FOOTPRINTS IN KILAUEA ASH ARE NOT FROM WARRIORS

1919, a lava flow on Hawaii's Big Island forced a crew of geologists to take a detour in the Ka'u Desert on the volcano of Kilauea. The walk led the team through a layer of hardened ash, where they discovered scores of well-preserved human footprints. Two years later, geologist Thomas Jagger suggested that the footprints had been left during a violent eruption in 1790, when a group of warriors under the command of Chief Keoua retreated from an attack by King Kamehameha. Jagger's ideas quickly became the accepted explanation for the tracks. But recent work suggests that the hikers were not warriors after all.

When Don Swanson, a geologist with the U.S. Geological Survey's Hawaiian Volcano Observatory on the Big Island, undertook a thorough study of the footprints last fall, he was surprised. "I expected to see that most of the tracks would be warriors, but I almost immediately saw that most weren't." Instead, he says, "it looks like several hundred people were making the tracks, and most were made by women and children. With so many families in the area, it appears that the eruption may have been unexpected." Swanson reported his findings at the annual meeting of the American Geophysical Union in San Francisco, Calif.

Working with Juanita Rausch, a geologist at the University of Hamburg in Germany, Swanson took advantage of the detailed preservation to take precise measurements of more than 400 footprints. Basing their analysis on forensic studies that indicate that a human foot is about 15 percent of one's height, they found that the average track-maker was 1.5 meters tall, nearly a quarter of a meter shorter than the height of warriors described by early missionaries.

The 1790 eruption of Kilauea is well-known in Hawaiian oral tradition and is referred to as *Keonehelelei*, the "falling sands." More than 5,400 people may

have died when the volcano blew. As the falling sands — technically accretionary lapilli ash — landed, the ash created a wet mud several centimeters thick that would have dried within days. When wet, however, the mud was an ideal medium for preserving tracks. Over the years, researchers have discovered thousands of tracks in the area, now part of Hawaii Volcanoes National Park.

Jadelyn Moniz Nakamura, an archaeologist at the park, says that Swanson and Rausch's work has added some key information not available from the archaeological record. For example, the geologists found a set of tracks where it appears that a child had just been put down on the ground, perhaps by a mother carrying her son or daughter. "It makes me wonder what they were thinking about" as they wandered through the ash and mud, Swanson says. But there are some riddles, like this one, that not even geology can answer.

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These footprints preserved in volcanic ash from 1790 were probably made by women and children.



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