mystery science

Grades K-5
Mini-Lesson: “How do earthquakes happen?”

VIDEO TRANSCRIPT

VIDEO 1

[Video Call]

- Hi, Andi!
- Hi, Doug!
- I have a question for you. How do earthquakes happen?
- Ooh, that's a great question.

When an earthquake happens, it happens very suddenly, and things can get scary. I didn't grow up anywhere that had earthquakes, but now that I live in California, I've definitely felt a few. This footage I'm showing you can give you a sense of what an earthquake is like—the whole ground beneath your feet is moving. Everything around you starts swaying back and forth, sometimes, things on shelves and ceilings fall. But what causes earthquakes to happen? Maybe you've even heard some ideas about this before.

VIDEO 2

One of the things that makes this question so interesting, is that it's really not obvious what could be causing the whole ground like that to shake. Sometimes the ground even cracks. And because strong earthquakes are so terrible and destructive, a long time ago some people thought that earthquakes must be a sign of an angry God. For example, some of the Ancient

Greeks believed that earthquakes were caused by Poseidon, the God of the sea, striking his trident in anger against the seafloor and shaking the land.

Other people thought, "That can't be the answer, there must be something in the ground itself—maybe some kind of underground explosion caused by volcanoes, or something." Scientists were determined to figure out the answer. The next time an earthquake happened, they decided that they would pay very careful attention and look for any kind of clues.

In the year 1906, they got their chance. The area in and around the city of San Francisco, California experienced one of the worst earthquakes it's ever felt. The ground shook for nearly 45 seconds non-stop. Buildings fell apart and toppled over. Like any strong earthquake, there was a huge amount of damage.

But one kind of damage seemed especially strange. A section of fence that, during the earthquake, had somehow been split and moved more than eight feet in this direction. That was interesting enough, but then reports came in of other fences split just like this. As more and more of these reports came in, very soon, a pattern was noticed. All the places where fences that were split could be connected in a line. And in each place, the fences had moved about the same distance. It was as if one entire section of land, the land on this side of the line, had moved forward in relation to this other section of land, the land on this other side of the line.

This split, or line, in the land like this, is what scientists today call a *fault line* or *fault*. The one in California was one of the first ones to be named—the *San Andreas Fault.* But there are fault lines all over the world, especially in these places. And all of these places are the same places that regularly experience earthquakes.

Today, scientists have collected lots of evidence that the surface of the Earth is made of several different sections—some of them pushing against each other. For the most part, most of the time as two sections push against each other, nothing happens. We think this is usually because the two sections of land are jagged, fitting together like a puzzle piece. So, as they push against each other, they stay locked together.

But, every once in a while, the pressure becomes too great, and that jagged lock suddenly gives way, causing both sections of land to move. This explains why fences built across the San Andreas Fault were offset by several feet during the 1906 earthquake. But, more importantly, two entire sections of land suddenly moving like that would cause the ground—and everything built on top of it to shake violently—this is what happens during an earthquake.

By itself, just the fact that the ground shakes isn't that dangerous. It's when the shaking causes entire buildings and houses to start swaying back and forth—that's when people can get hurt. Like if they're hit by falling objects, or worse if a building itself were to collapse.

That's why scientists and engineers work hard to find ways of making buildings stronger and less likely to collapse during intense shaking. They've come up with a lot of solutions such as by building metal braces that keep buildings together—even if they get rocked back and forth violently. Still, there are plenty of old houses and buildings where they haven't been updated yet to have these special features. And there's always the risk of objects falling, which is one reason why it's so important to duck and cover, such as under a table, during an earthquake.

Even though most scientists feel like we have a pretty good understanding of how earthquakes happen, no one has been able to figure out yet when they're going to happen. No one has the

ability to predict earthquakes, at least not yet. That's one of the big questions for the future that will be amazing if it can be solved. Maybe one day, you or someone you know will be the person to figure it out.

That's all for this week's question. Thanks, Andi, for asking it!