The Balance of Nature
Is Our World Washing Away?

Rain and wind are eroding the hills, mountains, and coastlines of the earth's crust. Studying these forces, one could expect that any land left above sea level would eventually be rather flat. However, other earth-shaping forces are at work, changing the earth's surface and maintaining a balance.

Over long periods of time, the moving plates of the earth's crust cause large areas of the earth to change. Mountains are pushed up and deep valleys are formed as plates converge and diverge. Erosion may flatten one area of our planet, but other areas rise to keep a balance.

As erosion reduces the amount of land area, especially along coastlines, more land is formed by volcanic activity and by the uplifting caused by convergent plates. Examples of folded rock layers can sometimes be seen where roads have been cut through hills and mountains. With this destruction of the old and creation of the new, once again a balance is maintained on the surface of the planet.

Whose Fault Is It?

The movement of the earth's plates can cause pressure to build up in the rocks of the lithosphere. This stress and strain can cause the layers of rock to fold. Sometimes, the pressure is so great that the rock layers crack. This crack, or fracture, in the rocks is called a *fault.*

Faults can be classified by the way the rock layers move. A vertical fault is created when one segment of rock moves up higher than the segment next to it. Vertical faults can result in the formation of cliffs. A horizontal fault is formed when rock layers slide along side each other. Horizontal faults can cause rivers to change their courses or roads to change their positions.

Sometimes rock layers fold without fracturing or breaking. They may warp in one direction or another. This warping may cause mountains to rise. Some examples of folded mountains are the Alps and the Appalachians.

Earthquakes that occur along these faults change the earths's surface in yet another way. They cause the liquification of the soils. The vibrations from the earthquake cause soil with a high water content to liquify. The soil becomes something like quicksand or very soft mud. Hillsides, rocks, trees, and even buildings found on these suddenly soft soils may come tumbling down.

Name _____ Date _____

For the student:

1. How does erosion affect mountainous areas?

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2. Is the land mass of the earth shrinking?

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3. Why doesn't the land mass of the earth all wash away?

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4. What causes the earth's crust to fold?

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5. Are there any examples of exposed rock layers that show folding in your area? Where are they?

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6. What are two types of fault movement?

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7. What causes rock layers to fracture?

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8. How were the Appalachian Mountains formed?

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9. What are two factors that cause soil to liquify?

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10. What type of fault movement can cause cliffs to form very suddenly?

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Show and Tell
Recording Earthquakes

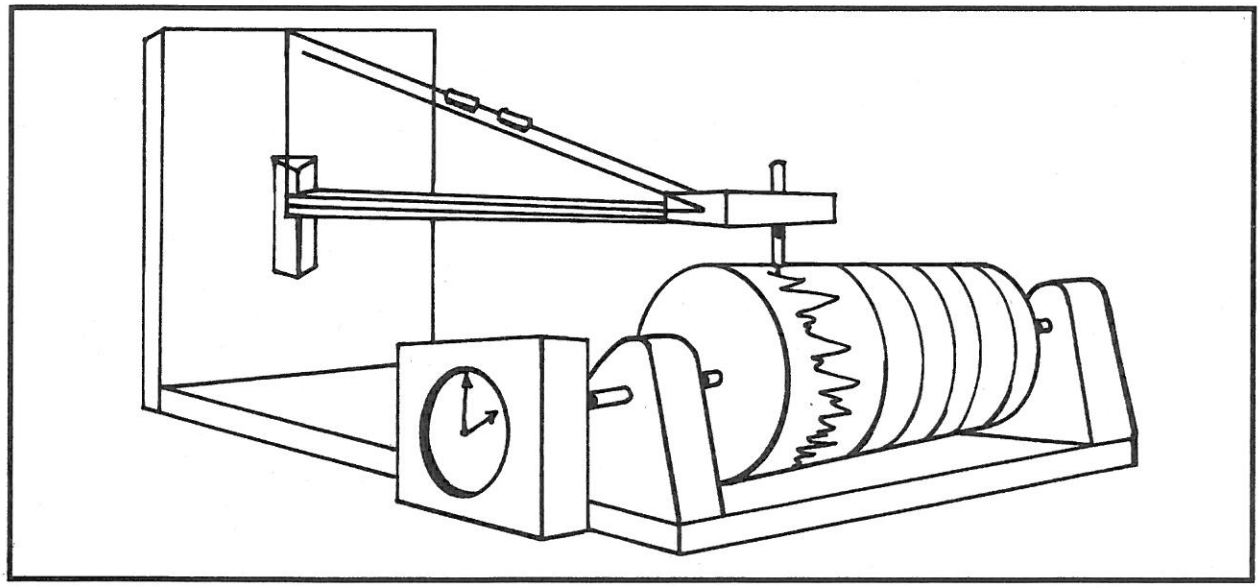
We all have equipment we use for the many jobs we do. In school we have pencils and pens for writing our assignments. We also have erasers for helping us correct the mistakes we make from time to time. We have calculators to help us with complicated math problems and rulers to help us measure distances accurately. Scientists have many types of equipment, too. They have equipment that has been specially designed to help them record earthquake activities.

A seismograph is an instrument used to record earthquakes. From 1880 to 1890, British scientists were working in Japan, studying earthquakes. They developed the first seismographs. John Milne developed the most well-known one. His model was a horizontal pendulum.

Pendulum seismographs depend on the principle of *inertia.* According to this principle of physics, when a heavy weight is allowed to move freely, it will tend to remain in its original position, even when the ground underneath it is moving. Pendulum seismographs hang a heavy weight from a support. The support is anchored to a base that is set upon a stable surface such as bedrock. Attached to the weight is a pen-like device. Just beneath the pen is a drum that rotates. The drum is attached to the base, as is the support. A paper is placed on the rotating drum. The pen just touches the paper and is able to record any movement.

When the earth moves, the seismograph's base will move. The support will move along with the base. The drum will also move. The heavy weight, however, does not move. The pen leaves ink marks on the paper as the earth moves. When there is little movement, the pen lines will be close and short. When there is greater movement, the lines will be longer.

With increased knowledge and advanced technology, newer seismographs have been developed. Today computers are providing useful information about the exact locations of earthquakes and their strengths.



A pendulum seismograph

Name _____ Date _____

For the student:

1. What instrument do scientists use to measure earthquake activity?

2. When was the first of this type of instrument developed?

3. What principle of physics was used in developing this type of instrument?

4. What did John Milne do?

5. Why were British scientists in Japan from 1880 to 1890?