Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Plotting Earthquakes**

 Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Integrated Science III Period \_\_\_\_\_

Standards:

8Sc.2: Explain how scientists use seismic waves—primary, secondary, and surface waves—and Earth’s magnetic fields to

 determine the internal structure of Earth.

8Sc.6: Explain how the theory of plate tectonics accounts for the motion of the lithospheric plates, the geologic activities at

 the plate boundaries, and the changes in landform areas over geologic time.

8Sc.8: Explain how earthquakes result from forces inside Earth.

8Sc.3: Infer an earthquake’s epicenter from seismographic data.

***Vocabulary***

**crust**: the outermost and thinnest of Earth’s layers. The crust is mainly composed of igneous and metamorphic

 rocks and is divided into plates that move very, very slowly.

**earthquake**: a sudden rapid shaking of the ground caused by a rapid release of energy along faults

**epicente**r: the point on earth’s surface that is vertically above the focus (hypocenter) of an earthquake

**fault**: a break or fracture in a rock mass across which movement has occurred

**longitude**: part of a grid used for describing positions on Earth’s surface, consisting of half circles joining at the

poles. A measurement, in degrees, of a place's distance east or west of the prime meridian, which runs

through Greenwich, England

**latitude**: part of a grid used for describing positions on Earth’s surface, consisting of parallel circles. A

 measurement, in degrees, of a place's distance north or south of the equator

**mantle**: the thick layer of dense, rocky matter found below the Earth’s crust and surrounding the Earth’s core

**plate tectonics:** the theory that explains the movement and interactions of plates, which are segments of the

 Earth’s crust. The plates move slowly and continuously, and their interactions generate earthquakes,

 volcanoes, and mountains.

**pressure**: the application of continuous force on an object

**wave**: an oscillation (a back-and-forth or up-and-down motion) that travels from one place to another with a

 certain velocity (speed and direction)

**Richter scale** : a scale used to measure earthquake strength

***Introduction***

Earthquakes are generally caused by the interaction of the plates on Earth’s surface. Earth’s crust is fractured into irregular plates that are constantly in motion. These plates can interact in three main ways: they collide, diverge, and slide against each other. Where plates converge, or come together, mountains and volcanoes are formed. Where plates diverge, or move apart, new crust is created by rising magma. Finally, some plates grind past each other, like in California where the Pacific and North American plates move in opposite directions. A recent (2012) earthquake near Bologna, Italy was the result of two colliding plates meeting. Read the article to discover why this earthquake was considered weird: [Italy’s 2012 earthquake](http://news.discovery.com/earth/weather-extreme-events/italy-quake-ferrara-shallow-far-from-plate-120522.htm).

Ninety percent of the world’s earthquakes occur in narrow zones along plate boundaries. As plates move relative to each other, they build up strain where the plates meet. When the rock finally moves, energy is released in the form of seismic waves, i.e. an earthquake. Scientists can use seismic data to determine where the waves originated and can then use that data to map the locations of the plates – which is what you will do in this activity.

***Procedure***

Read sections 181-186 in *ScienceSaurus*.

Watch *Brainpop* videos on [Earth’s Structure](http://www.brainpop.com/science/earthsystem/earthsstructure/), [Plate Tectonics](http://www.brainpop.com/science/earthsystem/platetectonics/), and [Earthquakes](http://www.brainpop.com/science/earthsystem/earthquakes/).

**What causes earthquakes?**

Identify the types of seismic waves and explain how they are similar and different by observing the following :

***Slinky (P-Waves and S-waves)***

* Take the metal slinky. One person will be at one end of the slinky, and a different student will be at the other end.
* Place the slinky on the table.
* Pull the slinky to the point where there is no slack (no clumps of slinky), but do not over-stretch the slinky.
* **P WAVES** – ONE PERSON WILL PUSH THEIR END OF THE SLINKY TOWARDS THE OTHER PERSON WITHOUT LIFTING THE SLINKY OFF OF THE TABLE.

Describe what the slinky did:

* Go back to the original positions (slinky on table stretched out with no slack).
* **S WAVES** – QUICKLY JERK YOUR END OF THE SLINKY FROM SIDE TO SIDE ONCE. DON’T LET GO OF THE SLINKY!

**Describe what the slinky did:**

**Which type of wave traveled faster?** If you are not sure, make each kind again.

Visit [USGS](http://earthquake.usgs.gov/earthquakes/map/#%7B%22feed%22%3A%221day_m25%22%2C%22search%22%3Anull%2C%22sort%22%3A%22newest%22%2C%22basemap%22%3A%22grayscale%22) (earthquake.usgs.gov/earthquakes/map/) for a list of up-to-date information on recent earthquakes worldwide**. Record data on the latest earthquake located nearest to Italy.**

Use the Richter Scale in section 186 of *ScienceSaurus* to identify the Earthquake Effects.

Location of Earthquake: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Time and Date of Earthquake: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Latitude and Longitude of Earthquake (Epicenter): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Magnitude of Earthquake: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_­

Earthquake Effects: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Locate the most recent earthquake with the greatest magnitude (strength) and describe:**

Location of Earthquake: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Time and Date of Earthquake: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Latitude and Longitude of Earthquake (Epicenter): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Magnitude of Earthquake: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Earthquake Effects: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

***Extensions***

Play “[QuakeQuizSF](http://quakequizsf.org/)” Players are given 6 different locations in which an earthquake might take place and then are asked what they should do in each situation.

Earthquakes, Volcanoes, and Plate Tectonics…Oh, My! Check out the [Science Spot Kid Zone](http://sciencespot.net/Pages/kdzethsci2.html)

