How Earthquakes Take Place

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2017

Depending on where you live, you may have experienced the effects of an earthquake first hand. But what causes these tremors in the earth? In this informational text, Jessica McBirney explores the causes and effects of earthquakes. As you read, take notes on what causes earthquakes and how people are impacted by them.

[1] Depending on where you live, earthquakes may be something you have never thought about, or something you have experienced personally. Earthquakes, whether they are long and rolling or short and violent, are infamous for causing destruction all over the world. But how and why do they happen?

Tectonic Plates

The Earth’s crust is a thin layer of rock and soil that covers the planet, kind of like an eggshell. It is what we walk on every day. However, even though it seems like it is one giant shell (just like an eggshell), it is actually broken up into huge chunks called tectonic plates. So in reality, the Earth’s crust looks more like the outside of a soccer ball than an eggshell.

There are seven large tectonic plates covering the Earth right now, and dozens of smaller plates that fit between them. The places where tectonic plates meet are called fault lines. Fault lines exist all over the world, including along the western coasts of North and South America, the pacific coasts of Japan and the Philippines, and between Europe and Africa, among others.

Friction + Pressure = Earthquake

Tectonic plates are not fixed or stationary. They move, but incredibly slowly. On average, plates move 1-2 inches every year — that’s about the same rate at which your fingernails grow.

However, because the tectonic plates fit together like puzzle pieces, sometimes they try to move past each other but get stuck instead. They stick together because of friction between the plates, but pressure builds up as they try to keep moving. When the pressure becomes stronger than the force of friction, the plates slip past each other, sometimes very violently, and the ground around the pressure point shakes. The slipping, and the shaking that follows, is what we know as an earthquake.

1. Infamous (adjective): famous for something considered bad
Measuring Power

Earthquakes have different intensities, which are measured using the Richter scale. The scale goes between 1 and 10, although it can be difficult to measure earthquakes weaker than a 2.0.

People can usually feel a quake between 3.0 and 3.9 on the Richter scale, but they rarely cause any damage. Almost 50,000 of these quakes happen each year. At about 5.5, earthquakes can rattle objects and cause damage to some poorly-built structures. Earthquakes above a 7.0 can cause some serious damage over a fairly large area, especially if people and buildings are not prepared; about 18 of these happen per year. More powerful quakes are much less common.

The most powerful earthquake on record happened in Valdivia, Chile in 1960. It was measured at an incredible 9.5 on the Richter scale, and was felt in places as far away as Hawaii, the Philippines, and Alaska.

The Dangers of Earthquakes

Earthquakes, especially powerful ones, can cause serious damage to people, land, and property. The shaking ground weakens structures, sometimes so much that they collapse completely. When this happens, building materials such as metal, concrete, bricks, and glass can fall on people below if they have not taken cover. The sudden trauma to the ground can also cause landslides and floods.

One of the most well-known effects of earthquakes are tsunamis. Tsunamis are huge, powerful waves in the ocean that result from earthquakes. They can be thousands of miles long, and they travel vast distances across the ocean at extreme speeds. Some are as high as 100 feet tall, although they are more commonly between 10 and 30 feet tall. Because they are so fast and powerful, they sweep away people, cars, houses, and even whole towns.

The deadliest tsunami on record happened in 2004 after a 9.3 earthquake in Indonesia. The giant wave hit 5 or more countries, including Indonesia, Thailand, and India, and it killed more than 215,000 people.

Preparing for Earthquakes

Scientists cannot predict for certain when or where an earthquake will happen, but we can still be prepared for when they do. Look on a map to see if you live near a fault line. This way you can know how likely it is that you might experience a quake.

One preventative method is to build structures that can withstand the shock of an earthquake. Some areas, especially places near well-known fault lines (such as in California) have building codes to make sure construction workers use strong, shock-absorbing materials and designs. Individuals can also prepare their own homes by bolting down furniture and storing heavy or unstable items closer to the floor.

2. Preventative (adjective): designed to keep something bad from happening
If you ever experience an earthquake, look for secure places that will keep you safe from falling objects. Drop down to take cover under a desk or table, or get under a doorway if possible. Stay away from tippy furniture and windows, which might shatter and send sharp glass flying everywhere. If you are outside, find an open space clear of tall trees or buildings.

[15] There are even some ways to try to avoid a tsunami. Usually people in the area can feel the earthquake that will soon cause the giant wave. If you are near the shore, watch the water. It is common for a tsunami to start sucking in water from a great distance, and you will probably see the water start to retreat right in front of you. When this happens, try to get to higher ground as soon as you can.

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Text-Dependent Questions

Directions: For the following questions, choose the best answer or respond in complete sentences.

1. PART A: Which statement best expresses the central idea of the text?
   
   A. While dangerous, studying earthquakes helps scientists better understand how our planet works beneath the surface.
   
   B. Earthquakes are powerful natural events that impact the world, but it is possible to prepare and take action to remain safe.
   
   C. The unpredictability of earthquakes makes it impossible for scientists to adequately prepare and protect people from them.
   
   D. While earthquakes can be frightening when they occur, the real damage is inflicted by the tsunamis that earthquakes cause.

2. PART B: Which detail from the text best supports the answer to Part A?
   
   A. “On average, plates move 1-2 inches every year — that's about the same rate at which your fingernails grow.” (Paragraph 4)
   
   B. “People can usually feel a quake between 3.0 and 3.9 on the Richter scale, but they rarely cause any damage. Almost 50,000 of these quakes happen each year.” (Paragraph 7)
   
   C. “The giant wave hit 5 or more countries, including Indonesia, Thailand, and India, and it killed more than 215,000 people.” (Paragraph 11)
   
   D. “If you ever experience an earthquake, look for secure places that will keep you safe from falling objects. Drop down to take cover under a desk or table, or get under a doorway if possible.” (Paragraph 14)

3. How do the comparisons in paragraph 2 develop the idea of tectonic plates?
   
   A. The comparisons help make it clear how earthquakes happen.
   
   B. The comparisons make it easier to understand what the Earth's crust is like.
   
   C. The comparisons show how the Earth and each of its plates have many layers.
   
   D. The comparisons illustrate the different parts of the tectonic plates.

4. How do paragraphs 14-15 contribute to the development of ideas in the text?
Discussion Questions

Directions: Brainstorm your answers to the following questions in the space provided. Be prepared to share your original ideas in a class discussion.

1. What do you think is the most important thing to understand or know about an earthquake and why?

2. Have you ever experienced an earthquake or had an earthquake drill? What did you have to do in response to the earthquake or earthquake drill?

3. How does the text explore the power that nature has over humans? How do humans attempt to resist nature's power? Cite examples from the text, your own experience, and other literature, art, or history in your answer.