

Mount Vesuvius

Mt. Vesuvius is a volcano that erupted on August 24, 79, blanketing the towns and thousands of residents of Pompeii, Stabiae, and Herculaneum. Pompeii was buried 10' deep, while Herculaneum was buried under 75' of ash. This volcanic eruption was the first to be described in detail. Pliny the Younger was stationed about 18 miles away in Misenum from which vantage point he could see the eruption and feel the preceding earthquakes. His uncle, the naturalist Pliny the Elder, was in charge of warships in the area, but he turned his fleet to rescuing residents and died in the effort.

In addition to Pliny's recording of the sights and sounds of the first volcano to be described in detail, the volcanic covering of Pompeii and Herculaneum provided an amazing opportunity for future historians: The ash preserved and protected a vibrant city against the elements until future archaeologists unearthed this snapshot in time.

Mt. Vesuvius had erupted before and continued to erupt about once a century until about 1037, at which point the volcano grew quiet for about 600 years. During this time, the area grew, and when the volcano erupted in 1631, it killed about 4000 people. During the rebuilding efforts, the ancient ruins of Pompeii were discovered on March 23, 1748. Today's population around Mt. Vesuvius is about 3 million, which is potentially catastrophic in the area of such a dangerous "Plinian" volcano.

Prior to the eruption, there were earthquakes, including a substantial one in 62 that Pompeii was still recovering from in 79. There was another earthquake in 64, while Nero was performing in Naples. Earthquakes were seen as facts of life. However, in 79, springs and wells dried up, and in August, the earth cracked, the sea became turbulent, and the animals showed signs that something was coming. When the eruption of the 24th of August began, it looked like a pine tree in the sky, according to Pliny, spewing noxious fumes, ash, smoke, mud, stones, and flames.

Named after the naturalist Pliny, the type of eruption of Mt. Vesuvius is referred to as "Plinian." In such an eruption a column of various materials (called tephra) is ejected into the atmosphere, creating what looks like a mushroom cloud (or, perhaps, pine tree). Mt. Vesuvius' column is projected to have reached about 66,000' in height. Ash and pumice spread by the winds rained for about 18 hours. Buildings started to collapse and people began to escape. Then came high temperature, high velocity gases and dust, and more seismic activity.

Plinian Eruptions

Plinian (or *Vesuvian*) eruptions typify the well-known historic eruptions that produce powerful convecting plumes of ash ascending up to 30 miles into the stratosphere. These explosive eruption types are named after *Pliny the Younger*, a Roman statesman who wrote a remarkably objective account of the eruption of Italy's Mt. Vesuvius (left) in 79 AD. Pliny's uncle, Caius Plinius (*Pliny the Elder*), was a much respected naturalist and Admiral in the Roman navy who died during the eruption. To properly record the circumstances of his esteemed uncle's death, Pliny the Younger wrote two letters to the historian Tacitus describing the Mt. Vesuvius eruption. The eruption killed thousands of people and buried the Roman towns of Pompeii and Herculaneum under huge volumes of tephra, pyroclastic flows and lahars. Pompeii laid buried for over 1700 years until it was rediscovered by accident during the excavation of a water line. Uncovering the remains of Pompeii has not only broadened our understanding of Plinian-type eruptions, but it has also provided a unique understanding of the lives of ordinary people during Roman times.

Rather than producing the discrete explosions that are typical of Vulcanian and Strombolian eruptions, Plinian eruptions generate sustained eruptive columns. Although they differ markedly from nonexplosive Hawaiian eruptions, Plinian eruptions are similar in that both of these eruption types generate sustained eruption plumes.

Plinian eruptions generate large eruptive columns that are powered upward partly by the thrust of expanding gases, and by convective forces with exit velocities of several hundred meters per second. These eruptive columns produce widespread dispersals of tephra which cover large areas with an even thickness of pumice and ash. The region of pyroclastic fall accumulation is generally asymmetric around the volcano as the eruptive column is carried in the direction of the prevailing wind.

The regions surrounding Plinian eruptions are not only subject to large volumes of pumice airfall (from 0.12 to 12 cubic miles), but they are also subject to the most dangerous types of volcanic phenomena: pyroclastic flows and lahars. The occasional collapse of the eruptive column will generate hot, pyroclastic flows that advance down the volcano flanks at hurricane-force speeds. A pyroclastic flow is a fluidized mixture of solid to semi-solid fragments and hot, expanding gases that flows down the flank of a volcanic edifice. These awesome features are heavier-than-air emulsions that move much like a snow avalanche, except that they are fiercely hot, contain toxic gases, and move at phenomenal, hurricane-force speeds, often over 65 miles per hour. They are the most deadly of all volcanic phenomena. In addition, large volumes of water are often generated by the melting of snow banks and alpine glaciers during the eruption. The mixing of this water with unconsolidated tephra can generate volcanic mudflows (lahars). These features have the consistency of wet concrete, yet they can advance down slopes at the same rate as a rapidly moving stream.

The human devastation associated with the Plinian eruption of Mt. Vesuvius in 79 AD is largely attributed to all of these volcanic phenomena. Pompeii was located to the southeast, on the downwind side of the volcano. Not only was it subjected to the destructive force of several pyroclastic flows, but it was also buried under a huge thickness of airfall tephra. Although the village of Herculaneum was also destroyed by the eruption, it was located west of the volcano, and was not subjected to the same volume of airfall tephra that buried Pompeii. Instead, Herculaneum was largely buried by pyroclastic flows and massive lahars which advanced down the volcano's western flank.