The science of earthquakes

By U.S. Geological Survey, adapted by Newsela staff on 02.24.17
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What is an earthquake?

The surface of the earth is divided into different pieces. These are called tectonic plates. When two plates suddenly slip past one another, an earthquake happens. This shakes the ground and everything on it.
What causes earthquakes and where do they happen?

The earth has four main layers. They are the inner core, outer core, mantle and crust. The crust and the top of the mantle make up a thin skin on the surface of the planet. But this skin is not all in one piece. It is actually made up of many tectonic plates. They are like puzzle pieces. These pieces are always sliding around and bumping into each other. Sometimes their edges get stuck together. When this happens, the rest of the plate keeps moving. Eventually the edges come unstuck. That is when an earthquake happens.

Why does the earth shake when there is an earthquake?

Earthquakes send out waves in all directions. When they reach the earth's surface, they shake the ground.

There are different types of earthquake waves. The P wave squeezes and stretches the earth. The S wave shakes it up and down.
How are earthquakes recorded?

Scientists use special tools to record and measure earthquakes. These tools are called seismographs. Recordings from seismographs tell scientists when and where an earthquake took place. The can also tell scientists the size of an earthquake.

How can scientists tell where the earthquake happened?

Scientists can tell where an earthquake took place by studying the P and S waves. This is because P waves are faster than S waves. In a way, the waves are like lightning and thunder. During a storm, you see lightning first. Then you hear thunder. This is because light travels faster than sound. If you are close to a storm, the thunder booms right after the lightning. But if you are far away, it takes longer. You can count several seconds before the thunder. The further away you are, the more time there is between the two.

P waves are like lightning. S waves are like thunder. The P waves shake the ground first. Then the S waves follow. Scientists can count the time between the two. It tells them how far away an earthquake was from a certain place.

Can scientists predict earthquakes?

Scientists know where earthquakes will probably happen. It is more difficult to know when one will occur. Scientists are working on tools to tell when earthquakes will happen. They also have systems to warn people a few minutes in advance. This gives people a chance to find safety before an earthquake hits.
Earthquake Early Warning Basics

1. In an earthquake, a rupturing fault sends out different types of waves. The fast-moving P-wave is first to arrive, but damage is caused by the slower S-waves and later-arriving surface waves.

2. Sensors detect the P-wave and immediately transmit data to an earthquake alert center where the location and size of the quake are determined and updated as more data become available.

3. A message from the alert center is immediately transmitted to your computer or mobile phone, which calculates the expected intensity and arrival time of shaking at your location.
Quiz

1. Which answer choice is a section title?
   (A) "The science of earthquakes"
   (B) U.S. Geological Survey, adapted by Newsela staff
   (C) "What causes earthquakes and where do they happen?"
   (D) "Earthquake Early Warning Basics"

2. Read the caption under the photo at the top of the article.
   According to this caption, what are the people in the photo looking at?
   (A) cracks caused by an earthquake
   (B) scientists studying a P and S wave
   (C) the four main layers of the Earth
   (D) the Earthquake Early Warning System

3. Look at the graphic near the top of the article that shows the layers of the Earth.
   How thick is the Earth's crust?
   (A) 800 miles
   (B) 1,400 miles
   (C) 1,800 miles
   (D) 5 to 25 miles

4. Look at the P Waves and S Waves graphic in the middle of the article.
   What is the FOCUS of this image?
   (A) when P and S waves happen
   (B) how P and S waves move
   (C) what causes P and S waves
   (D) who measures P and S waves