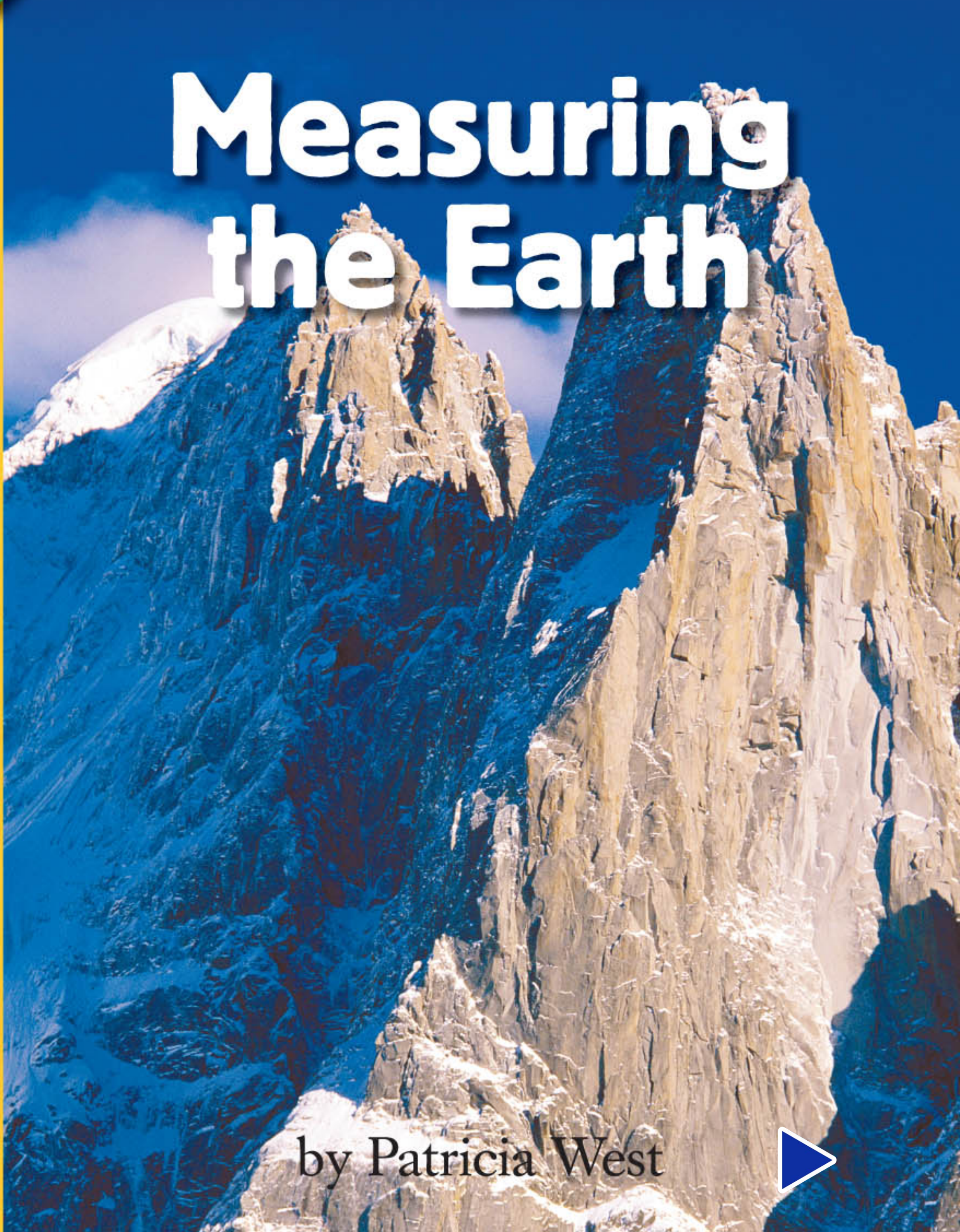
Science

Science

Earth Science

Measuring the Earth



by Patricia West

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Vocabulary

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erupted

outrun

peak

tides

waterfalls

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The Height of a Mountain

How do you measure a mountain? If mountains were shaped in straight lines, it would be easy. You could go to the top of a mountain and drop a string to the bottom. Then you could measure the string's length. But you can't do that because mountains have uneven shapes. Also, the ground under them isn't flat. That's because the Earth is curved.

Suddenly, measuring mountains looks like a difficult job! So how is it done? Keep reading to find out.

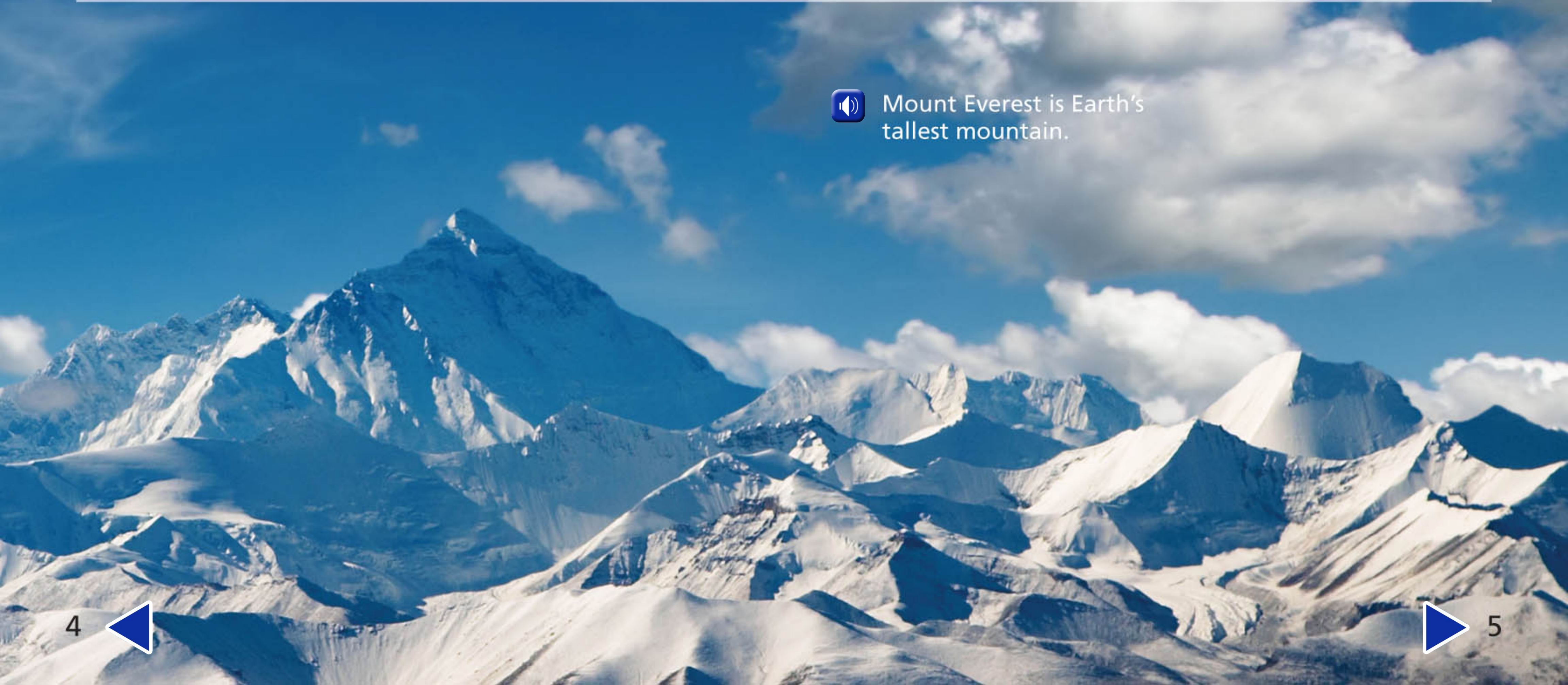
Mount Everest is a **peak** in the Himalayas. The Himalayas are a range of mountains on the continent of Asia.

A very long time ago the land that is now India began to push against the land that is now China. That caused the Himalayas to form. The height of the Himalayas is an **average** of 27,000 feet. And the mountain range is still growing!

Mount Everest was named for a British explorer, Sir George Everest. For years, people wondered how tall Mount Everest was.

In 1999 Mount Everest measured 29,035 feet high, the tallest mountain on Earth. How was that measurement made?

A satellite circling the Earth sent radio signals down to the Earth's surface. A radio receiver at the top of Mount Everest picked up one of the signals. When the signal was picked up, the computer in the receiver was able to figure out the exact height of the mountain!



Mount Everest is Earth's tallest mountain.

The Depth of an Ocean

In the past, it was not easy to measure the **depth** of the ocean. Sailors tied a heavy weight to the end of a rope. Then they let the rope down into the water.

The rope had knots in it. The knots were spaced every six feet. Sailors measured the depth of the water by counting the number of knots as they let the rope down into the water.

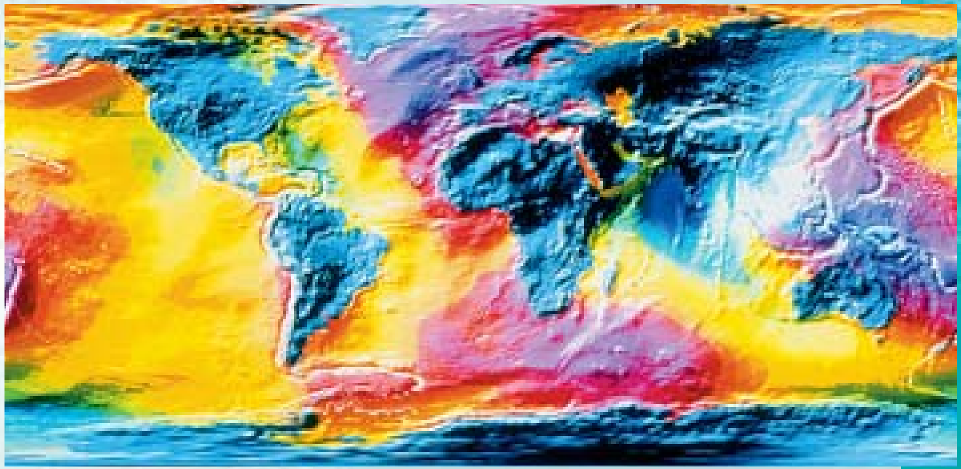
This method of measuring could take many hours. And it wasn't exact because the **tides** raised and lowered the water level!

Many years ago, sailors used knotted rope to measure ocean depth.

Today, scientists use sonar, or sound waves, to measure ocean depth. The sonar sends a "ping" sound to the bottom of the ocean. The ping sound hits the ocean bottom and bounces back to the ship. A timer keeps track of how long it takes the sound to travel down and back.

Sound travels about 5,000 feet per second in water. Knowing that, and using the timer, scientists can tell how far the sound traveled to reach the ocean bottom. That tells them how deep the ocean is.

A research ship uses sonar to measure the depth of the ocean.



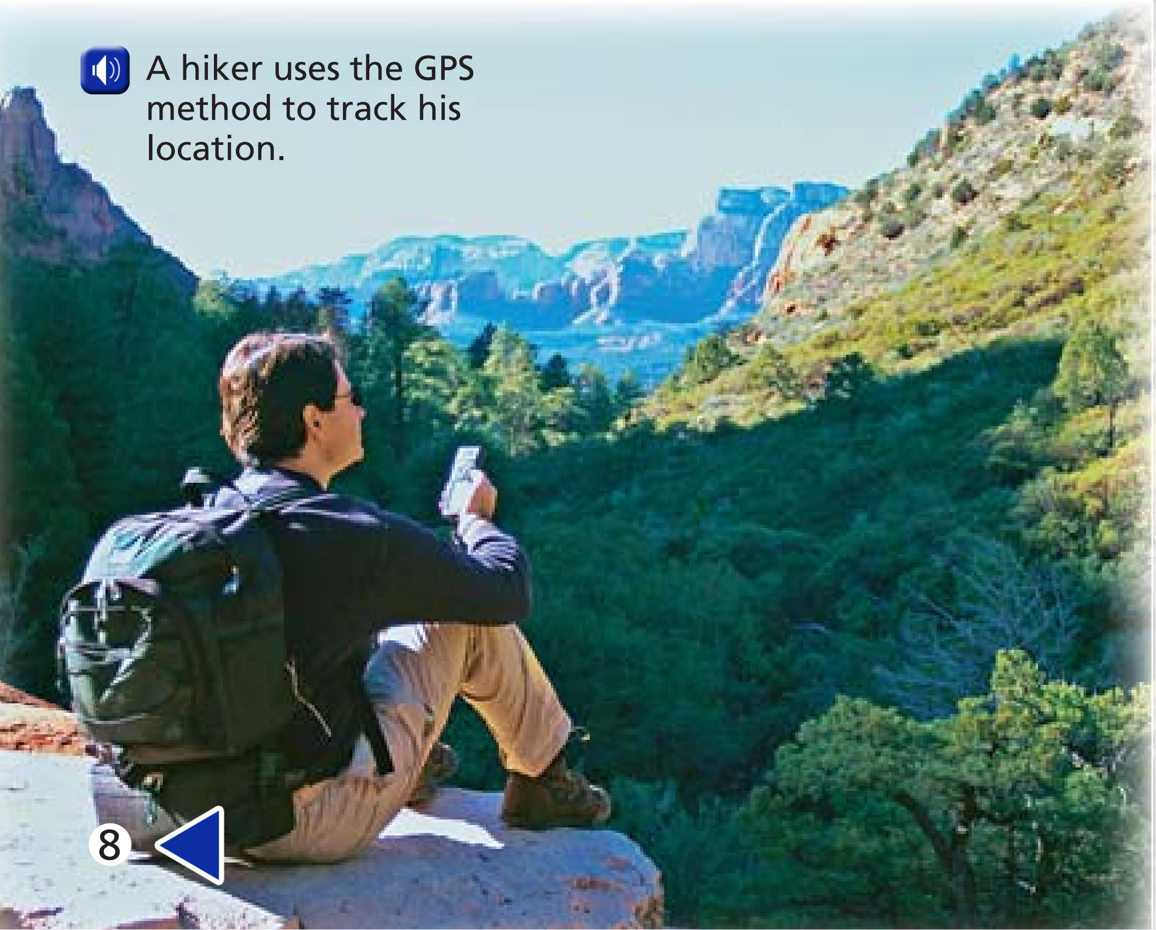
The colors on this map show the different depths of Earth's oceans.

Lost!

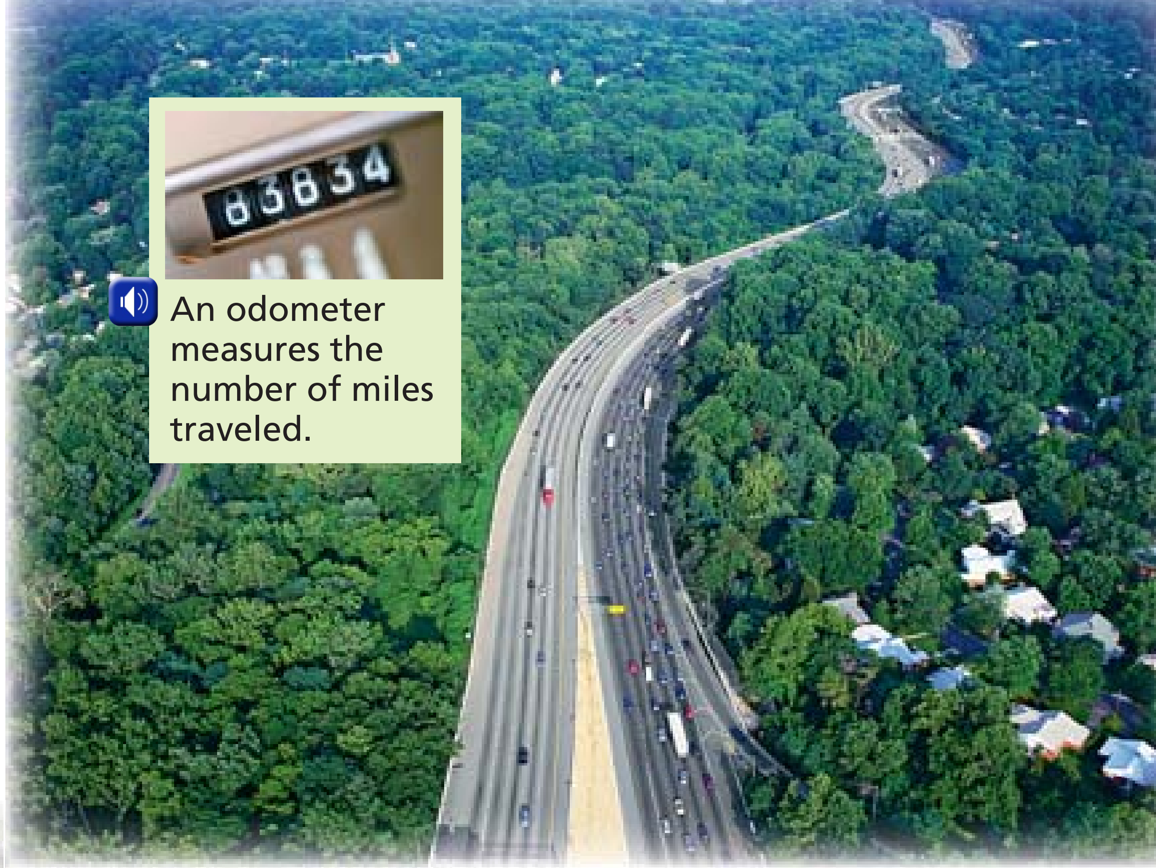
Another modern invention is the Global Positioning System, or GPS. GPS helps people keep track of where they are.

GPS picks up different satellite signals. The system pinpoints the exact place on Earth where those signals meet. That place, or position, is the location of the GPS user.

People who use GPS never have to worry about finding their way out of **deserts.** There's also no need to **outrun** the setting sun. GPS works just fine in the dark!



A hiker uses the GPS method to track his location.



An odometer measures the number of miles traveled.

Are We There Yet?

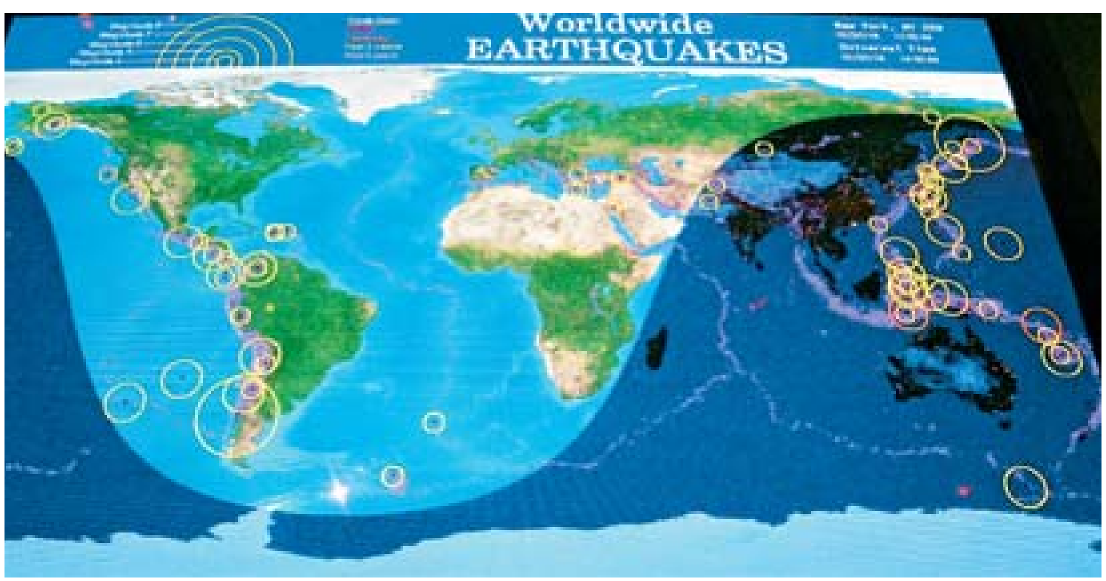
The odometer in a car measures the distance the car has traveled. Suppose that you're driving with your family to see some **waterfalls.** You know that the trip is one hundred miles long. But how do you know how many miles you have driven at each point along the way? The car's odometer can give you the answer!

The odometer is attached to a car's axle. It keeps track of how many times the car wheels rotate, or turn, on the axle. That's how the odometer shows how far a car has traveled.

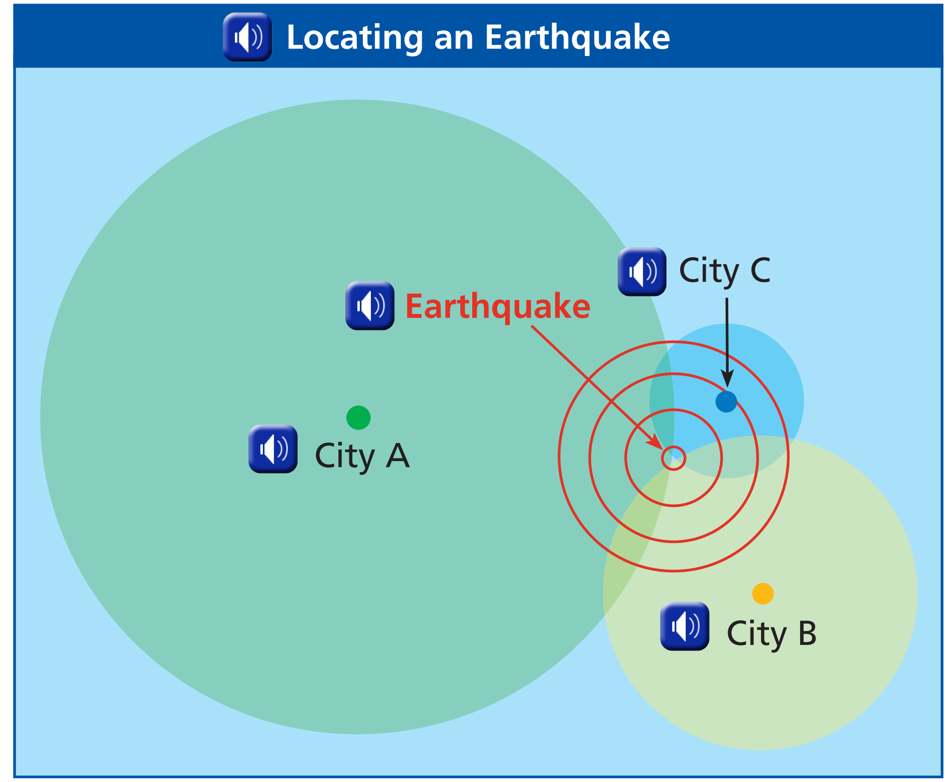
Earthquake!

It's important to measure distances when earthquakes happen. Scientists can pinpoint an earthquake's location by using seismographs, instruments that measure earthquake waves.

An earthquake makes two kinds of waves that travel through the ground. One kind of wave travels faster than the other. By measuring the time it has taken the waves to travel, the seismograph can tell how far away an earthquake happened.



An earthquake screen shows the shaking of Earth's ground.



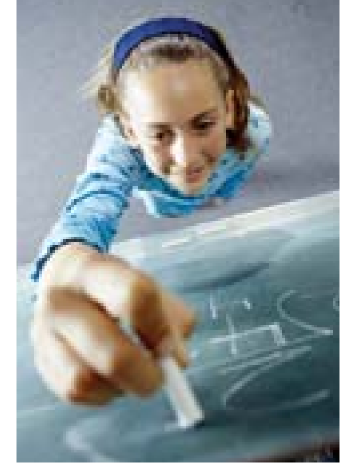
To find an earthquake's exact location, scientists measure the earthquake's distance from three cities. A seismograph in City A shows that an earthquake happened 200 miles away. A seismograph in City B shows that the same earthquake happened 100 miles away. A seismograph in City C shows that the same earthquake happened 50 miles away.

Scientists draw a circle 200 miles out from City A, 100 miles out from City B, and 50 miles out from City C. The spot where all three circles touch is the earthquake's exact location!

Measuring Minerals

There are many natural things that you can measure other than mountains, oceans, and earthquakes. For example, you can measure minerals.

When scientists study a mineral, they measure its size, weight, and hardness. The Mohs Scale is used to measure a mineral's hardness. This scale uses certain minerals as examples of different hardnesses. You can then take other minerals and compare them to the ones on the scale.

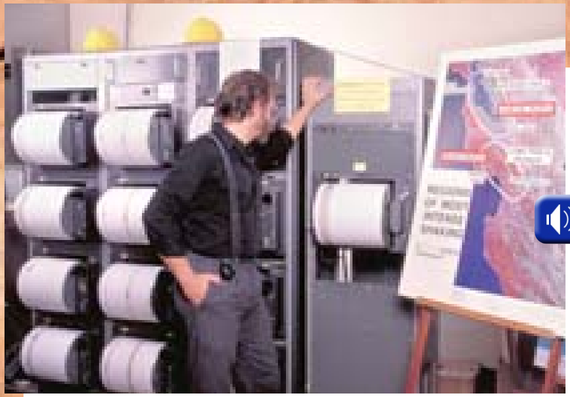


This chalk is made of gypsum, a soft mineral that leaves a powdery streak.

The softest mineral in the world is talc. You can crush it easily in your hand! Because talc is so soft, it was given a 1 on the Mohs Scale.

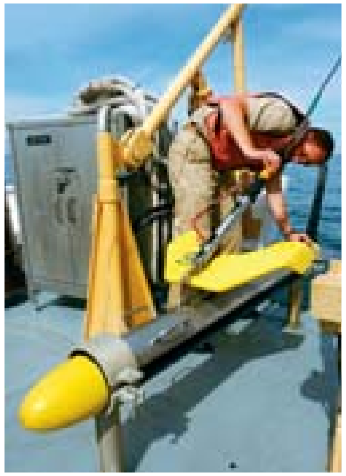
Your fingernail has a hardness of about 2.5 on the Mohs Scale. That means it is harder than both talc and gypsum. A penny has a hardness of 3 on the Mohs Scale. That means it is harder than your fingernail. And diamond, which measures 10 on the scale, is hardest of all!

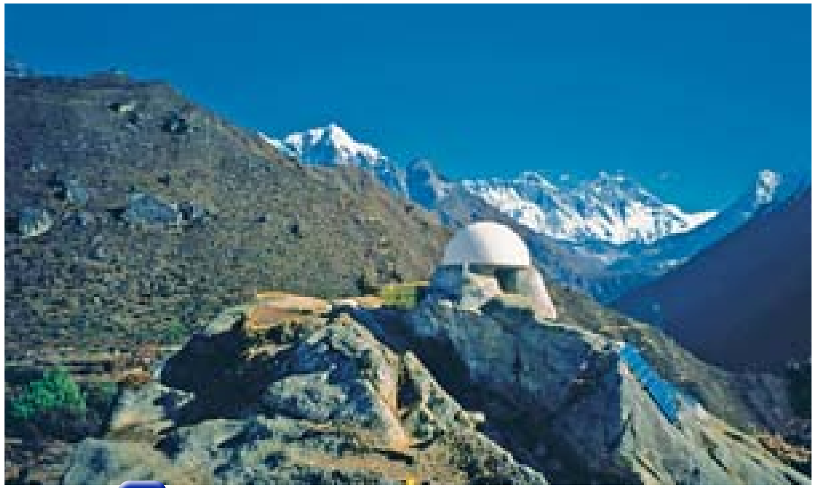
Mohs Scale



A scientist reads a seismograph in a California laboratory.

A fish-shaped sonar instrument can search for objects on the ocean floor.





A GPS station sits on rocks that face Mount Everest in the Himalayas.

Measuring Marvels

People have invented amazing ways to measure things! Our instruments are very good at measuring. But Earth's landforms are always changing. The Himalayas are growing and changing. Volcanoes **erupt** and change mountains too. The depths of the oceans are increasing and decreasing. Because of that, some measurements will always be a little out-of-date.

Even so, our measuring instruments give us a snapshot of many of Earth's measurements as they are right now. They teach us about Earth and clear up mysteries. And scientists are coming up with newer and better measuring instruments all the time!

Glossary

average *n.* The quantity found by dividing the sum of all the quantities by the number of quantities.

depth *n.* the distance from the top to the bottom.

deserts *n.* dry, often sandy, regions without much water.

erupted *v.* burst out violently.

outrun *v.* to run faster than someone or something.

peak *n.* the pointed top of a mountain or hill.

tides *n.* the rising and falling of the ocean about every twelve hours. This rising and falling is caused by the gravitational pull of the Moon and the Sun.

waterfalls *n.* streams of water that fall from a high place.

Reader Response

1. How does the Mohs Scale help you understand how scientists measure the hardness of different minerals?
2. What important ideas did you learn from this book? Why are they important?
3. Find the compound words on pages 8 and 9. Write them in sentences of your own. Use a chart like the one below to write your answers.

Compound Words	Sentences

4. What other questions do you have about Earth now that you've finished this book? Name two places where you can go to find answers to those questions.