LESSON 1

Earth's Changing Crust

Play Video: Introduction

What's happening in Earth's crust?

New Vocabulary

atmosphere the mixture of gases that surrounds Earth

fault a crack in Earth's crust whose sides show evidence of movement

hydrosphere Earth's water, including oceans, lakes, rivers, underground water, and glaciers

lithosphere the hard outer layer of Earth; about 100 km thick

plate one of the slowly moving pieces of Earth's broken crust

tsunami a giant ocean wave caused by an undersea earthquake

Soon You'll Know

Main Ideas

1. **How Earth and its atmosphere are divided into layers**
2. **How Earth's crust moves**
3. **What kinds of changes happen when plates move**

Play Video A: Earth's Layers

Remember In the video you learned about Earth's many layers. The planet may seem simple, but it's got more layers than a deep dish lasagne!

Think about it Earth's **atmosphere** extends more than 600 kilometers above the **planet.** At this height, the **atmosphere** does not have enough oxygen for you to breathe.

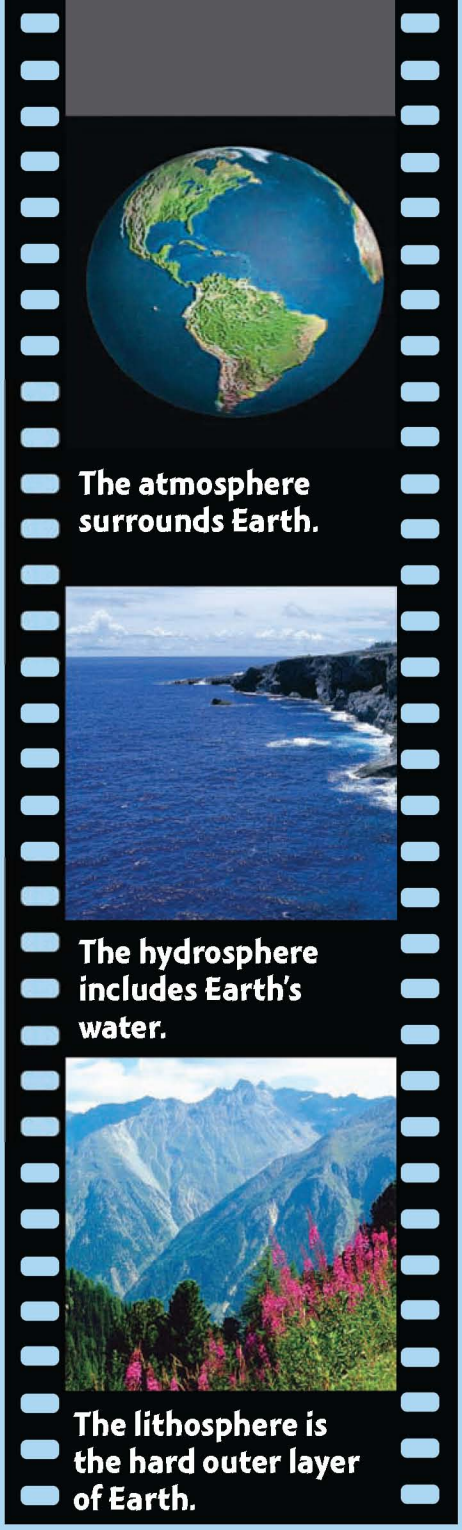
Within 10 kilometers of Earth's surface, you'll find the **troposphere.** Most of the air that makes up the atmosphere is in this layer. The troposphere is also where **weather** occurs.

If you keep dropping down through the atmosphere, you will land on Earth's surface. And because three-fourths of Earth is covered in water, chances are you will get wet! Earth's water layer is called the **hydrosphere.** It includes all the oceans, lakes, rivers, underground water, and glaciers.

Rock Solid

Hitting solid ground means you are entering the **lithosphere.** This hard outer layer includes both the **crust** and the upper **mantle.** Beneath the lithosphere is the inner mantle, where the rock is so hot it's more fluid than solid.

And finally, at the very center of Earth is the liquid outer **core** and the solid inner core.



The atmosphere surrounds Earth.

The hydrosphere includes Earth's water.

The lithosphere is the hard outer layer of Earth.

Now You Know

Main Idea 1: Earth's Layers

Scientists have divided Earth and its atmosphere into many layers including the atmosphere, hydrosphere, and lithosphere.

Play Video B: Plate Movement

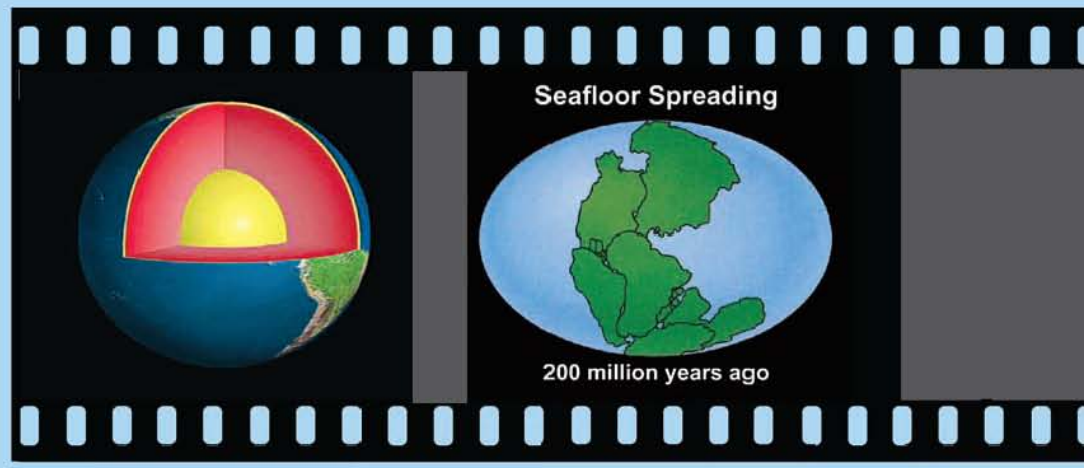
Remember In the video you learned what can happen because of Earth's moving plates. One thing is for sure: Earth's surface is never boring!

Think about it The mantle deep inside Earth is really hot. How hot? It's so hot that the rock material rises much like the water from the bottom of a pot of boiling water. This is called a **convection current,** and it creates upward pressure. Long, long ago, too much pressure made Earth's surface crack like dried mud in the hot sun!

Drifting Plates

The crust of Earth is now broken into **plates.** These plates drift on the surface of the mantle. Even though you can't feel it, Earth's rock-solid surface is slowly but constantly moving!

If pieces of Earth's crust, including the continents, are moving, then the way Earth looks must be changing. And it is. In fact, Earth is slowly changing right now. Millions of years ago, Earth must have looked quite different than it does today. What will it look like millions of years from now?



The crust "floats" on the mantle.

Earth's surface has changed over time.

Now You Know

Main Idea 2: Plate Movement

Earth's crust is separated into plates that are slowly and constantly moving.

Play Video C: Volcanoes and Earthquakes

Remember In the video you learned how volcanoes and earthquakes form. Even though we rarely feel it, it seems there's a lot of rocking and rolling going on beneath our feet!

Think about it As you might guess, when huge plates of solid rock move, big changes are bound to happen. As Earth's plates slowly collide and slide past each other, pressure builds up. Eventually this pressure becomes so great that something's got to give. When the land around a **fault,** or crack in Earth's surface, suddenly moves, the movement causes an **earthquake.**

Earth's crust is broken into plates.

Faults are cracks in Earth's surface.

Moving plates form volcanoes.

Although there are many earthquakes, we don't feel all of them. But some are strong and cause a lot of damage. Earthquakes that happen under the ocean can create **tsunamis.** These huge waves can cause massive flooding. Over many years, plate movements also form volcanoes, mountain ranges, and steep valleys. Earth is always changing.

Now You Know

Main Idea 3: Volcanoes and Earthquakes

Plate movements cause sudden changes such as earthquakes, and gradual changes, such as mountains and valleys.

Build Your Vocabulary

Vocabulary Review

Use the word bank to complete each statement.

atmosphere
fault
hydrosphere
lithosphere
plate
tsunami

1. The layer of gases that surrounds Earth is called the _____.
2. All of Earth's water forms the _____.
3. A crack in Earth's crust whose sides show evidence of movement is a _____.
4. One of the slowly moving pieces of Earth's broken crust is called a _____.
5. The hard, outer layer of Earth's surface is called the _____.
6. A _____ is a giant ocean wave caused by an undersea earthquake.

Word Study: Word Roots

Many parts of science words come from other languages. Those parts are called roots.

The root *sphere* means "ball" in Greek. The vocabulary word *atmosphere* uses this root.

atmo + **sphere** = ***atmosphere***

1. Which other vocabulary words use this root?
2. Think of two more words that use the root word *sphere*.
3. Write the words and what they mean.

Check Your Understanding

Show What You Know

Main Ideas: **Write the answer to each question.**

1. What are the main layers that make up Earth and the area around it?
2. Why is Earth's crust slowly but constantly moving?
3. What kinds of changes can plate movement cause?

Critical Thinking

1. **Analyze** Explain why it's correct to say that forces under Earth shape its surface.
2. **Evaluate** Why do you think it's important to monitor earthquakes that happen under the oceans?

Math in Science

Calculate In an average day, about 8,000 earthquakes occur around the world. But less than one in 100, or $\frac{1}{100}$ of them, are strong enough to do real damage.

- Figure out what percentage of earthquakes cause damage.
- How many earthquakes would cause damage in an average year?

Process Skill Quick Activity

Infer The plate boundaries that circle much of the Pacific Ocean are known as the Ring of Fire. In fact, 75% of Earth's active and dormant volcanoes are located along the Ring of Fire.

Find a map of the Ring of Fire. List the continents that are affected by it. Tell why people who live in the area should be prepared, but not panicked.