Directions:

1. Mark your confusion.
2. Show evidence of a close reading. Mark up the text with questions and/or comments.
3. Write a one-page reflection on your own sheet of paper.

Five Myths About Earthquakes

Source: Susan Hough, *Washington Post*: August 26, 2011

Earthquakes rattle our psyches as well as our structures. We Californians can crack jokes about jumpy East Coast types, but the truth is, our blood pressure also rises precipitously when the Earth suddenly springs to life, without so much as a warning.

Events such as this past week's magnitude-5.8 earthquake centered in Virginia, which shook up lots of people without inflicting tremendous damage, offer a good wake-up call: They provide a chance to consider our response and preparedness plans, and to reconsider what we really know and don't know about earthquakes.

1. Animals sense impending earthquakes.

A golden oldie. The notion that animals anticipate impending earthquakes predates the birth of Christ, with documented references to unusual animal behavior as early as the 4th century B.C. This belief was fueled recently by accounts, including one in The Washington Post, that some animals at the National Zoo had their knickers in a knot just before Tuesday's quake.

This notion could contain a kernel of truth: Being generally squat, four-legged, close to the ground and inclined to sit still, an animal might feel an initial weak shaking that goes unnoticed by humans until stronger waves arrive. But also, it is an example of a natural human tendency to look back in time for anomalies, or precursors, that supposedly heralded the coming quake. Every pet owner understands that, say, cats and dogs sometimes behave strangely for no apparent reason; that's what cats and dogs do. And if an earthquake had not subsequently struck, you can bet we would not be talking about strange animal behavior this week — because we wouldn't have noticed anything out of the ordinary. As far as we understand, animals, like humans, have no ability to predict earthquakes.

2. The frequency of large-scale earthquakes has spiked.

With so many earthquakes in the news recently — such as those in Haiti, Chile and Japan — it seems that the frequency of big temblors is on the rise. Here again, there is an element of truth: Since the magnitude-9.3 Sumatra-Andamans earthquake struck just after Christmas in 2004 and unleashed a tsunami in the Indian Ocean, the Earth has experienced more great quakes, with magnitudes near or above 9.0, than the historical average.

Yet the frequency of tremors across the world always fluctuates considerably from year to year. And the energy released by big earthquakes since the end of 2004 was less than the energy released by the two biggest recorded earthquakes: the 1960 temblor in Chile and the 1964 Good Friday quake in Alaska. The number of earthquakes greater than magnitude 7.0has been somewhat high in recent years but well within the range throughout the 20th century.

A more concerning trend is illustrated by the 2010 Haiti earthquake: This one had a devastating toll despite its relatively modest magnitude because of a prevalence of poorly built structures and a densely packed population. As both population and urbanization expand in developing nations, many more people are in harm's way. So even if the frequency of quakes is not expected to change significantly, the toll they exact is likely to keep rising.

3. Small earthquakes are helpful because they release pressure and prevent larger ones.

The earthquake magnitude scale, introduced by Charles Richter in 1935, is logarithmic, which means that progressively bigger quakes are a lot bigger than smaller quakes. For each unit increase in magnitude (i.e., going from 5.5 to 6.5), the energy released rises by a factor of about 30 — meaning that a two-unit increase translates into aquake that is nearly 1,000 times as severe. If enough stress has built up on a fault to generate a magnitude-7.0 earthquake, say, it would thus take about 1000 earthquakes with a magnitude of 5.0 to release the equivalent energy. The Earth doesn't work that way.

In any given area, the numbers of tremors of different magnitudes almost always follow a simple mathematical progression, with about 10 magnitude-6.0 quakes and about 100 magnitude-5.0 quakes for every single magnitude-7.0 quake. Thus, if there is significant strain energy to be released, it must be released in large earthquakes.

4. "Don't worry, it was just an aftershock."

One of the first questions that seismologists in California often get about an earthquake is whether it was a new quake or an aftershock. The implication is that an aftershock is somehow a less worrisome event.

Yet, as far as we understand, an aftershock of a certain magnitude is no different from an independent temblor of a similar magnitude. The shaking and rupture are the same; the energy released is the same. And aftershocks can be more damaging than larger "mainshocks" if they strike closer to population centers. This lesson was illustrated with the earthquake that struck Christchurch, New Zealand, in February — an aftershock of a larger but less-damaging quake that occurred the previous September.

Recent studies show that any earthquake — even an aftershock — has the same small statistical chance of triggering a larger tremor. So a single quake can potentially be an aftershock and a foreshock, further clouding the differences among them.

5. Earthquakes are a West Coast problem.

The West Coast of North America is more seismically active than the mid-continent and east; the San Andreas fault, the main boundary between the Pacific and North American plates, runs nearly the full length of California. To the north, the ocean seafloor sinks beneath the Pacific Northwest, giving rise to the Cascades volcanic range, and occasional huge earthquakes.

But, as millions of people on the East Coast were just reminded, less active does not mean inactive. By the end of the 19th century, two of the most notable temblors in the United States were the 1886 quake in Charleston, S.C., and a sequence of large events centered near the boot-heel along the New Madrid Fault of Missouri in 1811-1812.

We don't know exactly when or where the next Big One will hit the United States, but the central and eastern United States will inevitably experience large quakes in the future. And because of the relatively homogenous nature of the Earth's crust in central and eastern North America, earthquake waves can travel much more efficiently there than through the more fractured, hotter crust in the West. So when a quake hits the central or eastern United States, it is likely to inflict greater damage — and be felt more widely — than a California tremor of the same magnitude. You have been warned.

Reflection ideas:

- What can you and your family do to be better prepared for an earthquake? (See www.sdcounty.ca.gov/oes/docs/family.pdf)
- Explore other things you have heard about earthquakes to determine if they, too, are myths