LESSONS FROM THE MOUNTAIN

Mount St. Helens's spectacular show enables scientists to learn how to predict eruptions

by MARCIA F. BARTUSIAK

"There was no sound at all from the mountain, just those gentle-looking puffs of steam," says Michael Lawton, recalling the mid-April morning he photographed the above spectacular panoramic shot of Mount St. Helens. Despite the warning signals—white vapors rising from the summit—Lawton felt no fear: "I remember saying to myself that this would be a good place to see it explode."

With backpack and snowshoes, Lawton and his local mountain guide had trudged for five hours up snowy slopes to reach their mile-high vantage point, about eight miles from the smoldering mountain. Had they been there a month later, on May 18, the date of the volcano's most violent eruption, they would have had only seven minutes before the onrushing wall of hot gas, ash,

and rock overwhelmed them. Says Lawton: "Just enough time to pour one last drink."

Lawton returned four months later to within about a hundred feet of the same spot to take the picture below. He was stunned by the transformation of the once beautiful terrain into a desolate, Martian-like landscape. Well, not quite desolate. New plants have begun to poke through the ash, and ever since the eruptions began, the area has been crawling with scientists eager to use Mount St. Helens as a natural laboratory for probing the inner workings of an active volcano. Their seismographs record each tremor, while instrument-laden planes fly through the rising plumes, and satellites peer down at the ash-filled atmosphere—all in an effort to profile the mountain's unique personality. Those months of volcano-watching are paying off. Geologists at the site have compiled a rather good record for forecasting the series of moderate eruptions that have occurred since the May 18 blast. "We're still groping with even attempting to make predictions," says Peter Lipman, a geologist with the U.S. Geological Survey (USGS). "We have had some apparent successes, but the test will be whether we can repeat them."

Seismic activity continues to be the major forecasting tool. Many of the eruptions at Mount St. Helens, like those of other volcanoes, are preceded by harmonic tremors—rhythmic motions of the earth that are thought to be caused by the movement of magma (molten rock) deep within the mountain. Just before the August 7 eruption, the tremors started at noon and soon grew so intense that officials sounded the alarm for an evacuation from the restricted "red zone," which extends 20 miles in all directions from the volcano. Four hours later Mount St. Helens blew a tower of ash and steam 44,000 feet into the atmosphere.

The volcano's bulges are another precursor of violence. "Just before an eruption we see a swelling pattern, as if you were blowing up a balloon," says Lipman. "Then, after an eruption, there's a reverse pattern—a deflation." By bouncing laser beams off reflective targets placed on the mountain, scientists determined that its north flank was expanding as much as six feet a day before the big May eruption. Since then, the daily deformation has been measured only in fractions of an inch.

PHOTOGRAPHS BY MICHAEL LAWTON—ORAVA

More promising clues to understanding the volcano's fickle nature may be gleaned from the thousands of tons of gas and steam it belches forth each day. Before the July 22 and August 7 eruptions, for example, scientists detected a change in the ratio of carbon dioxide to sulfur dioxide in the gases being vented. During one quiet period, the volcano gave off about 14 times as much carbon dioxide as sulfur dioxide. But for several days before the August 7 event, the ratio declined steadily, to about three to one—for reasons scientists do not fully understand. "We hope this pattern will be repeated in the coming weeks," says William Rose, a professor of geology at Michigan Technological University. "We might then be able to give a 24-hour warning before an eruption."

Gas emissions also reveal information about the viscous magma bottled up inside the volcano and now surfacing to form a lava dome. Says Rose: "The gas emission rate of St. Helens is very high and suggests that significant amounts of magma are below the surface." Once the magma has given up all its gas, the mountain may start spewing out lava (like the familiar Hawaiian volcanoes) rather than erupting explosively. "It is something to watch for," says Lipman. "St. Helens's geologic record shows that it has previously gone into a lava flow phase late in a volcanic sequence." But nothing is certain about this volcano. "Mount St. Helens has a wide repertoire," says Donald Peterson, the USGS scientist in charge of the Mount St. Helens project. "It's likely to do anything that it has done in the past, but it could also come up with some new acts."

Fresh new fern pokes through the ash and mud; below, a bird's-eye view of the lava dome, showing molten rock glowing through cracks in the surface

Whatever Mount St. Helens does, the USGS apparently expects that it will keep percolating for a long time to come. The agency has requested more than $11 million from Congress to continue monitoring not only the U.S.'s one active volcano but also the other potentially explosive mountains in the Northwest's Cascade range. ▣

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