Name: _____ Class: _____

Voyage to Pluto

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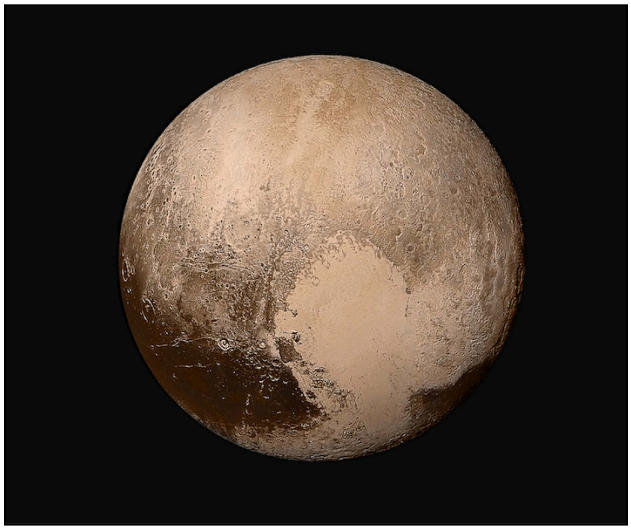
In this informational text, Ken Croswell discusses the New Horizons spacecraft's voyage to Pluto. The spacecraft was launched in 2006 and arrived at Pluto's system in 2015. Pluto was considered a planet until 2006, but then scientists decided it should not be counted as a planet. This announcement led to new interest in Pluto. As you read take notes on what the New Horizons spacecraft observed about Pluto.

[1] In July 2015, a spacecraft named New Horizons sped past Pluto, the farthest world NASA has ever visited. The spacecraft found tall mountains on Pluto and deep canyons on its largest moon. “I think the solar system saved the best for last,” said Pluto scientist Dr. Alan Stern.

Pluto is billions of miles from the Sun and Earth. It is so far away that our telescopes can’t see it well. So no one knew what the spacecraft would see.



"Pluto's "heart" is bigger than Texas!" by NASA/Johns Hopkins University Applied Physics Laboratory/Southwest Research Institute is used with permission.

Pluto vs. Eris

Pluto belongs to a belt of objects beyond the orbit of the distant planet Neptune. If Pluto were as big as a basketball, the typical object in this belt would be smaller than a marble.

But in 2005, astronomers found a similar world, Eris, which is much farther than Pluto. “If it’s not larger than Pluto, then I’ll eat my telescope,” the discoverer claimed. In 2010, Eris passed in front of a star and blocked its light. How long this event lasted revealed how big Eris is: 1,445 miles across.

[5] The New Horizons spacecraft measured Pluto’s size: 1,477 miles across. So Pluto is bigger than Eris. In fact, Pluto is the largest object in the solar system beyond Neptune.

A Cold World with a Heart

Pluto is so far from the Sun that sunlight there is weak. So Pluto is cold. The coldest temperature ever observed on Earth, near the South Pole, is -129 degrees F. But the spacecraft measured Pluto at -397 degrees F. Pluto is the coldest world a spacecraft has ever visited.

The New Horizons spacecraft surprised and delighted everyone by finding a huge white “heart” on Pluto. This heart-shaped region is a thousand miles across, bigger than Texas. Scientists named this heart Tombaugh Regio, after Clyde Tombaugh, who discovered Pluto in 1930.

Pluto's "heart" may be white because of frozen nitrogen and carbon monoxide. Nitrogen gas makes up most of the air on both Earth and Pluto. But Pluto is so cold that most of its nitrogen freezes and turns into ice. Carbon monoxide is a poison gas on Earth, but Pluto is so cold that this gas also turns to ice. Maybe geysers[1] or volcanoes in Tombaugh Regio erupt nitrogen and carbon monoxide gas that freezes, coloring this area white.

Pluto's heart has immense[2] mountains two miles high. That's as tall as the Rocky Mountains. But Pluto's mountains aren't made of rock. Instead, they're made of water ice! Pluto is so cold that its water ice is as hard as rock. Glaciers[3] made of nitrogen ice flow across parts of Pluto.

Mysterious Moons

[10] The spacecraft also looked at Pluto's five moons. The largest is Charon (pronounced "Karen" or "Sharon"). Spanning 753 miles, Charon is about half Pluto's diameter.

While Pluto is orange, Charon is gray, and it has a polar cap. The polar caps on Earth and Mars are bright white. Charon's polar cap is dark.

Charon has canyons that dwarf[4] the Grand Canyon in Arizona. The Grand Canyon is about a mile deep; it formed when a river cut through rock. Charon's canyons are hundreds of miles long and up to four miles deep. They probably formed when Charon's crust tore apart.

Charon has craters that scientists have named for characters on the TV series Star Trek: Kirk, Spock, Sulu, and Uhura.

Like Earth, Pluto and Charon are round because they have enough mass that their gravity squeezes them into spheres. But Pluto's other moons are so small that their gravity isn't strong enough to force them into round shapes.

[15] Styx is egg-shaped. Another moon, named Nix, is shaped like a jelly bean. The next moon out, Kerberos, looks like two small moons stuck together. And Pluto's outermost moon, Hydra, is shaped like Michigan's lower peninsula.[5]

The New Horizons spacecraft looked for more moons around Pluto but did not find any. That disappointed scientists.

But the mission was a big success. Someday another spacecraft may visit, one that will circle Pluto again and again. Then we can study Pluto and its moons for years, discovering even more about these distant and mysterious worlds.

1. a hole in the ground that shoots out hot water and steam
2. **Immense** ***(adjective):*** extremely large, especially in scale
3. an unchanging form of dense ice that constantly moves under the pressure of its own weight
4. **Dwarf** ***(verb):*** to cause to seem small or insignificant in comparison
5. a piece of land surrounded by water on the majority of its border, while connecting to a mainland from which is extends

Text-Dependent Questions

Directions: For the following questions, choose the best answer or respond in complete sentences.

1. PART A: Which statement best expresses the central idea of the text?
    A. Pluto is likely the farthest point any spacecraft will travel in the universe, due to the length of the journey and temperature in space.
    B. Scientists are now planning on sending a person to Pluto to further study the world and its moons.
    C. After New Horizons spacecraft's trip to Pluto, scientists are ready to reclassify it as a planet due to its size and moons.
    D. The New Horizons spacecraft was able to learn important details about Pluto's surface, landscape, and its moons.

2. PART B: Which detail from the text best supports the answer to Part A?
    A. "The spacecraft found tall mountains on Pluto and deep canyons on its largest moon. 'I think the solar system saved the best for last'" (Paragraph 1)
    B. "But in 2005, astronomers found a similar world, Eris, which is much farther than Pluto. 'If it's not larger than Pluto, then I'll eat my telescope'" (Paragraph 4)
    C. "But the spacecraft measured Pluto at -397 degrees F. Pluto is the coldest world a spacecraft has ever visited." (Paragraph 6)
    D. "But the mission was a big success. Someday another spacecraft may visit, one that will circle Pluto again and again." (Paragraph 16)

3. Which of the following describes the difference between Pluto and Eris?
    A. Pluto and Eris are both small worlds, but Pluto is frozen while Eris is not.
    B. Pluto and Eris are similarly small worlds, but it was discovered that Pluto is bigger.
    C. Pluto and Eris are both small worlds, but Pluto is within Neptune's orbit while Eris is not.
    D. Pluto and Eris are small worlds, but it was discovered that Eris is significantly bigger.

4. Which of the following describes the relationship between Pluto's distance from the sun and its landscape?
    A. Pluto is far enough from the sun that it doesn't get much light, which prevents plants from being able to grow.
    B. Pluto is too far away from the sun to receive light, which has caused the landscape to turn a dull color.
    C. Pluto is extremely cold because of its distance from the sun, however its surface does have liquid water.

5. How does the author use comparisons to familiar objects and places to develop ideas about Pluto in the article? Cite evidence from the text to support your answer.

Discussion Questions

Directions: Brainstorm your answers to the following questions in the space provided. Be prepared to share your original ideas in a class discussion.

1. In the text, studying Pluto is described as "saving the best for last." How could studying other worlds help scientists learn about the universe as a whole? When have you been able to discover something about your world by learning something new about another's world?

2. In this text, technology was used to learn new things about the distant world of Pluto. What is something you've learned, or another place you've been able to learn about, because of technology?

3. The scientists in the text get to name different aspects of the small worlds that they study. If you could name these same places in space mentioned in the text, what would you choose? What would factor into your decision-making process? Why?