WEEK 7 (5/11-5/15) READING/ELA PACKET

Monday	Review weekly overview, vocabulary words, and spelling words. Complete vocabulary and spelling word practice (pg.1-5 of packet).
Tuesday	Read the Changing Views of the Earth and answer Make Connections questions, read strategy pages and answer the Your Turn questions.
Wednesday	Read “When is a Planet Not A Planet?” then answer the Text Evidence Questions.
Thursday	Complete the Your Turn practice pages.
Friday	Finish Your Turn practice pages and any unfinished work.

Essential Question: How can scientific knowledge change over time?

Unit 5 Week 4

Story

When Is a Planet Not a Planet

Genre

Expository Text

Story

"New Moon"

Genre

Science Fiction

Story

"Changing Views of Earth"

Genre

Expository Text

Comprehension Strategy

ask and answer questions

Comprehension Skill

text structure: cause and effect

Vocabulary Strategy

Greek roots

Writing Traits

organization-strong paragraphs

Grammar

adjectives that compare

Other Skills

fluency: accuracy

Genre

Expository Text

SPELLING/ PHONICS

suffixes

-less

-ness

sadness
gladness
needless
harmless
darkness
fullness
stillness
hopeless
fearless
weakness
bottomless
foolishness
fondness
effortless
meaningless
emptiness
forgiveness
motionless
ceaseless
fierceness

Vocabulary

approximately- nearly correct or exact; about

astronomical- of or having to do with astronomy, the science of the sun, stars, planets, and other space objects

calculation- the act or process of determining something using mathematics

criteria- rules, standards, or tests by which something or someone can be judged or measured

diameter- the length of a straight line passing through the center of a circle or sphere, from one side to another

evaluate- to judge or discover the value of something

orbit- to move in a circle around another object

spheres- the extents or amounts to which someone or something changes or varies

Vocabulary

Use the picture and the sentences to talk with a partner about each word.

approximately

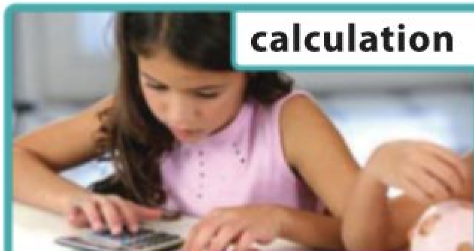
The recipe called for **approximately** two cups of oil, so I did not measure exactly.

What is an antonym for approximately?

astronomical

The space exhibit included amazing **astronomical** instruments to study stars.

Besides stars, what are astronomical instruments used to study?



calculation

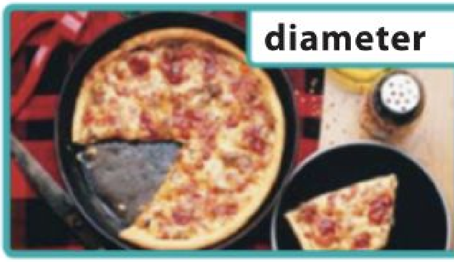
Mina did a quick **calculation** to figure out if she had enough money for six tickets.

What kinds of skills help with a calculation?

criteria

Blood pressure is one of the **criteria** doctors use for evaluating your health.

What other criteria help doctors to check your health?



diameter

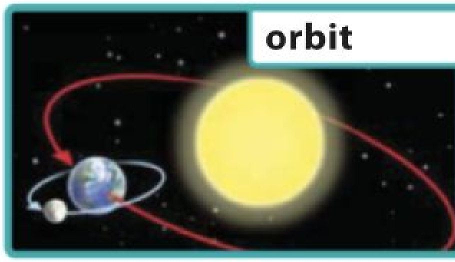
The large pizza pan has a **diameter** of fourteen inches.

How would you measure the diameter of a pan?

evaluate

Reading food labels can help you **evaluate** the nutritional value.

What questions might help you evaluate a restaurant?



orbit

It takes a year for the Earth to **orbit** the sun, and a month for the moon to orbit the Earth.

What objects in space orbit the sun?

spheres

Basketballs, soccer balls, and baseballs are **spheres**, but footballs are not.

What other objects are spheres?

COLLABORATE

Your Turn

Pick three words. Write three questions for your partner to answer.

Go Digital! *Use the online visual glossary*

(t to b)

Name ______________________________

approximately	astronomical	calculation	criteria
diameter	evaluate	orbit	spheres

Use each pair of vocabulary words in a single sentence.

1. spheres, diameter

____

____

2. evaluate, criteria

____

____

3. astronomical, orbit

____

____

4. calculation, approximately

____

____

Name ____

A. Read each sentence. Write the word with the suffix *-less* or *-ness* on the line. Then circle the suffix.

1. The owls went hunting under the cover of darkness. ________________

2. The fearless police officers raced to the rescue. ________________

3. "I will not tolerate this foolishness," our teacher said. ________________

4. Were you filled with sadness when your team lost the game? ________________

5. The photographer captured the fullness of the moon. ________________

6. The situation seemed hopeless, but we kept trying. ________________

B. Add the suffix *-less* or *-ness* to the word in parentheses. Write the new sentence on the line.

7. Our boat drifted for hours on the (motion) sea.

____

8. Did you see the (fierce) in the tiger's eyes?

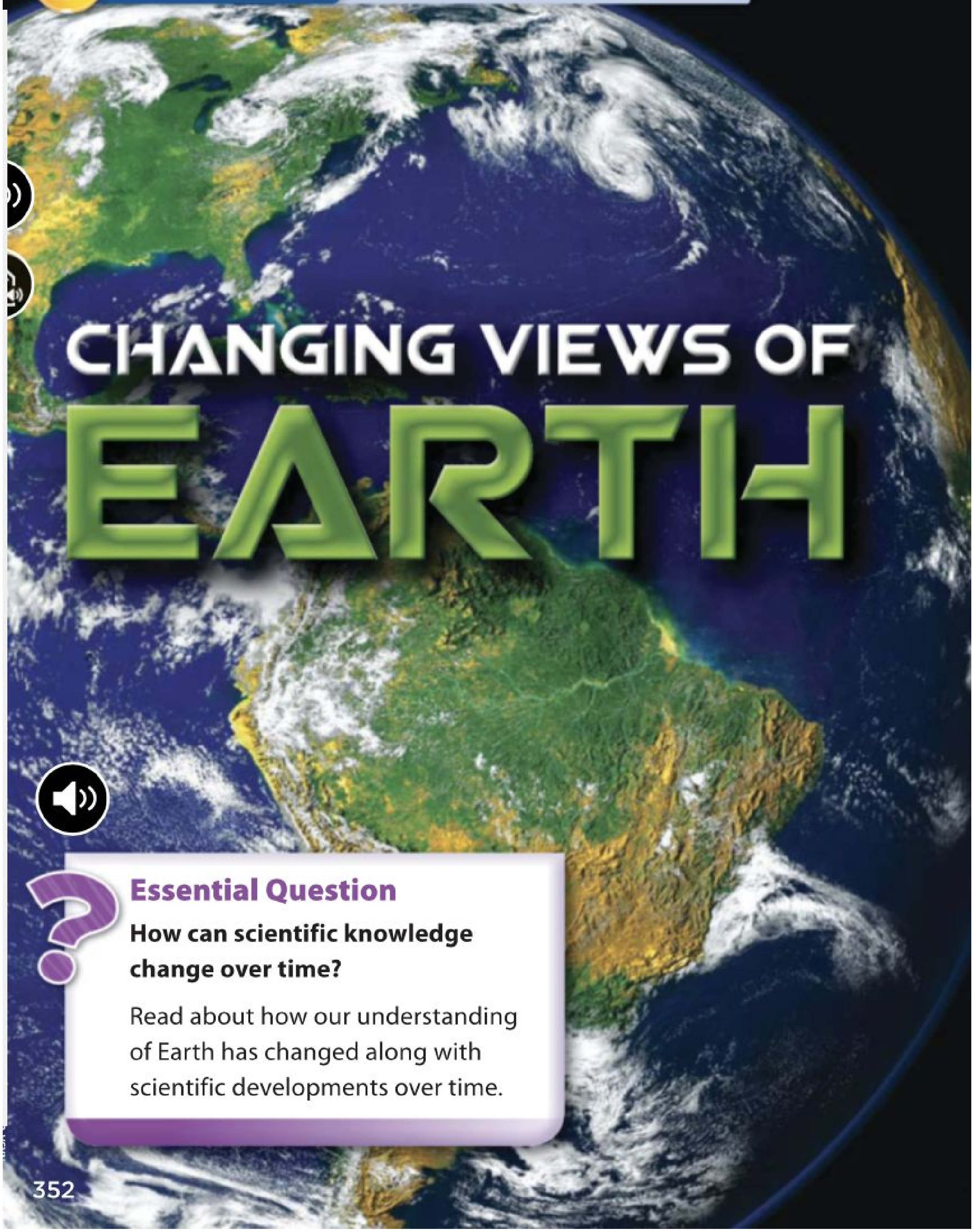
____

9. The spider looked (harm), but I decided not to touch it.

____

10. My parents and I have a (fond) for picnics in the woods.

____



CHANGING VIEWS OF EARTH

Essential Question

How can scientific knowledge change over time?

Read about how our understanding of Earth has changed along with scientific developments over time.

On the Ground, Looking Around

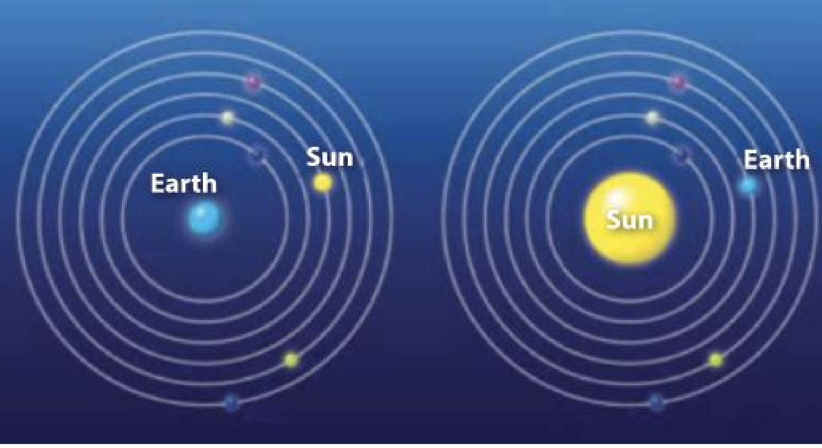
No matter where on Earth you go, people like to talk about the weather. This weekend's forecast may provide the main criteria for planning outdoor activities. Where does all that information about the weather come from? The ability to predict storms and droughts required centuries of scientific innovation. We had to look up at the skies to learn more about life here on Earth.

Long ago, humans based their knowledge on what they experienced with their eyes and ears. If people could heighten their senses, they might not feel so mystified by the events confronting them daily. For example, something as simple as the rising sun perplexed people for centuries. They believed that the Earth stayed in place while the Sun moved around it. This was called the geocentric model.

In the early 1600s, an Italian named Galileo pointed a new tool called the telescope toward the night sky. As a result of his heightened vision, he could see stars, planets, and other celestial spheres with new clarity. Each observation and calculation led him to support a radical new model of the solar system. In the heliocentric version proposed by the scientist Copernicus, the Sun did not orbit the Earth. The Earth orbited the Sun.

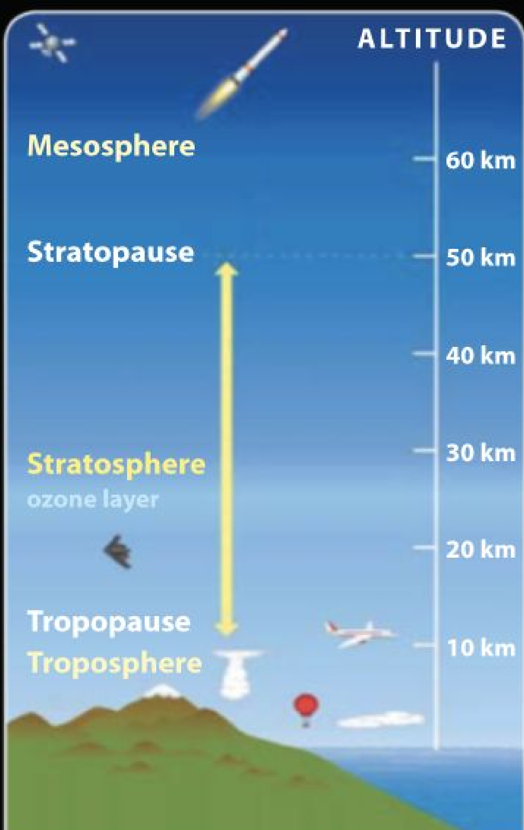
Galileo's telescope helped prove that Copernicus's heliocentric view was correct. ▶

These diagrams show the geocentric (Earth in the center), and the heliocentric (sun in the center) views of the solar system.



In the Sky, Looking Down

New technology allowed scientists to evaluate theories better than ever. Measuring devices such as the thermometer and barometer offered new insights into weather patterns. However, people were still limited to ground-based learning. What if they could travel into the sky, where the weather actually happened?



As humans reached higher, we learned more and more about Earth's atmosphere.

In the mid-1700s, some scientists sent measurement devices higher and higher. At first they used kites. Before long, hot-air balloons offered new ways to transport the tools—and sometimes scientists themselves—into the sky.

However, scientists were not satisfied studying the lower layers of Earth's atmosphere. The more they learned, the higher they wanted to go. They also wanted to obtain information more quickly and accurately. Kites and balloons were hard to control. As a result, they occasionally veered off course or got lost, taking their data with them.

The development of aircraft in the early 1900s promised safer ways to observe Earth's surface and the atmosphere above it. Kites and balloons could reach altitudes of approximately three kilometers. By comparison, airplanes lifted scientists to a height of five kilometers and more. Radio technology allowed scientists to transmit data from the air to the ground, where other scientists analyzed and compared information. Breakthroughs came fast and furiously. Still, scientists dreamed of reaching ever higher.

Out in Space, Looking Back Home

In the late twentieth century, advances in aeronautics led to more powerful rockets that lifted satellites into orbit around Earth. From these heights, scientists could study the composition and relative thinness of our layered atmosphere. Since meteorologists could analyze multiple factors at once, the accuracy of their weather predictions improved dramatically.

NASA launched dozens of satellites into orbit in the following years. Some stared back at Earth, while others peered deep into endless space. They gathered astronomical data about the ages of planets and galaxies. Sensors and supercomputers measured things such as Earth's diameter with incredible accuracy. Because of this technology, scientists could develop more reliable models about Earth's systems. For example, they could form theories to show how climate might change over time.

Space missions continue to venture farther from home. Even so, nothing compares to seeing Earth the old way, with our own eyes. Views of our planet from space inspire awe in nearly all people who have seen them, even in photographs. "With all the arguments . . . for going to the Moon," said astronaut Joseph Allen, "no one suggested that we should do it to look at the Earth. But that may in fact be the most important reason."

Satellites launched into orbit only last for a limited number of years and then must be replaced.

Make Connections

What were some effects of flight on our knowledge about Earth? **ESSENTIAL QUESTION**

How has your knowledge of Earth changed over time? What effect has this change had on you? **TEXT TO SELF**

Ask and Answer Questions

Asking and answering questions as you read helps you stay focused. Try it with "Changing Views of Earth." Think about each question the author asks, and form your own questions, too. Then read on for the answers.

Find Text Evidence

In the first paragraph on page 353, the author asks a question: *Where does all that information about the weather come from?* This may lead you to another question.

page 353

> No matter where on Earth you go, people like to talk about the weather. This weekend's forecast may provide the main criteria for planning outdoor activities. Where does all that information about the weather come from?

I think about what I already know—that weather forecasters use scientific instruments. So I ask myself, "What kinds of instruments do scientists use to make forecasts?" I will read on to find the answer.

Your Turn

Reread "Out in Space, Looking Back Home" on page 355. Ask a question and then read to find the answer. Use the strategy Ask and Answer Questions as you read.

Cause and Effect

Science and history authors want you to know not just *what* happens but *why* it happens. They show that one event is the **cause** of another event, called the **effect**. Cause-and-effect relationships often form a chain, with the effect of one event becoming the cause of another event.

Find Text Evidence

In the section "On the Ground, Looking Around" on page 353, I read that people once believed the sun orbits Earth. I learn the cause of this mistake: people had only their eyes for viewing the skies. The invention of the telescope had an important effect—the discovery that Earth actually orbits the sun.

Cause	Effect
Long ago, people had only their eyes to see the skies.	They thought the sun orbited Earth.
The telescope was invented.	People could see the stars and planets more clearly.
People could see the stars and planets more clearly.	They found out that Earth orbits the sun.

COLLABORATE

Your Turn

Reread the rest of "Changing Views of Earth." Show important connections between certain events by recording causes and effects in your own graphic organizer.

Go Digital! *Use the interactive graphic organizer*

CCSS **Genre** Informational Text

Expository Text

The selection "Changing Views of Earth" is an expository text.

Expository text:

- Presents information and facts about a topic in a logical order
- Supports specific points with reasons and evidence
- May include text features, such as subheadings, photos, and diagrams

Find Text Evidence

"Changing Views of Earth" is an expository text. The facts about inventions are given in a logical order. The author backs up her points with evidence, including a diagram.

page 354

In the Sky, Looking Down

New technology allowed scientists to evaluate theories better than ever. Measuring devices such as the thermometer and barometer offered new insights into weather patterns. However, people were still limited to ground-based learning. What if they could travel into the sky, where the weather actually happened?

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354

Diagrams A diagram is a drawing that shows the different parts of something and how they relate to each other. A title tells what the diagram illustrates, and labels identify each main part.

Your Turn

COLLABORATE

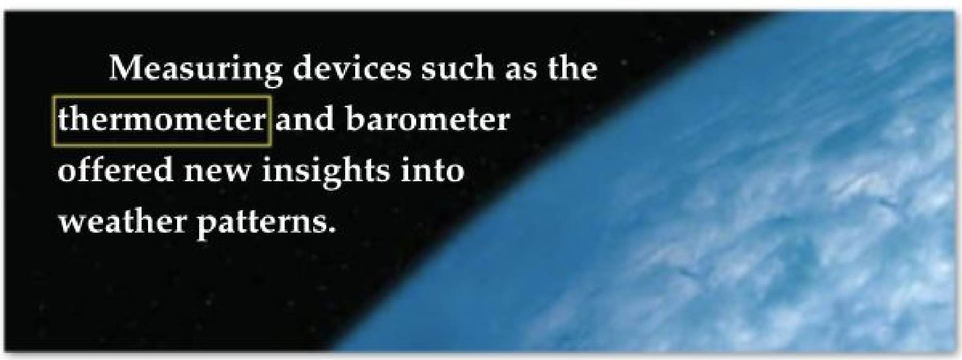
List three other examples of things in "Changing Views of Earth" that show that this is expository text.

Greek Roots

Many English words contain Greek roots. For example, the Greek root *meter* means "measure," so any English word containing *meter* (*thermometer*, *barometer*, *kilometer*) usually has to do with measuring something.

Find Text Evidence

On page 354 of "Changing Views of Earth," I come across the word thermometer. *The Greek root* therm *has to do with heat. Since I know that* meter *means "measure," I can figure out that a thermometer is something that records or measures temperature.*



Your Turn

COLLABORATE

Use the Greek roots below to figure out the meanings of two words from "Changing Views of Earth":

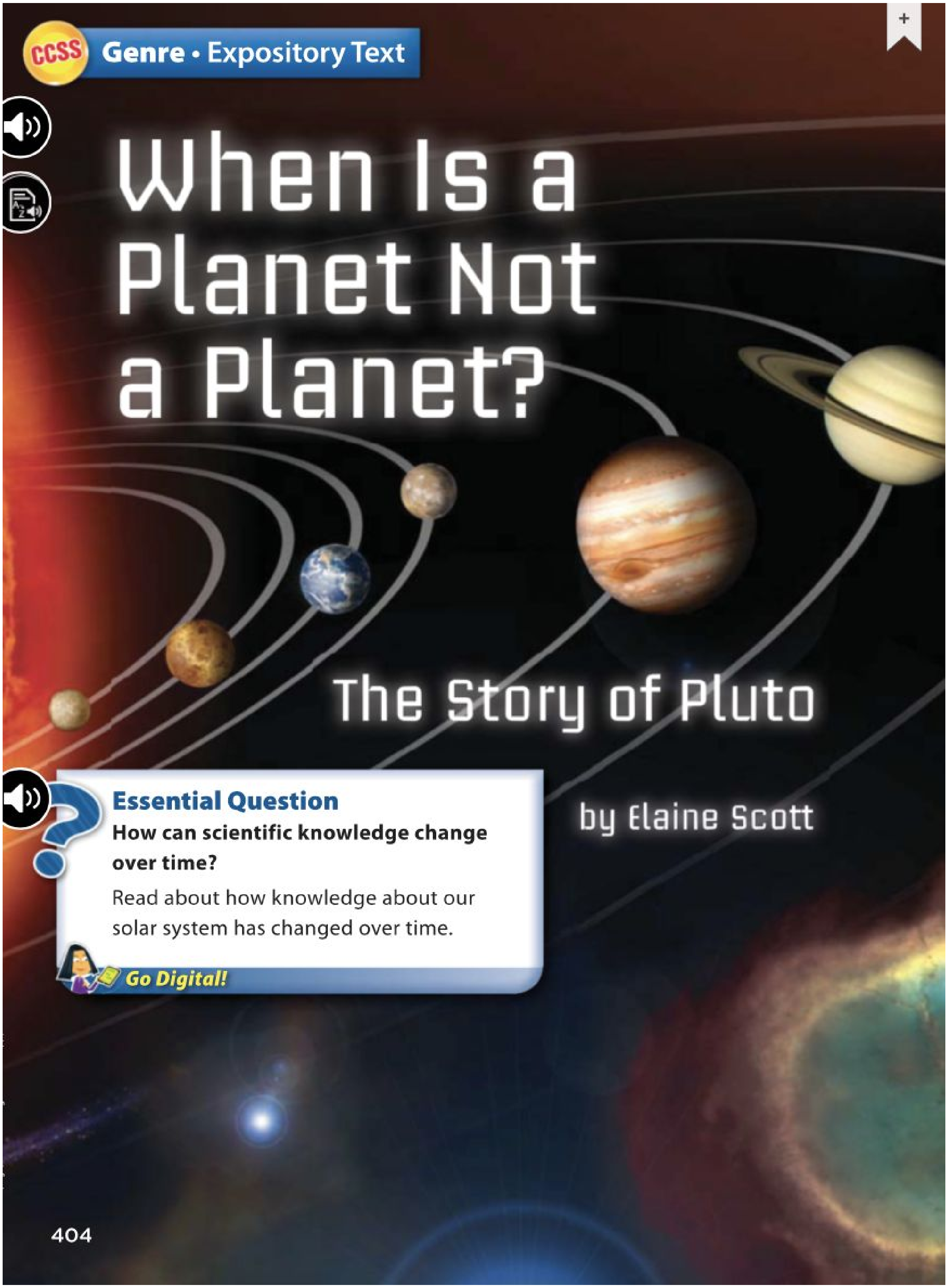
Greek Roots: *geo* = earth   *helio* = sun   *centr* = center

geocentric, *page 353*

heliocentric, *page 353*

CCSS **Genre • Expository Text**

When Is a Planet Not a Planet?



The Story of Pluto

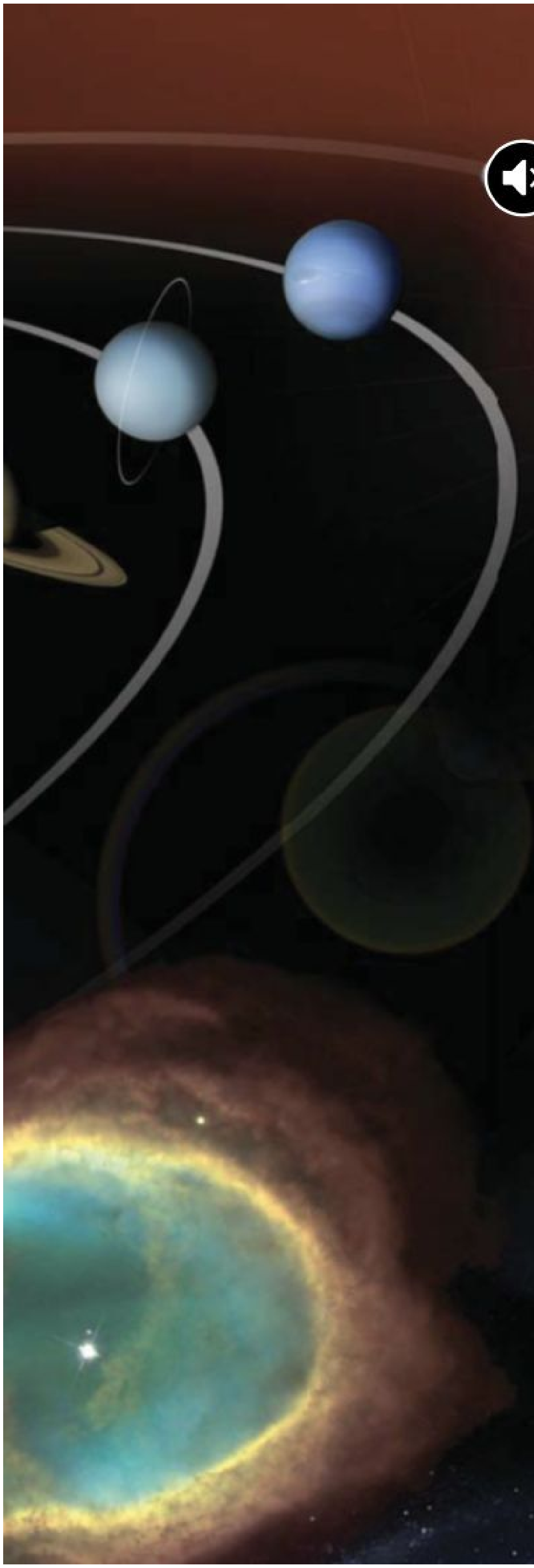
by Elaine Scott

Essential Question

How can scientific knowledge change over time?

Read about how knowledge about our solar system has changed over time.

Go Digital!



My very eager mother just served us nine pizzas.

A silly sentence, yet schoolchildren have memorized it for years, because it helps them remember the planets in our solar system. The first letter of every word stands for a planet, in the order of how close it is to the Sun. ***M**y **v**ery **e**ager **m**other **j**ust **s**erved **u**s **n**ine **p**izzas.* Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, and Pluto. Mercury is the planet closest to the Sun, and tiny Pluto is the farthest away. That is, until recently.

Pluto is still there, of course. Along with the planets, asteroids, comets, meteors, and bits of space rock and ice, Pluto is part of our solar system. Pluto and all those other objects **orbit**, or travel around, the Sun.

My very eager mother just served us nine pizzas. This is a composite of photos taken on many different NASA missions. It illustrates our solar system. Our star, the Sun, is at the far left; Pluto is at the far right. The wispy tail of a comet is shown in the lower left, and the Southern Ring Nebula is near the lower right. The other faint objects in the image are artistic additions, created with a computer.

However, on August 24, 2006, the International **Astronomical** Union (IAU), a group of individual astronomers and astronomical societies from around the world, made an announcement. They declared that Pluto was not a planet. Suddenly, "My very eager mother just served us nine pizzas" didn't work anymore, because now there are only eight major planets orbiting the Sun. Perhaps someone will create a new sentence to help us remember their names and order.

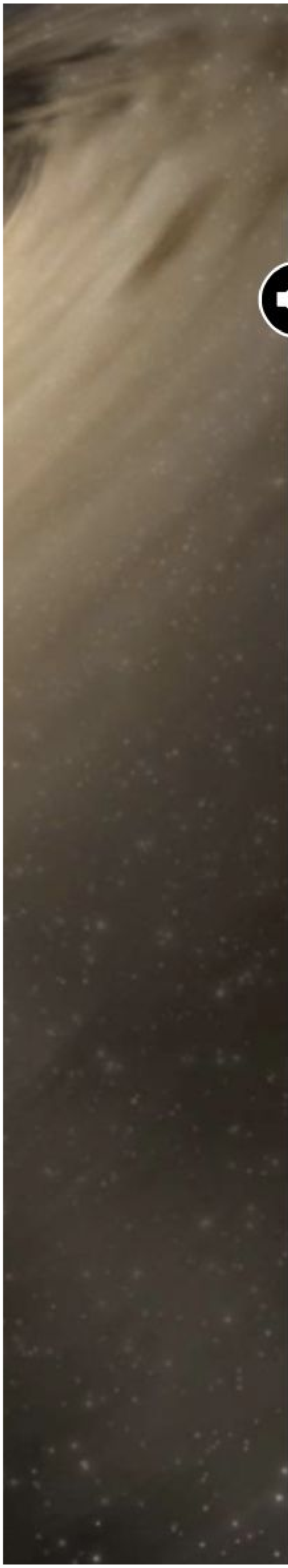
Names are important, but they are not the only things to know about the planets. Learning how planets form, where they are located, and what they are like is the kind of activity that makes science exciting and fun.

PLUTO'S PROBLEMS

There are two groups of planets in our solar system. The planets closest to the Sun—Mercury, Venus, Earth, and Mars—have a solid surface made of a mix of rocks, dirt, and minerals. The planets farthest away from the Sun—Jupiter, Saturn, Uranus, and Neptune—don't have a solid surface. They are made up mostly of gas, with a rocky core. Scientists have a theory about why some planets are terrestrial, or made of rocks and dirt, and why some are composed primarily of gas.

Most scientists believe that our solar system began as a space cloud, called a nebula. The nebula was made up of bits of space dust, rocks, ice, and gas. A tiny star, not yet ready to give light, began to form in the center of the nebula. The star was our Sun. As years passed, the Sun grew big enough that high temperatures and extreme pressure caused hydrogen at the center of the Sun to begin to fuse into helium and release energy as light—sunshine!

Meanwhile, the nebula continued to orbit the new Sun until it formed a large flat ring around it. Scientists call this ring a "protoplanetary disk." The disk, or ring, was hottest where it was closest to the Sun, and coolest at its outer edge. As the disk swirled around the Sun, the Sun's gravity went to work. It pulled and tugged at the bits of rock, dust, ice, and gas until they came together in clumps of material we now call the planets.

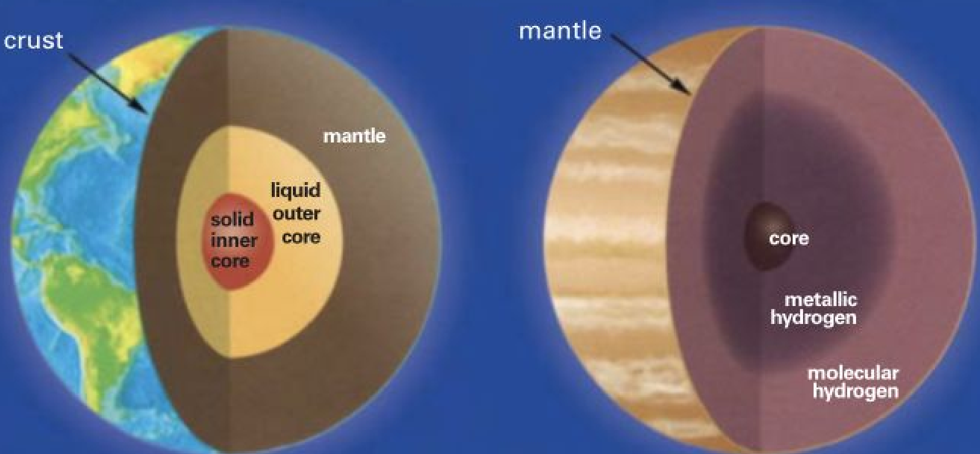


An artist's conception of a protoplanetary disk forming around a star.

A small portion of the Orion Nebula, 1,500 light years away from Earth. At least 153 stars in this region have protoplanetary disks swirling around them, forming new solar systems. Scientists believe our solar system formed in just this way.

The planets that were closest to the Sun didn't keep much of their gas. The Sun's heat blasted it away, leaving behind solid **spheres** of matter, with only a little gas. Those spheres became the terrestrial planets—Mercury, Venus, Earth, and Mars. But on the outer edges of the disk, far away from the Sun's heat, it was much cooler. The clumps of rock and dirt there still had their thick layers of gas; they didn't burn away. The planets farthest from the Sun became the gas giants—Jupiter, Saturn, Uranus, and Neptune.

Because astronomers still believed this theory about how our planets formed, they had a problem with Pluto. When it was first discovered in 1930, astronomers assumed Pluto was made of ice and gas because of its great distance from the sun. However, by 1987, Pluto had moved into a position that only occurs twice in its 248-year orbit and scientific instruments had improved. Astronomers were able to study Pluto and the light that reflected off it. Their instruments told them that Pluto was dense and must have a rocky core. That new information raised questions. If the planets closest to the Sun were rocky and the planets farthest away from the Sun were mostly made of gas, why was Pluto—the most distant planet of all—made of rock?



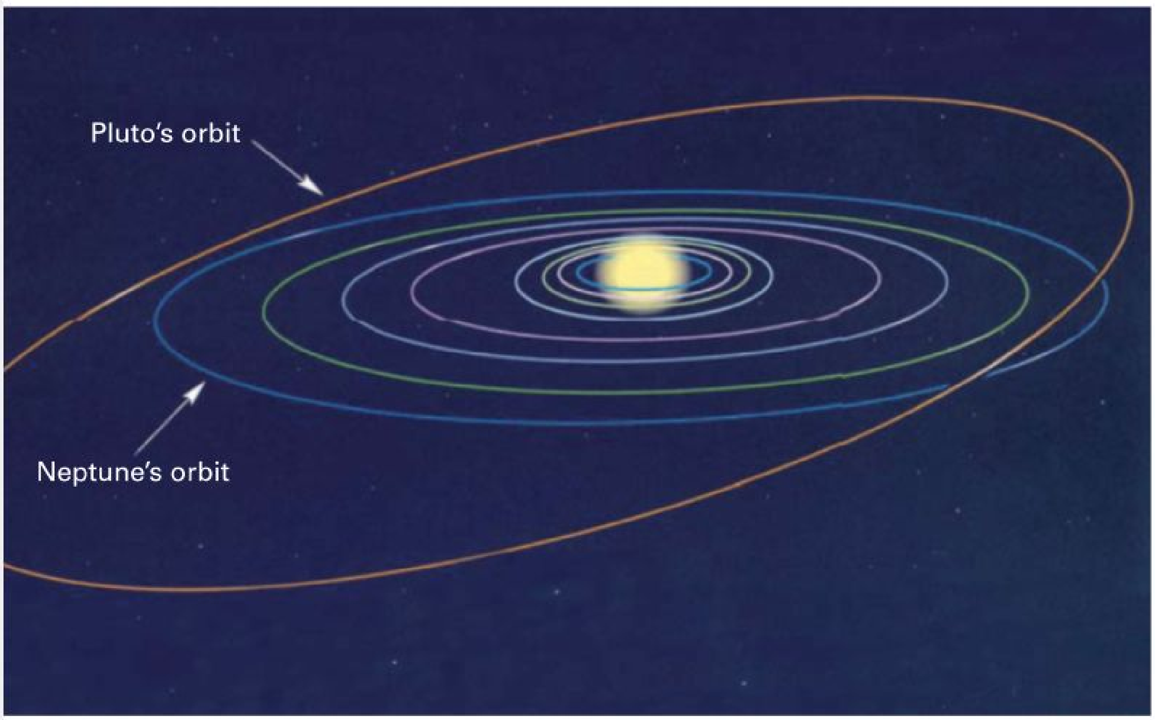
Earth is a terrestrial planet, which means it has a solid inner core.

Though they are made almost entirely of layers of gas, Jupiter and other gas giants have a small solid core.

STOP AND CHECK

Ask and Answer Questions According to theory, why are some planets mostly made of gas and others mostly made of rock? Go back to the text to find the answer.

There were other questions as well. Pluto's orbit is different from the orbits of the planets. Think of an orbit as a lane on a racetrack. Just as runners have their own lanes on the track, each planet has its own orbit around the Sun. For the runners, all the lanes together make up the racetrack. For the planets, all their orbits, taken together, make up the "orbital plane." Just as runners don't run outside their individual lanes, planets don't travel around the Sun outside their individual orbits. Except for Pluto. Pluto crosses Neptune's orbit.



All of the planets, comets, and asteroids in the solar system are in orbit around the Sun. Their orbits line up with each other, creating an imaginary flat disk called the orbital plane. Pluto's orbit, which takes 248 Earth years to complete, brings it outside the orbital plane. For 20 years of each orbit, Pluto moves inside the orbit of Neptune, making Neptune farther from the sun than Pluto. Pluto was inside Neptune's orbit from 1979 to 1999.

Pluto and its moon, Charon. Pluto was 2.6 billion miles from Earth when the Hubble Space Telescope took this photo.

The shape of Pluto's orbit is different, too. The larger planets travel around the Sun in an oval-shaped orbit. Pluto's orbit is more of a stretched-out oblong. The other planets' orbits are level with the Sun. Pluto's is tilted. Comets' orbits are often tilted, so astronomers wondered, Could Pluto be a comet?

And of course there is Pluto's size. Astronomers knew Pluto was tiny when it was discovered in 1930. But because it was so far away, it was hard to see the planet clearly. Pluto appeared as a tiny dot of light in the night sky. Then telescopes improved. In 1976, American astronomer James Christy discovered that the tiny dot everyone thought was Pluto was really two objects: Pluto had a moon—Charon (CARE-en). Once astronomers discovered that Charon was separate from Pluto, they realized that Pluto was even smaller than they had originally thought. Pluto is only 1,440 miles in **diameter.** (Charon's diameter is 790 miles.) They began to ask, Is Pluto too small to be a planet? And since they had found Charon, they wondered, Were there more objects out there the size of Pluto? Were *they* planets, too?

FINDING PLANETS

In 1992, astronomers made an amazing discovery: 9.3 *billion* miles away from our sun is another region of space, shaped like a disk. Astronomers believe it contains **approximately** 70,000 icy objects, including Pluto.

This area of space was named the Kuiper Belt, after the Dutch-American astronomer Gerard Kuiper (KI-per) who lived from 1905 to 1973. In 1951, more than forty years before its discovery, Kuiper actually predicted that a region like this might exist.

Michael Brown, Chad Trujillo, and David Rabinowitz are planetary astronomers who study Kuiper Belt Objects, or KBOs. People often call these men “the Planet Finders.” Together, they hunt for planets at the outer edges of our solar system using the Samuel Oschin Telescope at the Palomar Observatory in California. The Oschin telescope is a wide-field telescope, which means it views broad regions of the sky at once. When paired with a camera at the observatory, it can take pictures of these large areas.

In the past, astronomers had to spend their evenings peering through telescopes in order to study the night sky. Now things have changed. Robots control the Oschin telescope and its camera.

In the evenings, the cameras in the telescope at the Palomar Observatory are at work. They take three photographs over three hours of the part of the night sky the men want to study. Any object moving across the background of billions of stars and galaxies will be captured in pictures. The pictures are then sent from the telescope’s cameras to a bank of ten computers at the California Institute of Technology. Next, the computers decide which objects appear to be moving and therefore might be a planet. Usually, the computers select about 100 objects; when the men arrive at work each morning, the pictures are ready for them to view.

They call David Rabinowitz (left), Chad Trujillo (upper left), and Mike Brown (center) "the Planet Finders." The team used the Oschin telescope (right) to discover Eris.

Mike Brown says most of the objects he looks at on his computer screen are not planets. Many are caused by some kind of flaw in the telescope's camera. But every once in a while, an astronomer will get very lucky and something new and exciting will appear. That's how Mike and his team discovered 2003UB313, or Xena (ZEE-nah), as it was nicknamed, on October 21, 2003. Mike says, "The very first time I saw Xena on my screen, I thought that there was something wrong. It was too big and too bright. Then I did a **calculation** of how big it was and how far away it was. Xena is the most distant object ever seen in orbit around the Sun."

Pluto is 3.6 billion miles away, but Xena is 10 billion miles away and is approximately 400 miles bigger in diameter than Pluto. It takes Xena more than twice as long as Pluto to orbit the Sun.

Xena was always a nickname. On September 13, 2006, the newly discovered celestial body officially became Eris (AIR-is), for the Greek goddess of strife and discord. It seems an appropriate name, since there was a lot of strife and discord surrounding Eris. Was it a planet, or not?

An artist's conception of the Milky Way, our home galaxy. A galaxy is a group of billions of stars and their solar systems. The Milky Way is a spiral galaxy that contains 200 billion stars.

WHAT IS A PLANET?

Because scientists always check and recheck their work, Mike Brown and his team of astronomers didn't announce their discovery of Eris until January 5, 2005, after they had had a chance to verify their information. When they revealed their discovery, many people thought the solar system had gained its tenth planet. But others disagreed. Soon an argument was raging among astronomers all over the world. And the argument came down to one question. What, exactly, is a planet?

It seems surprising, but until August 24, 2006, science had never had a definition for the word "planet." Dictionaries had definitions, of course, but most said something similar to "A large celestial body that circles around the Sun or another star." For a scientist, that definition had problems. For one thing, what is meant by "large body"? Jupiter, the largest planet in our solar system, is 88,700 miles in diameter, and it is a planet. Pluto is only 1,440 miles in diameter and—at the time—it was a planet, too. The question "What is a planet?" needed an answer, and the International Astronomical Union decided to create not one definition but three.

The IAU came up with three classes of objects that orbit the Sun: planets, dwarf planets, and small solar-system bodies.

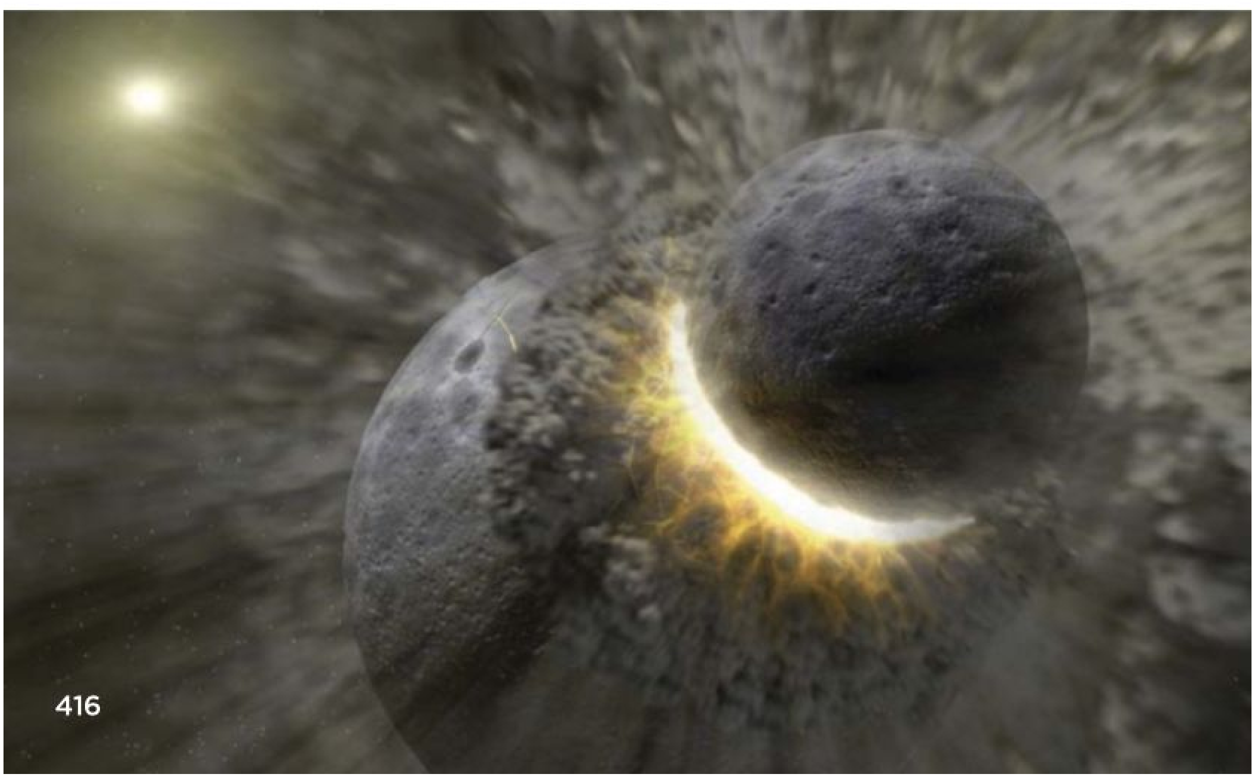
The IAU decided that a celestial body is a planet if it:

1. orbits the Sun
2. is round or nearly round, because its gravity has pulled it into that shape
3. is big enough and has enough gravity to "clear the neighborhood" around its orbit

The first two qualifications for planethood, orbiting the Sun and a round shape, are easy to understand. The concept of "clearing the neighborhood" is a little more difficult.

It might help to think of planets as the schoolyard bullies of the solar system. In order to clear the neighborhood, a planet has to be big enough, and have enough gravity, to get rid of any celestial objects in its way. A large planet might clear its orbit by using its gravity to pull other, smaller, objects toward it and destroy them, the way asteroids are destroyed when they hit Earth.

A cosmic collision. Planets often "clear their neighborhoods" in this manner.



Or a planet might clear its orbit by attracting smaller objects toward it, then turning them into moons that remain in orbit around the planet.

Sometimes a planet will simply push a smaller body into a completely different orbit and get rid of it that way. But no matter how it does the clearing, according to the IAU definition, a planet must travel in its orbit by itself.

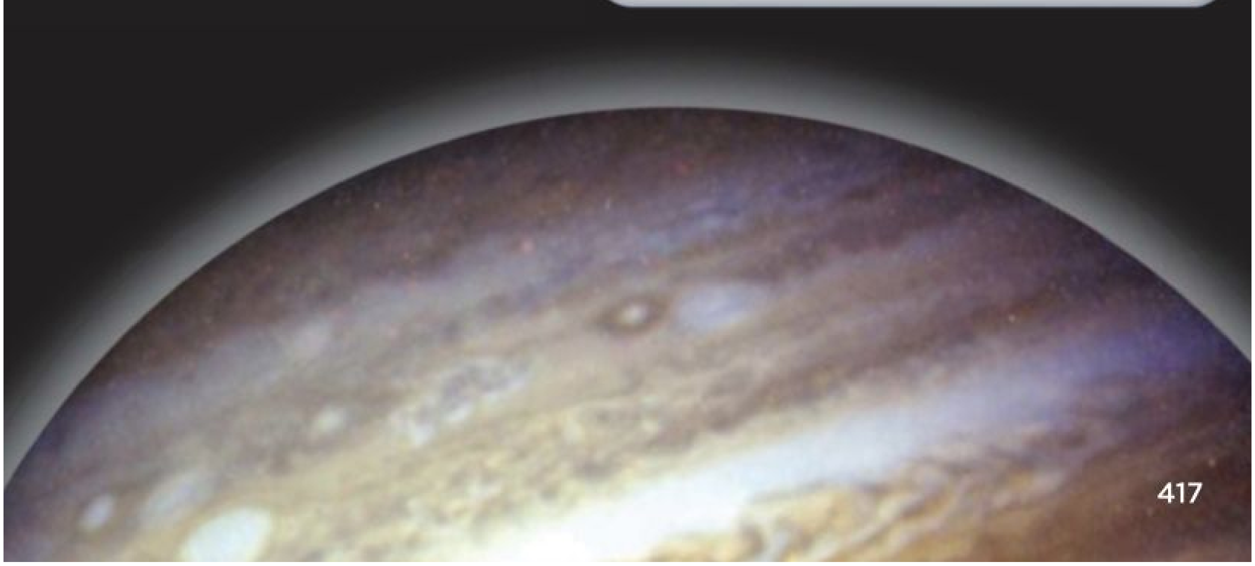
The secondary category of planets, called "dwarf planets," have the following characteristics. They must:

1. orbit the Sun
2. be round
3. not be a moon or satellite of another planet

By this definition, Pluto is a dwarf planet. And although Charon, its former moon, is still locked in an orbit with Pluto, it is a dwarf planet, too. Now they are known as a double-planet system. Ceres is a dwarf planet, also, and Mike Brown's discovery, Eris, is one as well. They are dwarf planets because they orbit the Sun, they are round, and they are not moons of another planet—but they're too small to have enough gravity to clear their neighborhood. Pluto, Charon, Ceres, and Eris are all KBOs—orbiting far out in space with other objects in the Kuiper Belt.

STOP AND CHECK

Ask and Answer Questions How does the size and gravity of a planet affect other objects around it? Look for details in the text to find the answer.

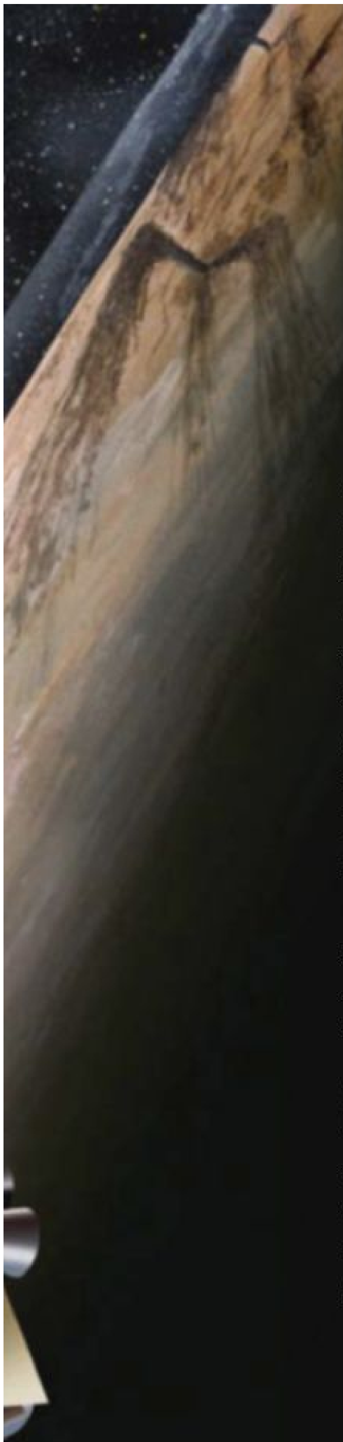


Everything else—asteroids, comets, meteors—are now members of the third class of objects that orbit the Sun and are called "small solar-system bodies."

Some astronomers think the definition of a planet will change again in the future. Others think the current definition is a good one and will last.

Science is exciting, because it continually changes as new information is discovered. A long time ago, we thought there were six planets. Then we thought there were eight. For a while, there were nine. Then it was back to eight. Then, with Pluto, the number jumped up to nine again. And now it's back to eight. And that is just in *our* solar system!

An artist's conception of the New Horizons spacecraft as it arrives at Pluto. Charon is visible in the distance.



We know our Sun is not the only star that has planets in orbit around it. New planets are forming around other stars, making new solar systems. There are 200 billion stars in the Milky Way galaxy alone. And there are billions of galaxies, full of stars, in the universe. As we study those planets and the stars they orbit, we ask questions. Are there other planets like Earth somewhere in the universe? Does life exist on them? We ask questions as we study the planets in our own solar system, too. Does life exist on one of them, or even one of their moons? Did life ever exist on any of them? Is Earth the only planet with life? Are we alone in the universe?

In January 2006, NASA launched the New Horizons mission to Pluto. If all goes well, the New Horizons spacecraft will reach Pluto and Charon sometime in the summer of 2015. Then instruments aboard the spaceship will begin to get a close look at these distant worlds. As the information beams back to Earth, scientists here will study it, trying to learn more about the origins of our solar system and what lies at its outer edges. Pluto still has a story to tell. There are questions that need answers, and the answers will come through science. New information is just waiting to be discovered.

STOP AND CHECK

Reread Why do some astronomers think the definition of a planet will change in the future? The strategy Reread may help you.

TEXT EVIDENCE QUESTIONS: "When is A Planet Not A Planet?"

1. **GENRE: How can you tell this selection is expository text? Identify a text feature and explain how it gives more information about a topic.**

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2. **CAUSE AND EFFECT: What caused scientists to question whether Pluto was a planet?**

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3. **GREEK ROOTS: The word protoplanetary in the third paragraph of page 407 includes the Greek roots proto, meaning "first formed" or "giving rise to". Use this information and context clues to figure out the meaning of protoplanetary.**

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4. **WRITE ABOUT READING: Write about how the discovery of Eris affected the classification of objects in the solar system, including Pluto.**

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Name ______________________________

Read the passage. Use the ask and answer questions strategy to check your understanding as you read.

Is There Life Out There?

“Is there life out there?” is a question scientists who study
11 astrobiology are trying to answer. They look for life in space. In recent
24 years, they have turned their attention to Europa, one of Jupiter’s four
36 largest moons.
38 Europa is a little smaller than Earth’s moon and is covered by a sheet of
53 ice. Its surface is too cold and exposed to too much radiation for anything
67 to live there. Scientists want to know what lies beneath the ice, for that is
82 where any life on Europa would most likely be.

91 **The Necessities of Life**

95 For years, scientists believed all life on Earth depended on energy
106 from the sun. During a process called photosynthesis, plants use energy
117 from sunlight to make food and to release oxygen into the atmosphere.
129 Aerobic creatures rely on that oxygen to breathe. In addition to providing
141 the fuel for photosynthesis, sunlight also provides the necessary
150 warmth for life to survive. Scientists believed life could not survive in
162 extreme temperatures.
164 Scientists also believed that all food chains led back to photosynthesis
175 and the food produced by plants. Recent discoveries, however, have
185 changed the way scientists think about life. They have discovered tube-
196 shaped, worm-like creatures and other animals living around hydrothermal
204 vents on the ocean floor. These newfound creatures do not rely on the sun
218 or plants for food and energy.

Name ____________________

The animals living around hydrothermal vents eat a form of bacteria that live on or below the ocean floor. The bacteria get energy during a process called chemosynthesis. Hydrothermal vents spit warm water filled with chemicals from inside the earth. The bacteria use these chemicals the way plants on the surface use sunlight: as a source of food and energy.

New Possibilities

The discovery of chemosynthetic life changed the way astrobiologists think about life in space. No longer do they have to look only for planets with sunlight and oxygen. Based on Earth's example, planets with oceans and hydrothermal vents might also support life. Based on these discoveries, Europa began to seem like a place where life might exist.

Europa has an oxygen-rich atmosphere, but the oxygen is not produced by photosynthesis. Europa is too far from the sun and too cold to support photosynthetic life. Its surface temperature is usually more than 200 degrees below zero Fahrenheit.

Europa does have oceans. In fact, Europa appears to have more oceans than Earth does. The ice on this moon's surface covers what appears to be moving liquid water. Do these oceans contain hydrothermal vents? Scientists do not yet know. If they do, the oceans of Europa might support chemosynthetic life. Only a space mission to Europa would tell for certain.

Until then, scientists are studying the closest possible environment they can find on Earth: Lake Vostok in Antarctica. Like Europa's oceans, Lake Vostok exists miles beneath a frozen surface. It does not receive direct sunlight, either. Therefore, like Europa, the lake cannot support photosynthetic life. If scientists find life in the lake, it would support the idea that there might also be life on Europa.

Name ____

A. Reread the passage and answer the questions.

1. What details from the first two paragraphs help explain why astrobiologists are interested in Europa, one of Jupiter's moons?

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2. What discovery on Earth caused scientists to become more interested in Europa?

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3. What is the scientists' main reason for studying Lake Vostok in Antarctica? What effect might their research have?

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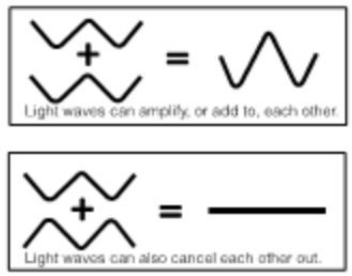
B. Work with a partner. Read the passage aloud. Pay attention to accuracy. Stop after one minute. Fill out the chart.

	Words Read	–	Number of Errors	=	Words Correct Score
First Read		–		=	
Second Read		–		=	

Name ______________________________

Seeing the Light

In 1803, Thomas Young made a discovery about light. He found that when light from two sources overlapped, it made a pattern of bright light and darkness. He thought light acted like a wave: the bright areas were created when two light waves matched up; the dark areas were created when two light waves did not match. His theory led to future discoveries about light.



Young discovered light waves change in brightness when they overlap.

Answer the questions about the text.

1. **What genre of text is this? How do you know?**

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2. **What text features does this text include?**

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3. **How does the title relate to the main idea?**

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4. **How does the graphic text feature help you better understand the text?**

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Name ______________________________

aero = air	*chemo* = chemical	*sphaira* = globe, ball
atmos = vapor, steam	*hydro* = water	*syntithenai* = making or putting together
astro = star	*logy* = the study of	*therme* = heat
bio = life	*photo* = light	

Read each passage below. For each word in bold, write the Greek root or roots from the box above. Use the Greek roots and context clues to write the word's meaning.

1. "Is there life out there?" is a question scientists who study **astrobiology** are trying to answer. They look for life in space.

   Greek root(s): ______________________________

   Meaning: ______________________________

2. During a process called **photosynthesis**, plants use energy from sunlight to make food.

   Greek root(s): ______________________________

   Meaning: ______________________________

3. Plants make food and release oxygen into the **atmosphere**.

   Greek root(s): ______________________________

   Meaning: ______________________________

4. **Aerobic** creatures rely on that oxygen to breathe.

   Greek root(s): ______________________________

   Meaning: ______________________________

5. The animals living around **hydrothermal** vents eat a form of bacteria that live on or below the ocean floor.

   Greek root(s): ______________________________

   Meaning: ______________________________

Name ____

Evidence is details and examples from a text that support a writer's ideas. The student who wrote the paragraph below cited evidence that explains how an author clearly shows a cause-and-effect relationship between an event and ideas.

Topic sentence → In "Is There Life Out There?" the author clearly shows the cause-and-effect relationship between a discovery and new ideas about life on planets.

Evidence → The author describes the discovery of animals that can live around hydrothermal vents in the ocean. This caused scientists to change the way they think about how life gets energy on Earth. The discovery also made scientists think that other planets with hydrothermal vents might also support life.

Concluding statement → The author clearly shows the cause-and-effect relationship between a discovery and new ideas about life on planets.

Write a paragraph about the text you have chosen. Tell how the author clearly shows cause-and-effect relationships between events and ideas. Cite evidence from the text.

Write a topic sentence: ____

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Cite evidence from the text: ____

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End with a concluding statement: ____

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Name ______________________________

A. Read the draft model. Use the questions that follow the draft to help you think about how to add related ideas and delete unrelated ideas to create a stronger paragraph.

Draft Model

The best way to learn about space is with a telescope. You can see what the surface of Earth's moon looks like. The moon is not a planet.

1. What is the main topic of this paragraph?
2. How might you describe a telescope? For example, are there different types?
3. What can you learn from studying the surface of the moon?
4. What idea in the paragraph is unrelated to the rest of the paragraph?

B. Now revise the draft by adding related ideas and deleting unrelated ideas to make a strong paragraph.