**Volcano’s – Mt St. Helen’s**

Perhaps nothing better demonstrates our inadequate grasp of the dynamics of the Earth’s interior than how badly we are caught out when it acts up, and it would be hard to come up with a more salutary reminder of the limitations of our understanding than the eruption of Mount St. Helens in Washington in 1980.

At that time, the lower forty-eight United States had not seen a volcanic eruption for over sixty-five years. Therefore the government volcanologists called in to monitor and forecast St. Helens’s behavior primarily had seen only Hawaiian volcanoes in action, and they, it turned out, were not the same thing at all.

St. Helens started its ominous rumblings on March 20. Within a week it was erupting magma, albeit in modest amounts, up to a hundred times a day, and being constantly shaken with earthquakes. People were evacuated to what was assumed to be a safe distance of thirteen kilometers. As the mountain’s rumblings grew St. Helens became a tourist attraction for the world. Newspapers gave daily reports on the best places to get a view. Television crews repeatedly flew in helicopters to the summit, and people were even seen climbing over the mountain. On one day, more than seventy copters and light aircraft circled the summit. But as the days passed and the rumblings failed to develop into anything dramatic, people grew restless, and the view became general that the volcano wasn’t going to blow after all.

On April 19 the northern flank of the mountain began to bulge conspicuously. Remarkably, no one in a position of responsibility saw that this strongly signaled a lateral blast. The seismologists resolutely based their conclusions on the behavior of Hawaiian volcanoes, which don’t blow out sideways. Almost the only person who believed that something really bad might happen was Jack Hyde, a geology professor at a community college in Tacoma. He pointed out that St. Helens didn’t have an open vent, as Hawaiian volcanoes have, so any pressure building up inside was bound to be released dramatically and probably catastrophically. However, Hyde was not part of the official team and his observations attracted little notice.

We all know what happened next. At 8:32 A.M. on a Sunday morning, May 18, the north side of the volcano collapsed, sending an enormous avalanche of dirt and rock rushing down the mountain slope at 240 kilometers an hour. It was the biggest landslide in human history and carried enough material to bury the whole of Manhattan to a depth of four hundred feet. A minute later, its flank severely weakened, St. Helens exploded with the force of five hundred Hiroshima-sized atomic bombs, shooting out a murderous hot cloud at up to 1050 kilometers an hour—much too fast, clearly, for anyone nearby to outrace. Many people who were thought to be in safe areas, often far out of sight of the volcano, were overtaken. Fifty-seven people were killed. Twenty-three of the bodies were never found. The toll would have been much higher except that it was a Sunday. Had it been a weekday many lumber workers would have been working within the death zone. As it was, people were killed twenty nine kilometers away.

The luckiest person on that day was a graduate student named Harry Glicken. He had been manning an observation post 9.2 kilometers from the mountain, but he had a college placement interview on May 18 in California, and so had left the site the day before the eruption. His place was taken by David Johnston. Johnston was the first to report the volcano exploding; moments later he was dead. His body was never found. Glicken’s luck, alas, was temporary. Eleven years later he was one of forty-three scientists and journalists fatally caught up in a lethal outpouring of superheated ash, gases, and molten rock—what is known as a pyroclastic flow—at Mount Unzen in Japan when yet another volcano was catastrophically misread.

Volcanologists may or may not be the worst scientists in the world at making predictions, but they are without question the worst in the world at realizing how bad their predictions are. Less than two years after the Unzen catastrophe another group of volcano watchers, led by Stanley Williams of the University of Arizona, descended into the rim of an active volcano called Galeras in Colombia. Despite the deaths of recent years, only two of the sixteen members of Williams’s party wore safety helmets or other protective gear. The volcano erupted, killing six of the scientists, along with three tourists who had followed them, and seriously injuring several others, including Williams himself.

In an extraordinarily unself-critical book called Surviving Galeras, Williams said he could “only shake my head in wonder” when he learned afterward that his colleagues in the world of volcanology had suggested that he had overlooked or disregarded important seismic signals and behaved recklessly. “How easy it is to snipe after the fact, to apply the knowledge we have now to the events of 1993,” he wrote. He was guilty of nothing worse, he believed, than unlucky timing when Galeras “behaved capriciously, as natural forces are wont to do. I was fooled, and for that I will take responsibility. But I do not feel guilty about the deaths of my colleagues. There is no guilt. There was only an eruption.”

But to return to Washington. Mount St. Helens lost thirteen hundred feet of peak, and 370 square kilometers of forest were devastated. Enough trees to build 150,000 homes (or 300,000 in some reports) were blown away. The damage was placed at $2.7 billion. A giant column of smoke and ash rose to a height of sixty thousand feet in less than ten minutes. An airliner some fifty kilometers away reported being pelted with rocks.

Ninety minutes after the blast, ash began to rain down on Yakima, Washington, a community of fifty thousand people about 130 kilometers away. As you would expect, the ash turned day to night and got into everything, clogging motors, generators, and electrical switching equipment, choking pedestrians, blocking filtration systems, and generally bringing things to a halt. The airport shut down and highways in and out of the city were closed.

All this was happening, you will note, just downwind of a volcano that had been rumbling menacingly for two months. Yet Yakima had no volcano emergency procedures. The city’s emergency broadcast system, which was supposed to swing into action during a crisis, did not go on the air because “the Sunday-morning staff did not know how to operate the equipment.” For three days, Yakima was paralyzed and cut off from the world, its airport closed, its approach roads impassable. Altogether the city received just five-eighths of an inch of ash after the eruption of Mount St. Helens.