

Volcanoes

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Volcanoes



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The Eruption of Vesuvius

Few people in the Roman city of Pompeii cared about the earthquakes in AD 79. No one connected them with the smoke coming from nearby Mount Vesuvius. The volcanic mountain was covered with trees, flowers, and grass. It had been a thousand years since the volcano had last erupted. Most people thought Mount Vesuvius was **dormant** or **extinct**.

But everything changed on August 24 around one o'clock in the afternoon. A huge explosion shook the ground. Dust, ash, and melted rock blew out of the top of the volcano, darkening the sky. Stones began to rain down on the city. Rocks and ash covered the ground as far away as 16 kilometers (10 mi) from the mountain.

By three o'clock, **lava** (melted rock) began pouring from the volcano, destroying everything in its path. By six o'clock, the cloud of dust and ash was 32 kilometers (20 mi) high. The ash kept falling, covering the ground to a depth of 1 meter (3.3 ft). Buildings collapsed under the weight of the stones and ash.

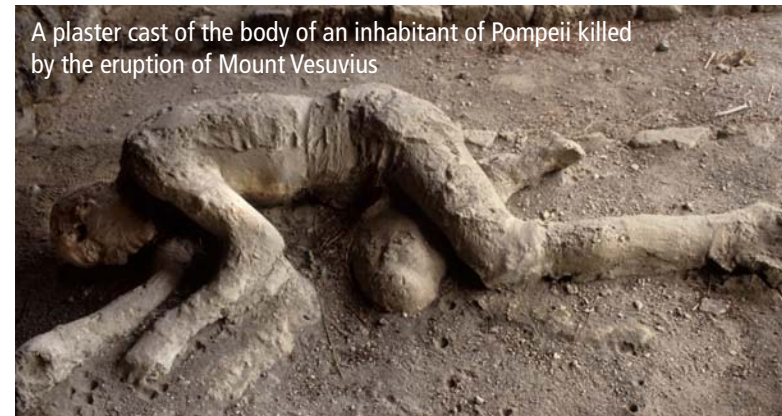
People tried to flee as the volcano destroyed their homes and farms. But the ash was so deep and hot that many people died as they tried to walk through it. Stones falling from the dark sky killed others. And many people choked to death on the ash- and dust-clogged air.

Around midnight, the situation became even worse. The massive cloud of ash, poisonous gas, glowing-hot dust, and smoke had become too heavy to stay in the air. The cloud collapsed, falling down the mountain at speeds of up to 500 kilometers per hour (310 mph).



Mount Vesuvius overlooks the ruins of Pompeii.

Within moments, people in the cities of Pompeii and Herculaneum were burned and buried by Mount Vesuvius's first **surge cloud**. As more dust and ash poured from the volcano, more surge clouds followed. When the eruption ended, two cities were completely buried and wiped off the face of the Earth. They would not be uncovered again for more than one thousand years.



A plaster cast of the body of an inhabitant of Pompeii killed by the eruption of Mount Vesuvius

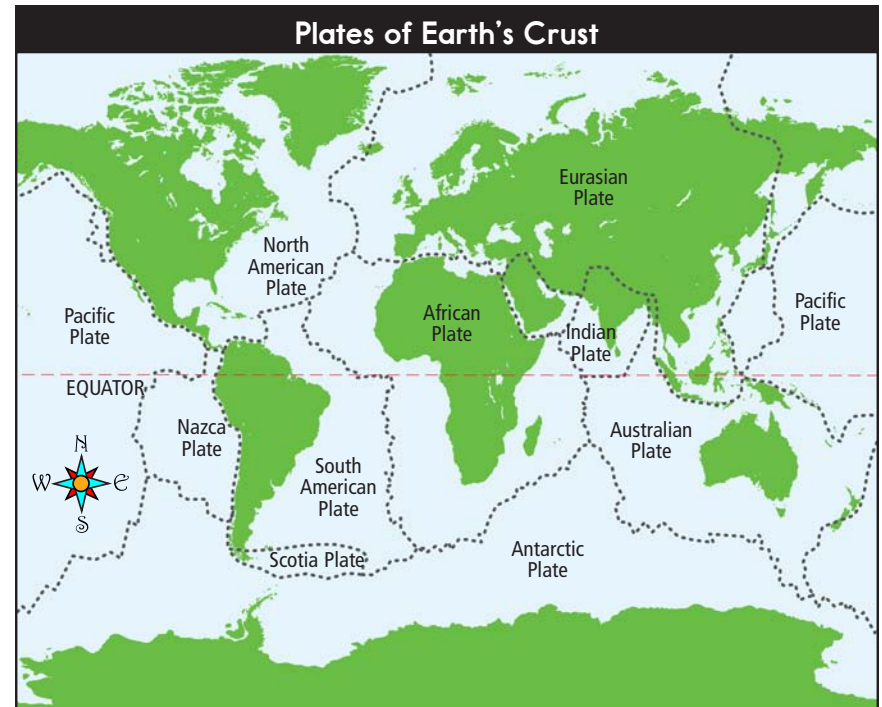
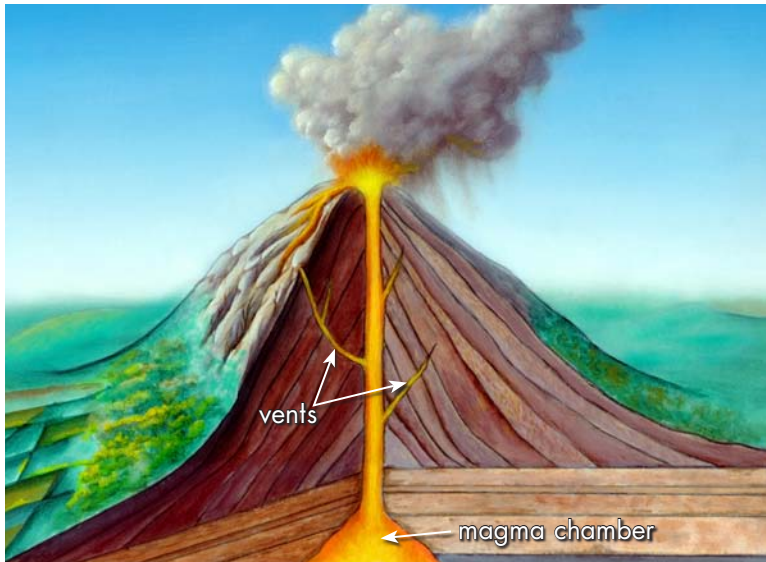
Do You Know?

Pompeii, a city not far from Mount Vesuvius, was completely buried by a surge cloud. As the bodies of victims decayed over time, they left pockets of air in the hardened ash and mud that surrounded them. These air pockets preserved the exact shapes of the bodies they once contained. Archaeologists filled the holes with plaster to make casts showing how the people looked when they died.

What you just read is a true story. But how did it happen? What could cause such a violent explosion? The answer lies in how different kinds of volcanoes form.

Where and Why Volcanoes Form

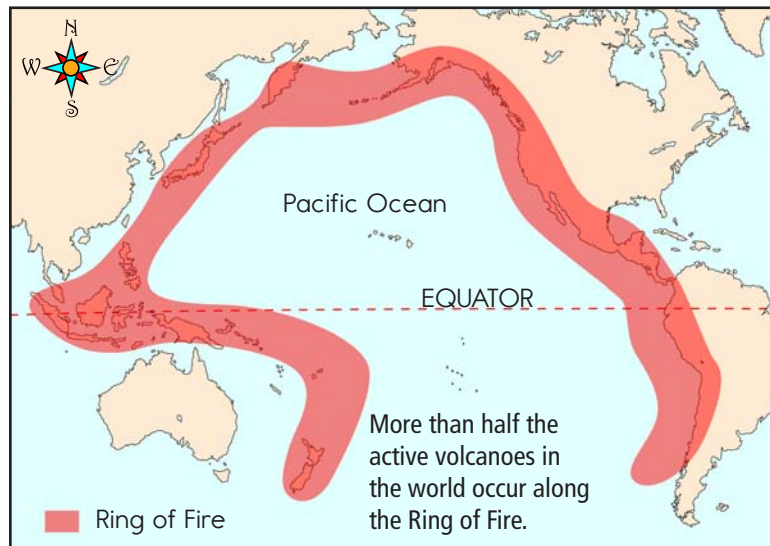
Earth's hard surface, or crust, is made of huge sheets of rock called **plates**. Some plates make up the continents. Others make up the ocean floors. Just under the plates, Earth is extremely hot—so hot that rock melts into a liquid called **magma**. Sometimes the magma flows to the surface and pours out through cracks in Earth's crust.



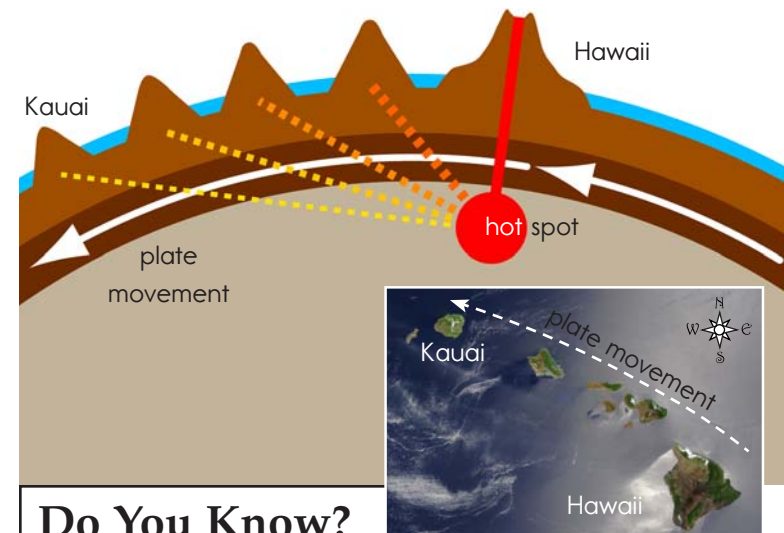
The dotted lines show the edges of the plates. Most of the world's volcanoes are found where the plates meet.

Volcanoes usually form at the edges of the plates. The plates float on top of the thick liquid magma, but the different plates move in different directions. Plates can crash into, pull away from, or grind past each other. The pressure released by the moving plates causes earthquakes, which create large cracks in the crust. Magma sometimes breaks through these cracks to form volcanoes.

There are at least five hundred active volcanoes in the world. Most are near the edges of the plates. The edge of the Pacific Ocean plate is an active volcanic region called the *Ring of Fire*. Another active volcanic region is along the Mid-Atlantic Ridge, an undersea mountain chain in the Atlantic Ocean. Two plates are pulling apart there, allowing magma to push up through the ocean floor and pile up as it cools into solid rock. Over time, the magma forms mountains that stick up out of the water as islands. The country of Iceland is located on the tops of large volcanoes in the Mid-Atlantic Ridge.



Other volcanoes form far away from the edges of the plates. The islands of Hawaii are in the center of the Pacific Ocean plate. They are above a “hot spot,” a place where hot magma sits unusually close to Earth’s crust. Beneath Yellowstone National Park, in the middle of the North American plate, another hot spot borders underground lakes. The magma heats the surrounding ground and the water, creating **geysers** and hot springs.



Do You Know?

A “hot spot” created the volcanoes of Hawaii. As the Pacific Plate moves over the top of the hot spot, old volcanoes go extinct and new ones form. It is almost like moving a piece of paper over a burning candle—the candle makes a row of holes, much as the hot spot makes a row of volcanoes.

Different volcanoes erupt in different ways, depending on where and how the volcanoes formed. Some volcanoes erupt gently and slowly, while others suddenly explode with the force of many atomic bombs. Let's take a look at different kinds of volcanoes and learn how they erupt.



A volcano blasts a shower of red-hot cinders high into the air.

Composite Volcanoes

Mount Vesuvius, which you read about earlier, is a composite volcano. Composite volcanoes are explosive volcanoes. Their eruptions can be violent and destructive. They are usually large mountains with steep sides and evenly shaped peaks, often with a bowl-shaped **crater** at the top. The crater is the place where the magma, hot gas, and ash come out.



Mount St. Helens before 1980 eruption

Mount St. Helens after 1980 eruption

Most composite volcanoes form from thick, slow-moving magma. Magma moves in underground tubes called **vents**. When the magma is very thick, it can cool and harden before it reaches the surface, plugging a vent. The magma below the plug suddenly has nowhere to go, so the pressure builds. When the pressure becomes great enough, the volcano explodes. Sometimes the entire mountain is destroyed. When Washington State's Mount St. Helens erupted in 1980, the entire northern side of the mountain was destroyed.

When composite volcanoes erupt, they send huge clouds of ash, dust, smoke, hot gas, and rock into the air. These clouds turn the sky black and rain ash onto the ground. When the cloud becomes too heavy to stay in the air, it collapses in a violent surge cloud.

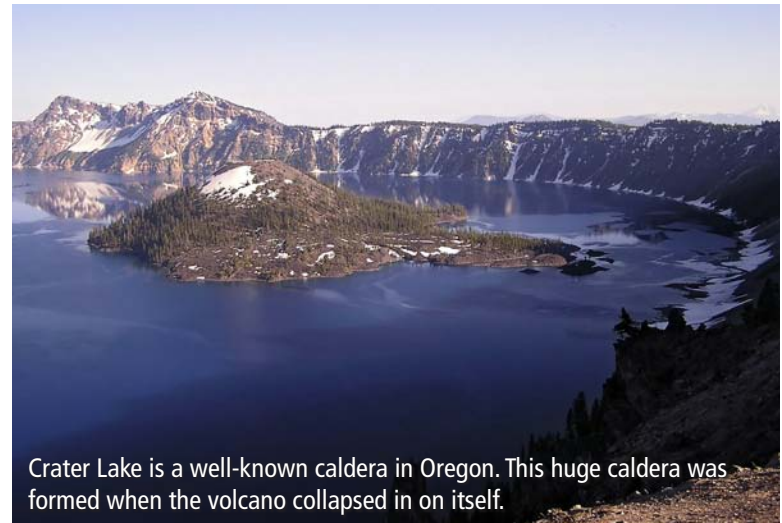
Many composite volcanoes are tall enough to have ice and snow on their tops. A hot explosion can instantly melt all of the ice and snow. A flood of water, mud, and rock then runs down the mountain at up to 100 kilometers per hour (62 mph).



Melting ice and snow sent a massive mudslide racing down the side of this volcano.

The biggest volcanic ash clouds can travel around the world. These clouds can block out sunlight over large areas and cool the planet. After the 1815 eruption of Tambora, a volcano in Indonesia, North America had an unusually cold, snowy summer.

Sometimes, an underground lake of magma pours out of a composite volcano, leaving a huge empty space below. The surface collapses into the empty chamber, leaving a large bowl-shaped **caldera**. Calderas can be as large as 100 kilometers (62 mi) across. They often fill with water, creating large lakes.



Crater Lake is a well-known caldera in Oregon. This huge caldera was formed when the volcano collapsed in on itself.



Mauna Loa, a shield volcano in Hawaii

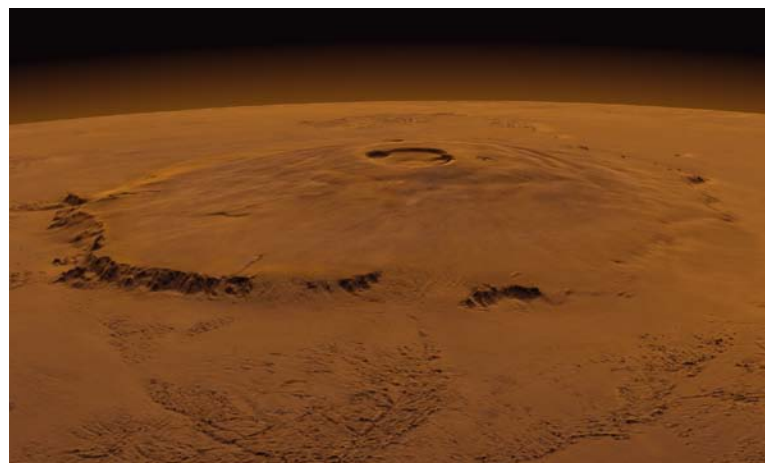
Composite volcanoes can destroy forests, bury cities, and kill people, but these volcanoes often stay quiet for hundreds of years between eruptions. People living nearby forget that the volcano can explode.

Shield Volcanoes

You may have seen a video of lava flowing or spraying from a volcano. The lava is runny and flows quickly. It flows far and fast before slowly hardening and building up. This kind of lava comes from a shield volcano. Shield volcanoes usually have gentle mountain slopes shaped like shields.

Eruptions of shield volcanoes are usually non-explosive, although the lava can still damage roads, homes, and forests. Sometimes the lava sprays dramatically from the crater, creating a lava fountain.

Shield volcanoes can remain quietly active for a long time and can grow very large. Mauna Loa on Hawaii is the tallest volcano in the world, rising 9,170 meters (30,080 ft) from its base on the seafloor. That's taller than Mount Everest! The largest known volcano in the solar system is Olympus Mons on Mars. This Martian shield volcano rises an amazing 27 kilometers (17 mi) in height.



Olympus Mons, on the surface of Mars, is the largest volcano in the solar system. It would cover the entire state of Arizona.



Cinder cones on Mauna Kea volcano, Hawaii

Cinder Cones and Lava Domes

Some volcanoes don't form large mountains. Instead, they just spray small amounts of lava into the air. The small lava chunks and bits of ash harden into light rocks called **cinders**. The cinders pile up around the vent into a hill with a bowl-shaped crater at the top. These hills are called *cinder cones*.

New volcanoes often produce cinder cones. Other cinder cones form inside the craters of larger, older volcanoes. Most cinder cones erupt only once. Because cinder cones are made of loose rocks, they are quickly worn away by wind and rain.

Small, quick eruptions sometimes form lava domes. Lava domes are created when thick lava oozes from a vent and quickly hardens. Sometimes more lava pushes through the dome, causing its sides to crack. Lava domes often form in areas with other volcanic activity. They can often be found in the craters of large volcanoes. Like composite volcanoes, lava domes often explode violently.



Lava dome atop Novarupta vent, Katmai National Park and Preserve, Alaska (above); a scientist monitoring a lava dome inside a crater

Conclusion

Volcanoes are impressive examples of how our planet is always changing. Many good things come from volcanoes. Lava creates new rock and new land. Volcanic ash makes rich soil for farming. And volcanic mountains, including Mount Fuji in Japan, Mount Rainier in Washington, and Mauna Loa in Hawaii, are some of the most beautiful mountains in the world.

It is no wonder that people often choose to live near volcanoes. But everyone should always remember that volcanoes are dangerous. Volcanoes set free some of Earth's most powerful forces.



Beautiful Mount Fuji in Japan

Glossary

| | |
|----------------------------------|---|
| caldera (<i>n.</i>) | a large, bowl-shaped basin where the land has collapsed into an empty magma chamber (p. 14) |
| cinders (<i>n.</i>) | small rocks or pebbles formed from flying lava and ash (p. 17) |
| crater (<i>n.</i>) | a bowl-shaped hollow area in a volcano where lava, ash, and gases come out (p. 11) |
| dormant (<i>adj.</i>) | quiet for many hundreds of years (p. 4) |
| extinct (<i>adj.</i>) | not having erupted in thousands of years and showing no sign of future eruptions (p. 4) |
| geysers (<i>n.</i>) | hot springs that boil from time to time, sending a column of water and steam into the air (p. 10) |
| lava (<i>n.</i>) | melted liquid rock that reaches Earth's surface (p. 4) |
| magma (<i>n.</i>) | melted liquid rock beneath Earth's surface (p. 7) |
| plates (<i>n.</i>) | large sheets of rock that make up Earth's crust (p. 7) |
| surge cloud (<i>n.</i>) | a superheated cloud of ash, gas, dust, and rock that moves quickly along the ground (p. 6) |
| vents (<i>n.</i>) | openings in Earth's crust through which magma and gases emerge (p. 12) |