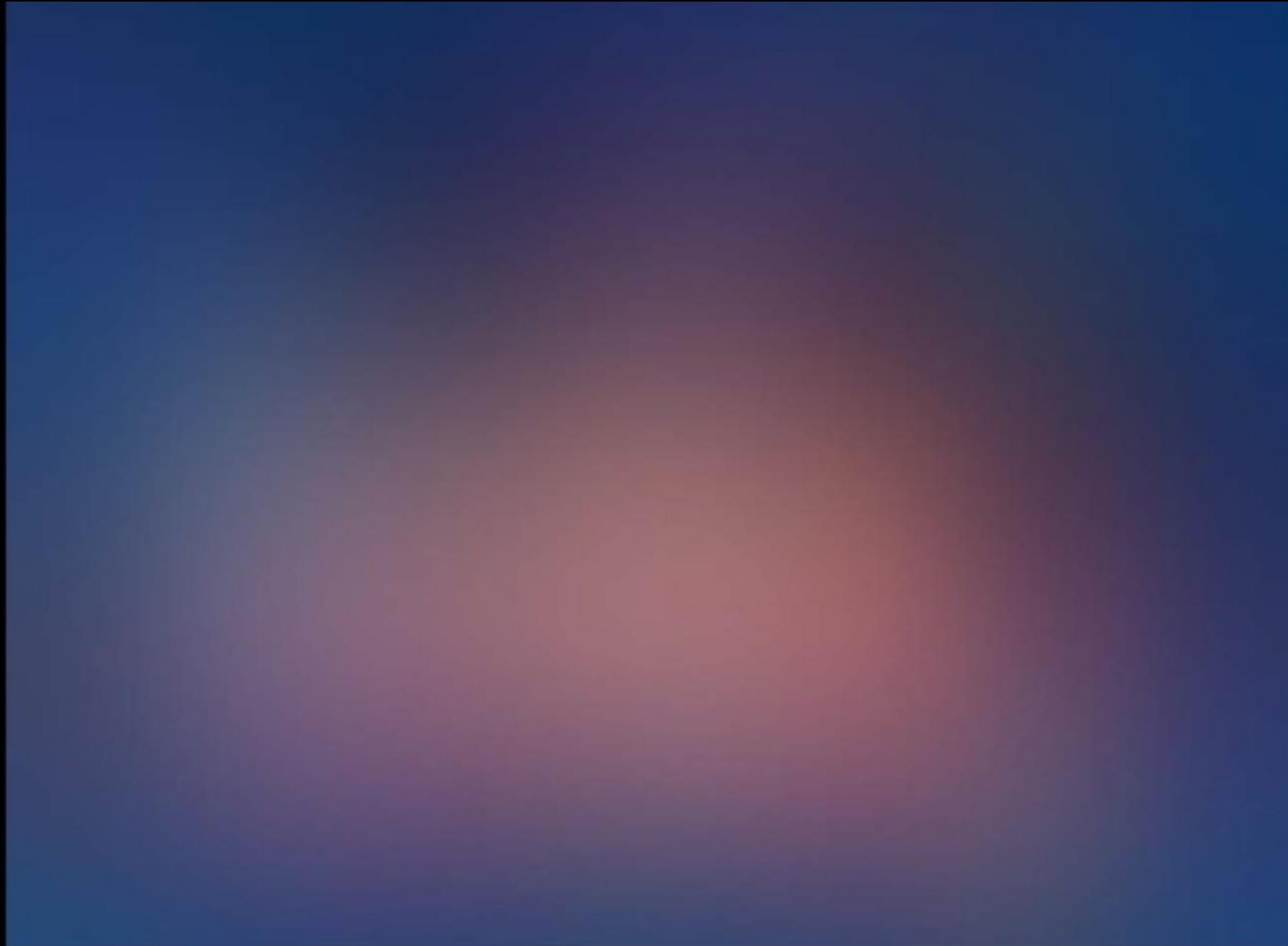


Flew by Pluto on July 14, 2015

# Hubble Space Telescope



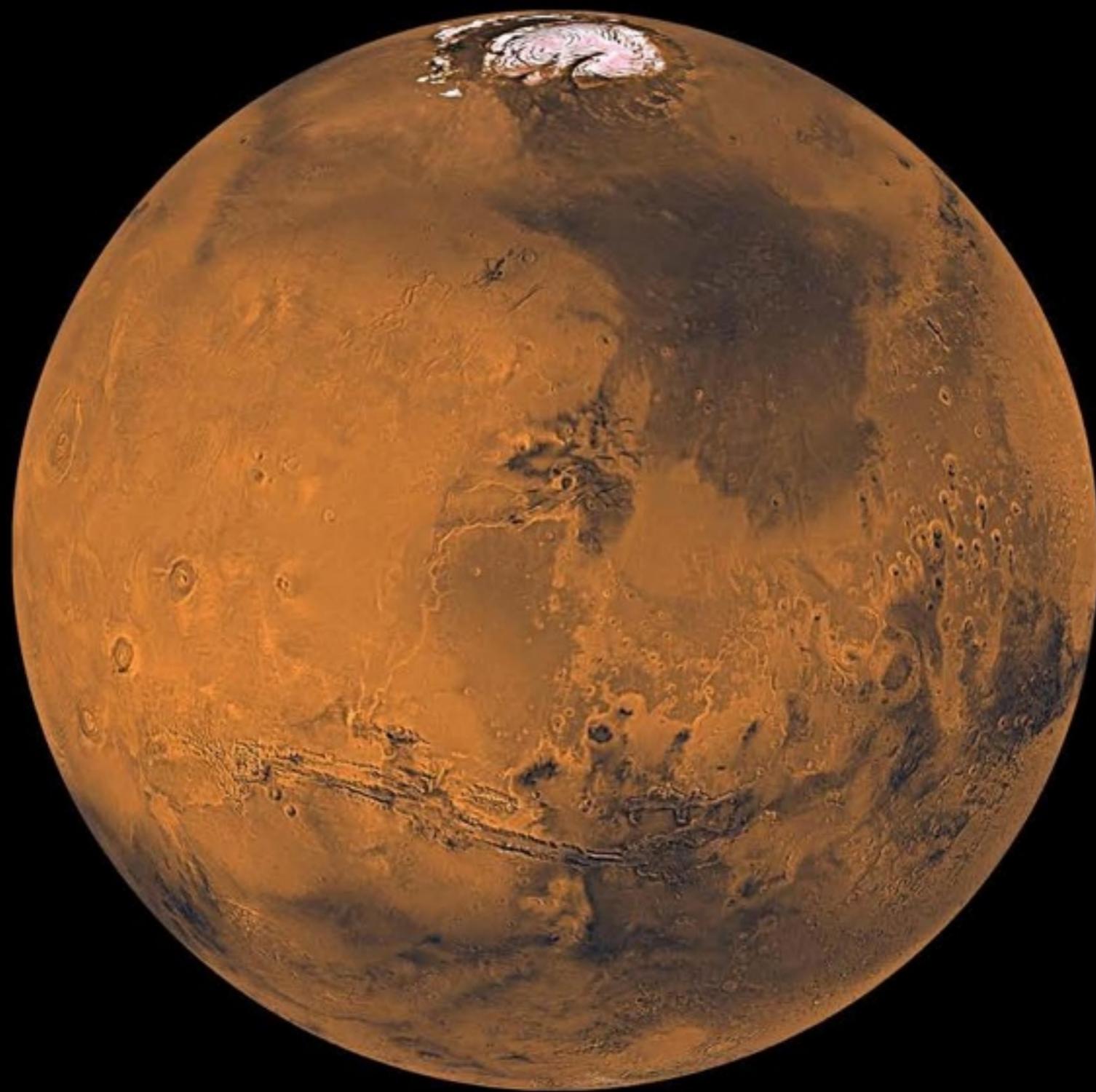
Example 1: This is an object taken at the same resolution that Hubble took of Pluto. It is something you have seen many times.  
Can you guess what it is?



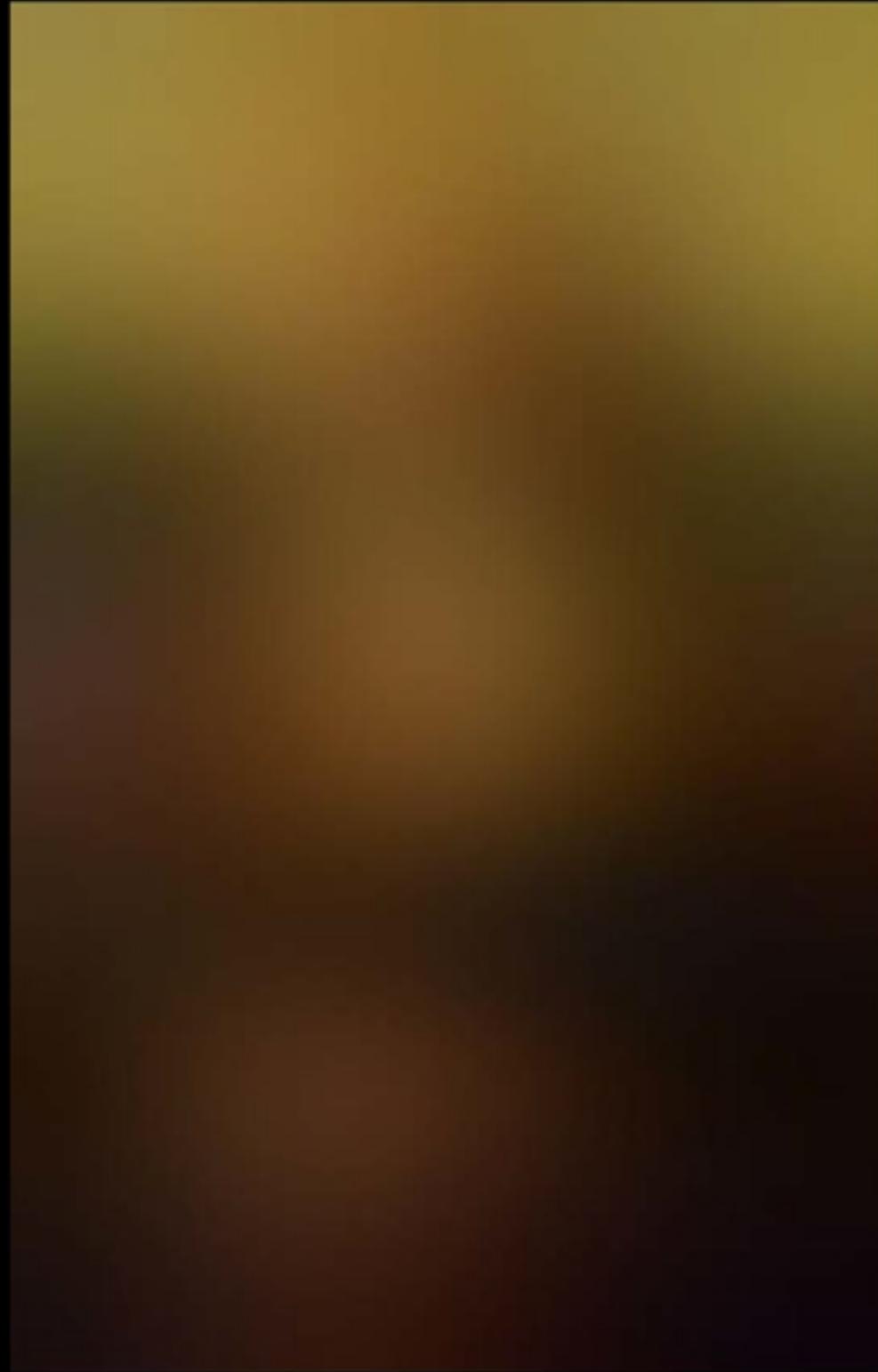


Example 2: You may have seen this before....





Example 3: This one is very famous!





Example 4: I think you've spent some time here.

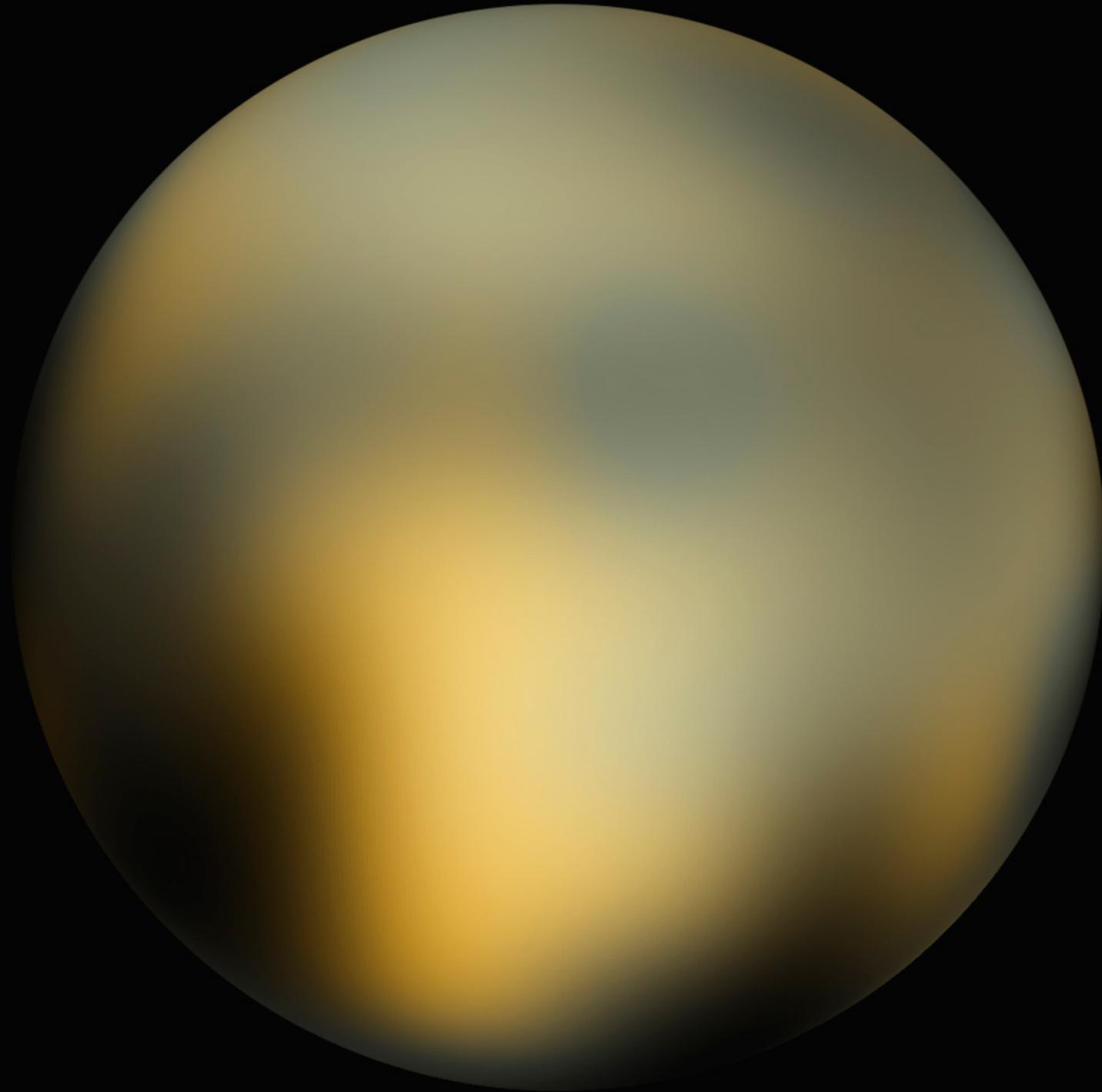


Earth From Space – Apollo 17  
NASA Langley Research Center

12/7/1972

Image # EL-1996-00155

# Hubble Space Telescope



New Horizons Image

