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MAUNA KEA, HAWAII, (AS SEEN FROM WAIMEA), 13,820 FEET HIGH.

THE ASCENT OF MAUNA KEA, HAWAII

Although the ascent of Mauna Kea presents no great difficulty and has often been described, yet a brief account of a late scientific expedition to its summit may be of interest to your readers.

The results of Mr. E. D. Preston's work on Haleakala in 1887 were so highly appreciated by scientific men, that the American Academy of Sciences recommended that a similar series of observations should be made on Mauna Kea. It was also decided to include in the plans a series of magnetic observations at a number of important points in the islands.

The U. S. Coast and Geodetic Survey agreed to grant Mr. Preston leave of absence for the purpose, and to lend the necessary instruments, while the trustees of the Bache fund of whom Prof. Dana is one, offered to apply its income to the same object. As this sum, however, was insufficient, a correspondence was opened as early as 1889, with the Hawaiian Government Survey, which promised to assist in transportation, and to furnish at least one assistant to record the observations, in consideration of the value of the magnetic and latitude work.

The plan would have been carried out last summer, if Mr. Preston had not been selected to co operate with Dr. A. Marcuse in carrying on a series of latitude observations of the highest degree of precision at Waikiki for a year, beginning about the 1st of June, 1891. As is well known, this laborious and delicate task was completed to the entire satisfaction of astronomers, and the way was now open for the execution of his original design. He decided to make complete series of pendulum, latitude and magnetic observations at the sea level, on the side of Mauna Kea, and again on its summit; one important object being to determine its specific gravity, and, as it were, to weigh the mountain. The stations occupied were to be carefully connected by survey with the triangulation of the Government survey.

The party left Honolulu for Kawaihae June 25th, consisting of Mr. E. D. Preston, astronomer, Mr. W. E. Wall, his assistant, Prof. W. D. Alexander, surveyor and quartermaster for the party, and Messrs. W. W. Chamberlain and Louis Koch.

The first station occupied was in the village of Kawaihae, near the sea, in a lot belonging to His Ex. S. Parker, to whom as well as to his agent, Mr. Jarrett, the party are indebted for many repeated kind and generous acts. The appearance of the place has been greatly changed by the groves of cocoanut and algaroba trees, that have grown up of late, and by the formation of a strip of new land along the shore, more than 100 feet wide, within the last fifty years. Like Lahaina it is rich in historic ruins and in reminiscences of better days.

Our next move was to the grassy and wind-swept plain of Waimea, 2600 feet above the sea, where we enjoyed a complete change of climate, and had glorious views of the three great mountains of Hawaii. We could not help noticing, too, the evident fertility of the soil, and the neglected opportunities for homestead farms. Only magnetic observations were made here, while we were preparing for the ascent of the mountain. Here we engaged our guide, hired our horses and part of our pack mules, and had our freight, ("impedimenta," as Cæsar appropriately called it,) carted thirty-five miles farther, half-way around the mountain to the Kolaieha Sheep Station. We made this our base of operations in attacking the mountain, in order to dispense as much as possible with the use of pack mules, on account of the heavy and costly instruments which we were obliged to carry. A wagon road made by the owners of the Humuula Sheep Ranch leads from Waimea around the western and southern sides of Mauna Kea. On the western side of the mountain it passes through a region which only needs more rainfall to make it a superb grazing country. The ancient forests here, as at Waimea, have been nearly exterminated, but a fine grove of mamane trees still survives at the Auwaiakeakua Ranch. The manienie grass is gradually spreading and will in time add immensely to the value of the land. At the half-way station, called Waikii, water tanks and a rest house have been provided for teamsters. After turning the corner we skirted the desolate plain studded with volcanic cones that lies between the giant mountains of Hawaii, riding through loose volcanic sand amid clouds of dust. Occasional flocks of quails or pigeons were the only living creatures to be seen.

At length the vegetation began to be more dense, the patches of piipii grass and the groves of the beautiful and useful mamane or sophora tree more frequent, as we approached the Hilo district. Barbed wire fences showed that we were approaching civilization, and at last we came in sight of the Kalieha Sheep Station with its neat buildings, its water tanks and telephone lines, and general air of thrift, all testifying to the energy and foresight of its manager, A. Haneberg, Esq.

Nearly every afternoon this region is enveloped in dense fog which pours in from the east, driven by the trade wind. At night, during our stay, the thermometer generally fell below 40° Fahr., and frost is not uncommon. The elevation, according to the barometer, is about 6700 feet.

Quails abound, and the mountain geese and wild ducks are found in the "Middle Ground." The mongoose has not yet arrived there. Wild cattle and boars are still numerous on the slopes of Mauna Kea, and the former supplied the best beef we have tasted in these islands. The present manager has been at much labor and expense in extirpating two pests, which are said to have been accidentally introduced from New Zealand, viz., the Scotch thistle and the gorse.

Here Mr. Preston established an astronomical and pendulum station, and made complete series of observations, as at Kawaihae, while surveys were made to connect it with the primary triangulation. The party was then joined by Mr. E. D. Baldwin, from Hilo, who brought two pack animals and a muleteer, and by Mr. J. J. Muir, from Mana. Mr. Baldwin had visited the summit in 1890, and had afterwards made a valuable map of the central part of Hawaii.

The first start for the summit was made on the morning of July 19th, but an ambitious mule, which had the honor of carrying the magnetic instruments, ran away in the thick fog, and was not found till 3 P. M., after six hours of searching. Fortunately no harm had been done to the instruments.

The next morning the thermometer stood at 35° Fahr. The fog cleared off early, and a finer day for the ascent could not be imagined. Mr. Haneberg now took command of the pack train, and had the caravan loaded and set in motion by 7:45 A.M., the guide riding in front, followed by eleven pack mules and as many men on horseback. One sturdy brute carried the pendulum receiver, weighing about one hundred pounds, on one side, balanced by bags of cement on the other.

After riding nearly two miles due east from the ranch, we turned to the north, gradually ascending through a belt of country thickly covered with groves of mamane.

We crossed a shallow crater just east of a conspicuous peak called "Ka lepe a moa," or cock's comb, and began to ascend the mountain proper. After climbing a steep ridge through loose scoria and sand, the party halted for lunch at an elevation of 10,500 feet. The upper limit of the mamane tree is not far from 10,000 feet. The Raillardia, apiipii, extends a thousand feet higher. The beautiful Silver Sword (Argyroxiphium), once so abundant, is nearly extinct, except in the most rugged and inaccessible localities.

The trail next turned to the east, winding around an immense sand crater called "Keonehehee," 11,500 feet in elevation, which stands at the edge of the summit plateau. Further to the southeast we were shown a pillar of stones which was raised to commemorate Queen Emma's journey over the mountain to Waimea in 1883.

The summit plateau, which is perhaps five miles in width, gradually slopes up from all sides towards the central group of hills. It is studded with cones (most of which contain craters), composed of light scoria, like those in the crater of Haleakala. The surface of the plateau is strewn with blocks of light colored, fine grained, feldspathic lava, interspersed with patches of black sand.

The rarity of the air was now felt by both men and animals, and it required forcible arguments to make the laggards keep up with the column. At last, about 3 P.M., we clambered over the rim of a low crater west of the central cones, and saw before us the famous lakelet of Waiau, near which we camped. It is an oval sheet of the purest water, an acre and three quarters in extent, surrounded by an encircling ridge from 90 to 135 feet in height, except at the northwest corner, where there is an outlet, which was only two feet above the level of the lake at the time of our visit. The overflow has worn out a deep ravine, which runs first to west and then to the southwest. A spring on the southern side of the mountain, called "Wai Hu," is believed by the natives to be connected with this lake. The elevation of Waiau is at least 13,050 feet, which is 600 feet higher than Fujiyama. There are few bodies of water in the world higher than this, except in Thibet or on the plateau of Pamir. No fish are found in its waters, nor do any water-fowl frequent its margins. Its depth was not sounded, as it was proved by experiment that we had not adequate means for navigating it. Small tufts of grass and delicate ferns were found growing among the rocks around the lake.

After the pack train had been photographed, the large tent was pitched close to the shore of Waiau, and all the animals were sent back to the ranch except one unfortunate mule, which was treated to a feed of oats and blanketed for the night.

All of the party were more or less affected by shortness of breath, but two of them had a severe attack of mountain sickness before supper. After suffering extremely for thirty-six hours without any signs of improvement, they returned to Kalaiha on the 22d, leaving five persons in the camp, taking the mule with them. The writer was hors de combat the day after the ascent with an old fashioned sick headache, but had no further trouble from that cause.

During each of the six nights which we spent on the summit the temperature fell much below the freezing point, registering 25 deg., 18 deg., 14 deg., and even 13 deg. Fahr., and considerable ice formed around the margin of the lake. During the day the maximum of the thermometer in the shade was generally between 60 deg. and 63 deg., but when exposed to the sun on the rocks it rose to 108 deg. The hygrometer indicated an exceptionally dry atmosphere.

A solid pier of masonry was built for the meridian circle, and a flat rock moved into position to serve as a stand for the pendulum apparatus. Such was the clearness of the air that star observations were usually commenced before 5 P. M. Contrary to expectation we found the trade-wind blowing as strong on the summit as it did below at Kalaieha.

Of Mr. Preston's work it may briefly be said that it was entirely successful. The opportunity was great and he made the most of it. Complete series of magnetic, latitude and pendulum observations were made, besides the observations of the barometer and thermometer, and a large number of interesting photographs were taken from different points of view. In the meantime a topographical survey was made of the summit plateau, in which Mr. J. J. Muir's assistance was most opportune and valuable. On the 22d a short base line was measured with a steel tape and a minute survey made of the lake and its neighborhood. On the same day two of our men came up with two pack mules, bringing the Honolulu mail, a load of firewood and some fresh provisions.

The next day, the 23d, Mr. Muir and the writer together with the guide ascended the central hill, about a mile and a half from our camp and 800 feet higher. It encloses two small craters. The scramble up that huge pile of cinders in the rarefied air is a severe strain on weak lungs. The pulse rose in one case to 120, and in another to 150 per minute. The old trig. station, which had formerly been sighted to from several points below, was now occupied with an instrument for the first time. The difference of height between this station and the next summit was found by levelling to be about 45 feet, as it had been estimated in 1872. The highest point is probably not less than 13,820 feet above the sea.

The view from the summit was sublime beyond description, embracing, as it did, the three other great mountains of Hawaii, and the grand old "House of the Sun," 75 miles distant, looming up clear and distinct above a belt of clouds. Mauna Loa was perceptibly a trifle lower than the point where we stood. Without casting up any loose heaps of sand and scoria, its majestic dome has risen within 150 feet of the highest point reached by its rival. Its surface was streaked by numerous recent lava streams, while a deep cleft, which breaks the smooth curve, gave us a glimpse into the vast terminal crater of Mokuaweoweo.

On the windward side of the summit ridge and in the craters were several large patches of snow, two or three feet thick, composed of large crystals, like coarse salt. While eating our lunch on the summit, we were surprised to see carrion flies at that altitude, attracted by it.

After surveying and sketching at several stations, we returned, sliding down a steep slope of sand and cinders, 700 feet in height, to our camp, where a repast awaited us, that reminded one of the Hamilton House. It is enough to say that our worthy chef de cuisine was Louis Koch, well known to former guests of the Hamilton and later of the Volcano House.

During the following night the thermometer fell to 13 deg. Fahr. We did not, however, suffer from cold, although the confinement of the blanket bags became rather irksome. A small kerosene stove was kept burning all night, which no doubt helped somewhat to keep up the temperature of the air within the tent.

On Monday, the 25th, the thermometer stood at 20 deg. at sunrise. Messrs. Muir and Alexander ascended the second highest peak on the northwest, overlooking Waimea, 13,645 feet in height to continue their survey. In the cairn on the summit a tin can was found, which contains brief records of the visits of five different parties from 1870 to the present time, to which we added our own. A party of eight girls from Hilo, "personally conducted" by Dr. Wetmore and D. H. Hitchcock, Esq., in 1876, must have been a merry one. Capt. Long of H. B. M.'s Ship Fantome had visited this spot in 1876, and Dr. Arning with several Kohala residents in 1885.

The same afternoon the surveyors occupied the summit of Lilinoe, a high rocky crater, a mile southeast of the central hills and a little over 13,000 feet in elevation. Here, as at other places on the plateau, ancient graves are to be found. In the olden time, it was a common practice of the natives in the surrounding region to carry up the bones of their deceased relatives to the summit plateau for burial.

During the following night the thermometer fell to 14° and stood at 18° at sunrise. After breakfast the surveying party ascended the third peak, east of Lake Waiau, and about 420 feet above it, where they took the closing sets of angles, and connected the latitude pier with the scheme of triangulation.

On their return the tents were struck, and instruments packed up in readiness for the pack train, which arrived about 11 A. M. Soon afterwards the fog closed in around us, and lasted till nightfall. We bid farewell to the lake about 1:30 P. M., and arrived at the Kalaieha Station before 6 P. M., without any mishap, having stopped half an hour at "Keanakakoi," the Axe-makers' cave. This is situated about a mile south of Waiau, and a hundred yards west of the trail, in a ledge of that hard, fine grained kind of rock, which ancient Hawaiians preferred for their stone implements. Here we saw the small cave in which the axe-makers lodged, their fire place, and remains of the shell fish which they ate. In front of it is an immense heap of stone flakes and chips some 60 feet across and 20 or 30 feet high. Near by several hundred unfinished axes are piled up just as they were left by the manufacturers, when the arrival of foreign ships and the introduction of iron tools had ruined their trade. Around the entrance of the cave the native dandelion or pualele (Sonchus oleraceus) was growing at an elevation of 12,800 feet. It was here that the late Dr. Hillebrand found a curious idol, which is still in the possession of his family.

On arriving at Kalaieha we learned that the pack mules had preceded us, and were already unloaded. None of the costly and delicate instruments employed had received the slightest injury. All the objects of the expedition had been successfully attained. I know of but one other instance on record when gravity measurements of precision have been made at so great a height.

Mr. Preston's final report will be looked for with interest by the scientific world, and will add another laurel to his well-earned reputation as a physicist and astronomer.

W. D. A.

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