SCIENCE NEWS OF THE WEEK

The Dark Side of Mt. St. Helens

The saga of Mt. St. Helens continued last week with a tragic and dramatic installment. Without warning of any kind, the 9,677-ft. volcano blasted away 1,300 ft. of its north slope in a massive eruption that flung hot ash, gases and debris 60,000 to 80,000 ft. in the sky. The 8:32 a.m. eruption on Sunday May 18 left at least 8 persons known dead and as many as 100 persons missing, including U.S. Geological Survey scientist David Johnston and National Geographic Society photographer Reid Blackburn.

The huge cloud of ash spread eastward, dumping several inches of debris on central Montana, 500 miles from the volcano, and leaving a fine dusting across Colorado. In the aftermath, scientists are reinforcing their ranks, retrenching for possible future eruptions and trying to outguess nature on the effects of the volcanic fallout.

Prior to May 18, the volcano was well-behaved: The previously detected bulging of the northern flank (SN: 5/3/80, p. 277) continued at a constant rate of about 1½ ft. per day. Emissions from the then 2,000-ft.-wide vent on the northwest flank were sporadic and contained mostly steam. The number of earthquakes was small compared with the rate of seismicity at the volcano's debut March 27. Harmonic tremors — low-level, rhythmic earth movements that are believed to indicate the movement of magma (SN: 4/12/80, p. 229) — had not been recorded since mid-April. USGS geologist Mindy Brugman had been on a glacier near the crater on May 17 and "found nothing unusual."

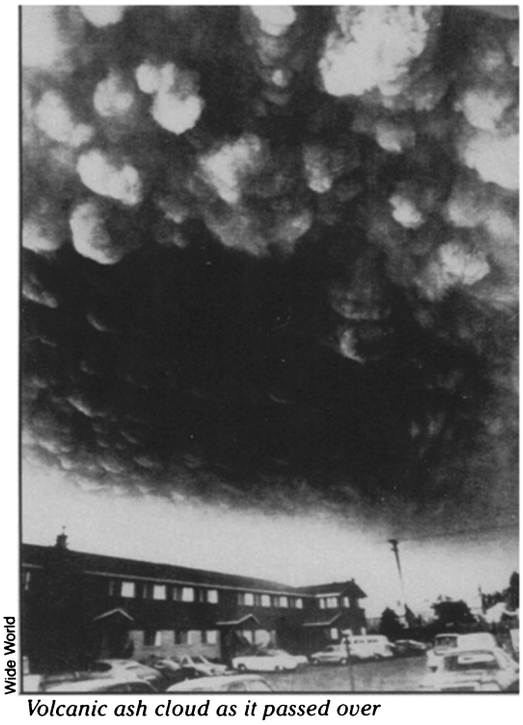
But everything changed the morning of May 18. An earthquake, measuring approximately Richter magnitude 5.0, apparently triggered the explosion of gas, ash and rock. The eruption cloud shot 60,000 ft. or higher, penetrating the stratosphere, where its fine ash will be carried around the globe. Trees were flattened for 15 miles around the former summit by the blast, and the hot gases and static-caused lightning sparked fires that destroyed parts of the Gifford Pinchot National Forest. A pyroclastic flow — a high velocity avalanche of ash and debris propelled by hot gases — that combined with a mud slide broke through the down slope rim of the crater and surged in a wall 18 miles down the Toutle River valley. The river peaked at 23 ft., racing at 15,000 cubic feet per second — three times its 1977 flood record — according to the USGS in Vancouver. Another pyroclastic flow containing volcanic pumice followed the trail broken by the first and flooded Spirit Lake, a reservoir. A 200-ft.-high wall of volcanic debris dammed the down slope side of the lake, raising its level 100 to 150 ft.

The fuming cloud continued to boil from the crater and later in the day, May 18, began to change color from dark grey and black to dark brown — a possible indication of the eruption of previously undetected magma, says geologist Brugman. Seismic activity saturated the instruments at the University of Washington at Seattle. The eruption continued intermittently through the next day, though by late May 18 the ash column rose only a maximum of 15,000 to 18,000 ft. By May 19, the eruptive clouds appeared to consist mostly of steam.

As the smoke cleared, observers found that the entire section formerly occupied by the bulge had been destroyed and an "amphitheater-like area replaced the bulge." The down slope rim of the crater is 1,200 ft. lower than before the blast, says Brugman. Seismically, the mountain seemed somewhat placated: From midnight May 17 to midnight May 18 only three quakes of magnitude 3 or greater occurred, compared with an average of 30 per day before the eruption. "We're not sure of the reason," says University of Washington's Steve Bryant. "It may be that a lot of the pressure was relieved." Three seismic stations were destroyed in the blast, he says, leaving about 10 still monitoring the volcano's shaking.

Despite the tragic surprise, scientists were not caught completely off guard. A crew from the University of Washington led by atmospheric scientist Peter Hobbs was flying through the erupting plume within "a couple of hours" after the event. Hobbs and co-workers sampled trace gases and the distribution and concentration of sizes of ash particles. Though much remains to be analyzed, Hobbs says much of the cloud consists of very fine particles — "from the submicron range to 1 to 10 microns [diameter]." The scientists also encountered volcanic "hail" — aggregations of volcanic debris that fall rapidly to the ground and disintegrate. Within the thick of the cloud, the scientists detected "virtually no" trace gases, probably because the particles had absorbed them. But where the particle concentration was lower, the researchers found a high concentration of gases, primarily hydrogen sulfide. Even 50 miles downwind from the volcano, the instruments detected gas concentrations 5 times higher than that considered toxic to humans. Such concentrations are expected to dissipate before reaching ground level.

The detection of mostly hydrogen sulfide and little sulfur dioxide may indicate that fresh magma did not break out of the crater, says Hobbs, though other signs indicate that magma may have been involved in the eruption. (Volcanic explosions are classified two ways: Either they involve fresh magma — molten rock — or they are due to exploding steam that forces out old rock.) Some of those signs, according to Richard Cadle of the National Center for Atmospheric Research, are the force of the explosion, the apparently very high temperatures and the extremely fine ash produced. "I will be very much surprised if it doesn't turn out that a large part of the ash is new [due to magma]," he said. "A lot had to be old stuff — it probably fell close to the volcano — but the stuff reaching [Montana and Colorado] is probably new." Confirmation will have to await hands-on examination of the region around the crater, says a USGS spokesman.



Wide World

Volcanic ash cloud as it passed over Richland, Wash., 130 miles east of eruption.

Aside from clueing scientists to the nature of the eruption, the fine eruptive ash may have some slight weather effects. No estimates are available for the amount of ash that entered the upper atmosphere, or stratosphere, but scientists from the National Oceanic and Atmospheric Administration say it may circle the globe for several months, creating spectacular sunrises and sunsets worldwide due to its light-scattering effects. According to Cadle, the fine ash may decrease the ozone concentration in the stratosphere — "but quite slightly and within the 'noise' level." In the lower atmosphere, or troposphere, NOAA scientist Lester Machta predicted little effect on precipitation or temperature as the plume moves east across the continent.

Meanwhile, the alert is on. For the first time since its eruption, Mt. St. Helens watchers are suggesting a lava flow is possible. Such a flow, however, would probably be confined to the immediate area around the volcano, according to a USGS spokesman. The more urgent danger is flooding and mudslides from the dammed and ever-rising Spirit Lake.

More to come. □