



**just in case arizona**

## **Build Your Own Seismograph**

With a few materials and some time, you can build your own seismograph.

To do this activity you need to understand how a seismograph works. A typical seismograph works in a very simple way:

- A heavy weight is fastened to a horizontal rod as shown in the diagram. This rod hangs from a pole and is free to swing from side to side when the ground shakes.
- At the other end of the rod (away from the pole) is an ink pen, and directly underneath the pen is a piece of paper rolled around a cylinder.
- This cylinder rotates so that the pen continuously draws an ink line along the moving paper.

If the ground does not move, the rod does not swing, and the pen stays in place, so the ink line is smooth and straight.

If the ground shakes, however, the rod swings and so the pen draws a zigzag line as the paper turns. The stronger the shaking, the sharper the zigzags. This zigzag picture made on the paper roll is called a seismogram.

Ever since people first became curious about earthquakes, they have tried to design some kind of seismograph. How would you make one?

### **Project 1: Your Own Design**

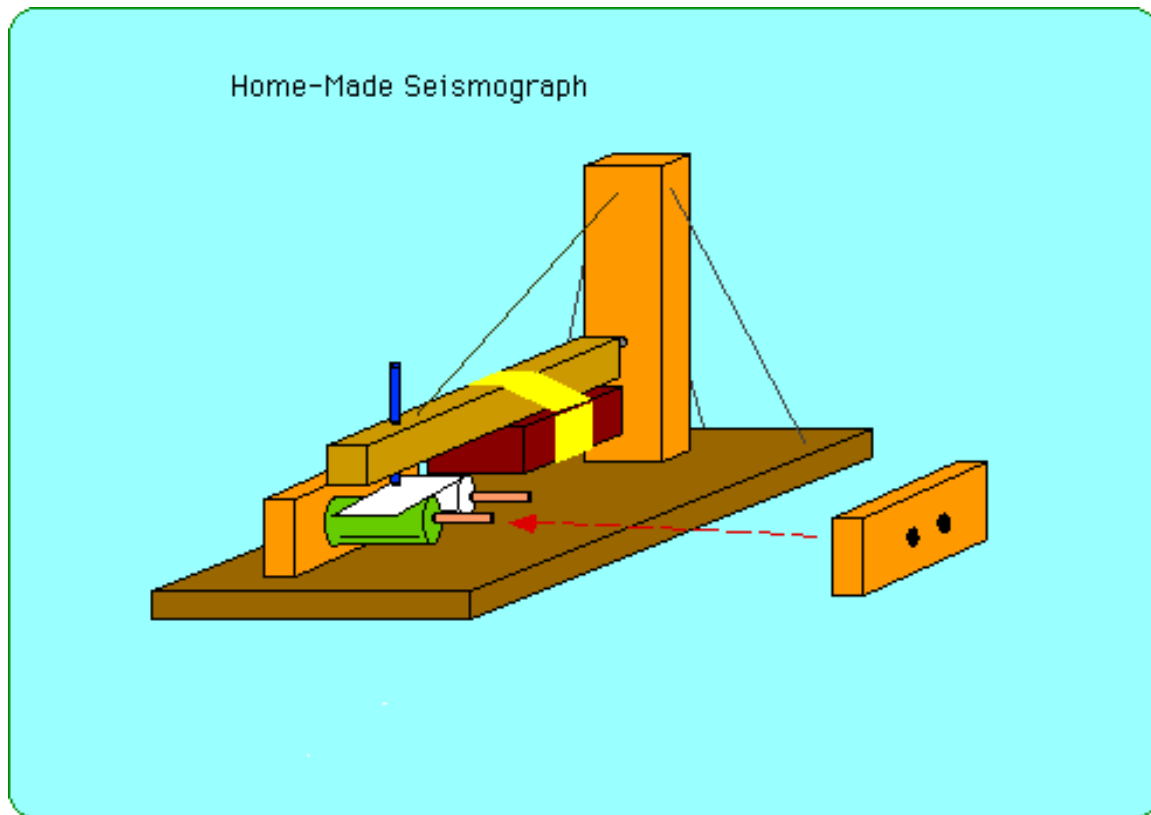
1. Think of a creative but effective way to measure the seismic waves (shock waves) from an earthquake. Draw a clear diagram that shows and labels all parts. Then write a paragraph explaining how your design works.

A good design would be:

- made of common inexpensive materials found in a local store;
- able to determine the relative magnitude (size) of each vibration it measures;

- able to measure vibrations continuously for at least one minute; and
  - able to measure even slight vibrations (such as a person jumping up and down next to your seismograph).
2. Gather the materials you need and build the seismograph you designed. Be prepared to show other students how your device works.

### Project 2: Try This Recipe



This seismograph can be built with some simple materials. Dimensions are approximate -- you might be able to vary them or even modify the design.

- Wood base (10 in x 24 in x 0.5 inch)
- Wood stand (2 in x 4 in x 12 in)
- Two wood support blocks (2 in x 4 in x 8 in)
- Wood beam (1 in x 1 in x 20 in)
- Two wood dowels (diameter = 0.25 in, length = 10 in). 1 dowel must slide through center of adding machine paper roll.
- Brick or other compact heavy weight
- Strong wire, or non-elastic thick rope or twine (7 feet)
- Roll of adding machine paper (width  $\geq$  2 in)
- Smooth-sided can with lid and base (similar dimensions as paper roll)
- Round-headed screw or bolt or nail (1 in long)

- Pen
- Various sizes of nails
- Masking tape, strapping tape or duct tape

Build the seismograph according to the diagram. Here are some important steps, and/or modifications you may need to consider:

- If you have a drill, you can mount the two wood dowels in holes drilled through the two wood support blocks. If you do not have a drill, saw two slots into the upper edge of each wood support block and then drop the dowel into these slots.
- The pen must write easily when pulled down onto the paper roll by the brick. Cap it when not in use. You may try substituting a soft lead pencil, a charcoal pencil, a crayon, etc.
- Fasten the wood stand securely to the wood base by nailing upward from underneath the wood base. The wire (or cord) attached to the back and side of the wood stand will help to keep it stable.
- Fasten the screw securely into one end of the wood beam. This screw will rest against the wood stand so that the wood beam hangs level over the base. To help the screw stay in place and not slip off of the wood stand, drill or carve out of the stand a hole 1/4-inch deep and slightly larger in diameter than the screw head. The head of the screw can sit in this hole and press against the wood stand.
- Both the adding machine paper roll and the smooth can should be able to rotate. The smooth can rotates when you crank the nail at one end of its wood dowel; the paper roll can turn either with its wood dowel or separately from the dowel. Tape down the end of the paper roll onto the can so that when you crank the can, the paper should wind up around the can and cause the paper roll to rotate as it feeds paper to the can.
- If you want to be creative, see if you can devise a way to make the paper roll feed onto the smooth can automatically so that you do not have to crank the can by hand. You might try buying a miniature battery-operated motor that can turn the wood dowel of the can.

(Source: The Regents of the University of California)

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