How half of Molokai slipped and slid

The *Guinness Book of World Records* describes the north coast of east Molokai, Hawaii as the highest sea cliff in the world. But this pithy portrayal tells only a partial story, because Molokai is only a partial island. As much as half of it, a geologist now reports, was sheared away in a giant landslide more than 400,000 years ago. This explanation for Molokai's striking cliffs illustrates dramatically that collapse of volcanic islands is a dominant process of island destruction.

At the recent meeting in Indianapolis of the Geological Society of America, Robin Holcomb of the United States Geological Survey in Vancouver, Wash., resurrected an old idea — that some of east Molokai is missing. He is not the first to notice the dichotomy between the island's opposing sides. On the south shore, the terrain follows a gradual incline toward the sea, in the fashion of all Hawaiian volcanoes. On the north shore, the island displays a steep and splendid face that ascends 3,300 feet, or nearly a kilometer, from the sea at an average gradient of more than 55°.

Unusually lumpy seafloor deposits extending 100 km out from Molokai were noted 20 years ago when the techniques of seafloor mapping were new. But then, scientists had no way to prove that the deposits were the remains of a landslide. By examining what remains atop the cliffs, Holcomb was able to demonstrate that an amphitheater-shaped feature is actually half of the volcano's former summit caldera, or sunken crater. He dismisses the notion that the cliffs were caused by erosion. The newest portion, the Kalaupapa Peninsula, is subject to the same wave action as the towering cliffs, but has suffered little erosion during nearly a half million years, Holcomb says. Similar scouring would not be sufficient, he says, to erase such vast quantities of rock, even over the 1.5 million years since the main part of the island formed. Holcomb calculates that about 500 cubic km of material fell away from Molokai, making the landslide "one of the largest documented anywhere."

Major landslides can occur long after the volcanic eruptions cease, Holcomb says. At least eight landslides, some as large or larger than the Molokai event, have occurred on other Hawaiian islands. The process is starkly apparent today on Kilauea, where at intervals vast chunks of volcano are shoved toward the sea, creating space where magma can be stored for future eruptions (SN: 7/9/83; p. 241). The most recent of these episodes was in 1975 when an earthquake tore through Kilauea's south wall, lowering the seaward portion of the volcano by several meters.

Scientists are finding that such landslides are not isolated instances, but may be commonplace. The Island of Reunion in the Indian Ocean also displays signs of landslides. But not all island volcanoes are landslide-prone. In 1982, Kazuaki Nakamura of the University of Tokyo suggested that the deciding quality may be the age of the crust on which the volcano is built. The Galapagos islands, for instance, are on young crust, and are landslide-free. In contrast, the Hawaiian islands are on crust at least 80 million years old. These volcanoes, some of the largest mountains in the world, rest heavily on a soft and unstable cushion of thick sediments. An earthquake or a change in the pressure of water trapped in the sediments could cause the foundation to shift. Movement on the seafloor literally can tear a volcano apart.

Since the 1980 eruption at Mt. St. Helens, researchers also have recognized that landslides are a dominant part of the eruption sequence at volcanoes on land. An earthquake triggered the landslide at Mt. St. Helens, and 2.5 cubic kilometers of material cascaded down the mountainside. As the landslide progressed, less pressure confined the hot gases in the volcano's interior, and the first violent explosion soon followed. This sequence explains why the eruption occurred toward the side, rather than from the top of the volcano's cone, says Robert Christiansen of USGS in Menlo Park, Calif. This example has led to a reexamination and better understanding of similar sideward eruptions 500,000 years ago at California's Mt. Shasta, the eruption in the 1880s at Bandai-san in Japan, and the 1957 eruption at Bezymianny in the Soviet Union.

—*C. Simon*

Left: Molokai's south shore slopes gently toward the sea. Right: The north shore sports the world's largest seacliff where a landslide sliced the island in half.

Baby cries: Whispers of future illness?

Baby cries come in many shapes and sizes — some are high pitched, some low; some in long, mournful whines; some in jolting, staccato bursts. Now, a psychologist reports that analyses of the *quality* of cries could reveal whether a child is at risk for anything from Sudden Infant Death Syndrome (SIDS) to learning disabilities, hyperactivity and "difficult" personalities.

"The cry may not be able to predict all this, but it may be a 'window' into these problems," says Philip S. Zeskind, assistant professor of psychology at Virginia Polytechnic Institute & State University in Blacksburg. In a series of studies with infants ranging from two days to several months of age, Zeskind has found that babies classified as "high risk" have distinctly different cry patterns from "normals." High risk was determined by the prevalence among mothers during pregnancy of factors such as toxemia, narrow birth canal, infection and poor nutrition.

With 48 two-day-olds, Zeskind reports that many high risk babies displayed these traits: Took longer to respond to the cry stimulus sustained their cry for less time but took an average of 11 seconds longer to start crying after being snapped with a rubber band; had a pitch twice as high as the normals. Zeskind, speaking at the Council for the Advancement of Science Writing meeting at Virginia Tech, also found that the "abnormal criers" had much more variable heart rates at rest. This suggests, he says, that the balance between the autonomic and parasympathetic nervous systems (which, in gross terms, speed up and slow down the body, respectively) are somehow out of whack in the abnormal criers — a finding that he says may have implications in diagnosing SIDS.

Further evidence to the link to the autonomic nervous system was provided when Zeskind found he was able to predict with 95 percent accuracy that the abnormal crying babies would shortly develop "poor state control" — either hanging loosely in a parent's arms and not responding, or responding too quickly (such as crying simply when being picked up).

And finally, he reports that spectral analyses of heart and respiration rhythms reveal that "subtly malnourished" infants not only have abnormal cries but yield rhythmic waves (depicted in cycles per hour) significantly different from normals'. Zeskind concludes that the malnourished youngsters do not get the proper nutrients to operate certain neurotransmitters, located primarily in the brain stem. Taken together, Zeskind says, these findings indicate that infants at risk for a wide range of later problems might be identified by their early cries and given special treatment that might prevent such disabilities.

—*J. Greenberg*