

## Weekly Concept **Now We Know**



### Essential Question

How can scientific knowledge change over time?



**Go Digital!**



# Going Deeper

Learning about the ocean is one of our greatest challenges. As researchers design new technologies and evaluate new ideas, our criteria for knowledge changes.

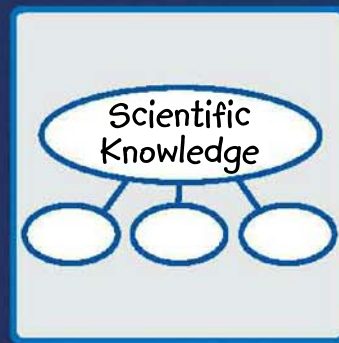
- ▶ Compare the modern research submersible on the left with the early diving suit on the right.
- ▶ The diving suit weighed 190 pounds, and the metal helmet allows almost no visibility! It's easy to see how today's technology allows scientists to learn so much more.



## Talk About It



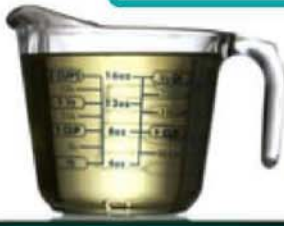
Write words you have learned about changes in scientific knowledge over time. Then talk about a scientific idea you would like to know more about.



# 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?*

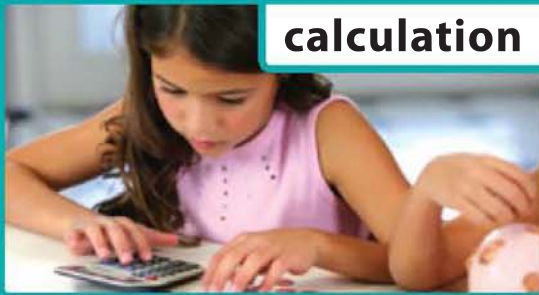
## astronomical



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.

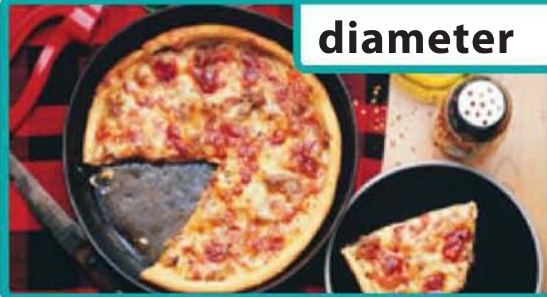
*What kinds of skills help with a calculation?*

## 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.

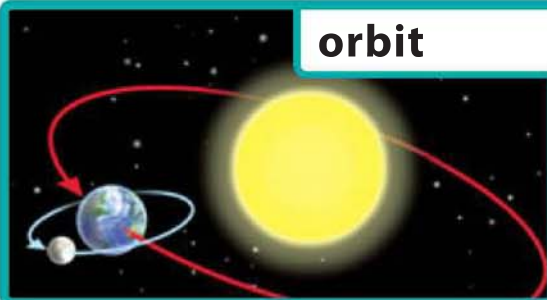
*How would you measure the diameter of a pan?*



## 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?*

## Your Turn

COLLABORATE



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

**Go Digital!** Use the online visual glossary

# CHANGING VIEWS OF EARTH

NASA-GFSC image created by Reto Stockli with the help of Alan Nelson, under the leadership of Fritz Hasler



## 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.

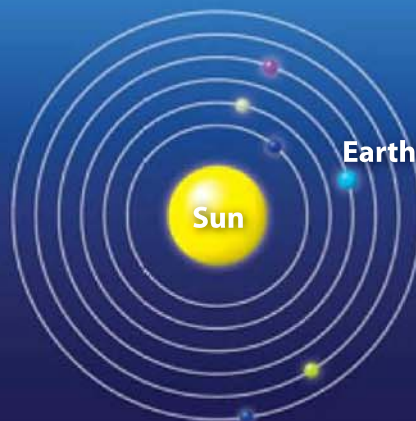
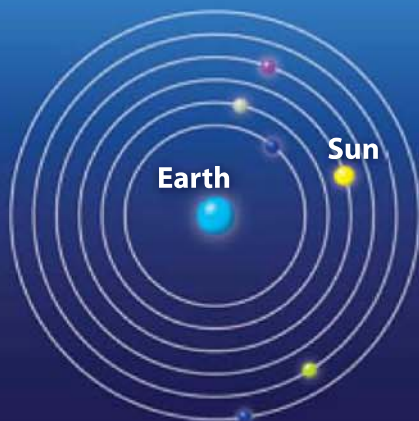
They believed that the Earth stayed in place while the Sun moved around it. This was called the geocentric model.

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. ▶

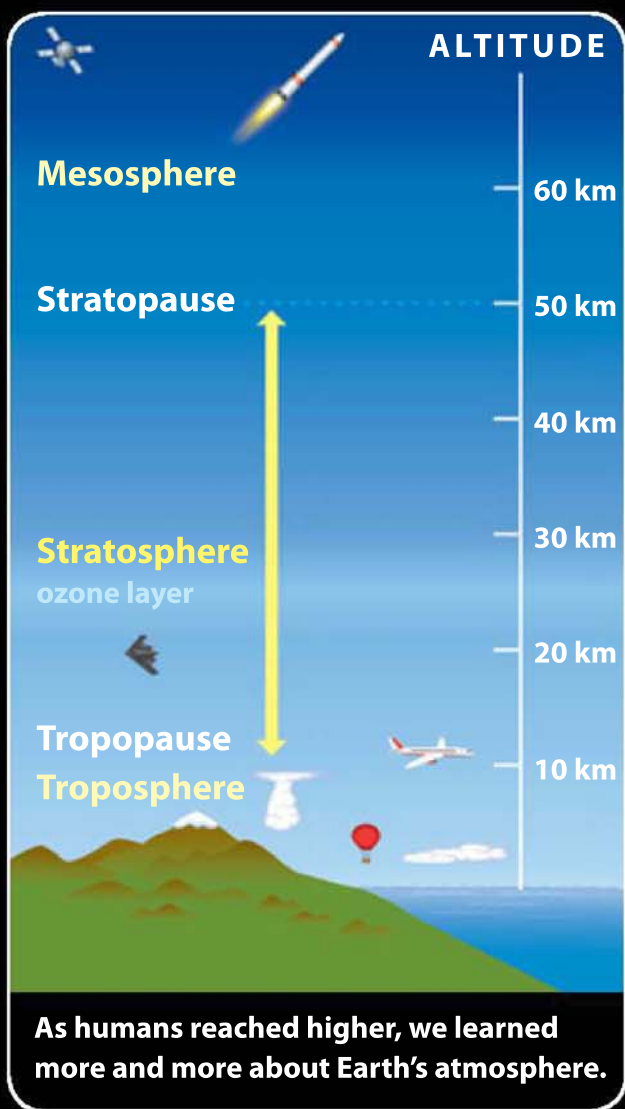


These diagrams show the geocentric (Earth in the center), and the heliocentric (sun in the center) views of the solar system.



## 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?



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

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

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."

### 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**

