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RECENT OBSERVATIONS AT KILAUEA.

BY JOSIAH KEEP, MILLS COLLEGE, ALAMEDA CO., CAL.

THE great volcano of Kilauea, on the island of Hawaii, like all other live things, is constantly changing, and any report of its condition is liable to need important corrections on the advent of the next steamer. The last great explosion, however, took place in 1790, more than a century ago, and since that time the huge pit has been filling up with black lava and the area of activity has been narrowing. During the month of July last I had an opportunity to observe the igneous action under exceptionally favorable circumstances, and a record of its condition at that time can hardly fail to be valuable for comparison with past and future reports.

The crater is a huge depression or pit, about three miles long and two miles broad. The walls are mostly precipitous, though quite irregular, and the floor is some three hundred feet below the surface of the island at that point. Forty years ago it was several hundred feet lower. Standing on the brink of the crater and looking down, one is reminded of a great cellar after a fire. Every thing is black or rusty, and the smoke and steam coming up from dark clefts put you in mind of the charred and smoking timbers to be seen after a conflagration. A zigzag path, a mile long, leads down through ferns and bushes to the black lava, and then you step out on a sea of absolute desolation. The lava is cold now, but there are the most abundant evidences of its recent fusion. The surface is greatly varied; here being nearly smooth, and there swelling up into steep hillocks, perhaps with caves beneath them, into which you can creep or perhaps walk upright. Cracks abound, and out of some of them the hot slag has oozed, and flowed, and cooled, and hardened.

After walking over two miles of this rough floor I came suddenly to the brink of a second pit in the floor of the greater one. This second pit, the "Halem' oum' ou" of the natives, is about half a mile in diameter, and at the time of my visit its floor was some two hundred and fifty feet below the point where I was standing. Some adventurous climbers descended the precipitous sides and actually stood on the freshly-cooled lava, but I did not accompany them. In the centre of this lower floor was the lake of moulten lava, nearly circular in outline, and about one thousand feet across. Its level surface was largely covered by a thin, gray crust, portions of which would often sink and reveal the glowing liquid beneath.

The fiery lake was never free from agitations, particularly around its edges, but the extent and violence of the activity were constantly changing. Occasionally a liquid hillock would rise like an enormous bubble, then sink back again, while a puff of thin, blue smoke would slowly rise and float off from the spot, showing that in a condensed state it had doubtless been the lifting agent. But most of the agitation resembled the lively boiling of a kettle of water over a brisk fire. The glowing fountains would jump and dance in the wildest manner, often throwing up the fiery drops to a height of fifty feet, while waves of lava would surge against the curb of the lake with a sound like that of ocean breakers In the night time, seen through an opera glass, the display was beautiful and grand beyond description.

The continual falling of half-cooled drops of lava around the edge of the lake, combined with the wash of the fire-waves, serves to build up a curb, which grows in proportion to the activity of the lake. On one side of the pool of melted rock its top was some thirty feet higher than the floor which joined the base of the curb to the walls of the pit. One night the lava rose in the lake and poured over the curb on that side in a magnificent cascade of fire. It was not possible to get in front of the overflow, but it was estimated that the stream was fifty feet wide. The motion of the current was like that of a water cascade, but when the flood reached the floor of the pit it quickly began to congeal on the top, while the under part ran on till it reached the confining walls. Another overflow, where the curb was not so high, came directly towards my point of observation, and I could clearly see that the central point of the stream moved swiftest, causing the hardening waves to assume the well-known crescent forms.

By such overflows from the moulten lake the inner pit is being gradually filled up; in fact, its floor has risen several hundred feet the past few years. The lake rises *pari passu*, the curb never rising very high above the floor. What the result will be is uncertain. Should the lava continue to rise, the pit will soon be filled and will overflow into the basin of Kilauea itself. But instead of this the bottom of the pit may drop out, so to speak, as it did very suddenly before this last rise, and instead of gazing into a lake of fire the tourist may be compelled to look into a huge smoking hole, some five or six hundred feet deep. Doubtless the whole floor of Kilauea rests on a very hot foundation, as the steam which ascends from many cracks indicates, but at the time of my visit there was no melted lava visible except in the lake which I have described.

The questions presented by these phenomena are intensely interesting; but the more I observed the boiling of the lava, the more I became convinced that aqueous vapor is not the chief agent which does the work, though it may be concerned in starting the tremendous chemical action, perhaps a decomposition of sulphides, which I think is the source both of the heat and of the commotion.

EXTREMES IN THE PLANT WORLD.

BY PROF. J. I. D. HINDS, LEBANON, TENN

OF living organisms, the largest, as well as the smallest, are found in the vegetable kingdom. In point of bulk, even the elephant compares unfavorably with the largest trees, and the smallest living objects, seen by the help of the microscope, are undoubtedly plants.

The largest plants known are what are popularly called "the big trees of California." They are conifers, belonging to the genus Sequoia, which is intermediate between the firs and cypresses. There are two species, *S. sempervirens* and *S. gigantea*. The former is the common redwood and abounds on the Coast Range from the southern part of California northward into Oregon. The latter is not so common, but grows to a larger size. "It is confined to the western portion of the great California range, occurring chiefly in detached groups, locally called 'groves,' at an altitude of from 4,000 to 5,000 feet above the sea." It grows to enormous size, varying in height from 200 to nearly 400 feet and in diameter from 20 to 30 feet. One tree in Calaveras County is 325 feet high and 45 feet in circumference six feet from the ground. Another measured 90 feet in girth and 321 in height. Some of these trees are supposed to be 3,000 years old. They were then in their vigor when the Roman Empire was at the height of its glory and hoary with age when Columbus landed on the American shore.

Let us now turn from these giants of the forest to those plants which can only be seen with the higher powers of the microscope. The smallest of these and at the same time the smallest of living things are the plants known as Bacteria. They have an average diameter of one twenty-five thousandth of an inch and a length