

weekend SPECIAL

LETTER FROM VOLCANO

by Sandol Stoddard

April 4, 1983

At 2:30 this morning, on the outskirts of Volcano Village on Hawaii's "Big Island," we stood in bathrobes on our driveway watching as a column of fire lifted itself nearly 1,000 feet into the air from fern and ohia forests nearby. The intense, red-gold flame sometimes formed a towering cone, an immense pylon upwardly tapering and appearing to be quite solid; then it tossed itself free and plumed the horizon with clusters of continuously rising and falling fire-showers. The clouds in the eastern sky were brighter than yesterday's sunrise, billowing upward in shades of cobalt and magenta as well as clear red, tinged at their lower edges with a coruscating, brassy gold.

Above all this, in a pale sky decked with stars, the moon lay serene, just past her prime. Thirty miles down slope the port of Hilo slept. A few dogs were up and barking on the mountain; a neighbor's rooster announced in puzzled tones that it was dawn. Otherwise all was silence except for the magnificent sound that had awakened us: the voice of fire, a steadily consuming and enveloping roar at base, punctuated by explosions like those of distant thunder or artillery, and then at times by a noise that was curiously metallic, as if something rather intimate and domestic were happening on a very grand scale. Pele, the Hawaiian goddess of the volcano, is whimsical as well as lavish when she flaunts her powers; like India's Maya-Shakti she dances the dance of pure energy, creating as freely as she destroys.

Now, in the cool light of a rainy morning on the mountain, the great cone of molten lava in the near distance appears to be two-dimensional, a flat, dark, noncommittal red. We have learned that it is just seven miles from us, and 12 from the observatory. A geyser of dark smoke stands like a chrysalis beside it, quivering. Its sound reaches us intermittently: jet planes, taking off.

According to local news bulletins no one has been hurt and, in this latest phase of its present eruption, Kilauea Volcano poses no immediate threat to human habitations or agricultural lands. The flame that waked us is one of the highest and most spectacular ever recorded at Kilauea, but it stands in a largely inaccessible area of the mountain known as the middle east rift zone. Its fallout is building a small, new mountain here at the moment—a potentially

fertile cinder cone already 200 feet high and rapidly growing.

Meantime, a two-mile-long flow of lava is blazing its way slowly through the forest toward the sea. Observatory scientists estimate today that 10 million cubic meters of lava have already poured from this vent; earlier this year they reported that 20 million cubic meters had covered a ground area of three square miles.

It is in Kilauea, Hawaiians say, that Pele lives, U.S. Geological Survey's scientists, in their own language, agree; their instruments tell them that Kilauea is the world's most active volcano. If the result is destruction that occasionally becomes terrifying to humans, it is also a process of creation that we are witnessing. The Hawaiian Islands owe their existence to volcanic action. Everywhere we look we see new land, and even now, southeast of the Big Island, an underwater peak is rising to join the visible archipelago. If the present flow from Kilauea's east rift reaches the island's edge and falls with an explosion of steam there into the surf, many new acres will have been added to Hawaii—land that needs only wind and rain, sun and time to reveal its marvelous richness.

April 5

Low-lying clouds and fog mixed with rain. The fire-fountain pulses invisibly; Pele's presence is everywhere on the mountain.

Old-timers of Hawaiian ancestry, far from tourist centers, will tell a friend even now that they have seen her walking on the road. She wears a dark, hooded cloak and leaves no footprints; dogs become frantic at her approach. Typically, she asks the passing driver for a lift, and then, having reached her destination in perfect silence, vanishes. One elderly Hawaiian, an spear fisherman I know never enters the water without offering a freshly-killed chicken to the shark-god, and he claims to have seen Pele face to face. He says he prays to Jesus in the daytime, and to Pele after dark. Modern kahunas (native priests) work quietly, during last month's flow into an inhabited area, to dissuade the goddess from her path; one appeared briefly on local television, offering fruits and flowers at the lava's flaming edge.

Scientists at the Hawaiian Volcano Observatory have developed an equally respectful, if differently structured, relationship with the power in the mountain. They have got

Pele wired. At the first sign of harmonic tremor—a continuous, cyclical and deeply humming vibration frequently associated with eruption—a programmed circuit shuts down, triggering an alarm in the laboratory and in the houses of several members of staff.

"The two hardest things



Sandol Stoddard

about running a volcano observatory," said Dr. Thomas Jagger, founder and for many years director of the station at Kilauea, "are keeping the staff from getting bored between eruptions, and from getting hysterical during eruptions."

If HVO staff members are hysterical today, they are concealing it under broad smiles. Challenger has gone up successfully and at 9:55 a.m. is due over Hawaii; the astronauts are going to try for photographs of the eruption. Five men are leaning over the radio as I arrive. A technician is operating the radio-telephone in communication with Campsite No. 4, near the base of the lava fountain.

There is a great deal of noise. Someone beaming in at the moment has either lost or found a helmet with a red strap on it; whether this helmet is floating in a lava pool or in outer space is not at all clear. They are amused in Texas. Suddenly it is all over; no photographs, Hawaii is soaked in.

Several telephones ring. The lava flow, emerging at 2,240 feet, has now reached the 2,000-foot elevation, nearing a settled area called Royal Gardens (long ago, Hawaiian queens bathed nearby) and a helicopter will be dispatched to monitor it. If it continues in this direction, Reginald Okamura says, not only Royal Gardens but the National Park Center at Waha'ula Hei'au will be at risk. There is an ancient temple site at Waha'ula where human sacrifice was considered the best mode of communication with Pele, during such emergencies, as recently as the early 19th century.

Here in the lab, a pen is

poised upon the slowly revolving, white-papered drum of a seismograph recorder labeled PUK, and of all the humming, clicking machines in operation, PUK is the star today. With great precision and speed, it tells us what is happening at Pu'u Kahauale'a, a cinder cone near the fountaining vent. PUK is responding to radio signals from one of 50 battery-operated devices that have been placed in the field for just such an occasion; its partner is 12 miles away, reporting strong harmonic tremors that translate themselves visually into something resembling an extremely long and elegant bottle-brush. Molten lava under tremendous pressure is therefore coursing along through underground channels near this site.

In the front window of the observatory, a modest, ranch style building at the brink of Kilauea's main caldera, six other seismographs are placed so that they can be seen by visitors. They record activity, day and night on a regular basis, at various locations: Ka'u Desert, Ahua, Mauna Lao, Pauahi, North Pit and Heiheiabulu.

Most tourists inspect them briefly and then turn to gaze instead, in astonishment, at Kilauea's vast, 2.5-mile caldera—a steep-sided basin far larger than the usual crater at the summit of a volcano. Today the cavern is dressed in gray, amber and black, trailing translucent skeins of mist from the steam-vents near its upper rim.

The observatory itself is a sophisticated, agreeably spartan field station staffed by 26 permanent personnel including geologists, geophysicists, geochemists and physical science technicians, aided by 19 part-time workers, many of whom are students from the Hilo campus of the University of Hawaii. Scientist-in-charge is Dr. Robert Decker, until 1979 professor of geophysics at Dartmouth.

Bob Decker is on the mainland for a month and Reggie Okamura, 25-year veteran of the observatory, is the suave and genial acting-scientist-in-charge. His relationship to Kilauea is one of bemused patience: "You always have to expect the unexpected here." Okamura has been on duty since Sunday; five or six of his men, in relays, will stay in the field indefinitely now, as close to the fountain as possible. They will be taking samples at temperatures of up to 2,200 degrees Fahrenheit of the blazing magma as it emerges, collecting gases in small vacuum bottles, taking photo-

graphs and videotapes, measuring the height and angle of the fountaining to establish a basis for predicting the amount of flow, and keeping communications open with headquarters as they dodge the flames.

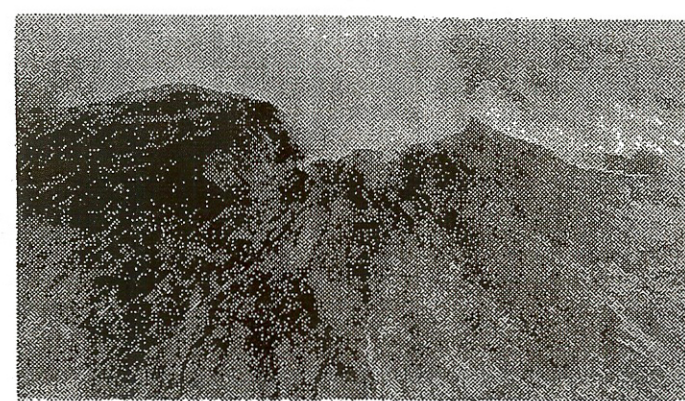
The fountain now under observation has erupted with spectacular beauty and violence, but Kilauea, as volcanoes go, is actually rather benign; thus it allows humans to live with relative safety on its slopes and offers itself as a rich source for scientific study. Tucked against the flank of a much larger neighbor (Mauna Loa, 13,000 feet above sea-level, 30,000 feet from its base on the ocean floor, bulks 100 times larger than Fuji or Mt. Shasta) 4,000-foot Kilauea, like many volcanic mountains of Hawaii, stands against the horizon in a sheltering curve like that of an ancient, Germanic body-shield, and so is known as a "shield volcano."

Kilauea erupts both at its summit, which presently has a "circular collapse feature" (its immense caldera) and on either of its two rift zones. Scientists believe, on the basis of seismic and deformation data, that the rift eruptions are fed by lava moving sub-horizontally, in thin vertical sheets (dikes), from Kilauea's storage chambers some 9,000 to 24,000 feet below the summit; thus the fire we are now watching comes to us from far below the sea.

Hawaiian lava, like so many creations of these gentle islands, has a special quality of its own. It tends to run freely, with great liquidity, rather than exploding in a pall of pumice, hurling rocks. According to geochemist Paul Greenland, gases emerging from the present vent are, in order of their relative abundance: water, sulfur dioxide, carbon dioxide, hydrogen, carbon monoxide, hydrochloric acid and hydrofluoric acid—not a promising environment for plants, animals or human beings and, in fact, one similar to modern industry's "acid rain."

If we turned on the garden hose full force, keeping a firm thumb over it for as long as possible, then pointed it upward and let go, the resulting geyser would be similar to the lava fountain on Kilauea's east rift; in other words, this is fundamentally a simple, mechanical event, a release of pressure that can be predicted by observatory scientists with fair accuracy as much as three months ahead of time, when it occurs on a rift. Summit eruptions, rising directly from the underground chambers, happen much more suddenly, giving notice of only three hours to a day.

Pahoehoe is the fast-running material now emerging



The Kilauea Volcano eruption continued from Mar. 28 through Apr. 9.

from the vent; it hardens in slick, sculptured whorls that are, in time, relatively kind to the feet. Aa, a rough and clinkery lava-type is moving at the moment somewhat farther down the slope; it produces a jumbled, blacker-than-black surface as it cools.

In order to predict the volcano's behavior, observatory staff keep careful watch not only on seismographs, but on a device called a tiltometer. When magma begins to rise and stir in the mountain, Kilauea's profile actually swells very delicately upward and outward, changing the distances between survey stations and the angles of ground-tilt accordingly. Such minute burgeoning is immediately noted by this scrupulous machine, and reported as a possible sign of impending eruption.

Have the phases of the moon anything to do with it? This seems an obvious question, but I wonder whether I am asking it in the right place. Everyone on the mountain has a theory, of course. "I could have told them," an old-timer said in the post office this morning. "It's on account of the drought. She always goes up during a dry spell, but the scientists don't pay any attention to that."

In fact, geologists here today tell me that climatology has no effect whatever on the mountain's activity, but as to the moon, they agree with Bob Decker that "when the volcano is ready to erupt, the tidal influence acts as a hair-trigger." Studies of Kilauea's last 40 eruptions show them occurring with statistical regularity during a new moon, or when the moon is full. For several weeks now, we have had high-tide warnings. Waves have surged over roadways and into a park in Hilo. The surfing, I hear, has been great.

April 6

The sky glowed all night and the pulsing roar continued. This morning, a sun the color of mustard; we've disconnected the catchment pipe. There has been a visitor in the night: the lawn, the steps and the top of the water tank are all aglitter with

"Pele's Hair." More of the lovely filaments are floating down now, in glassy strands so fragile that they break without a sound when I handle them. Some are perfectly transparent, some amber or pale gold, some glossy black. Iron and magnesium silicates, delicately spun as the finest of infants' hair, they remind us again how close we are to the scene of creation, for they have wafted to us, on only a little breeze, from the heart of the fountain: frozen fire. How does one respond to such a gift?

I have been trying to get a helicopter. The new cone can't be seen at all from any road, though it is almost 250 feet high. Above that, the fountain has been varying from 200 feet to 1,000. The lava flow, for the moment, has slowed down. Civil Defense has everything on hold, with Royal Gardens alerted for evacuation, and no one but observatory scientists may land near the site. After a considerable amount of thrashing around, I find a Cessna 172XP and a pilot named Joe. Then it begins to rain, and I stand around at the airstrip where a CBS crew has arrived, watching them watch the weather.

A strip of silver appears on the horizon, and Joe is suddenly ready to go—a young matador, a paniolo, with magnificent black mustache and a straw hat on his head set absolutely straight. We climb into the plane and take off, scooting at 1,200 feet over the outskirts of Hilo town, which immediately reveals to us its seamier backyard secrets, its plethora of wrecked and abandoned cars, its fuming dump. Cane fields come next, dirt roads winding among them, then scrubby orchards, bananas, papayas, macadamias, all drenched and ugly in this light. Kilauea to our right, which is southwest, is wrapped in gray wool; the clouds ahead look solid enough to walk on. Apparently, we will see nothing.

Over ohia forests now, jumbled and tormented by old lava flow, the desolation of last month's 2,000-acre forest fire. Rain that would have

helped stop that is now running down our windshield, and I fiddle with my binoculars, feeling certain that we will soon turn back.

"There she is!" says Joe. In the lifting, pale blue stretch of sky ahead there is a form at first outlined, then gradually filling itself with color, that is so primitive, so utterly known before one has ever seen it, that it halts the mind. For a time, nothing else registers. Like the images in certain dreams, I suppose, this is an ancient memory restored, reclaimed: young earth, as it was in the beginning. Dawn, and a smoking cone.

The rain is behind us; the trade wind blows lightly, steadily from the northeast. We will be able to make a close approach because spatter, gases and debris are being blown against the side of the larger mountain. Joe negotiates a sweeping turn of the Cessna with one hand, opening the window beside me with the other. We are going in at 999 feet, shaving 12 inches, evidently, from FAA regulations.

The fountain rises now in twin flames, wide and tossing, then overlapping; what appears at first to be pure glitter and iridescence in their midst is actually a continuous shower of blazing lava-clots, seized by air and cooling rapidly. I cannot tell how high the flame is; Joe thinks 500 feet.

The rounded cone is enormous at this range, deeply scooped and hollowed at its brim; its western ridge arches high, then sinks in a voluptuous curve to the forest floor. The heat of it, through the open window, is astonishing. We make a series of close turns. The open tip of the cone, pouring fire, looks delicate as a leaf or a flower burning, folding in upon itself, flexible somehow; and soft; lava slips easily from its rim, like red silk. Where it reaches the forest it is a forked stream, sequined, jeweled, moving like a snake. Trees wait their turn, and then, at a time, catch fire.

"Pretty good ride," says Joe. "Better than Challenger, yes?" For perhaps half a mile on all sides of Pele's new mountain, the forest floor is utterly black. All light seems contained at its source within the cone itself; there is nothing left in the landscape around it, even to reflect. After a few minutes I spot Campsite No. 4, looking like a moon-landing. Bundles are spread out like cards placed for solitaire, and there is a man without a shadow, walking.

Sandol Stoddard is an American writer who has published a number of books on such subjects as the hospice movement. She also writes short stories, articles and reviews, and has published some books for children, one of which has been translated into Japanese.—Ed.