DEPOSITION

WHAT IS DEPOSITION?

If you're a fan of courtroom dramas, the word *deposition* might make you think of a person testifying in a trial. But in geology, deposition refers to the process where, over time, layers of sediments are naturally deposited (or let fall) on top of one another. In the absence of other factors (such as waves), pressure increases as the layers build up. This causes the sediments to compound and cement, turning the layers into solid rock.

Sediments are rocks, minerals, or silt that have been deposited due to a physical process such as weathering, erosion, glacier flow, or even a volcanic eruption.

VOLCANIC DEPOSITS

If asked to draw a volcanic eruption, you might sketch a landform with streams of lava erupting and flowing down its sides. But the release of lava is just one of the potential effects: a significant eruption can also release huge quantities of ash and rock, and trigger devastating mudflows called lahars.

Taken together, these materials (lava, ash, rock, and silt) are deposited onto the Earth's surface when a volcano erupts. Over time, the layers of these materials cement together, forming solid rock. Let's take a look at how.

As lava cools, it hardens into solid rock

LAVA

When a volcanic eruption occurs, lava is released from a magma chamber located in the Earth's crust. If the eruption is non-explosive, the magma flows out of the volcano. As the lava meets the atmosphere at the Earth's surface, it rapidly cools, hardening into rock.

This is why, if you visit the volcanoes on the Island of Hawai'i, you'll see hot lava flowing over what look like lumpy beds of rock—those misshapen rocks used to be lava.

ASH

In an explosive eruption, however, the lava is violently released into the atmosphere, shooting a cloud of hot ash and rock into the sky. Most of this material will fall around the volcano—but not all.

Since ash clouds can reach massive sizes depending on how explosive the eruption is, the material they release can travel far from the site of the eruption. When Mount St. Helens erupted in 1980, its ash plume reached a height of nearly 31 kilometers—within 24 hours of erupting, that ash cloud had traveled from Southern Washington to the central United States.

Explosive volcanic eruptions, like that of Mount St. Helens, release huge ash clouds into the atmosphere

DEPOSITION

PYROCLASTIC FLOWS

Lava flows and ash clouds are nothing compared to pyroclastic flows. From the Ancient Greek for “fire” (pyro-) and “broken” (clastic), these flows typically form in one of two ways: 1) when the plume released into the atmosphere by the eruption falls back to the ground, and 2) when the material released by a volcanic eruption immediately starts to flow down the sides of the volcano.

Pyroclastic flows are essentially avalanches, but instead of snow and ice, they’re composed of hot rock, ash, and deadly gas—and they can move at speeds as high as 724 kilometers an hour. While they’re hugely destructive, pyroclastic flows are responsible for a great deal of deposition on (or around) the volcano from which they erupted.

LAHARS AND LANDSLIDES

Lahars are destructive mudflows caused when hot volcanic ash and rock (from an eruption or pyroclastic flow) meets, and melts, ice. Lahars are extremely deadly, since they can absorb anything (including rocks, trees, and even buildings) in their path, increase their volume tenfold, and reach speeds of up to 200 kilometers/hour.

As a lahar moves farther from the site of eruption, it starts to slow down and get smaller. Along the way, it deposits the mud, rock, and ash it picked up after the eruption, adding another layer to the landscape.

Similarly, explosive eruptions can also trigger landslides. Like lahars, these flowing masses pick up—and then deposit—material like soil, rocks, and sediments as they move from the eruption site.

Lava flows, ash plumes, pyroclastic flows, lahars, and landslides all contribute to the process of deposition. Over time, layers deposited from these processes cement together, forming a solid mass. If you took a rock sample from the area around a volcano, you’d be able to see some of these different layers—from cooled and hardened magma, to ash, to rock deposits left from a pyroclastic flow. Studying rock layers, known as stratigraphy, is how geologists read the rocks around them.

The Ancient Roman city of Pompeii was completely buried by a huge pyroclastic flow, caused when nearby Mount Vesuvius erupted in 79 CE—you can now visit the city’s excavated ruins

How Fast Do They Move?	
	Maximum Speed
Lava Flows	*10 km/h, and up to 60 km/h*
Pyroclastic Flows	*100 km/h, and up to 700 km/h*
Lahars	*160 km/h, and up to 200 km/h*