**Overview**

Picture it. You're sitting on the sofa watching another fun-packed episode of Newton's Apple when out of nowhere, you hear a dull roar. The room starts to shake, pictures fall off the wall, and for a few seconds it seems you've lost your sense of balance. Suddenly, all is quiet. Was it an explosion? Did a truck crash into your house? Finally, the announcement comes over the television--you have just survived an earthquake. Could this really happen to you? If you live in California, it happens fairly often. But what if you live in places like North Dakota, Florida, or New York? Are you safe? Well, don't get too comfortable. Earthquakes can happen in many places, although they are concentrated in certain areas. An earthquake occurs when two parts of Earth's lithosphere slide past, away from, or into each other. According to current theory, Earth's surface is made up of many large slabs of crust called plates, which ride like giant rafts on semifluid rock below. Geologists believe that the plates are driven by large convection currents created by heat generated deep within Earth by the radioactive decay of certain elements. While most earthquakes happen at plate boundaries, some occur in the middle of a plate. Just as the continents have moved, plate boundaries have also changed. Over the years, Earth's lithosphere has been split up and put together many times, leaving millions of scars or faults. Many of these old faults are static, but every so often stresses build up because of rock movement in the mantle, causing a fault to rupture and an earthquake to occur. Today, geologists use two different scales to measure how strong an earthquake is. The Richter scale measures the actual size (or amplitude) of the wave generated by a particular earthquake on a seismograph. This is an indirect measure of the amount of energy released by the earthquake. A one-point increase on the Richter scale equals a tenfold amplitude of wave increase, which equals approximately 32 times more earthquake energy. A second type of scale, the modified Mercalli intensity scale, measures the amount and type of damage that earthquakes do to buildings and other structures, and their effects on humans. Because of these differences in measurements, an earthquake with a low Richter magnitude reading that occurs in a densely populated area like Los Angeles can actually have a higher Mercalli value or intensity than a high-magnitude quake in a desolate region like Antarctica.

* What do you think would happen to your community if it were hit by a Richter magnitude- 8 earthquake?
* What structures would be damaged?
* What evacuation plans could you make?
* How could you earthquake-proof your classroom?

**Activity**

One of the main causes of damage in an earthquake is the collapse of buildings not strong enough to withstand the shaking. Engineers and architects try to design buildings rigid enough to withstand the shock, but flexible enough to give a little under the stress. By building and testing different models, you can "shake down" ideas and see which one "stands" the test of time. *Groups whose buildings do not collapse will receive 5 bonus points on the Chapter 21 exam!*

**Materials**

* 40 coffee stirrers or cocktail straws
* 20 drinking straws
* 40 mini marshmallows
* a meter stick
* 1 piece of cardboard to build structure
* a pair of scissors
1. Ms. Price has built the shake tray for your structures.
2. Using the marshmallows and straws (or stirrers) as building elements, assemble a structure that measures AT LEAST 50 cm high. (be sure to make it no wider than the shake tray)
3. When you are satisfied with your structure, notify Ms. Price. Place the structure on the middle of the shake tray and see how it stands up to your quake. Try building several different designs to see if one particular shape stands up better than the rest.



**Questions**

1. What structural shapes seem to survive quakes best? Can you think of any existing buildings that use this type of design?
2. Do you think that it is possible to build an earthquake-proof structure? Why or why not?
3. What do you think would happen to your community if it were hit by a Richter magnitude- 8 earthquake?
4. What structures would be damaged?
5. What evacuation plans could you make?
6. How could you earthquake-proof your classroom?
7. What are the pros and cons of releasing earthquake predictions to the public?

**Resources**

* Bolt, B. (1993) Earthquakes (3d. ed.). New York: W. H. Freeman.
* Coch, N. & Ludman, A. (1991) Physical geology. New York: Macmillan.
* Davidson, K. (1994, May) Predicting earthquakes. Earth Magazine, pp. 56-63.
* Earthquakes. (1989) Educational materials produced by NSTA and FEMA. To order, phone
(800) 722-NSTA.
* Robinson, A. (1993) Earth shock. London: Thames & Hudson.
* Ross, K. (1992, Fall) Shake tables in the classroom. Science Teachers Bulletin, pp. 20-
25.
* 3-2-1 Classroom Contact videotape: Earth is change. GPN: (800)
228-4630.