THE GEO-SAMPLER

Geotechnics
geotechnical & geosynthetic testing

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When you spend as much time in the lab as we do—and okay yes, in the breakroom, too—conversations take a lot of interesting twists and turns. So when recent news about an earthquake led to a robust discussion about the hows, whats and whys of earthquakes, well, we had to dig a little deeper. Being as into geotechnical stuff as we are, we found this info pretty moving. Hope you do, too.

"I fear one day I'll meet God; he'll sneeze, and I won't know what to say."

WHOLE LOTTA SHAKIN' GOING ON

According to NASA, an earthquake is "an intense shaking of Earth's surface." Also known as a quake, it's more specifically the shaking of the surface of the Earth resulting from a sudden release of energy in the Earth's lithosphere that creates seismic waves. Earthquakes can range in intensity, from those that are so weak that they cannot be felt, to those violent enough to propel objects and people into the air, damage critical infrastructure, and wreak destruction across entire cities. (You've likely seen a movie that put the fear of tremors into you.) The seismic activity of an area is the frequency, type, and size of earthquakes experienced over a particular time. Some places on Earth are more shaky than others.

Here in the U.S., the San Andreas Fault is one of the more well-known earthquake locations. But, it turns out that the San Andreas Fault is NOT actually a single, continuous fault; actually it's a fault zone made up of many segments and movement may occur along any of the many fault segments at any time. The full San Andreas fault system is more than 800 miles long, and in some spots is as much as 10 miles deep. Which is quite a bit larger than San Andreas Lake, the oft-cited origin for the fault's name. However, based on some 1895 and 1908 reports by geologist A.C. Lawson, who named the fault, the name was actually taken from the San Andreas Valley. He likely did not realize at the time that the fault ran almost the entire length of California. Ahh, to have the benefit of hindsight!

But before we get ahead of ourselves with a whole collection of fun facts about faults, let's take a moment to understand how earthquakes happen. The Earth's tectonic plates are always slowly moving, but sometimes, they get stuck at their edges due to friction. When the stress on the edge overcomes the friction, an earthquake releases energy in waves that travel through the Earth's crust and cause the shaking that we feel. You know, as Carole King so accurately sang, "I feel the earth move under my feet."

But first, let's talk plates

In California, there are two plates: the Pacific Plate and the North American Plate. The primary boundary between these two is, you guessed it, the San Andreas Fault. The Pacific Plate grinds northwestward past the North American Plate at a rate of about two inches per year. (At least as of the past three million years). This is about the same rate at which your fingernails grow. Assuming this rate continues, scientists project that Los Angeles and San Francisco will be adjacent to one another in approximately 15 million years. Should make for an interesting baseball game between the Giants and the Angels.

How do they measure up?

As students of testing and measurements, we are fans of the Richter Scale, which measures the magnitude of earthquakes. Developed in 1934 by Charles F. Richter, it uses a formula based on the amplitude of the largest wave recorded on a specific type of seismometer and the distance between the earthquake and the seismometer. We love a good formula and Chuck's has really been able to stand the test of time.

The largest recorded earthquake in the United States was a magnitude 9.2 that struck Prince William Sound, Alaska on Good Friday, March 28, 1964. The largest recorded earthquake in the world was a magnitude 9.5 in Chile on May 22, 1960. We always knew the 60s were an era of moving and grooving and this is scientific proof.

PUNISHMENT

I've started telling everyone about the benefits of eating dried grapes. It's all about raisin awareness.

I've started investing in stocks: beef, vegetable, chicken. One day I hope to be a bouillianaire.

If you boil a funny bone, it becomes a laughing stock. Now that's humerus.

I accidentally rubbed ketchup in my eyes. Now I have Heinzsight.

Once upon a time there was a King who was only 12 inches tall. He was a terrible King but he made a great ruler.

Singing in the shower is fine until you get soap in your mouth. Then it's a soap opera.

Then there was the time Fruit of the Loom took Hanes to court... it was a brief case.

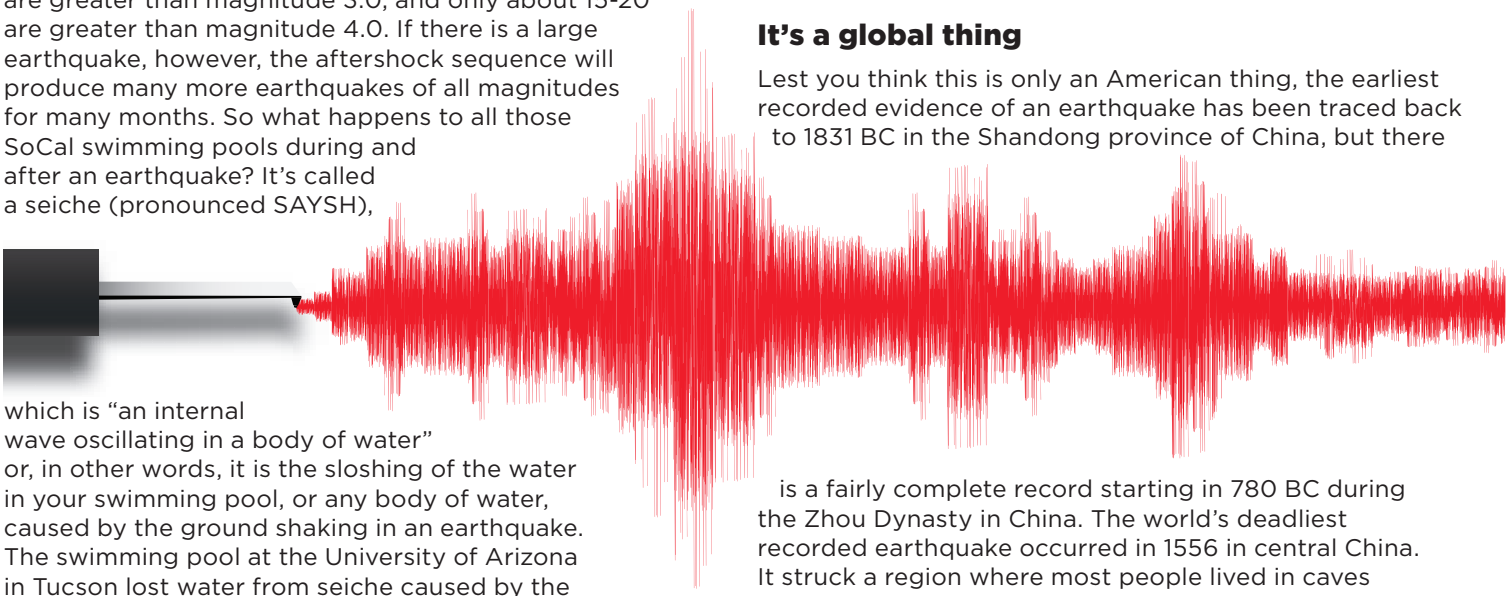
How much does a chimney cost? Nothing, it's on the house.

I was struggling to understand how lightning works and then it struck me.

I went to the paint store to get thinner. It didn't work.

Shaking and sloshing?

Southern California experiences about 10,000 earthquakes a year. Most are so small, they aren't felt. Several hundred are greater than magnitude 3.0, and only about 15-20 are greater than magnitude 4.0. If there is a large earthquake, however, the aftershock sequence will produce many more earthquakes of all magnitudes for many months. So what happens to all those SoCal swimming pools during and after an earthquake? It's called a seiche (pronounced SAYSH),



which is "an internal wave oscillating in a body of water" or, in other words, it is the sloshing of the water in your swimming pool, or any body of water, caused by the ground shaking in an earthquake. The swimming pool at the University of Arizona in Tucson lost water from seiche caused by the 1985 M8.1 Michoacan, Mexico earthquake, which was a full 1,240 miles away!

So this is just a California thing, right?

Alaska is the most earthquake-prone state and one of the most seismically active regions in the world. The northernmost state experiences a magnitude 7 earthquake almost every year, and a magnitude 8 or greater earthquake on average every 14 years. Florida and North Dakota have the smallest number of earthquakes in the United States. So consider these facts as you plan the location of your retirement home.

It's a global thing

Lest you think this is only an American thing, the earliest recorded evidence of an earthquake has been traced back to 1831 BC in the Shandong province of China, but there is a fairly complete record starting in 780 BC during the Zhou Dynasty in China. The world's deadliest recorded earthquake occurred in 1556 in central China. It struck a region where most people lived in caves carved from soft rock. These dwellings collapsed during the earthquake, killing an estimated 830,000 people. In 1976, another deadly earthquake struck in Tangshan, China, where more than 250,000 people were killed.

So if you, like us, still have bad dreams about the 1974 action thriller, *Earthquake,* you may also want to strike China from your retirement location plans.

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