Expedition to a Modern Pompeii

A Museum Scientist on the Scene of a 1902 Disaster

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On May 14, 1902, a scientist named Edmund Hovey boarded a ship that was headed from the United States to the Caribbean islands. Hovey worked for the American Museum of Natural History in New York. He had been sent on an expedition to the Caribbean to investigate three volcanic eruptions that had happened there the week before. These violent volcanic eruptions had killed nearly 30,000 people in fewer than 24 hours.

The first eruption happened on the afternoon of May 7 on the island of St. Vincent. That day, the volcano Mt. Soufrière erupted, sending out boiling hot mud, steam, and ash. The eruption killed 1,565 people. The next morning, another volcano erupted on Martinique, an island 75 miles to the north of St. Vincent. This volcano, Mt. Pelée, exploded in a cloud of hot gases, ash, and rocks. This hot material rushed down the side of the volcano at a speed of 300 miles an hour. It destroyed everything in its way, including the seaside town of Saint-Pierre and nearly all the ships in the harbor. About 27,000 people were killed by this eruption within just two minutes. And finally, on May 20, the day before Hovey arrived in Martinique, Mt. Pelée erupted a second time. This equally powerful eruption covered what remained of the town of Saint-Pierre again.

When Hovey got to Saint-Pierre, he could barely find the words to describe what he saw. He wrote that even photographs could not properly show the ruin and wreckage of Mt. Pelée's eruption. Saint-Pierre had once been called the "Paris of the Caribbean," and people had gone there to trade rum, sugar, cocoa, and coffee. Before the eruptions, the town's streets had been lined with shops and handsome homes. But when Hovey got there, the town was a burning ruin with barely any buildings left. The town had been located right in the path of the volcano's eruption. Hovey wrote that Saint-Pierre and the people who lived there were "as helpless as an animal in a trap" when faced with an eruption.

Left: Dirt and rocks cover a street in Saint-Pierre in 1902 after the eruption.
Right: Museum scientist Edmund Hovey, second from right, at Mt. Soufrière volcano in 1902.

The explosions from Mt. Pelée were a type of eruption called *nuée ardente*. This phrase means "glowing cloud" in French. Mt. Soufrière, the volcano on St. Vincent, also had a *nuée ardente* eruption in 1902. Because there was a lake near the volcano, the eruption also caused a mudflow. A very famous *nuée ardente* also took place in the year 79 AD, at Mount Vesuvius. Vesuvius is a volcano located east of Naples, Italy. An explosive cloud rose high in the air and then collapsed downward, killing about 20,000 people in the nearby towns of Pompeii and Herculaneum.

Magma, or liquid rock, is what erupts from a volcano. Magma is less dense than solid rock. Because of this, it can rise to the surface through cracks in the volcano. Magma also contains gases. If the gases in magma can boil away slowly as the magma makes its way towards the surface of the volcano, the eruption will be less forceful, and the lava can just flow out of the volcano. But in a *nuée ardente*, the vents through which the magma can flow are blocked and the gases in the magma can't boil away. This causes pressure to build until the magma blasts its way through the surface and erupts as a swirling mass of hot gas, glowing dust, and pieces of rock.

In some *nuée ardente* eruptions, the gaseous magma rises up into volcanoes whose rocks have been weakened by chemical changes. In these instances, the cloud of ash and gas might blow violently out of the side of the mountain, before rushing downward. Volcanoes are the most explosive when their rocks are weakened like this. This is because the magma and gas can blast out of the volcano more quickly, making them faster and possibly more deadly.

This especially violent kind of eruption was observed in 1980 at the volcano Mount St. Helens in the U.S. It is believed that the 1902 eruptions at Mt. Pelée were *nuée ardente* eruptions as well because the eruptions at Mt. Pelée and Mount St. Helens left behind a similar pattern of marks on nearby trees. After both of these volcanoes' erupted, there seemed to be a very sharp line between burnt areas and unaffected areas. As Hovey investigated some areas affected by Mt. Pelée's eruption, he saw some trees that were burnt and brown on one side, and unharmed and green on the other.

During his expedition, Hovey also collected and sent back some items he found to the museum he worked for. These items included melted household objects, destroyed street signs, and lumps of half-melted lava called "bread-crust bombs" that had come from the volcano. These items were incredibly important to the study of volcanoes, or volcanology.

Left: A stack of café glasses were melted together by the heat of the deadly volcanic cloud.
Right: This "bread-crust bomb" was formed when a partly-melted mass of lava cooled and shrank. The cooling and shrinking caused the solid outside to crack.

Left: Heat and pressure softened and twisted this champagne bottle.
Right: This glass doorknob is only melted on one side. This melting pattern is very similar to the trees Hovey observed in Saint-Pierre, which were burnt on one side and unaffected on the other.

At the time of Hovey's trip, the study of volcanoes was very new. Even though scientists had basic technology that allowed them to measure volcanic activity, they didn't have a clear understanding of how volcanoes erupt. Since then, scientists have learned a lot more about volcanoes. They've learned about the importance of volcanic gases, as well as the relationship among earthquakes, the movement of magma and volcanic activity. They've even learned about how gas can open a pathway in rock for magma to follow.

Hovey's research was part of that long, steady path that has helped scientists gain a better understanding of volcanoes. Scientists are still learning more about volcanoes, with the hope of being able to better predict volcanic eruptions.

Because people in 1902 didn't know much about how volcanoes worked, the people who lived near Mt. Pelée underestimated the risks of living in the vicinity of a volcano. They ignored signals and ominous signs that it was still active. When the volcano would occasionally spit out steam and ash, people didn't take that as a warning. More often, they'd take that as a chance to have a picnic near the top of the volcano. As one former resident of Saint-Pierre said, "No one ever thought of fearing the volcano, which all thought to be extinct…The people wandered about by thousands, never dreaming that there was any danger."

Mt. Pelée gave ominous signs that it was likely to erupt in the months and weeks before its May 8 eruption. For example, on April 23, there were earthquakes in the town of Saint-Pierre, knocking dishes off shelves in houses. The next day, ash fell on a town nearby for two hours. On May 2, a column of ash and gases rose nearly two miles high above the mountain. That same day, an inch of ash fell on Saint-Pierre. Then, on May 5, a mudflow from the volcano killed 23 people north of the city. Fifteen minutes later, a giant tidal wave washed into the harbor. And on May 6, the mountain tossed huge melted rocks in the air. But people failed to pay attention to all these warning signs.

The people of Saint-Pierre couldn't possibly have known what would happen to them, because there wasn't enough scientific knowledge about volcanoes in the 1900s. But even today, with better science to back up predictions, about half a billion people live near active volcanoes. This includes more than 4,000 people who live near Mt. Pelée. It also includes about 4 million people who live near Mount Vesuvius, near Naples. In fact, Naples recently built an emergency response hospital on the side of the volcano itself. If Vesuvius erupted, the first place people would want to go would be that hospital. But the hospital would also be the first place destroyed. Vesuvius had relatively large eruptions in 1631 and 1944, with smaller ones in between, so it is definitely still active. It would be very difficult to evacuate a large population from the area around a volcano. Getting the 4 million people of Naples away from Mount Vesuvius would be a huge task.

Still, it's important to remember that volcanic eruptions are usually not the most destructive natural disasters. Earthquakes and hurricanes cause many more deaths and much more property damage than volcanic eruptions. And if scientists are monitoring a volcano carefully, they can generally warn people of eruptions before they occur.

Even so, it's difficult to figure out the actual risk of an eruption. This is partly because humans have a

hard time understanding the huge periods of time over which these eruption patterns are measured. These patterns happen over thousands, or even tens of thousands of years. Scientists disagree in their predictions of when Vesuvius may erupt again. Vesuvius has had a large eruption every 500 to 1,000 years. Some scientists think that a large eruption is not likely to come any time soon. But others think that Vesuvius could erupt disastrously soon. Either way, scientists need to monitor the volcano carefully in order to make the best predictions they can.

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