

# Young Science Explorers

Science fun for 4 to 9-year-olds!

## Amazing Volcanoes



Mountains that could erupt at any time forcing hot lava, gas, steam, rock, and ash out of the earth can be very dangerous, but they are amazing forces of our planet earth!

### Earth Science Projects

#### Make An Erupting Volcano

Have you ever seen a volcano erupt, maybe on television or in a movie? You can make your own small-scale eruption right in your kitchen! Or, if the weather is nice, this is a great outdoor project.

#### What You Will Need:

- ▶ empty plastic soda bottle (20 oz. size works well)
- ▶ an aluminum pie plate or a dish with edges
- ▶ modeling clay (or dirt if you're doing it outside)
- ▶ white vinegar
- ▶ red food coloring
- ▶ baking soda
- ▶ dish soap
- ▶ water
- ▶ tissue paper
- ▶ thread
- ▶ tablespoon

#### What To Do:

1. Fill the bottle about half full with vinegar. Add 2 or 3 drops of food coloring to make the vinegar red. Add a tablespoon of dish soap, then fill the bottle with water so it is about 3/4 of the way full.
2. Gently swirl the bottle to mix everything together. Set the bottle in the middle of the pie plate.
3. Use modeling clay or dirt to create a mountain around the bottle - it should go all the way up to the mouth of the bottle, but not up the sides of the pie plate.
4. Make packets of baking soda by tearing tissue paper into small squares and filling each one with 1 tablespoon of baking soda. Bring the corners of the tissue paper square together and tie a piece of thread around the paper to make a little packet filled with baking soda. Make several of these if you want to make your volcano erupt more than once.
5. Carefully move your volcano to a place that is easy to clean up (outside is best). Drop one of the baking soda packets into the bottle and watch what happens!

#### What's Happening?

Nothing much happened when you mixed the vinegar, water, dish soap, and food coloring. It was sort of like your volcano was "dormant" or asleep. When you dropped the packet of baking soda into the bottle, the vinegar soaked through the tissue paper and reacted with the baking soda and your volcano became active and had a big eruption! When the vinegar and baking soda mixed, they formed a gas called carbon dioxide. This gas created lots of little bubbles that quickly filled the bottle and overflowed and spilled down the sides of the mountain, similar to the way lava would erupt and flow out of a volcano. The red food coloring turned the bubbles red to look more like lava, and the soap helped create even more bubbles to erupt out of your

volcano. Try dropping another packet of baking soda into your volcano once the first "eruption" slows down and see what happens. Was there enough vinegar left to cause another reaction? If nothing happens, all of the vinegar was used up in the first reaction, so pour a little more vinegar into the bottle to see it react again. Since this project is pretty messy, the best way to clean up is to dump everything out of the pie plate into the trash can.

## Earth's Layers

What You Will Need:

- ▶ a hard-boiled egg
- ▶ an adult to help
- ▶ a table knife

What To Do:

1. Carefully crack the egg's shell in three or four places. Don't crack it too hard - you just want to separate the shell into several large pieces, not shatter it into lots of little pieces.
2. Have an adult help you use the table knife to cut the hard-boiled egg in half - cut it across the middle, not from end to end.
3. Look at one half of the egg where you cut it. You should be able to see the shell around the outside, the white part, and the yolk.

What's Happening?

The outer shell of the egg is similar to the earth's crust. When you cracked the shell into several large pieces, those pieces were similar to the tectonic plates on the earth's surface. Notice how the pieces stayed together even though they were separate. That's exactly how the earth's plates work - they can move around a little bit, but they all stay in the same general spot attached to the next layer of the earth. The middle white part of the egg represents the earth's mantle. The earth's mantle is much harder because it is made of rock. The inner yellow part - the egg yolk - represents the earth's core. The earth's core actually has two parts - the liquid outer core and the solid inner core. Read the Teacher Tidbits below to find out more about the layers of the earth!

## Fun Facts

There are over 1500 volcanoes around the world today that are considered active - which means they could erupt at any time.

Debris from the eruption of Mount St. Helens in Washington traveled very fast - up to 250 miles per hour!

Volcanoes tend to smell a lot like rotten eggs. The smell is caused by poisonous gases that come up from inside the earth through a volcano.

The largest volcano in the world is Mauna Loa in Hawaii; it is more than 56,000 ft high, although a lot of it is underwater. It is also one of the most active volcanoes.

## Silly Science

What did one volcano say to the other volcano? (Answer: I lava you!)

What did the mother volcano say to the baby volcano? (Answer: Don't erupt while I'm talking!)

A volcano is a mountain that has hiccups!

## Way Cool Websites

Learn more about [how volcanoes form](#) and watch videos of real volcanic eruptions!

Check out these [satellite pictures](#) of volcanoes around the world.

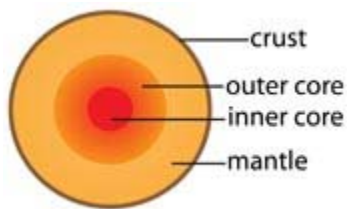
## Teacher Tidbits

### The Earth's Layers

The amazing planet we live on is made up of several layers.

**Crust** - The top layer, which we know the most about because it's where we live, is called the *crust*. Some parts of the crust are covered by land (the continents, like North America and Africa) and some parts are covered with water (the oceans). The earth's crust is not all one piece. It is divided up into smaller sections called tectonic plates. These plates are huge slabs of rock that can move slightly and sometimes rub against each other, causing earthquakes and volcanoes. The crust layer is about 20 miles thick (it is not as thick under the oceans as under land).

**Mantle** - The layer under the crust is called the *mantle*. It is the middle layer and is very thick - in fact, it is about 1800 miles thick! This layer is made of rock that is very heavy - heavier than any type of rock on the crust of the earth. Sometimes parts of the mantle get hot enough to melt the rock so that it flows sort of like melted plastic.



**Core** - The core is the layer below the mantle, farthest down into the earth. There is an outer core and an inner core. The *outer core* is extremely hot and is made mostly of molten (or melted) iron, which is called *magma*. It is about 1300 miles thick. The *inner core* is at the very center of the earth, surrounded by the outer core. Scientists believe that the inner core is a solid ball made mostly of iron and is more than 750 miles thick!

If we could cut the earth in half, its layers would look something like the picture above. Check out the *Earth's Layers* science project to make a simple model. Also check out this [Earth Cross-Section Model](#) as a helpful visual way to teach kids about earth's layers.

### How Volcanoes Are Formed

A volcano is formed when there is a crack or hole in the crust, called a *vent*. The temperature in the deeper layers of the earth sometimes gets so hot that it melts rocks that are deep down in the earth, in the mantle and the core. Then, extremely high pressure from inside the earth builds up so much that it forces the melted rock up out of the earth through the vent, causing a volcano! Often times the vent is inside of a mountain, which means that when a volcano erupts, it shoots out of the top of the mountain. Sometimes the vent is in a flat area and the rock that erupts cools around the vent and the volcano forms its own mountain-like structure. There can even be vents in the floor of the ocean, so sometimes volcanoes can erupt underwater.

The melted rock that is pushed out of the earth is called magma. Once the magma reaches the surface of the earth and explodes out of the volcano, it is called *lava*. The lava flows very quickly and is very dangerous because it is burning hot! Dangerous gases, whole rocks, and ash can also shoot out of a volcano along with lava. The effects of a volcano on the land surrounding it can be very deadly. Plants and trees are often burned by the flowing hot lava or completely covered. However, the nutrients found in the lava and ash that a volcanic eruption spreads across the land actually work like a fertilizer that makes the soil a perfect place for new plants to grow!

### Predicting Volcanoes

A person who studies volcanoes is called a *volcanologist*. What does a volcanologist do? They study lava left behind from explosions of volcanoes as well as water and rocks around the sites of volcanoes to learn more about what is going on inside a volcano. They test water and rocks nearby to find out what kinds of minerals and gases came from the volcano. They map out where the lava from an eruption flowed to get an idea of

what areas around a volcano will be in danger the next time that volcano erupts. All of the information they gather from these types of tests and observations can help scientists predict when a volcano might erupt next. While the work that volcanologists do can help give us an idea of when volcanoes might erupt next, it is very difficult to tell for sure, and it also costs a lot of money for the equipment that is required to help volcanologists do their job.

## Types of Volcanoes

What do you think of when you picture a volcano in your mind? Do you picture a tall mountain with fire and steam coming out of the top? That is a very common type of volcano, but there are also other types. Knowing the shape of volcanoes is very helpful for volcanologists who want to learn more about them. Here are some of the most common types of volcanoes:



**Cinder Cones** - these volcanoes are a round or oval cone shape and do not get as tall as some kinds of volcanoes. They are formed when lava from a vent in the ground is pushed up into the air and then falls to the ground and cools, making a little cone shape around the vent. Cinder cone volcanoes usually have a *crater* at the top, which is a bowl-shaped indentation. They usually reach their maximum size very quickly, and do not cause a big explosion when they erupt. There is a cinder cone volcano in Mexico, called Paricutin, which grew to be 300 feet tall in just 5 days!

**Composite Volcanoes** - these volcanoes are also cone shaped, but they can get very tall and have steep sides, like a mountain. Composite volcanoes are formed when thick hot lava (like honey) large chunks of rock, and ash shoot up out of a vent and then cool around it. The next time the volcano erupts, the same thing happens and the mountain is built up even higher with more layers of cooled lava and rock. Most of the tall volcanoes, like Mount St. Helens and Mount Rainier in Washington and Mount Fuji in Japan are composite volcanoes. These volcanoes usually have a big explosion when they erupt, and in-between eruptions you might not even be able to tell they are volcanoes, because they are very quiet and look just like other mountains.

**Shield Volcanoes** - these volcanoes are very different from the other types. They are usually very wide because they are formed when liquid lava comes out of a vent in the earth's crust and spreads out a long way from the vent into a flat sheet. As the lava cools, it dips down in the center leaving sloped sides, like a bowl or a shield. Some of the biggest volcanoes in the world are shield volcanoes, such as Mauna Loa on the island of Hawaii. These volcanoes do not explode the way composite volcanoes do; instead, lava just flows out of them.

**Lava Domes** - these volcanoes are usually the smallest type of volcano. Although lava dome volcanoes can have violently explosive eruptions like composite volcanoes, the lava that comes out of them is so thick that it does not flow very far from the vent. Sometimes the lava just piles up over the vent and then the dome will start to expand from the inside - when it erupts, the new hot lava cracks through the sides of the dome and then hardens again. There are several lava dome volcanoes in California.

Go [here](#) to see video clips of different ways that lava can flow.