the lava which still retain a sufficient quantity of heat to maintain a plastic condition. Persons who have witnessed the movement of a clinker field in the last stages of an eruption describe it as being so slow as to be quite imperceptible until it has been watched for a long time, and as being attended with a cracking noise which comes in vollies like the report of musketry.

Turning around with Mauna Loa at our backs, the majestic pile of ***Mauna Kea*** rises immediately before us. The contrast is very great. The eye is instantly caught by the large number of cinder cones which [page 157] everywhere stud its surface, from the summit where they cluster thickly, down its flanks to the plain below. All of them are symmetrical and normal in their outline, and in an admirable state of preservation. They are truncated at their tops, showing the existence of regular craters within the truncated portions. Some of these cones, by a careful eye estimate and comparison with known magnitudes, appear to be more than 1,000 feet in height and more than three-fourths of a mile in diameter. The number is too great to be easily counted. They are most numerous upon the summit platform, but they are very abundant, not only upon the immediate base of the mountain, but at all intermediate zones, and they ramble away far beyond the base like a crowd dispersing from a common center. The general form of the whole pile of ***Mauna Kea*** is notably different from that of Mauna Loa. Its slopes are much greater. And yet they are very far from being so abrupt as those which are found in the majority of the grander volcanoes of the world. Nowhere do they appear to exceed fifteen to eighteen degrees, except upon the flanks of the cinder cones, and the average profile upon the side here in view is about twelve degrees. The northern front of the mountain, which is not visible, has a slope considerably greater. Comparing this with Mauna Loa, we find that the average slope on the steepest flank of the latter mountain nowhere exceeds seven degrees, and in the longer ones it is only four degrees. Yet, in comparison with other great volcanoes, ***Mauna Kea*** is rather flat and obtuse.

Its composite character is disclosed at once. It has no dominant central peak or cone like Etna, Shasta, and Teneriffe, which completely overpowers any other features, but it has been accumulated by eruptions from numberless vents, which are spread out over a very large area and cluster most thickly at the central and highest part. Upon the summit are many large cinder cones grouped closely together and planted upon a well marked summit platform. But it is impossible to select anyone out of a dozen of these cones which can be confidently pronounced largest, nor is it possible to say which out of half a dozen is the highest. Cones even larger than those upon the summit are seen at varying altitudes upon the flanks.

Glancing back once more at Mauna Loa, not a single cinder cone of normal type is anywhere visible upon all its mighty expanse. Far up towards the summit are two or three minute pimples, which, upon examination with a strong field-glass, convince us that they were originally intended for cinder cones, but that the attempt was abandoned in a preliminary stage of the experiment. All of that stupendous pile, so far as visible, is built of streams of flowing lava. But ***Mauna Kea*** consists largely of fragmental material. What proportion of its mass is thus composed of fragmental matter can only be guessed. But the percentage is no doubt great.

The lavas of ***Mauna Kea*** will be alluded to more in detail hereafter. At present it may be remarked that nowhere in this part of the mount- [page 158] ain are its lavas well exposed. The volcano has been extinct for many centuries, and although the degradation on this side of the mountain has made comparatively little progress, we shall soon find reason for believing that the epoch of final cessation, historically speaking, is quite ancient. The impression produced is that the period which has elapsed since the last sign of activity should be reckoned by thousands of years rather than by hundreds. Soil is everywhere

abundant, and no fresh looking rocks are known. The dense forest comes up only to the level where the steeper part of the mountain begins its ascent; that is, to altitudes varying from 5,000 to 6,000 feet. Above that are many scattering groves with a gradually increasing proportion of open spaces. Up to an altitude of nearly 10,000 feet the mountain is clothed with long mountain-grass, which has a pale yellowish color. The cinder cones have that faint reddish cast often assumed by basaltic *lapilli* which has long been exposed to weathering.

Winding onward by a rough stony trail, where old rotten clinkers and slabs of weathered basalt project up out of the soil, we at length reach a pool of stagnant water, where we make camp. Just before reaching camp the way was somewhat obstructed by a thicket of thorny bushes which at once aroused the keenest interest. They were apparently raspberries, but such raspberries! The bushes were gigantic and the fruit equally so, the berries being over two inches in length and an inch in diameter. Conceive our ordinary pale red garden raspberries magnified two and half to three times in linear dimensions whether in stalk, leaf, or fruit, and we shall have a very good idea of its appearance. Its flavor, however, was somewhat inferior, though by no means unacceptable. The taste of the fruit is almost exactly the same as our common Lawton blackberry. The abundance of fruit was remarkable. For two or three miles the banks and hillsides were covered with them and they could have been gathered by thousands of bushels. They were growing at an altitude of about 6,000 feet, where snow frequently falls in winter and where the climate probably does not differ greatly from that of the coast range of California; though I presume this climate is rather the more equable of the two, being cooler in summer and perhaps a trifle milder in winter.

The journey from Hilo had been a very long and arduous one. Unpleasant as was the struggle with the forest, the journey of twenty miles over *pahoehoe*, so coarse and rough as that of the flow of 1855, proved in the end to be almost as harassing to the animals. The foothold upon the rocks is all that could be desired, but the constant ascent and descent of the smooth rounded hummocks produced an incessant lurching and strain upon the animals the effects of which were now manifest in the shape of sore and scalded backs. Two days' rest was deemed absolutely necessary to recuperate the sore, weary, and half-starved brutes. I occupied the time in tramping over the rolling hills and half-concealed lava beds around the base of ***Mauna Kea***, and in exploring three or four [page 159] long caverns or ancient lava pipes, which are quite as common here as they are upon Mauna Loa. No results of any importance attended the investigation. Many specimens of rock were picked up and examined superficially. They have no great variety, but at the first glance they show a well-marked difference as compared with those from Mauna Loa. Olivine is abundant, but is never seen in such excessive quantities. On the other hand, the feldspars are present in great quantity in well-marked tabular, crystals, and many large crystals of augite occur. The groundmass in the majority of cases inclines to bluish gray instead of being greenish black, as in most of the lavas of Kilauea and Mauna Loa. In short, they are true basalts, approaching more nearly the normal type than those we have hitherto seen. The methods of flow are apparently quite similar to those seen on Mauna Loa. The two forms, *pahoehoe* and *aa*, are as distinctly represented and yet there is some difference, especially in the case of *aa*, but a difference which I should find it extremely difficult to define.

Mauna Kea

After two days' rest and recuperation the ascent of ***Mauna Kea*** was determined upon. The summit is easily reached from the southern side, so easily in fact that no great precaution is necessary in the choice of routes. Still, some routes are much easier than others, and it was thought best, in view of the long and tedious character of the ascent, to take a guide familiar with the mountain. I found a native who had been to the summit

many times and who had hunted sheep, cattle, and goats all over its southern flanks. At daylight the party was in motion with three pack animals carrying photographic apparatus, provisions, and also blankets, in case it should be found necessary to spend the night upon the mountain top. The guide went afoot from preference, a most unusual thing for a *kanaka*, while the rest of the party were well mounted.

Our camp was situated at an altitude of about 5,670 feet, and the top of the mountain was more than 8,000 feet above us. Two hours were spent winding deviously among the foothills and cinder cones around the base of the mountain before the principal slope of the mass was reached. The platform consists of lava beds in a somewhat advanced stage of decay and having much the same character originally as the lava fields which make up the gentle slopes descending away from Kilauea. There are the same alternations of *pahoehoe* and *aa*, but the roughness has been greatly mollified by weathering and by the formation of soil. In many places, especially at the foot of steep slopes, the soil has accumulated to a very considerable thickness, having been washed down from above, and lies in heavy banks. Erosion also has begun its work. Here and there we crossed sharply cut ravines of small depth scoured in the rocks by the torrents. As yet no perennial stream exists on this side of the mountain, but the evidences of frequent spasmodic floods of great power and volume are often encountered. As we reach the principal slope the ascent becomes very rapid, but by no means uniform. Here for a few hundred feet it rises so rapidly that the animals struggle and strain. There it is so gentle that we may jog along at a trot. With increasing altitude the slope becomes greater, and at last we dismount to ascend on foot a continuous slope at an angle of more than twenty degrees. We do not leave vegetation behind us until we have attained an altitude of nearly 11,000 feet.

Most of the route lies through an alternation of rugged fields of lava [page 161] which show less and less soil the higher we ascend, and the fine *lapilli* of the cinder cones, into which the feet sink deeply. The flanks of these cinder cones are never excessively steep, but owing to the very loose character of their component materials the ascent becomes toilsome and very protracted. The cones also become more abundant as we approach the summit. They show no signs of decay as yet, except, possibly, a little weathering of the *lapilli* in the upper layers, which have turned red and brown, while at some little depth the color is still black. It is worthy of note that the *lapilli* of basaltic cinder cones are sometimes red when first ejected, though more frequently they are black, the color depending, I presume, upon weathering. The iron constituents have the form of protoxide or peroxide. Weather usually converts the iron sometimes to peroxide, sometimes into the hydrated form. Many cinder cones, however, preserve, for an indefinite period, even until they are half obliterated, their original black color. In the cones of ***Mauna Kea*** the *lapilli* as originally ejected were, no doubt black, but have superficially changed to red or brown. All of it is comparatively fine and no large pellets are seen.

About one o'clock, after seven hours of travel without a halt, we reached what may be termed the summit platform, which has an altitude varying somewhat with its inequalities, but averaging probably 12,500 feet. This platform is about five miles in length and two miles in width, with a slightly pronounced ridge running along its axis. Upon this platform stand about a dozen large cinder cones, from 700 to 1,000 feet in height, carrying the extreme apices of the mountain very nearly to 14,000 feet. It is difficult to judge which of these cinder cones stands highest. But it soon becomes apparent that this distinction belongs to one of a group which are clustered thickly together near the western end of the platform. Towards these we direct our steps.

The aspect of the lavas beneath our feet now becomes somewhat different from those seen lower down the mountain. They are lighter colored and some of them are much more compact. A fragment when struck rings like clinkstone, and on being broken shows

a dark, but very compact fracture and an entire absence of the vesicles which are universal in the lavas which we have hitherto seen. Some are vesicular, others glassy or obsidian like. It is interesting also to note the effect of weathering upon the summit. These lava beds have evidently lain for a long time exposed to the action of the elements. In a few places are to be seen traces of running water. But for the most part the weathering simply amounts to a slow decay and dissolution of the rock in place. Some of the sheets have been broken up into small fragments, and by the gradual dissolution of the exterior portions the angles have become rounded and the fragments smoothed off. In one place we crossed what was once probably an old sheet of lava. This is now reduced to a mass of rounded stones separated by considerable intervals.

As we approach the western end of the platform we gain notably in [page 162] altitude, and at length find ourselves in a spot where in almost every direction we are hemmed in by large cinder cones towering to a considerable height above us. Here we halted for a midday camp. We brought up a few sticks of wood to build a fire, and enjoyed a cup of coffee, a few slices of bacon and some bread. The guides suffered somewhat with mountain sickness, and the animals betrayed the effects of the unaccustomed altitude, for we were more than 13,000 feet above the sea. There is no difficulty in ascending the summit cones which are composed of fine loose *lapilli* and about 800 feet in height. The prospect was a total disappointment. The country below was completely buried in clouds, out of which the mountain rose like a great island. But to the southward was the mighty dome of Mauna Loa, rising above the clouds which floated about 6,000 feet below the summit. It seemed very near, though in reality it was about twenty miles distant. The great caldera was distinctly seen with portions of its encircling wall. There is a partial opening or gap in this caldera towards the north which enables the observer from ***Mauna Kea*** to look into it. And so clear is the atmosphere at these high altitudes that with a good field glass many details of the rock faces are easily discerned. To the southwestward and rising about 2,000 feet above the clouds was the summit of Hualalai, presenting an aspect quite similar to the summit of ***Mauna Kea***, but upon a smaller scale. To the northwestward the dome of Haleakala, about eighty miles distant was in full view. By means of a field glass it was possible to discern easily the cliffs inclosing its vast caldera, and one or two of the cinder cones within it. A purer atmosphere than that which prevails here at high altitude, it is impossible to conceive. Even the summit of Haleakala is seen in its natural colors without any of the adventitious tints usually imparted to distant objects by a hazy atmosphere. Now and then a glimpse is caught of some small portion of the country below from momentary openings in the clouds. Upon the leeward side of the island short stretches of sea coast are here and there disclosed, but from so great an altitude they have a strange visionary aspect.

Several hours were spent in photographing and in rambling about the platform in search of whatever might be found. Hard by the noon-day camp is a mass of very light-colored lava which seems at first to have a constitution notably different from the very black almost ultra basalts to which we have thus far been accustomed. It is exceedingly compact and fine grained and has a very light gray color. The fresh fracture, however, is notably darker than the smooth weathered surfaces. It has been called a feldspathic rock, meaning, I suppose, a rock more nearly allied to the trachytes than to the basalts. Other observers have called it phonolite, probably because it is highly resonant when struck. But the term phonolite is now used by lithologists to indicate a special and limited group of rocks having a tolerably definite chemical constitution and possessing nephelin as its most characteristic [page 163] mineral. This light-colored rock of ***Mauna Kea***, however, is undoubtedly a basalt possessing an abundance of triclinic feldspar in exceedingly minute crystals and without olivin. It appears to be identical with a very large proportion of the basalts occurring in the western portion of the United States. This rock was used by the primitive Hawaiians for making their stone implements, for which it is very well suited,

being very hard, tough, fine grained, and free from vesicles; and it flakes readily. Hard by are abundant vestiges of the work of manufacturing weapons and tools; and incomplete products in all stages of manufacture, with large quantities of flakes, lie scattered about.

No signs of any recent volcanic activity are to be seen. All the lava beds look old and greatly weather-worn. In some of them the decay and disintegration are so far advanced that they are reduced to mere heaps of weather-beaten fragments. How these lava sheets have thus been torn to pieces, as it were, and reduced to piles of moldering ruins I can explain only by suggesting the action of frost and ice filling the cracks and wedging the pieces apart by expansion. To this, however, should be added the wasting away of the pieces by the solvent action of the rains. A few hundred yards from our noon camp is the head of a ravine which has been scored to a considerable depth by the unmistakable action of running water. Thus erosion has made a good beginning here, and under circumstances where its action is undoubtedly slow and spasmodic. This ravine has at one part a depth of nearly 70 feet, and is exceedingly rough and much obstructed by fallen fragments. The cinder cones, however, do not appear to have suffered much from the ravages of time. Their preservation is no doubt due to their open, porous character. The rain can never fall fast enough to start a torrent or even a minute rill upon their surfaces, but sinks into the interstices at once. Everything indicates that a long period has elapsed since these vents became silent.

The temperature at the summit in the daytime was rather mild, being about 50º F. The air was calm, only a very light breeze blowing. But we knew quite well that the temperature would fall greatly during the night time; and the lightly-clad *kanaka* is not fond of cold. As a minute exploration of the summit promised little of special interest beyond what had already been seen, I decided to seek a lower altitude to pass the night. As we started, the day was drawing towards its close, and as we reached the verge of the summit platform the sun was near the horizon. Meantime the clouds to the southward had dispersed, revealing the whole northern side of Mauna Loa, which rose in indescribable majesty before us. Through the clear, pure atmosphere every detail was visible. Innumerable recent lava streams could be seen stretching their tortuous courses from the upper dome down to the plain below, spreading out in enormous fields of blackness and roughness. Three long streaks in particular attracted the attention. One upon the northwestern side, starting from a point a little below [page 164] the summit, reached down the slope into the broad intervale between ***Mauna Kea*** and Hualalai, and vanished away in the distance towards the sea-coast. This I had no doubt was the flow of 1859. Far to the left, upon the northeastern slope of the mountain, could be seen two streams which had flowed out from a year to a year and a half before. The one emanating from the point east of the mountain was the stream which first broke forth in November, 1880, and rushed rapidly down the slope directly towards ***Mauna Kea***. The other, which was the last of three distinct streams from this eruption, started from a point lower down the mountain, flowing northeasterly then turning towards Hilo. Many other streams were distinctly visible, wearing an appearance of recency. Down the main slopes of the mountain these floods are comparatively narrow, having widths which might be from half a mile to a mile. But as they reached the plain between the two great volcanic piles they spread out into immense floods, which are mostly *aa*. The appearance of the plain thus deluged by the frequent outpours from Mauna Loa is black, desolate, and horrid in the extreme. They end very abruptly upon a sinuous line, where they meet the ascending slope of ***Mauna Kea***.

The sun disappears and the brief twilight follows. At length we enter the clouds and move on in the mist and darkness, reaching camp a little before midnight.

In the afternoon of the day following the ascent of ***Mauna Kea***, I moved camp about five miles further westward, to a locality called ***Kalaieha***. This point is now used as a sheep

station. The pasturage upon the slopes of ***Mauna Kea*** is very abundant and rich, but there is no water. At first it was a mystery to me how these animals could flourish with nothing to drink. It appears, however, that the fog is so abundant that a night rarely passes without more or less rain or a condensation of vapor sufficient to thoroughly saturate the grass, and the animals thus obtain sufficient moisture from the grasses they feed upon. They seem to thrive very well, and I have never heard of any serious loss arising from want of moisture.

Kalaieha is situated near the summit of the pass between ***Mauna Kea*** and Mauna Loa, at an altitude of about 6,900 feet. Both to the eastward and to the westward there is a very gentle slope towards the ocean, so gentle in fact that from here it appears to the eye like a broad level plain. The lavas from Mauna Loa have flooded it again and again, and are now outspread over a vast expanse in fields of black, ominous, naked *aa*. These lava floods stretch all the way up to the very base of ***Mauna Kea*** and find a sharp line of demarkation upon its lowest slopes. The base of ***Mauna Kea*** is well covered with soil and volcanic sand, giving life to an abundant herbage and no inconsiderable number of trees, thus offering a strong contrast to the desolation and blackness of the lava fields beyond. Around us are very many cinder cones, some of noble proportions, and from the summit of any one [page 165] of them we may obtain an overlook of these Phlegrean fields. The sense of desolation which they awaken is exceedingly impressive. In the preceding chapter I have already mentioned how the descending lava streams from Mauna Loa spread out over wide areas when they strike the comparatively level platform below. It is often difficult to distinguish one field from another, so intimately are they blended together and so faint is the distinction of color. Only when some field of extreme recency has been spread out like that of 1881, disclosing a superlative blackness, is it possible to comprehend its full extent and individuality, by its contrast with fields a little older and just beginning to show the first effects of weathering. The entire prospect conveys to the mind the idea that these flows succeeded each other at very brief intervals and that all of them are of great magnitude. The portion of any coulèe which is comprised in its course down the mountain slope invariably bears a small ratio in respect of mass to the quantity spread out upon the lower plain. Nor do these currents by any means stop always at the base of the mountain, but deflect sometimes to the eastward, sometimes to the westward, according to the slope of the land. They stretch onwards towards the sea for a distance of many miles, and not a few of them have entered the ocean. This was the case with the great eruption of 1859, which entered the sea upon the western coast of the island, while the last eruption of 1881 came within about a mile of the sea at Hilo upon the eastern coast.

Several days were spent at ***Kalaieha*** searching for varieties among the lavas and for such other facts of interest as might present themselves. Very little, however, was discovered. The lavas of ***Mauna Kea***, especially around the base of the mountain, show but little variety, and those of Mauna Loa are even more homogeneous.

Leaving ***Kalaieha***, my next objective point was the valley of Waimea, on the northern side of ***Mauna Kea***. To reach it, it was necessary to go over the mountain. This was not a serious undertaking, for it presents no difficulty except the length of the journey, and this is readily overcome by dividing up the march between two days. The mountain was crossed upon its western flank by an easy trail and our camp was pitched near the summit of the ridge. From this point a fine view of Mauna Loa and Hualalai is presented. The huge lava streams descending from Mauna. Loa to the northwest between ***Mauna Kea*** and Hualalai are distinctly visible and present a most suggestive aspect. The best defined among them is the great flow of 1859, which is visible in all its extent, reaching from a point near the summit to the sea, a distance of about 35 miles. The interval between ***Mauna Kea*** and Hualalai, which, reckoned from base to base, is about twelve miles, has been traversed by

a great number of such lava floods within a very recent period in the history of the mountain. Viewed from a lofty standpoint on ***Mauna Kea***, the general grouping of these beds and the long flowing profile which they have generated are presented to the eye most vividly. [page 166]

It is easy to imagine how, step by step and by flood after flood, this part of the island has been built up by the simple superposition of numberless lava streams.

Plains of Waimea

Descending the northern slopes of ***Mauna Kea*** the plains of Waimea at length are reached. These plains are bounded by Kohala Mountain on the north and ***Mauna Kea*** on the south, and form a moderately elevated pass hardly 3,000 feet high between the east and west side of the island. The western declivity of this pass is arid, hot, and barren, suggesting the desert plains of Nevada. The comparison is strengthened by the occurrence of cacti, which seem to be very closely related to some of the opuntias of southern Nevada and Arizona, and the first impression is that they are merely varietal forms of the common prickly pear which have here attained a considerably larger size, but without any other change of habit. But the ubiquitous sage (*Artemisia*) is wholly wanting and seems to be about all that is needed to complete the similarity of the picture. In place of it are many low, sickly, stunted shrubs having the air and habit of desert plants quite as distinctively as the American sage. As we approach the summit of the pass there is a gradual but rather rapid increment and freshening of vegetable life. From the summit to the eastern coast the descending slope is clothed with abundant vegetation, which soon becomes a tropical jungle similar to that which we traversed in passing from Hilo to the base of ***Mauna Kea***. Thus in the course of a very few miles the journey from west to east over the plains of Waimea will lead us from a region as truly desert as Nevada to a region where the ground is muddy by incessant fog and rain and incumbered with the densest of tropical forests. The cause of this extreme contrast is easily discerned. The perpetual trade wind striking the eastern coast is thrown upward nearly 3,000 feet in the course of about fifteen miles, and is depleted of a great portion of its moisture. It then descends as rapidly to the western coast, and of course becomes very dry. Through the Waimea pass a powerful breeze is always blowing from east to west. Its effects may be seen in many ways, some of which are sufficiently striking. All of the cinder cones, and there are many of them scattered around the base of ***Mauna Kea***, are deformed, being built up more upon their western than upon their eastern sides. The steady wind has caught the showers of *lapilli* as they were projected upward and caused them to fall in much greater quantity upon the western sides, so that the vents are situated upon the eastern sides of the cones, giving them all a uniform aspect of deformity. The effect of the wind is also seen in the steady drift of the sand dunes, and even the clinkers scattered about upon the plains show a marked wearing upon their eastern sides by the ceaseless action of the sand blasts.

The little village of Waimea is situated upon the southern base of Kohala Mountain, a little west of the summit of the pass. It is a beautiful spot, seeming as we approach it from the south or from the west [page 167] like an oasis in the desert. It lies just upon the verge where the arid region passes into the moist. A stream of delicious water, and perennial, comes down from Kohala Mountain, and flowing towards the western sea gradually sinks into the earth long before it reaches it. Like most other Hawaiian towns it is but a faded remnant of a population which was once considerable. There is still some thrift here, arising from rather exceptional advantages for pasturage. Curiously enough, horses and cattle seem to thrive best in a desert country when left to their own natural ways and devices. This is as true of these tropical islands as it is of Western America.

From Waimea we obtain a superb view of the northern flanks of ***Mauna Kea***. As compared with the southern portion of that mountain there is one notable difference. This is in the amount of erosion, which is at once seen to be very much greater upon the northeastern or windward side. Several huge ravines are visible, commensurate in their proportions with the magnitude of the mountain. An observer viewing these gorges from the northern and eastern sides would be apt to conclude that a very long period of time has elapsed since eruptions of lava and cinders have ceased to exercise any appreciable effect in building up the mountain pile. Viewing it upon the opposite sides, he would be equally apt to infer a relatively brief period since the cessation of volcanic action. The difference in the effects of erosion upon the two sides is certainly very great; but I can hardly doubt that it may be fully accounted for by the difference in the precipitation alone. In noting the effect of atmospheric degradation upon the rocks of these islands, as well as in other countries, I have been most forcibly impressed at all times with the enormous disparity in the rates of weathering, where the only variable factor is the amount of atmospheric moisture. Wherever the climate is moist the lavas decompose with great rapidity, so that a very few years are sufficient to produce a very appreciable amount of superficial disintegration, and to start the vegetation growing upon the rocks. Wherever the climate is dry rocks of identical character—nay, even identical streams, passing from a wet to a dry region—preserve their freshness for probably a century or more. Many instances may be seen here of lava flows which descend through a belt of moisture to some of the driest regions along the western coast (most notably in Kona), and as a general rule the portions which are situated in the moist region will simulate very great antiquity, while the portions in the arid belt upon the coast will look extremely recent. We should of course expect to find the degradation of rocks much greater in a wet locality than in a dry one, but the difference is considerably greater than might be at first supposed. [Dutton, 1884:168]

Surveyor's Ascent of Mauna Kea (1889)

E.D. Baldwin, Kingdom surveyor, and author of the Mauna Kea and central Hawai'i mountain lands Register Map No. 1718, traveled from Hilo, across Pi'ihonua, to Halealoha and Pua'ākala; then across Humu'ula, and past Kaupakuhale (identified by typographical error in the Hawaiian Annual as "Kaupaloihale"), to the summit of Mauna Kea in August 1889. In the Hawaiian Annual of 1892, he provided readers with an account of the journey, including interesting descriptions of the mountain lands, vegetation, and the occurrence of wild cattle:

A Trip to the Summit of Mauna Kea (1889).

Mauna Kea, so seldom visited by any one, yet claiming universal admiration, as it looms up gradually and beautifully decked in its shroud of snow is truly named the "White Mountain." What wonders there were to be seen thereon, amongst its numerous cones, which looked like so many mole hills from the distance, could only be ascertained by actual ascent. Thus, with expectations rife to aid the arduous duties of an advance surveying party—consisting of six—we left Hilo at eight o'clock A.M. of August 6th, 1889. We followed the Hitchcock road to near Bougainville—a distance of about four and one-half miles—where the road enters the woods. They call it a mile and three-quarters by measure through the woods. We believed the distance correctly measured; but some of the party thought it the longest mile and three-quarters ever traveled. We sympathized, however, with them and wondered if it could be possible for the chain to have stretched. Evidently the road through the woods had not been used very lately. The *oi* bushes and ferns had interlocked across the road, hiding from view the numerous mud holes. Our animals were not very fond of mud, or of pushing through the *oi* and fern jungle—though some of them came from Hilo. But for all that they plunged bravely through the *oi*, only to land in a "slough of Despond;" into one of such places one of our pack mules became so firmly imbedded that we had to unload him, and pull him out by main force. Many quizzes about this time came from down along the line, "Was there any end to the woods?" "Were

we ever going to get out?" But the woods suddenly ended, and what a contrast! As we emerged from those beautiful Hilo woods, where the *ieie* and *iiwi* vines vie with each other in their attempt to wreath the trees with beautiful garlands. Before us lay a bleak waste.

We were at the end of the 1855 flow, at a point where the 1881 flow had overlapped it a little. To our left, the 1881 flow stretched out like a huge glossy black monster. To our right, thinly covered with stunted *ohia*, ferns and numerous *ohelo* bushes, stretched the great 1855 flow. After refreshing ourselves on some boiled eggs, which one of the party had considerately, brought, and resting the animals a little, we proceeded on our trail over this older flow. For about half a mile it was very narrow; from thence it had banked up fully between 200 and 300 feet above the surrounding country, and spread out over two miles in width. One could only imagine what [page 54] consternation this great flow, directly above and only seven miles from Hilo, must have caused its residents as month after month it banked itself up here, extending even to the Wailuku river; then broke out near the center of the embankment with a sudden rush, and made directly for Hilo, but only to reach a distance of about a half mile, where it ended its mad career.

Our advance over the flow was slow and tedious. The trail, marked every few hundred yards by piles of stones, being very rough and hardly visible in places. Bleaching bones of many poor animals lay strewed all along the trail. Night overtook us before we reached a suitable camping place, but as it was moonlight we pressed on to the *aa* part of the flow, some twenty miles from Hilo. The flow at this point is not more than a mile in width. Our trail then turns to the right and enters the woods again, where a short distance brings us, about eight o'clock P.M., to ***Halealoha***, our camp for the night. Our barometer gave this point an elevation of 4,050 feet, being nearly the same elevation as the Volcano House.

The next morning two of the party started on ahead with the rifles. The trail leaves the woods about two miles from ***Halealoha***, thence skirts along over *pahoehoe*, mostly near the edge of the woods. Many sheep paths cross and recross this section of the trail, making it very difficult at times to keep the right trail. We are now nearing the main base of ***Mauna Kea***, which looms up in its full majesty before us. A sudden turn in the trail to the right carries us off from the Mauna Loa lavas through a narrow belt of woods to Hitchcock's camp, ***Kipukahina*** [Kīpuka-'āhina], about five miles from ***Halealoha***. We are now on the slopes of ***Mauna Kea***. The whole character of the surrounding country has changed. Instead of a bleak waste of lava there are open fields of fine pasture land. A short way below ***Kipukahina*** two wild young bulls were shot, which gave us plenty of meat for several days. Leaving ***Kipukahina*** we stayed off on a sheep trail, but headed for ***Puu Oo***, where we found the trail leading around the mountain towards Waimea, which we followed, reaching ***Puakala***—Hitchcock's mountain house—at five o'clock P.M. This house is sixteen and a half miles in a direct line from Hilo, but about thirty-five by the trail. The Hitchcocks had kindly invited us to make this point our headquarters. What a surprise it was to find, at this distance, such a large comfortable house, built of solid *koa*, all of which had been sawed out by hand! It was surely mountain luxury to lay off in [page 55] comfortable rocking chairs before the large, open, old-fashioned fireplace. The elevation at this point is 6,325 feet.

The rest of the week was spent getting out poles for the ***Aahuwela*** trigonometrical point. A fire had evidently passed through the woods some time ago, killing all the *ohia*, so that we had to go about a mile below ***Puakala*** for suitable poles. These we dragged up the hill with our mules, setting up a large tripod signal which was clearly seen from Hilo later. We lived high and well at ***Puakala***; neither did our six cooks spoil the broth; but a specialty from each one helped to swell the bill of fare each meal. One made such fine biscuit, another such soup, another veal pies, another oyster fritters, and another still hit the climax by making *akala* (wild raspberry) pies.

Monday was set as the day for making the ascent of the mountain. We all rose before daylight, but found some of the horses gone, which were not found until noon. This necessitated our giving up the trip for that day.

Tuesday, after an early breakfast, four of the party made the start of the summit. Two of the party were rather overcome by too high living, and did not feel well enough to make the ascent. There is no regular trail to the top. Numerous cattle trails traverse up the flanks of the mountain. We followed some of these main trails up to two sand cones called ***Kaupaloihale*** [***Kaupakuhale***]. To this point the ascent is very gradual, passing mostly through a scattering grove of *mamane* trees, which, with the exception of a few *koa* trees, seems to be the only tree that grows above the regular forest line. Numerous small gulches cut the sides of the mountain. The soil is very sandy, the sides of the mountain being made up mostly of disintegrated *aa* flows and sand cones, the latter being especially numerous. Leaving Kaupaloihale the cattle trails soon terminate and vegetation grows very scarce, the tree limit ending at the foot of Kaupaloihale. We now had to pick our way over loose blocks of scoria, which were more or less rounded, and in many places the blocks had been packed in smooth even layers by the action of the snow.

Over such places the animals easily picked their way. On reaching the top plateau, the ascent became much more gradual. About three miles from the top one of our mules gave out; so left him behind, securely tied to a large rock, with a feed of oats near by. We headed for a group of cones, which seemed to be near the center of the plateau. The last part of the climb, up between two of these cones, was very steep and rough. The texture of the scoria is somewhat different [page 56] here, being of a light bluish gray color; rings when struck and splits in regular smooth layers; the feldspars being present in large quantities. Looking toward the space between Mauna Loa and ***Mauna Kea***, a grand sight presented itself to our view; this space was filled in with immense banks of spotless white clouds, which we looked down upon from our elevated point of view.

Passing the cones we pressed on some two miles further west, in hope of finding lake ***Waiau***. Camp was pitched in a sand hollow while two of the party further looked for the lake, which was found quite a distance above us, among the central cones. Our camp was fully 13,000 feet in elevation, and distant from ***Puakala*** about ten miles. The air at this elevation becomes very rare, and any over-exertion is liable to tell on one not used to it, to which two of the party can well testify. The wood for our use was packed up in bags from ***Puakala***. The animals were very uneasy during the night, clawing up large holes in the sand, chewing off and breaking their ropes. One mule persisted in hanging around the tent all night, barking all of our wood and tearing up a horse blanket and enamel cloth.

Shortly after daylight we struck camp and started back, visiting the lake on the way, which we found to be about 200 feet long by 150 wide. It occupies a small crater between two sand cones, about half a mile directly west from the central cone. The shores of the lake are composed of sand and rock, the sand being very compact. The water was muddy and very stagnant. Selecting the cone which looked the highest we made the ascent, packing the four-inch transit and a flag pole up on horseback. The transit level showed this cone to overtop all the others considerably. This cone is fully 800 or 900 feet higher than the main plateau, and composed of sand and cinders, with here and there masses of loose slag cropping out. The view from this elevation of 13,805 feet above the sea level was grand beyond description. Mauna Loa's smooth outline was only broken by the view into its crater, its side towards ***Mauna Kea***, blackened and streaked by the numerous eruptions, was desolate in the extreme; the later flows could be easily traced down the mountain side by their shining surfaces, and through the woods toward Hilo. These flows are very narrow on the steeper slopes of the mountain, where the lava has run with great speed. On reaching the plateau between ***Mauna Kea*** and Mauna Loa the flows have turned,

some to the right toward Hilo, and others to the left toward South Kohala. The speed of the flows, being retarded [page 57] they have spread out in width, in many places covering immense tracts of country.

The central group of cones consists of four; about three miles further to the north another group of several very prominent cones stands on the northeastern edge of the main plateau; also, at the same distance south towards ***Kalaieha*** there are a large number of sand cones. With the exception of a few the cones had small craters at their summits, having the appearance of being cut off on top and being very regular in shape. Their state of regular preservation is owing to the loose character of the cinder and *lapilli* that form them, which slide and roll, quickly filling up any crevices which may be formed in their sides. The top plateau slants gradually in all directions from the central cones; its greatest width, about eight miles, extends in a north-east to south-west direction. It has a very desolate appearance, and with the exception of a very few clumps of a hardy grass there is nothing growing. The whole formation and texture of the mass of ***Mauna Kea*** is very aged, there being no signs of any late volcanic action.

Our descent was slow and tedious. We found our played-out mule gone. Fog set in thicker and thicker as we descended; only a short distance was visible around us. We pressed steadily on down, crossing our ***Puakala*** trail several times without recognizing it. Night set in, but the fog did not lift; it became intensely dark, and we almost despaired of finding the house, when all of a sudden our headway was stopped by a fence. Recognizing it as the inclosure of the ***Laumaia*** pasture, and that we were on the lower side of it, we followed the fence back—about a mile—to the road, and trusted the rest of the guidance to our animals, who carried us safely back to the house, which we reached at eight o'clock P.M.

A trip to the top of the mountain can not be said to be one of very great pleasure. The rarity of the atmosphere takes away one's energies in a most surprising manner, but the after effects of the trip are very exhilarating. As you descend from the summit life seems to come back again, slowly at first, but at about 10,000 feet elevation you feel almost like a new man, and as hungry as a bear.

The intention of the party was to make a rapid topographical survey of the summit plateau with the stadia. This was given up for the present; but it is hoped that such a survey can be made in the near future with the assistance of photography. [E.D. Baldwin, in the Hawaiian Annual, 1892:54-58]

Pendulum Party's Ascent of Mauna Kea (1892)

In June 1892, W.D. Alexander, Surveyor General of the Kingdom; E.D. Preston, astronomer with the U.S. Coast and Geodetic Survey; W.W. Chamberlain, L. Koch, and W.E. Wall, traveled to the Island of Hawai'i to ascend Mauna Kea—the journey undertaken between June to July 1892. At Kalai'eha, the party was met by A. Haneberg, of the Humuula Sheep Station, and also joined by surveyor, E.D. Baldwin, and J.J. Muir. The purpose of the trip to Mauna Kea and the *'āina mauna* was multi-faceted, with interests of the Hawaiian Government Survey (perfecting the survey of the mountain lands); and the U.S. Coast and Geodetic Survey (collection of magnetic readings and determining the mean density of the earth).

Communications between Alexander and Preston, representing the governmental interests in the Mauna Kea work began as early as 1889. Various letters, articles, maps and photos, found in the collections of the Hawai'i State Archives (HSA), State Survey Division, NOAA National Library (NOAA), National Archives and Records Administration (NARA), and the Hawaiian Historical Society Library (HHS), provide us with some of the most significant documentation of cultural features, the historical landscape, and historical land use, found to date.

Through the combined accounts, we learn of several important cultural and historical activities, including, but not limited to: the traditional practice of burials being interred at Lilinoe, and at other locations in the summit region; that an *'ahu* (cairn) was erected to commemorate the visit of Dowager Queen Emma to the summit of Mauna Kea; and of the adze quarries. Alexander also reported that by June 1892, the gorse, an unwanted introduction to the Humuula Sheep Station lands, was becoming a pest, and that eradication efforts were being employed by the lessees of the land.

The letters and accounts that follow below, dating from 1889, are among those reviewed, describing—planning for, and the purposes of the trip; the landscape of Mauna Kea in 1892; and the work of the Pendulum Survey Party:

Washington D.C.
August 12, 1889
E.D. Preston; to Professor W.D. Alexander
(Proposing a "Pendulum" survey trip to Mauna Kea):
…In view of the fact that there is now under consideration the making of pendulum and meteorological observations* at the summit of ***Mauna Kea*** early next summer, I would like to ask you for an approximate estimate of the cost of occupying two stations on Hawaii; one at the sea level and one between thirteen and fourteen thousand feet higher. Can you tell me also what the occupation of Haleakala in 1887 cost the Hawaiian Survey? Is the summit of ***Mauna Kea*** reasonably accessible, and on which side is the best approach & I think the sea station for gravity should be on the lee side, somewhere near Puako if it is not always cloudy there. The best time would probably be June or July. Would the Hawaiian Survey lend an aid as assistant observer if it were necessary for a few weeks? I doubt if money enough can be had to pay the expenses of an assistant from Washington.

The plan has not yet taken definite shape. The general outline of the scheme, however, is for the Bache Fund of the National Academy of Sciences, with possibly some help from the Elizabeth Thompson Science Fund, to furnish the money, and the Coast Survey to lend the instruments and let me have a leave of absence to do it. I write this merely in anticipation of what may happen. Professor Dana takes great interest in the project; in fact if it is done it will be entirely due to his influence.

By this same mail I send you a proof of my Bulletin three maps will appear with it, but I cannot send their proofs.

Washington, D.C.
June 20, 1890
E.D. Preston; to W.D. Alexander:
(Regarding proposed "Pendulum" survey trip to Mauna Kea):
…I find your two letters here on my return… I have neither seen the Sup't. nor heard from Professor Dana since my return, but I hear that we cannot undertake the ***Mauna Kea*** work before next summer. I want to get out my report on the African work as soon as possible – and the full report on the Hawaiian work is now passing through the press & they want me to do the proof reading. How many copies would you like to have for the use of the Hawaiian Gov't survey & I will write to Prof. Dana today to see if the appropriation will be available for 1891 as well as for 1890. When I know definitely how we stand I will write you again. I congratulate you on having Mr. Dodge again… [HSA – ID Survey, 1890]

* Probably some magnitude obs. may also be made.

April 7, 1892
Honolulu, H.I.
E.D. Preston;
to Professor T.C. Mendenhall, Sup't Coast & Geodetic Survey, Washington D.C.
(Regarding preparations for the Mauna Kea Survey, and status report on work undertaken in Hawai'i to the date. Preston also reported that there was political unrest in the Kingdom, and fear for Queen Lili'uokalani's position):
…Until quite recently we have been unable to say just how long it would be necessary to observe at Waikiki. It was once thought that possibly we could double up a little on the last part of the program making the connection between Groups VIII and Group I and probably extending the observations to include Group II, finishing sometime in May. The weather however has been so bad that this part of the series cannot be made as complete as others without going on through June. Dr. Marcuse tells me that Professor Hilmut desires him to make the connection up to Group II which will furnish one more conditional equation in the final adjustment, and more over June is about the time when we may look for a recurrence of the motion brought at the beginning of the observations here last summer; so that it may be said definitely that the work will close on or about July 1st.

There then remains the gravity and magnetic work outlined in your instructions of 22 March 91. The observations on ***Mauna Kea*** which are the most important will be made first. This work must be done in the late summer or early fall as the summit is only accessible during this period on account of snow. It is therefore my intention after closing the observations here, to determine gravity in Honolulu at the base station of 1877 and then leave immediately for the windward islands, landing probably first on the leeward side of Hawaii. This will enable us to put in the gravity and magnetic station at the sea level, while making preparations for the ascent, and if there is unavoidable delay in getting the requisite number of pack animals, help, &c, the time can be employed in the magnetic observations at the other stations on this island. Kealakeakua Bay (Captain Cooks station) is on the same side of the mountain and can be reached on mule back in a day. The road is simply a trail over lava and carrying any thing by cart is entirely out of the question.

There would no doubt be difficulty in working at an altitude of 14 thousand feet soon after leaving the sea level, and as some reconnaissance will be necessary to find a suitable station, it is proposed to stop just above the cloud line, and where grass and water may still be found for the animals, and make a determination here while selecting a place at the top. This point which is at an elevation of about 8000 feet, will be our base of supplies while up in the crater. Of course at the summit there is no subsistence and all animals and packers must be sent back to await the completion of the observations. Vegetation ceases I think at about 9000 feet and wood as well as water must be packed up to the camp every few days.

This gravity station on the mountain flank will be interesting in showing whether the law of change is the same for the lower and upper half of the cone. Besides the gravity and magnetic work on the top I want to determine latitude; partly to see if there is any deflection of the vertical, but principally because Surveyor General Alexander wishes this done for his triangulation and has promised to aid my work in the matter of transportation and the services of one or two aids. After the completion of the ***Mauna Kea*** work there will be magnetic observations on several of the other islands, especially at Lahaina on Maui where Dr. Freycinct observed in 1819 and at Waimea on Kauai where the Russians were in 1815.

In regard to your question (letter of 29 February) as to how long I shall be able to stay without more money it is impossible on account of the nature of the mountain work to make a very close estimate of the expense. At the end of the International observations,

here at Waikiki there will be left something over 400 dollars. This is to be expended in the gravity work in Honolulu, the ***Mauna Kea*** observations and the magnetic work on the other islands. I had hoped not to ask for more funds and still trust that it may not be necessary but as it is uncertain yet how much help may be coming from the Island Government, it would be wiser to leave the matter in reserve for two or three months. I should feel easier and it would facilitate the shaping of the end of the work of the expedition if it could be known before hand whether a few hundred dollars more would be available in case it were needed. Could you inform me on this point by return mail. I shall not ask for it unless it seems for the best interests of the work to continue the observations to a certain extent.

My uncertainty in regard to help from this Government comes from the unsettled condition of political affairs. You probably know that the McKinley bill has had the effect of decreasing the revenue of the islands by about 5,000,000 dollars during the year. This has made times hard; the natives are becoming dissatisfied and a change of government is openly talked of. The people arose one morning recently to find sand bags piled around the Palace. This was done during the night in anticipation of an attack the next day, and everybody seems to think that without the presence of the U.S.S. San Francisco and Iroquois the present government would be immediately overthrown. The trouble is that the kanakas want to tear down without having any definite idea of what they are going to build up, or how they are going to do it. I think a suppression of Queen Liliuokalani and her government, by the elements now laboring to that end would introduce chaos into the country and be a great misfortune. The abuses at the Palace are grave and should be corrected but not in the way the adventurers want to do it, and although the withdrawal of American men of war from the harbor of Honolulu would no doubt be the signal for an uprising soon after, there would probably not be much bloodshed and I don't think foreigners would be molested at all unless they took a hand in the play.

This slight discussion will indicate why there is some uncertainty as to the amount and kind of help to be expected from the government for our scientific work. I feel sure of some help but whether it will be enough to complete the observations without a little more from Washington, I shall inform you later. This letter is already long, and that it may not be too composite I will start a separate one, the subject of which will be the International Latitude Observations… [Coast & Geodetic Survey, NARA Collection]

June 15, 1892
Honolulu, H.I.
E.D. Preston;
to Dr. T.C. Mendenhall, Sup't. Coast & Geodetic Survey, Washington D.C.
(Regarding Preparations for the Mauna Kea Trip; and a Visit by Queen Lili'uokalani to the Waikīkī Observatory):

So we shall probably leave in the course of two weeks for ***Mauna Kea*** I give here an outline of the status of the work and what is proposed to be done. I have told you in a previous letter that the latitude work at this place would close about July 1st, Dr. Marcuse having intended to take the boat of July 2d for Japan. Rather suddenly however he decided not to wait so long and sailed about a week ago for Australia, I had already, in conjunction with Professor Alexander, made arrangements to undertake the mountain work about July 1st – and as the help of the Government Survey will be necessary both for guides and transportation, it will be best not to start until the time decided on. The interval however can be profitably and fully occupied – for the last letter I received from you (a week ago) contained a memorandum from Mr. Schott suggesting that at least five more series be obtained for micrometer. Parenthetically I may remark here that I had already computed the micrometer values and that the results sent me from the computing division through you, agree with mine within one or two hundredths of a second, so that I have not thought it worth while to change my computations of latitude on this account.

Besides these additional micrometer determinations there are several other things to be done. We are getting our longitude from Honolulu by exchanging chronometer beats, utilizing the telephone by tapping on the box. The signals are distinctly received and noted at the office in town. There is the trigonometerical connection of our station with the triangulation of the Government Survey, so that all doubt as to finding the station at some future time may be removed. I have made one connection myself and the Survey will make another independent one as a check. Considering that the observatories are to be removed and the piers demolished above ground this precaution seems advisable. Again, before starting to the other islands a determination of gravity should be made in Honolulu to connect the Waikiki work, with that done in 1883 and 1887 and indirectly with all other work done by the C. and G. Survey.

All these odd pieces of work will be accomplished, I think, within two weeks, including several days necessary to pack the instruments and settle accounts in order to leave a clean score behind should anything happen on the mountain.

The magnetic work is now all finished on Oahu. This was done at the same time as the latitude observations. It was an easy matter to do Waikiki, and attend to the time gravity and latitude at the same time because I was here on the ground night and day, but Honolulu just concluded was more difficult for it was necessary to work late at night here and rise early in order to get into town (three miles) for the morning elongation. I am so anxious to get all the data attainable bearing on the latitude question that I am going to leave the zenith telescope up as long as possible, and have dismounted the pendulum apparatus and chronograph and taken them in town, and go in every morning to set up the instruments, run the wires, and make other arrangements, and returning here in the afternoon am ready for stars at night. When the pendulum work begins I think I will get time in the early evening in Honolulu and returning here about 9:30 or 10 o'clock get the second group of the latitude list the same night.

Everybody is very ready to help me in the work. Here is an instance – I wanted wires run from the government building across a vacant lot to the observatory, and then I wanted a few cells of gravity battery for temporary use – a few days only. The manager of the telephone company is interested in scientific work and it appears that when I was here in 1883 I took the trouble to show him the methods of work and the instruments. I had forgotten the incident, but he had not, and now he not only had the wires run for me and loaned the battery but said that if I wanted anything else to call on him and there would be no expense. The Superintendent of Public Works came out to see the observatory at Waikiki one day and when I told him we were going up on ***Mauna Kea***, he said, "Why, we have two splendid pack mules and a house at the foot and you might just as well use them to pack your instruments to the top – it will be no expense and I will write by next mail to have them ready for you." I accepted gladly on that it will make so much less outlay from the fund.

We will leave about July 1st. From the nature of the mountain work it is impossible to give a very close estimate of the time required. I should think that in July the stations at the sea level, the one half way up, and the summit could all be occupied. As there has never been any magnetic observations made on these islands in which the declination, dip, and horizontal force have all been measured the Government Survey is anxious to have one or two stations made on each of the principal islands, (see accompanying map), and although I am getting tired of this continual hot weather and am quite ready to turn my face homeward, I think that once here, it would always be a matter of regret later, if the work was left incomplete. The occupation of eight or nine stations does not require much time if one is on the ground but the trouble is in getting to the place. After the mountain trip is over I shall be able to give a better estimate of the time required to finish.

I send herewith an account of the Queen's visit to our observatories. The chronograph sheet on which Her Majesty placed her signature is No. 61 (Roll also sent by this mail). The translation of the phrase "Na ko kakou moi i kilo i na hoku i keia po" is, The Queen observes the stars tonight.

I send also a photograph of the observations, one of our residence and one of the Queen's Hospital grounds in Honolulu. I have made many more negatives but have had no time to do printing. I shall have to leave this part of the work until I return to the states. [Coast & Geodetic Survey, NARA Collection]

July 10, 1892
Waimea, Hawaii
E.D. Preston;
to Dr. T.C. Mendenhall, Sup't Coast & Geodetic Survey, Washington D.C.
(Regarding Activities of the Mauna Kea Trip):
I have just received your letter with check for $500.00 to be expended, if necessary, for gravity work in Hawaii. It is impossible to say at present how much of it will be needed as the bulk of the expense for climbing ***Mauna Kea*** is still to be incurred. We left Honolulu a few days before the time mentioned in my last letter (July 1st) and have already determined gravity, magnetism and latitude at Kawaihae which was selected as the station to be occupied at the sea level. We are now at Waimea on the plateau just north of the foot hills and have risen from sea level 2600 feet. A stop of several days is made to get animals and to put in two magnetic stations for the Government Survey. One is where they have observed in 1852 and 1872 & the other is one they want as a base station. We hope to leave day after tomorrow for the intermediate station, ***Kalaieha***, which is just above the cloud line, 8000 feet elevation. Unfortunately last night three of the party were suddenly taken sick with something like cholera and are not able to be about today, I hope they will be able to leave at the appointed time. The cause of the trouble is probably in bad water or change of food. At Kawaihae all our drinking water had to be carted twelve miles. Even here at Waimea they have an exceptionally dry summer and at the sea level where at best there is not enough rain to start much vegetation of any sort during this dry season there is absolutely no water fit to drink.

We are here in full view of the summit, and although it is mid-summer and in the tropics many patches of snow can be seen in the valleys around the topmost peaks. We shall no doubt experience some discomforts on the summit, consequent upon our changing from an atmosphere where the barometer reads 30 in to one where it stands at 18 in, to say nothing of passing from a temperature of 93º which we had at Kawaihae to one which produces ice every night. When this work is concluded on the mountain I expect to send the instruments down this side to be shipped back to Honolulu, and taking a guide, cross the lava flow of 81 and get to sea level on the opposite side of the island. This will enable me to get in a magnetic station at Hilo before the return trip of the steamer. The *aa* species of lava is so rough and sharp that no horses can traverse it without being heavily shod and instances are known where the shoe coming off and the rider having no means of replacing it the animal was necessarily left to perish on the flow. I was told yesterday that colts arrive at Hilo with double mittens of bullock hide drawn over their feet and tied above to save the soft hoof from being cut away. The lava flow of 81 (year of eruption) is only two miles wide at the point where it must be crossed so that it probably does not require more than an hour or so to get over this part of the road, but I have seen some flows on this island that I do not think, to save ones life, more than two or three miles per day could be made… [Coast & Geodetic Survey, NARA Collection]

"The Ascent of Mauna Kea, Hawaii"
Report of W.D. Alexander on the Mauna Kea Trip of 1892

In the Pacific Commercial Advertiser of September 14, 1892, W.D. Alexander published an important account of the Mauna Kea survey trip. The narratives identify the locations of several significant cultural features on the mountain landscape. These features include, but are not limited to—trails on Mauna Kea; an "axe maker's cave" (location where the wooden image found by Dr. Hillebrand in 1862 came from); a possible *heiau* and burial site; the *ahu* "pillar" erected to commemorate the trip made by Queen Emma to Mauna Kea and Waiau in 1882; named localities; and the landscape of Waiau (crater and lake). Alexander also reported that gorse had been identified as an undesirable weed on lands of the Humuula Sheep Station by the time of the 1892 survey.

Field Book No. 429 (in the collection of the State Survey Division), kept by Alexander and his assistant, J.M. Muir, includes several important sketches depicting the sites described in the following article (selected illustrations are included here in addition to the article):

> 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 1877 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… …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… …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… Here we engaged our guide, hired our horses and part of our pack mules, and had our freight, ("impedimenta," as Caesar appropriately called it,) carted thirty-five miles farther, half-way around the mountain to the ***Kalaieha 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 ***Kalaieha 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 40º 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 a 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 [Register Map No. 1718].

[from the base camp at ***Kalaieha*** Sheep Station – July 20th] …The fog cleared 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 horse back. 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 on 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 trip was made in 1882]. [*Figures 8a & 8b*]

The summit plateau which is perhaps five miles in width, gradually slopes up from all sides toward 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.

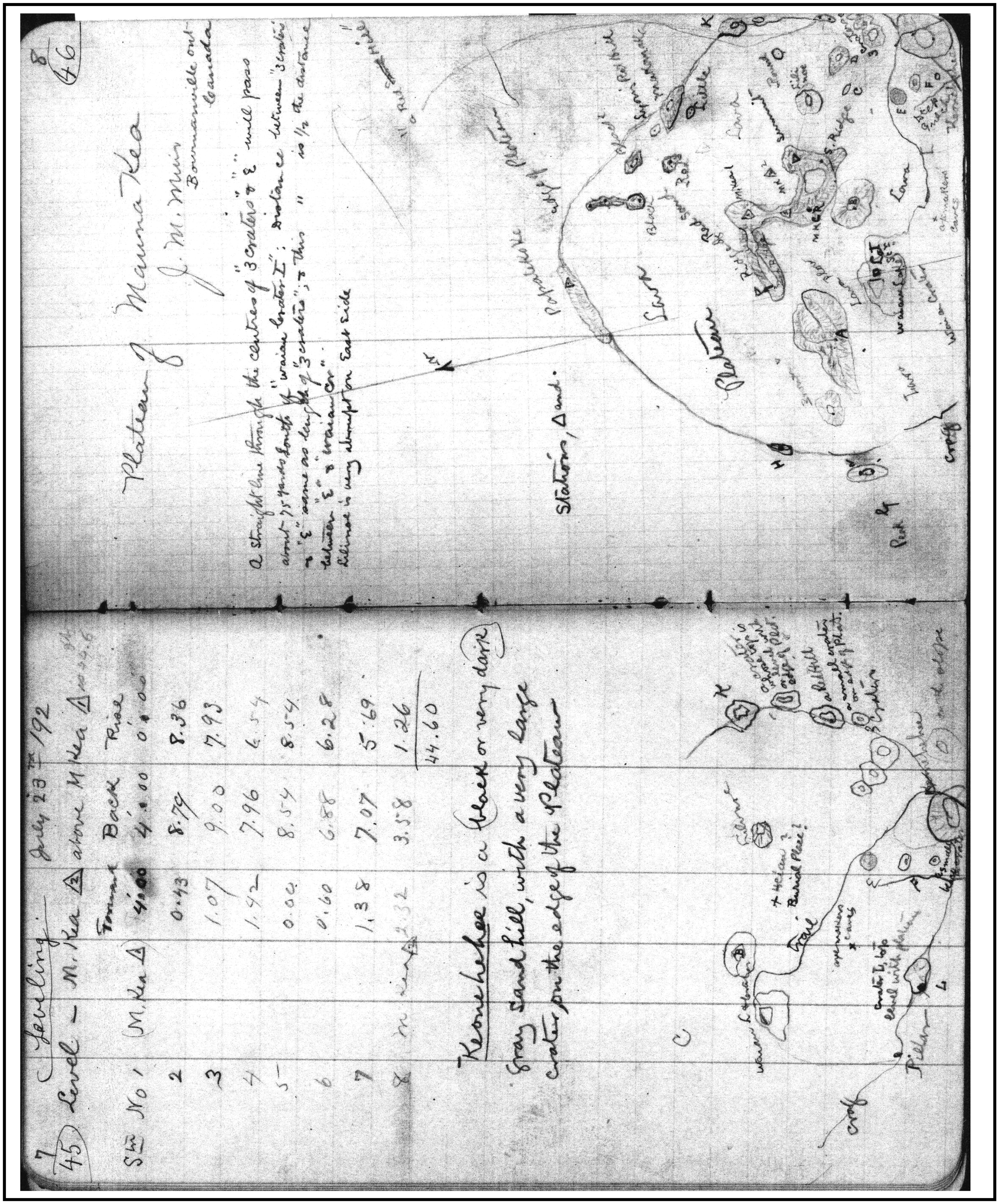

Figure 8a. Sketch of the Mauna Kea Summit Region – Depicting Trail, "Axe Maker's Cave," "Pillar" of Queen Emma, Heiau and Burial Place and other Cultural Features (J.M. Muir, July 23, 1892. Field Note Book, Reg. 429:7-8)

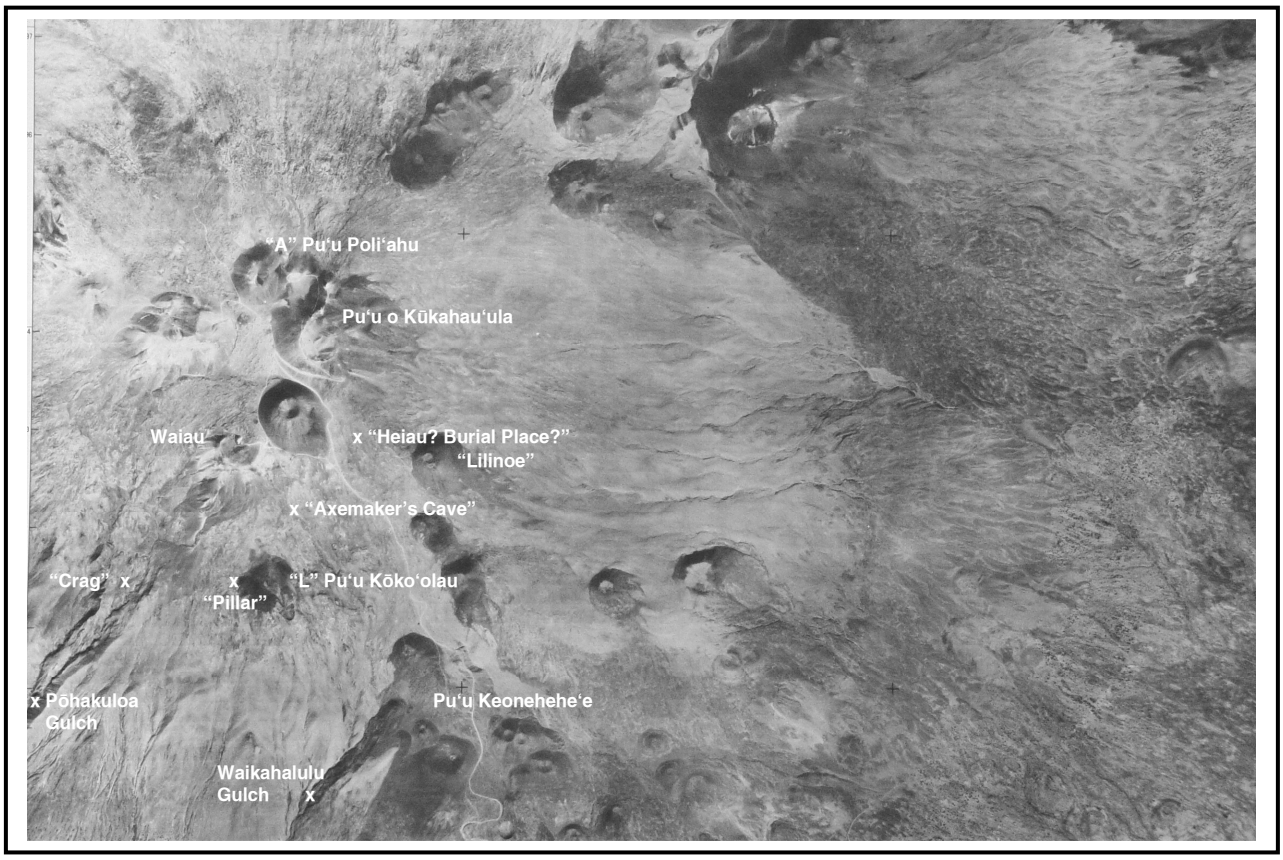

Figure 8b. Annotated Aerial Photo – Portion of Mauna Kea (1978 Advance Print); Depicting <u>Approximate</u> Locations of the "Pillar" of Queen Emma, "Crag," "Axemaker's Cave," "Heiau" or "Burial Place," and Named Puʻu Described by W.D. Alexander in 1892. (From Notes Prepared by John P. Lockwood, Ph.D., March 29, 2005)

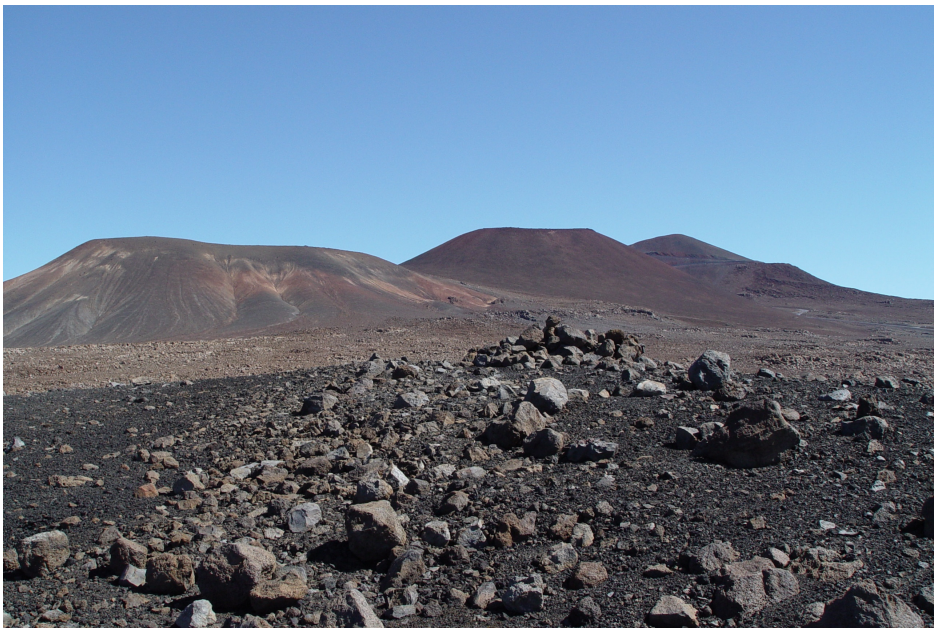

Figure 8c. Remains of 'Ahu on Puʻu Kōkoʻolau (area indicated by Muir's sketch map of July 23, 1892. Alexander's Field Book No. 429; see Figure 8a) (Photo KPA-S2526)

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 purist 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. [*Figure 9*]

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 for one unfortunate mule, which was to be treated to a feed of oats and blanketed for the night… 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 60 deg., and 63 deg., but when exposed to the sun on the rocks it rose to 108 deg…

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 of the summit plateau, in which Mr. J.J. Muir's assistance was most opportune and valuable. On the 22nd 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 fire-wood and some fresh provisions.

The next day, the 23rd, 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 from several points below, was now occupied with an instrument for the first time. The difference in height between this station and the next summit was found by leveling to be about 45 feet, as it had been estimated in 1872. The highest point is probably not less that 13,820 feet above the sea. [*Figure 10*]

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, looking 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

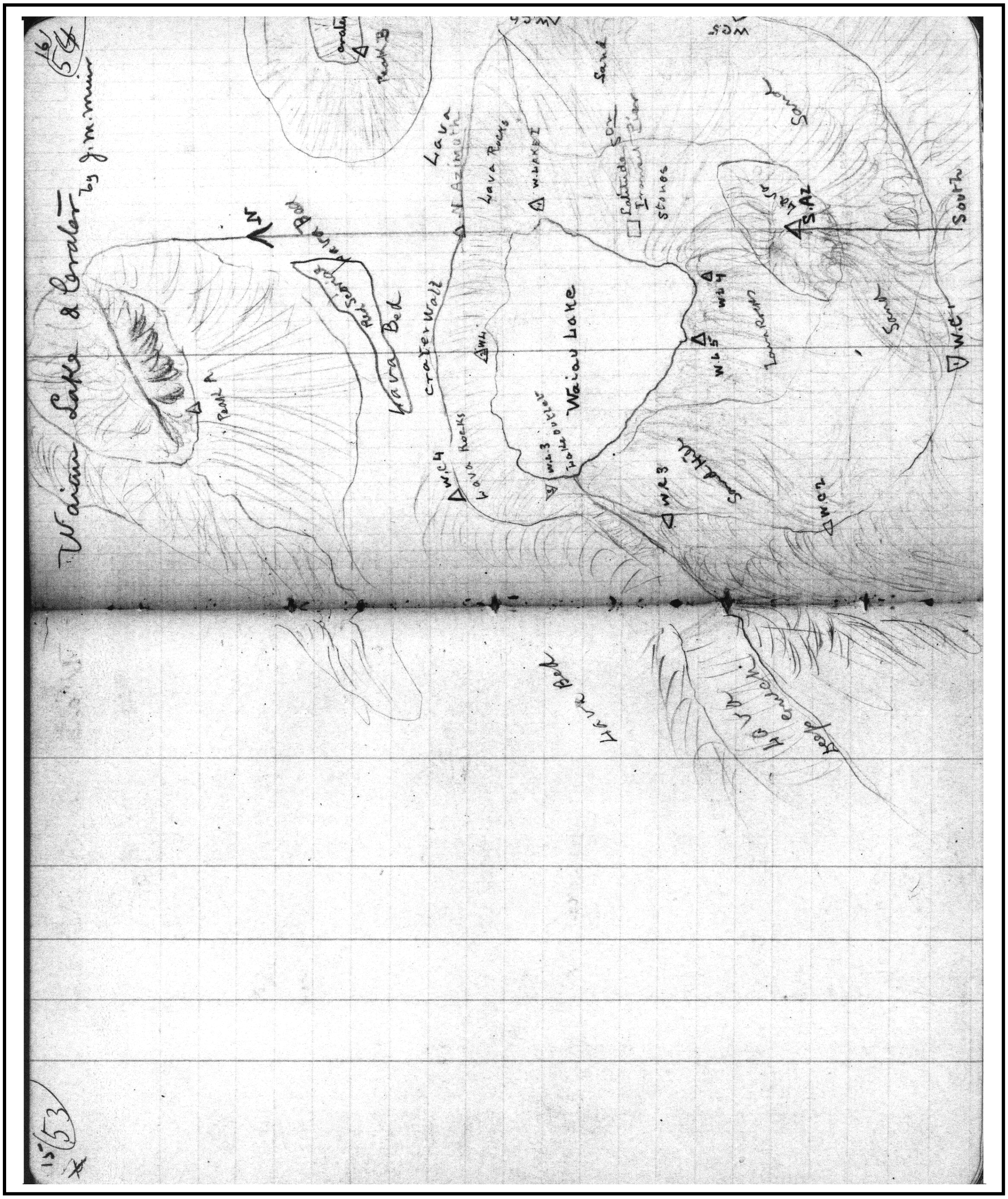

Figure 9. Sketch of Waiau Lake and Crater (J.M. Muir, Field Note Book, Reg. 429:15-16)

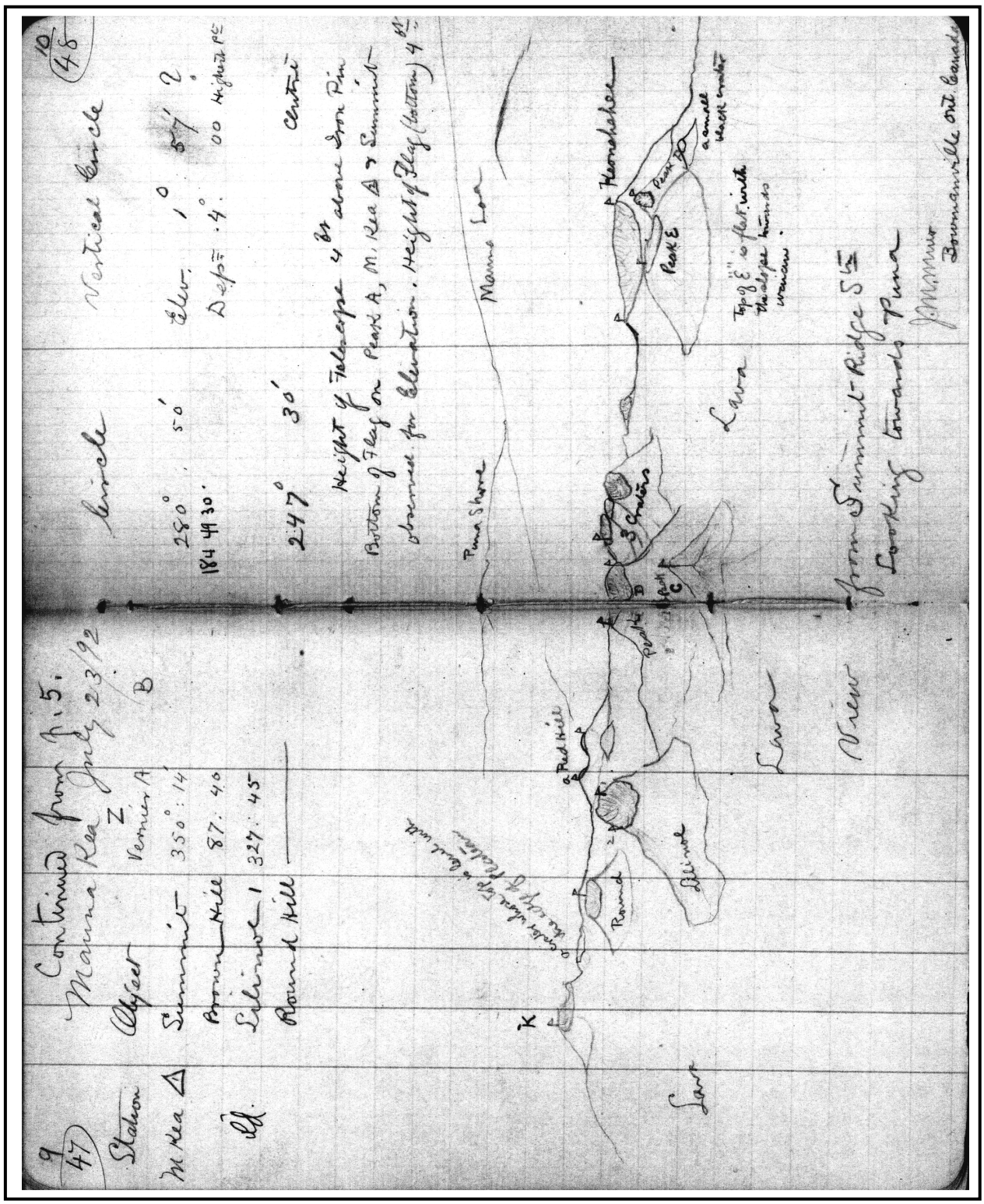

Figure 10. Sketch — View from the Summit Ridge Station, Looking Towards Puna (J.M. Muir, July 23, 1892. Field Note Book, Reg. 429:9-10)

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 [*Figure 11*], 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.* [see *Figure 8a*]

During the following night the thermometer fell to 14º and stood at 18º at sunrise. After breakfast the surveying party ascended a 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 [*Figure 12*].

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. [see Figure 8a] 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* [see article of October 25, 1862, in this study].

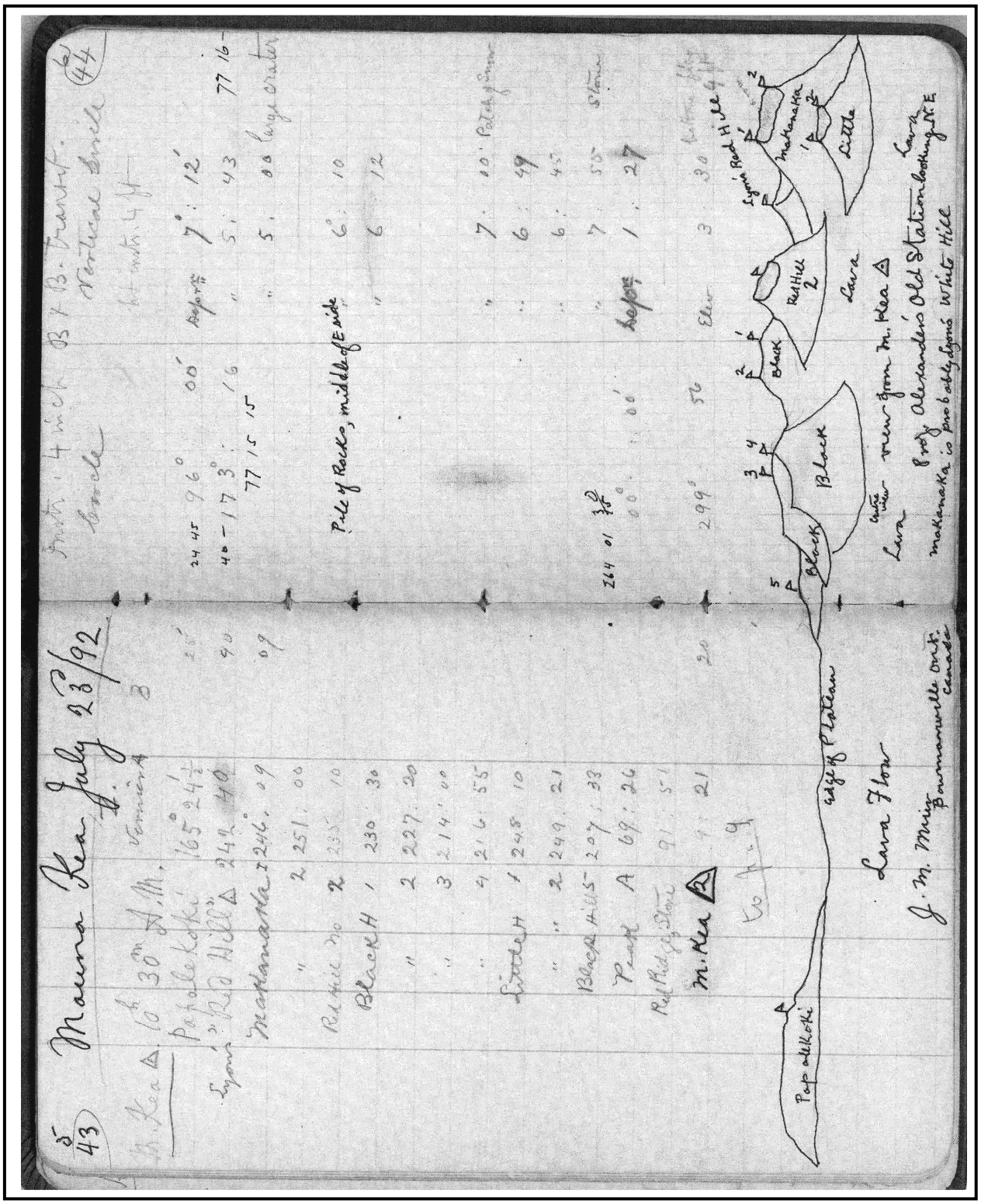

Figure 11. Sketch — View from the Summit Ridge Station, Plateau between Papalekoi and Makanaka (J.M. Muir, July 23, 1892. Field Note Book, Reg. 429:5-6)

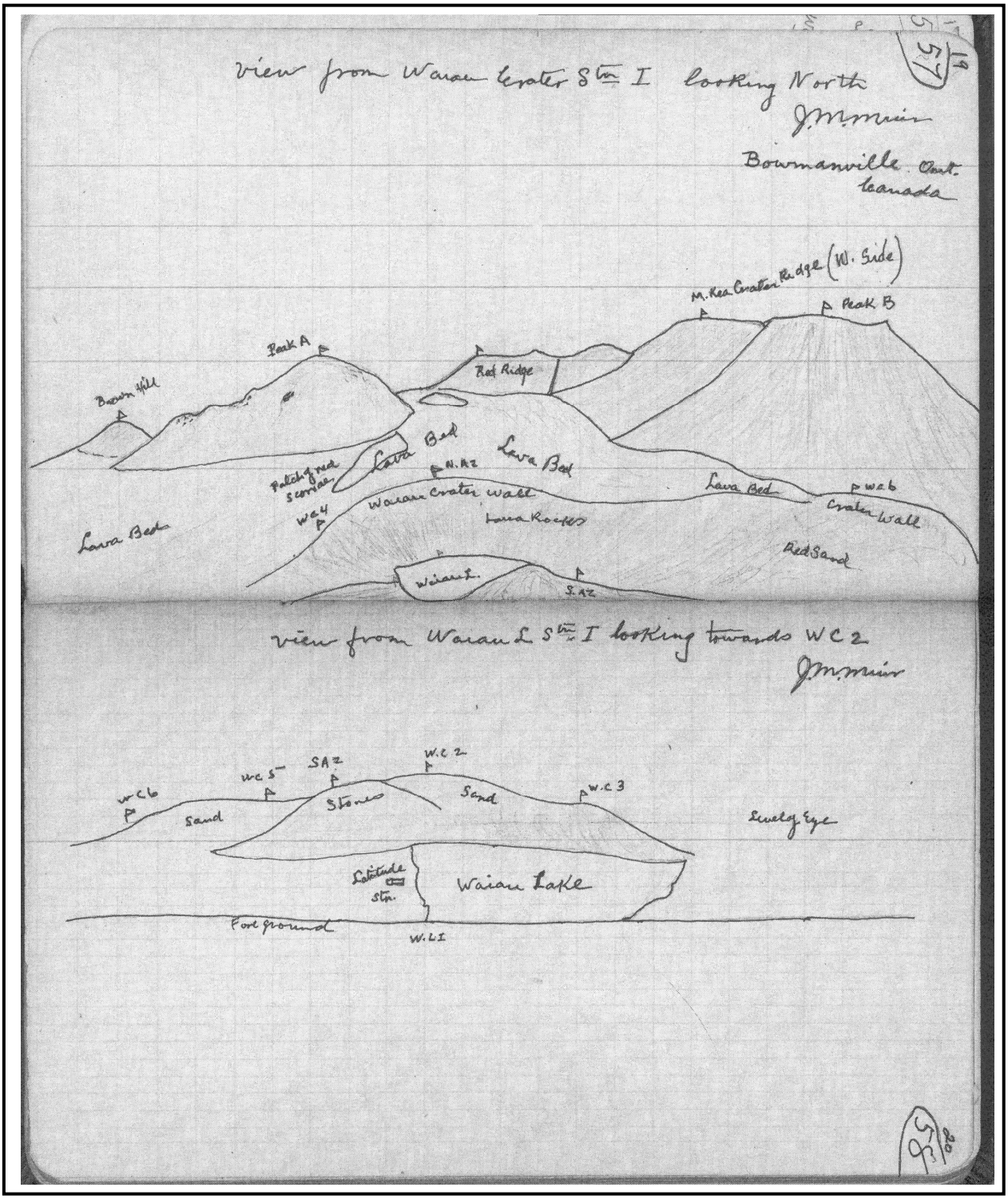

Figure 12. Sketch — View from Waiau Crater Looking North (J.M. Muir, July 25, 1892. Field Note Book, Reg. 429:19-20)

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. [Alexander in *Pacific Commercial Advertiser*, September 14, 1892]

August 8, 1892
Honolulu, H.I.
E.D. Preston;
to Dr. T.C. Mendenhall, Sup't Coast & Geodetic Survey, Washington D.C.
(Reports on the Completion of the Mauna Kea Survey; and Descent from the Mountain Lands to the Town of Hilo):
After thirteen and a half consecutive hours in the saddle, over the roughest road I ever saw, we reached sea level again at Hilo on the windward side of the island. *Five days and six nights were passed in camp by the side of a lake at an elevation of between 13000 and 14000 feet. This, if I am not mistaken, is one of the few high bodies of water in the world.* At this altitude about two fifths of the atmosphere was left below us and we had the novel and rather uncomfortable experience of a range of temperature of nearly 100º F in twenty four hours, the lowest registered being 13º at night and the highest 108º at noon. The thermometer having the same position at both readings. Ice and snow are not familiar objects in the tropics yet we had both of them in abundance on the summit of ***Mauna Kea***.

It was impossible for us to quite reach the highest peak with the instruments. It was something of an undertaking to get ourselves there with barometers and camera, but it was quite beyond the pack animals strength to climb those cones of scoria at an angle of say 40º, and where one sinks ankle deep at every step. An unloaded mule might possibly get up, but an animal with the pendulum receiver on one side and 100 lbs of cement on the other would certainly fail in the attempt. Our train consisted of eleven mounted men. The party was made up of Professor Alexander, the Surveyor General, and two associates from the Government Survey Staff, one volunteer observer & general helper, a steward, a guide (for no one ever runs the risk of being lost on that great barren plateau of the summit which is studded with cinder cones from 500 to 1000 feet high) several drivers and myself. Professor Alexander's idea in accompanying the party was to make a topographical survey and triangulation of the plateau. His part of the party far from increasing the expenses, has had the contrary effect for he had aided me, in transportation, in assistants, and in funds to such an extent that I feel under very great obligations to them – and I feel this all the more that they are now passing through a very critical period where the appropriations have been cut down so that he has been obliged to dispense with the services of several much needed assistants. Unfortunately however for his part of the work, his two assistants were prostrated by mountain sickness and after passing two wretched days utterly unable to do any work, they were obliged to come down to about 7000 feet elevation (our starting point) and wait until the party returned.

All three pendulums were serving, three days observations being made, declination dip & horizontal force were determined for magnetics, and more than fifty measures of the latitude were secured. Of course we had no difficulty getting time for the gravity work. The sky was so clear that I began star observations an hour before sundown, and the nights were suspect if we leave out of account the fact that they were to us, accustomed to the tropics, bitterly cold.

When we reached the halfway station after having finished on top, I discovered that by riding to Hilo about 35 miles I could get in three or four days magnetic work there and take the same steamer that would a day later pass around to the other side of the island and pick up the rest of the party and the instruments; so with an aid I started and one more station was accomplished at almost no expense and we all came back to Honolulu together.

There now remains magnetic observations at Kealakekua Bay (Captain Cook's Station) and at Lahaina (De Freycincts station of 1819). The first steamer leaves in about a week and I will be back here in Honolulu 10 or 12 days later. This will probably close the work. They wanted to have one or two magnetic stations on Kauai but it looks doubtful if this can be realized on account of funds… [Coast & Geodetic Survey, NARA Collection]

August 15, 1892
Honolulu, H.I.
E.D. Preston;
to Dr. T.C. Mendenhall, Sup't Coast & Geodetic Survey, Washington D.C.
(Transmits Documents of Surveys):
I have the honor to transmit you by this same mail the following records:

Package IX
1 Vol. duplicated magnetic observations at Kawaihae, Waimea, ***Kalaieha***, ***Waiau*** and Hilo.

1 Vol. duplicate pendulum obs. for Kawaihae, ***Kalaieha*** and ***Waiau***.

1 Vol. dupliated pendulum obs. for Waikiki and Honolulu.

Package X
1 Vol. dup. time observations Honolulu.

1 Vol. dup. observatory notes & time for Honolulu, Kawaihae, ***Kalaieha*** and ***Waiau***.

1 Vol. dup. latitude observations for Kawaihae, ***Kalaieha*** and ***Waiau***.

Package XI
5 duplicated magnetic observations at Kawaihae, Waimea, ***Kalaieha***, ***Waiau*** and Hilo.

Package XII
1 Roll chronograph sheets for Honolulu Time observations… [Coast & Geodetic Survey, NARA Collection]

August 15, 1892
Honolulu, H.I.
Dr. T.C. Mendenhall, Sup't Coast & Geodetic Survey;
to Professor W.D. Alexander, Surveyor, General Hawaiian Islands
(In appreciation of help rendered by Hawaiian Government Survey to
U.S. Coast and Geodetic Survey):
…During the recent visit of one of our officers to Hawaii the Government Survey under your direction has rendered valuable and repeated services in furtherance of the work. I desire to thank you for the substantial aid given, not only during the International work at Waikiki, but throughout all the observations made to determine the force of gravity at the base and summit of ***Mauna Kea***.

Mr. Preston speaks especially of your assistance in the location of the observatories, in setting a meridian mark on Makiki ridge, and in the longitude determination of Waikiki. In the mountain work your experience was particularly valuable, and the help given both in observers and in funds contributed greatly to the successful completion of the project.

For all these kind offices please accept the acknowledgments of this service… [Coast & Geodetic Survey, NARA Collection]

Washington, D.C.
January 5, 1893
E.D. Preston; to W.D. Alexander
(Reporting on results of Pendulum Survey on Mauna Kea):
…Yours of Dec. 13 is at hand and I thank you for the data in regard to the connection of the Waikiki Observatory with your triangulation. I will have my own observations worked up here at the office and the two determinations will check each other.

I have been unable to find among my instruments a little box of electric lamps (dimensions about 10 in x 6 in x 6 in) and think that in repacking they may have been left in your storeroom in the (Kapuaiwa Building). Will you please have some one look for them? It is a wooden box. If found please advise me when you write (no hurry).

We are still engaged on the latitude computations and expect to turn out some results shortly. The pendulum work at Honolulu, Kawaihae, ***Kalaieha and Mauna Kea (Waiau)*** has been completed and I will send you the results as soon as I speak with the Superintendent to ask his permission. The pendulum work at Waikiki will not be done for some time as the computation of 200 nights time observations is quite an undertaking and we want to dispose of the latitude first.

Relative forces of Gravity
(Determinations of 1892)

Washington	980.1000 dynes
Honolulu	978.9364
Kawaihae	978.8035
Kalaieha	978.4905
Waiau	978.0599

These do not take into account any change in the pendulum during the trigs. The observations after the return may necessitate a slight correction as far as the ratios between Washington and the others are concerned, but the ratios between all the island stations will probably be unchanged. The Hawaii ones indicate a very great density for the lower half of ***Mauna Kea*** and a marked difference between the upper and lower half. The result being – upper half 2.1 and lower 37… [HSA – ID Survey, 1893]

Washington D.C.
February 15, 1893
E.D. Preston; to Professor W.D. Alexander:
(Reporting on results of Pendulum Survey on Mauna Kea):
…Yours of January 31 has just come and I thank you for the information about the box of electric lamps – I will write you again shortly in regard to them. For the present will you please label the box and let it remain in your store room.

I have to thank you for the papers kindly sent. Everything at present is very eagerly read, coming from the Islands.

Professor Dana is going to publish the results of the ***Mauna Kea*** *work in the next Journal of Science.*

I have met several times the Commissioners, especially Mr. Carter & Mr. Castle with whom I am better acquainted than the other three. Neuman has not yet arrived and is expected in a few days. I was glad to hear from your family – You speak of Judge Hartwell's little children worshiping their teacher – That does not surprise me in the least.

Some months ago I gave a talk on Hawaii before our French Club. As soon as I have a copy made I will send you one… [HSA – ID Survey, 1893]

Report of E.D. Preston on the Mauna Kea Trip of 1892

In 1893, E.D. Preston, prepared his report on the Mauna Kea Trip, which was subsequently published in 1894, in the "Report of the Superintendent of the U.S. Coast and Geodetic Survey, for the Fiscal Year Ending June 30, 1893 (Part II, Appendix No. 12)." Preston's account further confirms the occurrence of cultural resources in the summit region of Mauna Kea, and documents the experiences of the Pendulum Party on the mountain lands. Importantly, a number of photographs shot by Preston, and used to illustrate this account, were found in the collections of the NOAA National Library and the collection of the Hawaiian Historical Society. These photos provide us with a valuable view of the landscape of Mauna Kea, as seen from Waimea, Kalai'eha, and at various locations in the summit region. We include below, Preston's introductory texts, providing readers with the scope of his project and work conducted at various locations in the islands, and the detailed accounts of work leading to, and on Mauna Kea:

Appendix No. 12—1893.
Determination of Latitude, Gravity, and the Magnetic Elements at Stations in the Hawaiian Islands, Including a Result for the Mean Density of the Earth. 1891, 1892. [Figure 13]

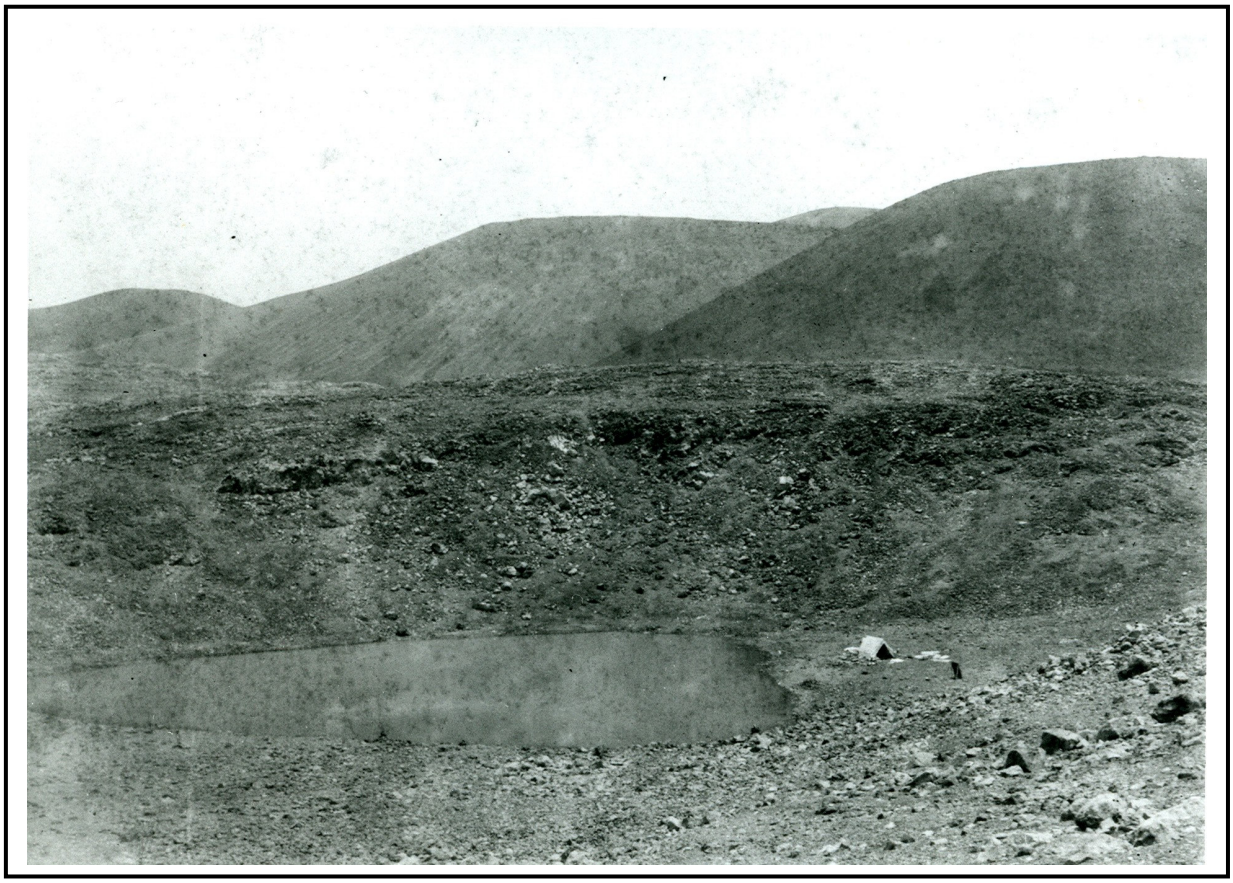

Figure 13. Gravity, Latitude, and Magnetic Station at Waiau, Looking Northeast. Elevation 13,060 Feet (3,981 meters). Plate No. 22 (E.D. Preston, 1892). (Photo No. 976, in Collection of the Hawaiian Historical Society.)

A report by E.D. Preston, Assistant.
Submitted for publication June 30, 1894.

While engaged in astronomical observations in the Hawaiian Islands in 1891-92, in cooperation with the work of the International Geodetic Association, occasion was taken to make a continuous study for one year of the force of gravity at Waikiki.

After the work had been completed at this place an expedition was undertaken to the summit of ***Mauna Kea***, an extinct crater, having an elevation of 13,825 feet. The object of this trip was the determination of the force of gravity at the base and summit, from which the density of the mountain and the mean density of the earth might be deduced. Availing ourselves of the occupation of this unique station, magnetic, latitude, and hypsometrical observations were carried on, besides making a trigonometric and topographic survey of the great plateau at an elevation of about 12,500 feet. When this was done, some magnetic observations were made at other points of the group, notably at Napoopoo, Kealakeakua Bay, on the lee side of Hawaii, where Captain Cook made similar observations in 1779, and at Lahaina, Maui, where De Freycinet had an observatory in 1819. For an account of other work done in the Hawaiian Islands in 1891-92 the reader is referred to Appendix No. 12, Coast and Geodetic Survey Report, 1891 (Transit of Mercury); Appendix No. 13, Coast and Geodetic Survey Report, 1891 (Preliminary note on the occupation of stations in the Hawaiian Islands); Appendix No. 2, Report for 1892 (On the variation of latitude at Waikiki, near Honolulu, from observations made in connection with the International Geodetic Association), and Bulletin No. 28, on the Constant of Aberration. [page 513]

The following report has to deal with—

I. Gravity observations at Waikiki.

II. Gravity observations at Honolulu, Kawaihae, ***Kalaieha***, and ***Waiau*** (summit of ***Mauna Kea***).

III. Latitude-observations at Kawaihae, ***Kalaieha, Waiau***, and Lahaina.

IV. Magnetic observations at Kahuku, Waikiki, and Honolulu, on Oahu; at Kawaihae, Waimea, ***Kalaieha, Waiau,*** Hilo, and Napoopoo, on Hawaii; at Lahaina, on Maui; at Waimea, on Kauai, and at Nonopapa, on Niihau.

V. Hypsometrical observations at Honolulu, Hilo, Kawaihae, Waimea, ***Kalaieha***, and ***Waiau***.

The location of these stations is shown in Illustration No. 23 [figure not reproduced here, see original manuscript].

The gravity observations at Waikiki were made in connection with the International Geodetic Association work. The subsequent determinations were carried on with the cooperation of the Hawaiian Government Survey. The greater part of the expense was borne by this Bureau, and the personnel of the party was largely composed of members of the staff. Prof. W. D. Alexander, the accomplished surveyor general of the islands, accompanied the expedition to the island of Hawaii and remained with us at all stations except Hilo. During the occupation of the summit of ***Mauna Kea*** he assumed the difficult task of making a trigonometrical survey of the plateau. The peaks have an altitude of nearly 14000 feet and are composed largely of scoria and red volcanic sand, which makes the ascent one requiring extraordinary endurance. In this work he was assisted by Mr. J. M. Muir, who voluntarily accompanied the expedition without compensation and whose services were of great value. The other members of the party were Mr. W. E. Wall, Mr. E. D. Baldwin, and Mr. W. W. Chamberlain, of the Government Survey staff. Mr. Louis Koch

performed the duties of steward, a service of some difficulty and of great importance to a party encamped above the clouds, and Kauwe, an intelligent *Kanaka*, acted as guide both during the ascent and on the return. In the computations I had the help of Mr. C. C. Yates during the latter part of the work.

PRELIMINARY AND CONCLUDING OBSERVATIONS AT WASHINGTON.

The gravity work of 1891-92 was entirely of a differential character. The continuous determinations at Waikiki simply required that the pendulums should receive no accident during the year of occupation, while the observations for the density of ***Mauna Kea*** only made it necessary to guard against accident between the times of swinging at the base and summit of the mountain. It is evident, however, that if the periods of oscillation of the three pendulums are determined in Washington before leaving on the expedition and again on the return an agreement of these two determinations will give increased confidence in all the work executed during the trip… [page 514]

Kawaihae.
Island of Hawaii.

Leaving Honolulu in the afternoon of June 28, on board the *Kinau*, we arrived at Kawaihae on the evening of the 29th. The party consisted of Prof. W.D. Alexander, surveyor-general; Messrs. W.E. Wall, W.W. Chamberlain, Louis Koch, and myself. The first observations were made on the 30th… The station was situated on the property of the Hon. Samuel Parker, to who, as well as to the general superintendent, Mr. Paul Jarrett, our thanks are due for many acts of kindness… The general location of the property is between the boat landing and the *Heiau* of Kamehameha I, and about one-third the distance from the *Heiau*. [page 587] At this station are the remains of an ancient temple, famous in early Hawaiian history as the scene of the first steps by which all the islands were consolidated under one government. It was here that Kamehameha betrayed and murdered his rival, Keoua, baked his body in an oven as a last indignity, and finally deposited it in the temple on the altar of the war god. He was henceforth recognized as master of Hawaii. A sketch of this interesting *Heiau* from actual measurements has been furnished by Professor Alexander and is given here as a matter of curiosity [Illustration No. 28.].

A remarkable feature of it is that although the early Hawaiians had no metal tools, and are today poor mathematical reasoners, their temples furnish examples of quite accurate right angles. One tested with a theodolite at Napoopoo was surprisingly near the truth.

Magnetic observations were made on July 1, 2, and 3. The pendulums were swung on the 3d, 4th, 5th, and 6th, and time and latitude were observed during the entire stay. We left on the morning of the 7th. The weather was generally favorable for work with the exception of one or two occasions when we had a sudden gust of wind from the mountains. (These storms are called *mumuku* in the native language, in contradistinction to the storms from the southeast, which received the name of *kona*.)

At this point preparations were made for the ascent of ***Mauna Kea***. Packers and horses were engaged and the services of a guide secured… [page 589]

Determinations of Latitude.

The latitude work at the three stations occupied for gravity was only of secondary importance. Only a limited number of pairs were selected for observation, and at ***Kalaieha*** the weather was so unfavorable that but three latitudes were obtained. The instrument used was a meridian telescope of 31 inches focal length, 2 ½ inches aperture, and magnifying power of 77. One revolution of the micrometer gave an angular value of 65” .85. One division of the latitude level is equal to 1” .66, and that of the striding level is 2”.21. The instrument is known as Meridian Telescope No.2. In making the observations

only one bisection was made, and the level was not read more than once, generally after the measurement with the micrometer. The results are not comparable in point of accuracy with those made at Waikiki with the zenith telescope, partly on account of the inferior accuracy of the instrument, but principally because the pier was generally constructed under poor conditions of stability. At Kawaihae and ***Kalaieha*** only a wooden pier was available, and at ***Waiau*** the great difficulty of trans- [page 592] portation and labor made it necessary to construct a very small substructure… [page 593]

Waimea.

(See Illustration No. 29 [*Figure 14*])

On Thursday, July 7, 1892, Waimea was reached. At this station only magnetic observations were made. One station was at the west end of the base line of the Government survey and the other was identical with the station occupied in 1872 by Mr. C. J. Lyons. Additional horses and pack mules were engaged here for the ascent of ***Mauna Kea*** and preliminary arrangements made for the trip. Throughout our stay the work was much facilitated by Mr. W. L. Vredenburg. Our camp was established in his yard. The party was also recipient of other favors at his hands. Waimea is situated at an altitude of 2600 feet: above the sea level, with a moist atmosphere. Nearly every afternoon, the trade winds bring in rain, so that the observations were made with difficulty. With so much regularity does the rain appear that it becomes to some extent a timepiece. In reply to the question, asked by one of our party, as to when school was dismissed for the day, the answer was that the school closed generally a quarter of an hour before the rain set in. The climate is well adapted to fruit, and the grazing land is of the best quality.

Figure 14. Mauna Kea, as seen from Waimea, Distant 15 Miles, Looking Southeast. Cloud Belt at 10,000 Feet Elevation. Plate No. 29 (E.D. Preston, 1892) (Photo No. 1016, in Collection of the Hawaiian Historical Society)

The following plants were noticed in one of the gardens: Figs, wild tomatoes, bananas, coffee, pineapples, taro, mangoes, cauliflower, and sugar cane. The following is a sketch of the magnetic station occupied by Mr. Lyons in 1872; the other one is at the west end of the base line and needs no further description… [page 594]

Kalaieha.

Leaving Waimea at 7.25 a. m. on July 12, we arrived at ***Kalaieha*** at 5 o'clock in the evening, having passed the entire day in the saddle. The distance is about 30 miles. The road is not steep, as the elevation to be overcome between the two places is only 4,000 feet. This gives an average rise of 1 in 40, or an inclination of about l ½ º. On the road specimens of lava were gathered at designated points in order to form a basis for estimating the average density of the rocks of the island. The route taken, as well as the points from which specimens were obtained, is shown in illustration No. 31 [*Figure 15*; Map in Collection of the Library of Congress]. ***Kalaieha*** is situated on the ***Humuula*** ranch, which contains 237000 acres, including a part of Hamakua. The tract runs down to the sea on the windward side and extends from the summit of Mauna Loa on the south to

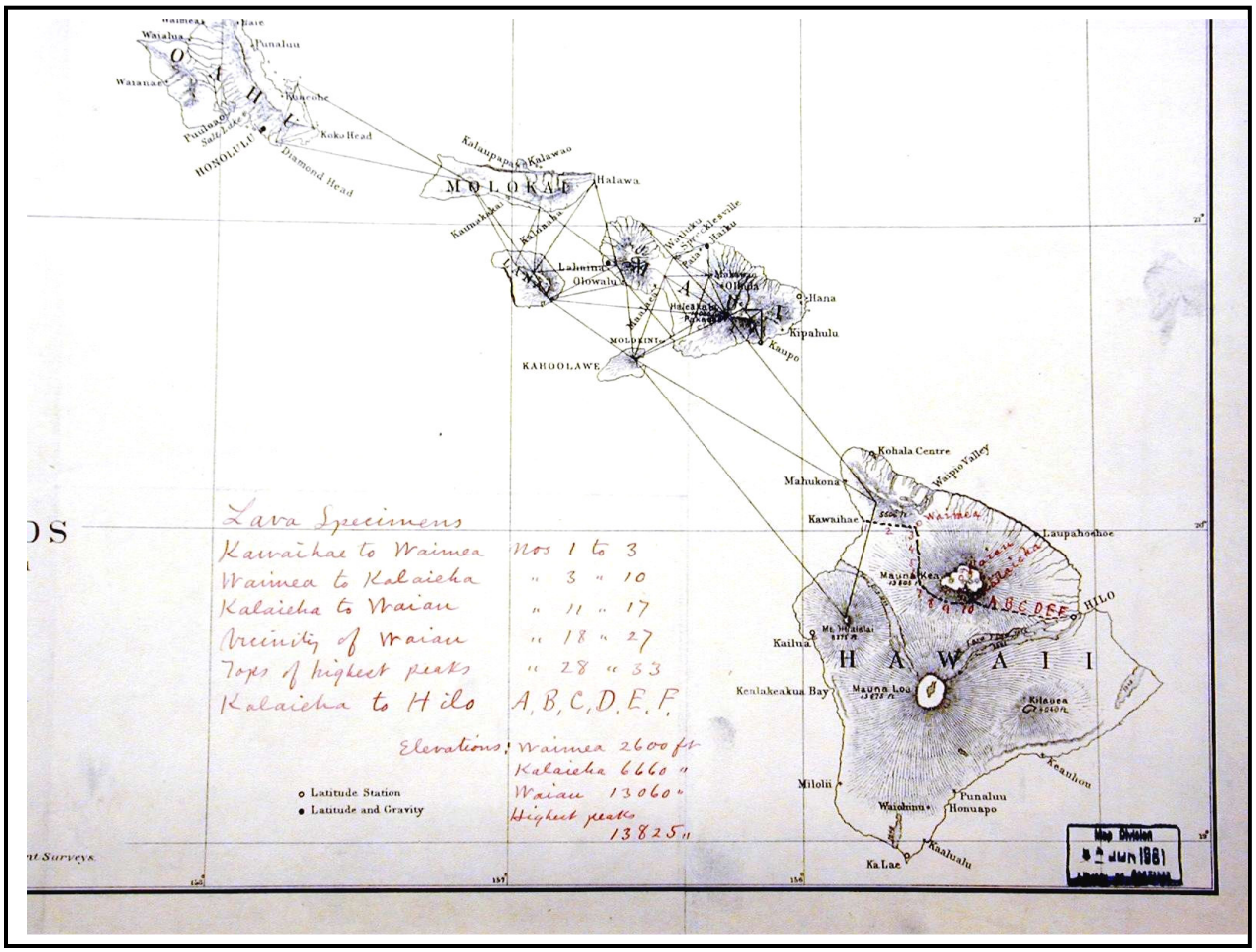

Figure 15. Preston's Map of Route to Mauna Kea, and Locations Where Specimens were Collected (Library of Congress; Copy Photo, KPA-N043)

Mauna Kea on the north. At its widest region it is 20 miles broad. Its longest dimension is about 45 miles. On July 13 the stations were located and the tents and instruments put in position, and on the following day work was begun. The pendulum receiver was mounted on a large rock about 100 feet west of the house farthest to the west, and the latitude pier was within 2 or 3 feet of the pendulum in a southeast direction. The magnetic station was 200 feet due north of the pendulum. A general view of ***Kalaieha*** is shown in illustration No. 32 [*Figure 16*]. The prominent peaks along the path to the summit are identified by rectangular coordinates. [page 595]

Location of Prominent Peaks on Mauna Kea (Elevation, 13,825 feet).
The important points on this mountain are to be found in Illustration No. 32 [Figure 16] at the intersection of vertical and horizonal lines as follows:

w = Waiau. Location of gravity and magnetic station.
b = Poliahu*.
a = Ku-ka-hau-ula. Highest peak; trigonometric station is near this point.
c = Ke-one-he-he‘e. Trail to summit passes right of this hill.
e = Ka Lepe a Moa. Trail passes between this and c.
k = Omahulua… [page 596]

* “Poliahu is a poetical name, being that of the demigoddess with snow mantle who haunts Mauna Kea. See Legend of Laieikawai. I therefore propose to attach it to this nameless peak. The rest are the genuine native names.” [W.D. Alexander.]

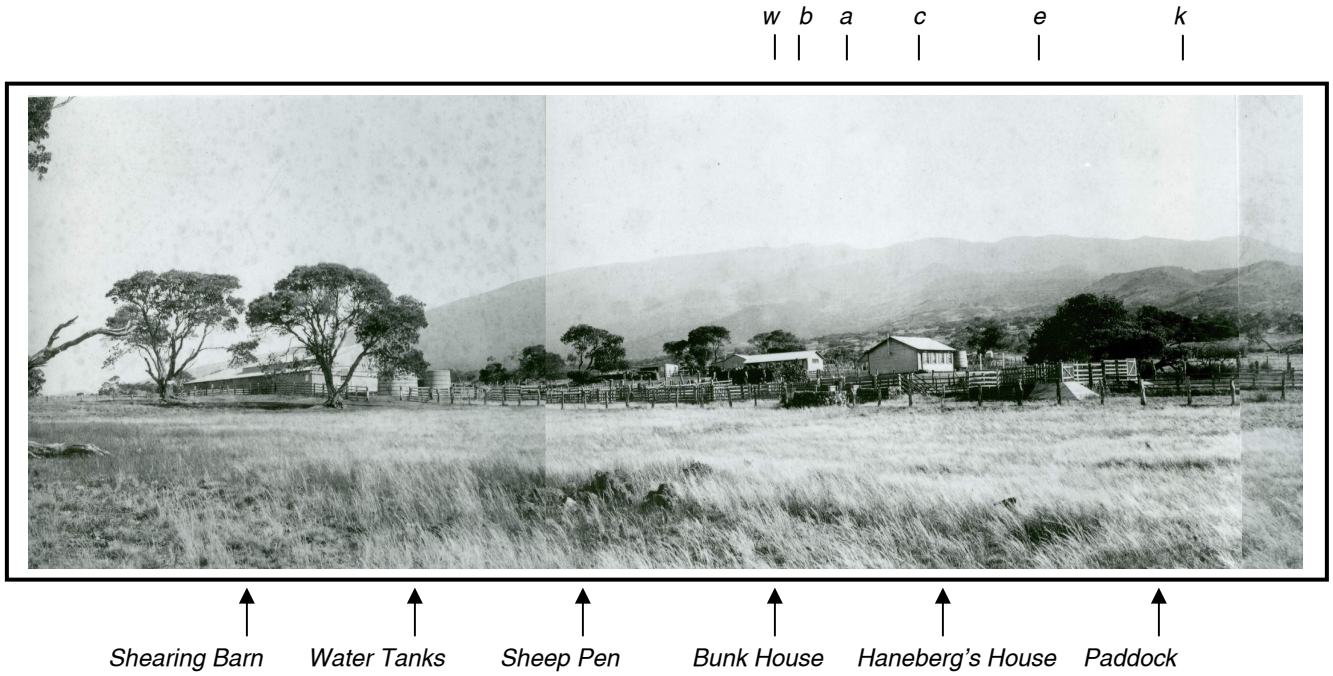

Figure 16. Mauna Kea viewed from Kalai‘eha, the Humuula Sheep Station Headquarters Viewed in Foreground, E.D. Preston (1892). (Portion of Tryptic Photo Combined by E.D. Preston; compiled here from Photo No.’s 1008, 1019 & 1018, in the Collection of the Hawiian Historical Society)

…The latitude observations at this station were made with great difficulty. During the entire stay not more than four pairs could be obtained. The evenings were always either foggy or rainy, and as the telescope was mounted in the open air, it was often necessary

to lift it from the Ys and take it inside the tent to be dried. The latitude was always made to give way for the time observations, as these were necessary for the success of the gravity work, which was the real objective point of the trip… [page 600]

The instruments were dismounted at ***Kalaieha*** on July 18 and packed for the final ascent. The distance to the summit, in an air line, is about 7 miles, and the difference of elevation about 7,000 feet. The path, however, was about 12 miles in length, and ***Waiau*** is 700 feet below the summit, so that the average rate of rise was 1 in 11 , or an angle of about 5 ½º. The amount of material to be transported to the top of the mountain was very great. Besides the astronomical, gravity, and magnetic instruments, and the provisions required to maintain the party on the summit long enough to complete the work, it was necessary to carry fuel, tents, and blankets, and enough cement to build a pier for the meridian telescope. The whole outfit was packed on 11 mules, and the party consisted of 11 persons, including 3 packers. Everything being in readiness, a start was made on the morning of July 19. Before getting well under way, however, a fog set in. Some of the pack animals became difficult to manage, and soon it was noticed that the mule carrying the magnetic instruments, probably the most delicate ones of the outfit, was missing. A halt was made and eight of the party started in search, but as the fog was now dense, our efforts were of no avail. After a couple of hours of delay it was decided to abandon the journey for the day. We all returned to ***Kalaieha***, the animals were unpacked, and the day given up to hunting the lost instruments. The mule was found about 3 p.m. at the foot of the ***Omaokoili*** hills, some 3 miles distant.

Waiau. [Figure 17; illustration No. 33.]

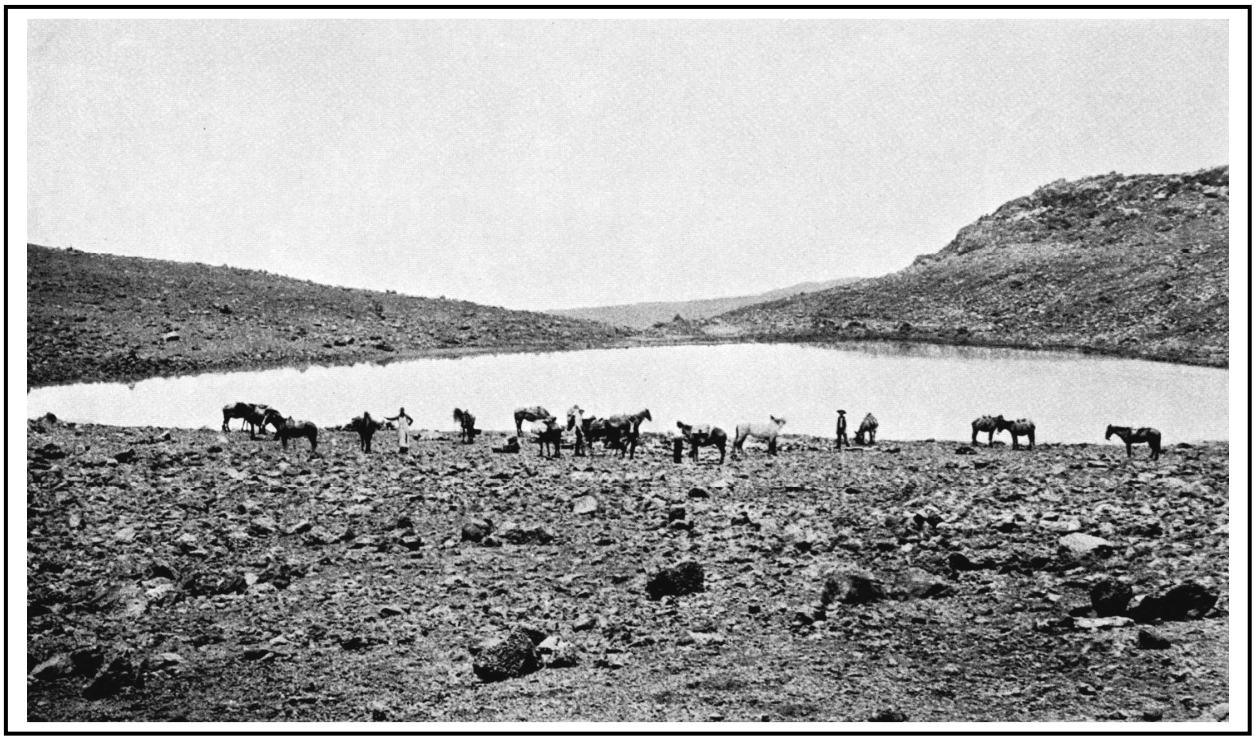

Figure 17. Waiau Lake, Near Summit of Mauna Kea. Elevation over 13,000 Feet. Plate No. 33 (E.D. Preston, 1892) (Copy Photo KPA-N078; in collection of NOAA Central Library Silver Spring, Maryland)

On the following day we again set out at 7:40 a.m. At 11:40, a stop was made for lunch. The route passed between ***Lepe a Moa*** on the left and ***Kole*** on the right, and we now found ourselves at an altitude of about 10,000 feet. Continuing in the direction of ***Keonehehee***, and climbing this cinder cone in a northeast direction (see illustration No. 34 [*Figure 18*]), we arrived at the plateau level at 2 p.m. The elevation of this point is 11,600 feet. The *mamane* trees were not seen above 10,000 feet, and the *raillardia*, the only remaining sign of vegetation, disappeared at 11,500 feet. From this point on, the path was over an unbroken landscape of lava. *Some interesting pyramids of stone, built to commemorate Queen Emma's visit, were seen on the edge of the plateau, and at an elevation of 12,000 feet was found* ***Keanakakoi****, a famous quarry opened by the natives many centuries ago for the manufacture of battle axes. At an elevation of nearly 13,000 feet, near Lilinoe, a burying ground was found, where the ancient chiefs were laid to rest in the red volcanic sand.* Before reaching the plateau the animals suffered considerably from the rarity of the atmosphere. On the flank of ***Keonehehee*** it was with great difficulty that they were driven—with tongues out and sinking ankle deep in the soft scoria at every step, they presented a pitiable picture indeed and seemed [page 601] utterly regardless of the drivers' urging, whether with noise or whip. Although heavily laden, they repeatedly lay down, profiting by even a few minutes, when unobserved, to snatch a few moments' rest. Some were unable to reach the destination and had to be unloaded three-quarters of a mile from ***Waiau*** and turned loose to descend to the plains below. Their loads were repacked on stronger mules, which were sent back from the summit. The endurance of these mountain animals is remarkable. On the leeward side of the island, where it seldom rains, it is a common occurrence for them to pass eight days without water, and cases are on record where two weeks have elapsed between drinking times. Our camp was established on the banks of the lake known as ***Waiau***. This is a body of water formed by the melting snow and gathered from the sides of an extinct crater. It is one of the

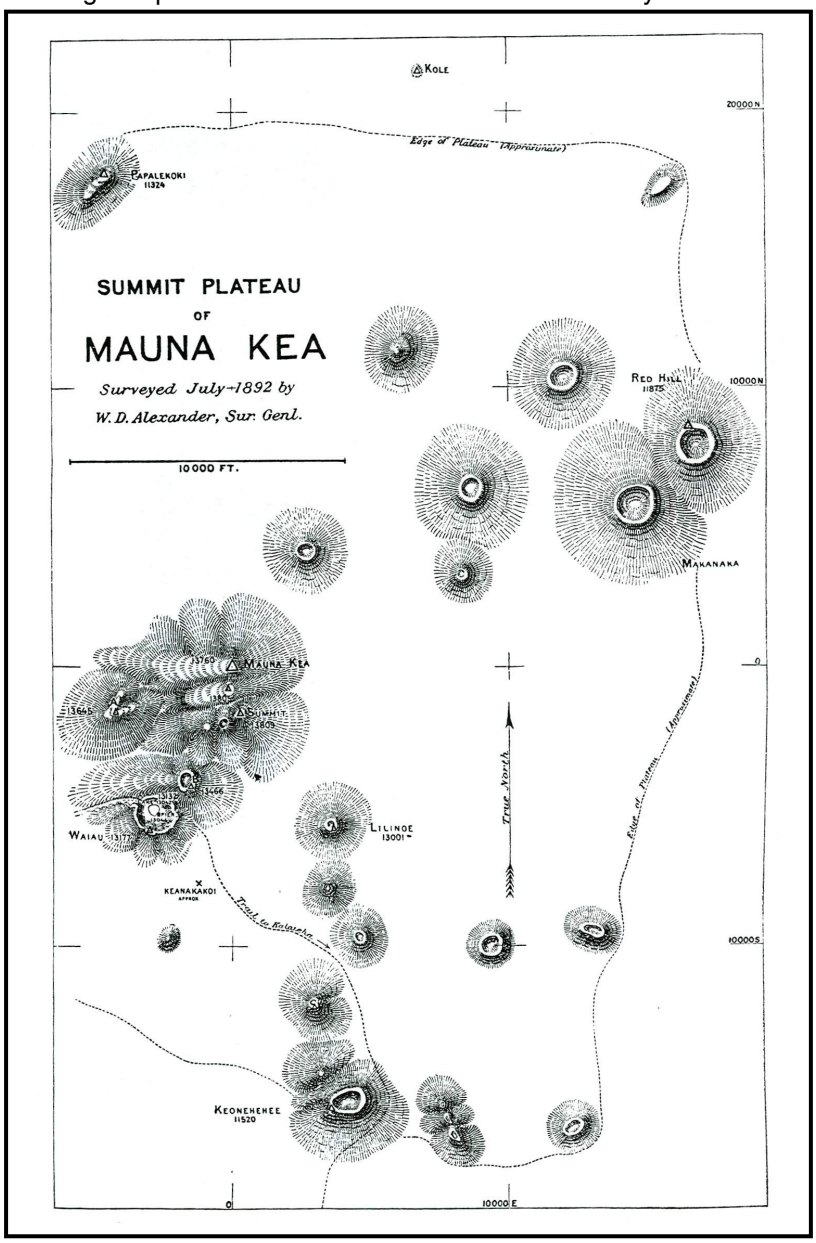

Figure 18. Summit Plateau of Mauna Kea (Surveyed July, 1892, by W.D. Alexander). E.D. Preston's Plate No. 34

highest bodies of water in the world, being at an elevation of over 13,000 feet. At 4 p.m. the baggage was all at the station and the animals were sent back to ***Kalaieha***, as there is no provender within many miles of the place.

The boiling point of water on the summit (illustration No. 35 [*Figure 19*]) is about 186º F. The ranges of temperature during our stay were from 13º F. at night to 108º F. in the daytime, the thermometer having the same position at both times. The barometer stood at 18.30 inches at 54º F. We found the trade winds blowing at the summit, although the anti-trades are supposed by some to appear much below 14,000 feet elevation.

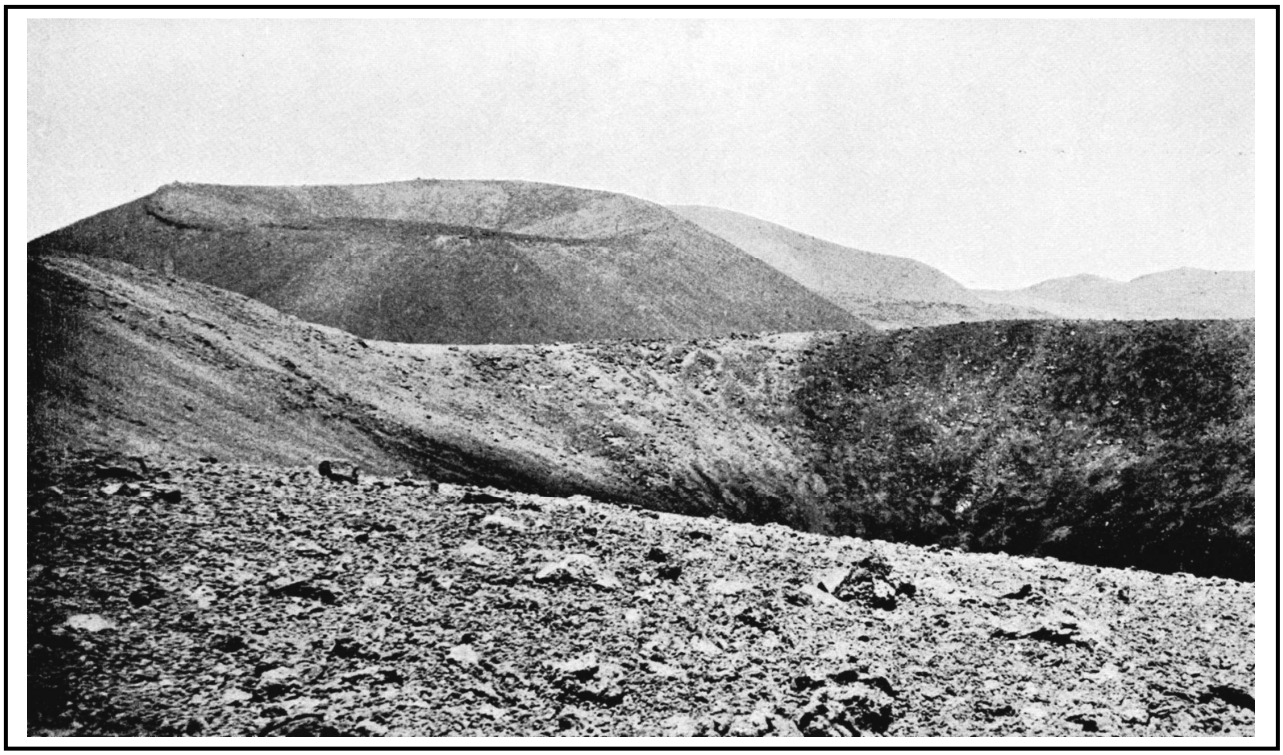

Figure 19. View from Ku-ka-hau-ula, the Summit of Mauna Kea, Looking Southwest. Elevation 4,214 Meters (13,825 Feet). E.D. Preston, 1892. Plate No. 35. (Copy Photo KPA-N093; in collection of NOAA Central Library Silver Spring, Maryland)

The atmosphere was very clear. *Many stars were observed before sundown with a small telescope.* We had, of course, ice every night on the lake. With such extreme ranges of temperature there was much discomfort. Sleeping cots were not taken, as it was entirely too cold at night to lie off the ground. It was found necessary to make sleeping bags by sewing blankets together. Although for miles in every direction around ***Waiau*** there is an unbroken landscape of lava, and apparently nothing to support life, we saw spiders, butterflies, and flies during the stay.

Around the shores of the lake the following plants were found growing, although the lake itself is several thousand feet above the last limit of vegetation. They were submitted to President D.C. Gilman, of the Johns Hopkins University, who kindly forwarded the list, as follows:

Cystopteris fragilis Beruh.
Trisetum glomeratum Trin.
Poa annua L., forma vel vaz.
Deschampsia australis Nees.[25]

The first specimen was determined by Mr. John Donnell Smith, and the last three by Dr. George Vasey. All the above plants were found growing near the same locality, at an elevation of about 13,100 feet above sea level. See illustration No. 35 for summit view… [page 602]

From Waiau to Hilo.

The last observations were made at ***Waiau*** on the evening of July 25. The next morning the animals arrived from ***Kalaieha***. They were packed during the forenoon of the 26th, and at 1.30 p.m. we started down. We reached the ***Humuula*** ranch (***Kalaieha***) at 5:45 p.m., having stopped an hour at ***Keanakakoi***. On the 27th the instruments and baggage were all repacked. The party separated at this place, some going' down the windward side of the mountain to Hilo, and the others returning to the sea over the same route taken in the ascent. This course was necessary because magnetic observations were to be carried on at Hilo, and as it was impossible to transport the baggage to the steamer on this side of the island, it was sent to Waimea and then to Kawaihae. We left ***Kalaieha*** at 6 a.m. on July 28th with a small pack train and a guide. The path is about 30 miles long, very rough, and much of the way over sharp lava. We were supplied with horseshoeing implements. This is a requisite to everyone making the trip. The lava is so hard and sharp that if a shoe is lost the horse's foot is badly cut in a few minutes, and neither persuasion or force will induce him to continue the route unshod. Many carcasses were seen along the road, of animals that had been killed or left to die, as there is nothing by the wayside to support life. Just before arriving at Hilo we passed through 1 ¾ miles of swampy woods, which consumed two hours in crossing. Hilo was reached at 7.30 in the evening, after having spent thirteen hours in the saddle.

The photographic plates exposed on the mountain were developed the next day, and on Saturday, the 30th magnetic observations were begun… [page 607]

[25] *Trisetum glomeratum*. Hawaiian name, *he'u pueo* (apparently a name for this species on Hawai'i, while elsewhere in the Hawaiian islands it is referred to as *pili uka*). Endemic to the Hawaiian islands. It occurs at high elevations on Mauna Kea, Mauna Loa, and Haleakalā. It is a major constituent of the alpine grasslands that occur around 13,000 ft.

Poa annua. No known Hawaiian name. Introduced and naturalized, by ca. 1871. Annual bluegrass.

Deschampsia australis (new scientific name, *Deschampsia nubigena*). No known Hawaiian name. Endemic to the Hawaiian islands, generic name for this genera of grass is "Hairgrass." It occurs in the subalpine dry forests and up into the alpine *Trisetum* grasslands.

Cystopteris fragilis (new scientific name, *Cystoperis douglasii*). An endemic fern, threatened in the upper region of Mauna Kea.

(Above information provided through the courtesy of DLNR-DOFAW Biologist, Lyman Perry (Feb. 4, 2005); and notes compiled by Patrick Aldrich, Intern at Office of Mauna Kea Management (2005).)

U.S. Coast and Geodetic Survey
June 21, 1894
E.D. Preston; to W.D. Alexander
(Regarding photos of Mauna Kea; and information on Plant Species Encountered on Mauna Kea Trip):
…I am in receipt of yours of 20 June and have to thank you for it as well as for the papers you have so kindly sent from time to time. The news has always been extremely interesting to me. I feel almost as much interest in the Hawaiian Islands as I do in my native land, indeed in some respects even more.

The report on the latitude gravity and magnetic work done in the islands after June 1892 is very nearly ready for the printer. It has gone slowly on account of many unavoidable interruptions and even now within a few days I have been taken off to work up a new value of the observation constant from Davidson's San Francisco observations. I hope to be able to send you the principal results with this which I will hold for a few days on that account.

In my memorandum kept during the progress of the office computation I find the enclosed list which indicates a few points on which information was desired. If you can answer any of the questions without inconvenience it can be inserted in the proof when it returns from the printer which will probably not be for some months yet. But it is hardly worth while to make any special effort to get the data.

By putting three of my photos together & having them again photographed I have succeeded in getting a good outline of ***Mauna Kea*** in which the principal peaks can be identified by means of rectangular coordinates. ***Ku-ka-hau-ula*** and ***Poliahu*** have been slightly exaggerated by hand before reproducing in order that they may be easily made out after reduction. I enclose both prints & you will see the amount of exaggeration.

The plants found at the summit were identified to be:

Nos 1, 2, 3, & 4
Cystopteris fragilis.

Nos 5, 7, 10 & 11
Trisetum glomeraturn.

Nos 6 & 8
Poa annua L.

No 9
Deschampsia australis.

We were both delighted to receive your *Aloha olua* and we each return *Aloha oukou* for you all… [HSA – DAGS 6, Box 8]

Washington, D.C.
August 25, 1894
E.D. Preston; to W.D. Alexander
…Your letter of recent date came to hand yesterday and I take the first opportunity to thank you for the information it contained in regard to heights and azimuths at Waimea Hawaii.

I am glad you thought well of the photograph of ***Mauna Kea***. A copy of it is the front piece of a paper published by the Phil. Soc. of Washington. I send you a copy tonight and will shortly send you a number of copies, and will also send some to other friends in the Islands… [HSA – DAGS 6, Box 8]

IV. Historical Accounts of the ʻĀina Mauna Recorded After 1900

Following the advent of the 1900s, travel to the summit of Mauna Kea and the mountain lands became more frequent. Travelers included the adventurous, curious, and those of a scientific interest. Selected articles, journals, letters, and reports describing travel to the mountain lands, and observations of both cultural and natural resources are cited in this section of the study. The narratives describe travel conditions; forest resources; introduction of plant and animal species to the landscape; cultural and historic resources; ranching activities; proposals for road development and land use activities; forestry and hunting programs; the results of scientific surveys covering historical resources, the geology and glaciation of Mauna Kea, and botanical surveys; and the development of skiing interests on Mauna Kea.

Pertinent excerpts from the articles and papers are given verbatim, and presented in chronological order, by date of visit to Mauna Kea and the neighboring *ʻāina mauna*; or, when given as general accounts of the mountain lands, by date of publication.

"Hawaii Rdeivivus" Orchards of the Keanakolu Vicinity Planted in ca. 1885:
by Lillian Shrewsbury Mesick
Paradise of the Pacific, September 1909

An article in a recent number of the Advertiser written by the Rev. Mr. J. M. Lydgate has made me wonder whether or not the dream of the so-called visionary who favors the coming of the small farmer and fruit-raiser is indeed "as a dream of a night vision" or a foresight of what actually is to come.

Mr. Lydgate visited an abandoned fruit orchard at ***Keanakolu***, which is situated on the southern slope of ***Mauna Kea*** on the Island of Hawaii at an elevation of about five thousand feet. This orchard was planted about twenty-five or more years ago close to where the ***Humuula*** Sheep Ranch house was then situated. The headquarters at ***Keanakolu*** were afterward abandoned and the fruit orchard was left uncared for.

Very fortunately, however, a fence strong enough to prevent cattle, wild goats, and other animals from damaging the trees had been erected, and it is because of this that we are enabled to judge of what results might have been obtained in other places had the same condition prevailed. The trees at ***Keanakolu*** were overrun with such a growth of weeds and underbrush as might naturally be expected in a location which has been uncared for during a period of twenty years. The trunks and limbs were covered with the long gray moss so common to neglected trees and shrubbery, but the fruit—several varieties of which were ripe—were all that could be desired, and far more than could well be expected under the circumstances.

Mr. Lydgate found apple, plum, pear, apricot, cherry, and peach trees, and several varieties of each. He states that the apple trees run mostly to whips, causing a meager crop of fruit, but Mrs. Lydgate claims that those she saw were of excellent quality. The fine crop of Bartlett pears and the cherries and peaches were, at the time of their visit, too green to eat, though the cherries, which were few, are probably ripe by this time. There were but few peaches, but those seen were of good size. The plum and apricot crops had already matured and there was no fruit left by which one might form an opinion, but it is

said that the fruits have been gathered by those who have visited the orchard during the past few years, and have been found equal to those grown on the mainland.

One peculiarity that Mr. Lydgate could not explain was the ripening of the apricots long before the cherries. The opposite condition prevails in California, apricots coming into market there some weeks after the close of the cherry season. Mr. Byron O. Clark tells me, however, that he has known apricots to ripen in Southern California in April, so the unusual condition at ***Keanakolu*** may be due to a very early variety of apricots and a late variety of cherries having been planted there. This is not entirely a satisfactory theory, however, as cherries in California usually have disappeared entirely when the first apricots come into market.

Mr. Lydgate states that he found a considerable number of Loganberry bushes in the enclosure on which the fruit was just beginning to ripen. The bushes were in a very thrifty condition—so very thrifty that the fear was expressed that they might in time become such a pest as the common Jamaica thimbleberry, which is said to have been imported fifteen or twenty years ago, is now on the Island of Hawaii.

The trees and bushes in the orchard at ***Keanakolu*** are reported to be entirely free from all disease and in a surprisingly healthy condition, considering the neglect of something like a quarter of a century. This is surprising to one who knows the fate of abandoned orchards on the Coast. There, without some care, the trees become dwarfed and stunted and the fruit scarce, small, and of inferior flavor and grain. [page 21]

"Mauna Kea, The Highest of Island Peaks" (1911)

by Solomon Sheridan with photos by Alonzo Gartley
Mid Pacific Magazine, December 1911:403-411

Mauna Kea, on Hawaii, is the highest island peak in the world. It rises so gently from the ocean side that, although its base is in the tropics and its crest in the snows, the eye is deceived, and it seems but a gentle slope of no great final altitude, yet a plumb line dropped from the summit of ***Mauna Kea*** to the sea level would have to be nearly three miles in length. It might be possible for a good horseman to ride in a day from the seaside to the summit of ***Mauna Kea***. Usually a day is spent on the trip to a ranch within eight miles of the summit, where the night is spent, and an early start made so that the summit may be reached within a couple of hours and a return made for lunch at [page 403] the ranch house. It would be easy to walk the eight miles but for two obstacles—fog and wild cattle. The fog causes the wanderer to lose his way, for there is no regular trail—you just keep your eye on the highest level of the gentle slope and walk. The cattle are unaccustomed to men who are not on horseback; they invariably approach out of curiosity, and if the tramper shows the white feather and runs, and sometimes if he doesn't, they charge, and out alone on the mountain chased by wild cattle is more thrilling and dangerous sport than climbing the Matterhorn.

Then, too, there are wild dogs, that live on sick cattle that they worry to death. The dogs hunt in droves and afford as good shooting sport as do goats on some of the craggy mountains of Hawaii.

From the summit of ***Mauna Kea*** its sister mountain Mauna Loa, but a few feet lower in height, is seen a few miles away, and sometimes smoke is seen issuing from its crater summit. It is possible to ride and walk from one mountain peak to the other, but those who have crossed the high, desolate lava flow, nowhere less than 8000 feet above the sea level, tell tales of hardship that would deter any but the fool-hardy.

Sol. N. Sheridan has given a good account of an ascent he made of ***Mauna Kea*** on horseback from the ranch station:

"We had started in pommel-slickers from ***Humuula*** sheep station." He tells us, "riding in a little drizzle of rain that would have soaked us to the skin if we had ridden in other garb. As we rose through the forest line we rode into the body of the cloud itself, and the rain changed to a mist that was dense, but not cold."

"Slowly the cloud seemed to break. We were riding out through the top of it, but that did not appear all at once. Then the sun broke out, flashing, and we rode out upon a high cone of ash and looked down upon the valley between the peaks of Hawaii as upon a rolling mass of white wool with a tinge of silver upon it."

Ahead, the jagged cones of ***Mauna Kea*** arose all about us. To the south- [page 404] ward the sweep of the blue dome of Mauna Loa stretched in a splendid curve above the clouds, broken at its apex by the jagged edge of its central crater, and wearing small ones at intervals, strung like the jewels of a woman's necklace. To the westward, farther away, the less lofty top of Hualalai pierced the clouds sharply—a jagged peak.

Up and still upward we rode, our horses feeling the great elevation seemingly as little as we did ourselves. Now the formation changed, and from riding up cinder cones we began a steeper climb along a ridge marked by an old lava flow broken by the action of frost and snow into jagged boulders. There was no snow, here, but traces of its action were very apparent on all parts of the mountain above 10,000 feet elevation.

Presently there appeared, far ahead of, and still a long distance above, us, what seemed in the distance a dump-pile from an abandoned mine.

"There," said Rawhide Ben, "is where the natives used to come in the old days to chip out the rude forms of their stone adzes from the hard rock of the mountains, carrying the implements down into the lowlands to perfect and polish them afterwards."

We rode on, still climbing, and presently took off our hats to the shades of the men of the Stone Age*. Here they had lived and wrought in a time that is fading very fast into the past—that is, the past of our own race. It is not many centuries ago that these men of Hawaii were at the stage that our own forbears reached and passed ten thousand years ago. Here were the caves in which they dwelt, with rude stone walls built up in front to shelter them from the cold winds of the mountain. Here were the ledges of hard, black, basaltic rock which was the material most prized in the making of their implements—of war, of fishing, of agriculture, for the service of gods and the chiefs. Here, covering several acres in different places, were piles of sharp chips from the tough stone, beaten off through many a weary day of patient labor. Here, where each workman had sat in the quarry, there was a little depression around which he had slowly built up his own pile of [page 405] chips.* 'How long, oh Lord, how long!'

To climb to this height, to delve and dig and chip at hard stone through the long days, to carry down the masses of stone for the polisher and to carry up food and wood and even, it might be, water to the quarrymen, to live and even to die, as some must have died, there above the clouds while the warm rains were marching across the sunny isles far below and lazy plenty waited on the happy

dwellers by the fragrant beaches! Surely that was a fate that was filled with bitter pain.

It is said that slaves, taken in war, worked these quarries. Let us hope that it was so. A slave taken in war would have felt something in his life, at least, when the hot lust of battle ran in his brain, and the sun shone red through the red blood of the foes of his hate. And he could still beat in the skull of his enemy while he beat out his own life upon the black basalt. A slave taken in battle has had his chance.

The old quarries are at an elevation of 12,500 feet. From here the highest point of the mountain comes plainly into view, rising beside a cone that is an absolutely perfect circular crater. It looks, this little crater, as though it might have shot out its vomit of cinders and red ash but yesterday, before going to sleep. It is sleeping most profoundly now, and little dots of white snow nestled at its feet feels none of the heat that must have radiated from it in its waking days.

From the quarries it looks an easy ride to the highest summit through a gentle valley that seems to lead right to the top. It is really very hard—the hardest stretch of all. The summit cone in reality a double cone—is steep and is of red cinders; and the horses, beginning now to feel the great elevation, even as we ourselves do a little, find the footing difficult and the climbing steep. We zigzag backward and forward, each rider following in the guide's steps, and make many stops in the last 500 feet—more, indeed, than in all the climbing that has gone before.

And then, we are at the summit—and through the clouds that have partly broken away below us we catch glimpses of the sea and of the distant sunny vales of Hawaii. At our feet, almost, the [page 407] plains of Humuula lie spread out like a map, and beyond, above the clouds, are Mauna Loa, with its yawning mouth open to heaven, and Hualalai and, far in the distance, the blue outline of Haleakala. It must be a magnificent view on a clear day. It was rarely beautiful, in its sweep and in its coloring, on the day that we saw it.

At the highest point, an elevation of 13,825 feet, a mound of rocks is built, and in this a can lies that contained lists of the names of those who, in recent years, had climbed the mountain, and deposits of silver money made toward a fund for a monument there, and divers articles, the leaving of which had suited the taste and fancy of the depositor. One had left a small compass, another a bunch of sulphur matches, another a brass button, another a penny.

We copied the names of those who had been there before us, and left our own and gave each a bit of silver for the Summit Monument. Then we bethought ourselves that as the sum in the can had reached the amount of $4.05, it was time some steps were taken looking to the carrying out of the purposes of the contributors. And so we then and there perfected the organization of the Mauna Kea Association, Limited, and elected Joseph G. Pratt president, Eben P. Low secretary and collector, and A. L.C. Atkinson treasurer. The amount of the collection was turned over to the treasurer, and it was determined that any person who has made the ascent of Mauna Kea, the highest point in the Hawaiian Islands, shall be eligible for membership upon proof that he has been on top of the mountain, and that each member contributing to the monument

fund shall receive a certificate stating the date of his ascent and acknowledging the amount of his contribution.

After the organization of the association, we mounted our horses and rode to the top of the twin cone, at a little lower elevation than the summit proper and looked down upon a field of snow having a front of several hundred yards in length. Of course, we rode to it. It was so white and beautiful that we had thought we would have ridden into it—but we found, upon approach, that it was caked hard—a frozen mass of glacial snow, each tiny, beautiful flake a gleaming crystal. It was difficult to break off bits to eat from the hard [page 408] points into which the winds and the sun had shaped it, but how good it was! Fancy eating snow here in Hawaii in July, and blowing upon your pallid fingers afterward to thaw them out!

The face of that snowbank was higher than the head of a man on horseback, and presumably it is there the year around. At such an elevation, at all events, it can melt but slowly.

From the snow we rode down to *the Crater Lake, a clear green pool covering an area of two acres, perhaps, and sheltered in a cup-shaped depression at an elevation of 13,000 feet. It was once said of this, as of all other crater lakes, that it is bottomless. Like all such sayings, too, this one has been proven a fallacy. I do not know the figures, but men have come with long lines and shattered the former faith.* Men with long lines are the iconoclasts of old beliefs.

We had no lines—but we lunched at the lake and the Secretary and the Postmaster would have shied stones across it. They failed ignominiously. So did Jimmie, who had vaingloriously boast- [page 409] ed, all the way to it, that he would swim the puddle. But Jimmie has the artistic temperament, and so was expected to be long on promise and short on performance. All those artist fellows are like that.

“Now,” said Rawhide Ben, as we rode away from the lake, “we will try a little rough riding.”

And Rawhide Ben, when it comes to finding rough country, is short neither on promise nor performance. He can find and ride through more rough country than any man I ever saw. That is all right, if he likes it. When it comes to finding it and leading me to ride through it—well, that is different. I did not know before how many kinds of an idiot I could be. To be perfectly frank, I do not know now—but I added a large assortment to the collection of a long life in that ride down Mauna Kea.

If Rawhide Ben had taken us down by the way that we came up, it would have been easy enough. He took us down by a way that was one long and hard scramble over great masses of loose and rotten lava, and slipping sand, and once, in the middle of this, he led us across a gulch where I did not think anything could go without wings. I have more faith in my horse since seeing him cross that place—but I own I did not have faith enough in him before. I got off and walked. So did the Postmaster. And that is plenty good company for me.

Afterwards, when we had had the coldest drink I have ever taken in these islands, from a mountain spring at an elevation of 10,500 feet that is probably

seepage from the Crater Lake, Rawhide Ben and the Secretary went off to shoot wild bullocks, leaving the balance of us hanging in the air on a pinnacle just above the forest line, to which we had descended by a series of long slides. They did not get the bullock, of which I was very glad. I had, at the moment, a great and abiding sympathy for all hunted and tortured wild things. And I was pretty wild, too. [page 410]

However, I grew tamer as we neared the plain which is the saddle between the mountains, and I galloped to Humuula at least as fresh as a green man could be after such an experience—and with enough of glory achieved for one day. A mighty few men have conquered ***Mauna Kea***. Fewer have come down it, as I did, by a kind of wobbly tobogganing that leaves a man with a sense of uncertainty, for a night and a day, as to whether he is really alive from the waist down.

From Honolulu it is a day and a night by steamer to Hilo on the Island of Hawaii. From Hilo a visit may be made in a day by coach to the coffee plantation of the Louisson brothers on the slopes of Mauna Kea, and the next day the horseback ride made to the sheep ranch.

There is an alternative route; from Honolulu a steamer trip may be made in a day to the Kona side of the Big Island and from the port of Kawaihae it is but a two or three hour stage ride to Waimea, the village headquarters of the Parker Ranch, that extends from the sea to the summit of Mauna Kea. From Waimea to the sheep ranch is a day's ride, or the summit may be reached in a day and the return made the next day to Hilo.

In Hawaii there is every conceivable kind of mountain climbing, but for an easy horseback ascent of nearly 14,000 feet, Mauna Kea offers one of the most surprising mountain climbs in the world—from the eternal tropics to the eternal snows in a single day. [Mid Pacific Magazine, 1911:411]

Trails of Mauna Kea and the 'Āina Mauna Originally built in the Time of 'Umi

In October 1912, Sol. Sheridan, wrote again of a journey taken by the mountain trails around the island of Hawai'i, and included an account related to him by Eben Low of the adze makers who traveled to Mauna Kea—following trails from the lowlands of Kona to the summit region. In the following excerpts, Sheridan described the section of the trail crossing from Mauna Kea, over the Pōhakuloa flats, and across the 1859 lava flow to Ahu-a-'Umi:

The road by which we went down into Kona from our dry camp in the lava is a road that has been traversed by few men now alive. Long ago, before the history of these Islands began to be written, *it is said that the natives went that way to get stone forms for their adzes from the hard rock of* ***Mauna Kea***, but that is a tale only.

All that is known is that the natives did get their rock from there for their stone implements—and there are in places in that wild region that lies between the peaks of Mauna Loa and Hualalai the traces of a trail so old that in some parts it has been covered by lava flows whose date is forgotten, and in other places trees have grown up in it that are as large as the body of a robust man.

"Umi's Trail," they call this road. How few white men in these islands have ever even heard of Umi's Trail, although most may have read the story of Umi as it is told in Alexander's history… [page 331]

Eben Low and a native assistant went that way once, and marked the way. It was by this marked way that Rawhide Ben led us out again… We have traveled several hours from

our dry camp when we struck Umi's trail, plainly marked across an old *a-a* flow upon which a forest had grown up. The trail was plain, and showed that much work had been done upon it. Like all Hawaiian roads of the olden time—or most of them—it ran straight away toward the point that it was desired to reach, regardless of the topography of the country. Umi was a trail builder, up to this date. Where the *a-a* was level, his men marked their way across it by smooth going. Where there were depressions in it, they were filled up to the general level, much as a modern engineer would fill them. Where there were hillocks to be crossed, they were cut away if not too high and passed over in a straight line if their altitude forbade grading.

And this road, as smooth and as easy as though built yesterday, was constructed so long ago that in the center of it, through the rotten lava, *lehua* trees had grown up, having the girth of a strong man. *Umi's slaves marched this way to the quarries of* ***Mauna Kea****,* and his couriers went this way and his armies marched this way, it is probable, to battle with the men of the Waimea and Kohala country… This road, or maybe another, ran from [page 332] Kailua, straightaway to Hilo, and old tales are that the kings living at Kailua would have millet caught for them in the ponds of Waiakea in the morning, and would eat them at night, relays of swift couriers carrying them across the island.

We lost Umi's road, as we went on, a little before we reached the great flow of 1859… Over this flow Eben Low and his native man had marked the road with dabs of white paint upon the smooth surface of the black lava, and for miles we went by these white disks—not crossing the flow directly but following it down so that we might make the point for which we were aiming on the table land of Umi… [October 1912:333]

A Visitor's Guide to the "Mountain Country" (1913)

In 1913, H.W. Kinney, prepared a visitor's guide for the island of Hawai'i. His guide included a short section on the "Mountain Country" of the island, and described the various approaches to Mauna Kea, Mauna Loa and Hualālai. Notably, at the time of writing, the Hilo-Pu'u 'Ō'ō route was the primary one used, and the Pu'u 'Ō'ō Ranch served as the base camp for those wishing to travel to the summit of Mauna Kea. Kinney wrote:

The mountains of ***Mauna Kea***, Mauna Loa and Hualalai and the highlands surrounding them are comparatively seldom visited, as the journeys to the summits are attended with difficulties, unless the traveler can depend on the ranch stations for assistance. The map shows the trails and stations. The ***Puu Oo*** ranch is ordinarily the starting place for the summit of ***Mauna Kea***, though this mountain may be ascended from almost any side. From Hilo or the Volcano House to the ranch is a good day's ride. From Hilo one follows the Kaumana road to the end of the wagon road at the big flume. Here one should take the first trail left of the last house on the road and take the trail across the lava flow. At about 3500 feet elevation is a cave at the left of the trail with drinking water. The last part of the trail is across grass. From ***Puu Oo*** one must take a guide to the summit, the trip from that point to the top and back being made in a day. Near the summit is a lake, as well as a quarry where the old Hawaiians made stone implements. Snow is generally found near the top.

The ascent of Mauna Loa is more seldom made as it is more arduous, and as the top can be gained only from a few directions. At this writing the Volcano Stables Co. is preparing a trail, with a camp, which will start near the gate which crosses the Volcano-Kau road east of Kapapala. When this is finished, the trip can be made by autoing to the camp in an afternoon, making the trip from camp to summit and back to camp in a day, returning the following day. It is also possible to make the trip from the Pualehua Station, in Kona, to the summit and back to the station in a day.

The Hualalai mountain is more accessible. The Judd road, which was intended to lead in a straight line from Kona into Hilo, but was abandoned, leads to the ***Ahua o Umi***, where King Umi held the first census. He had the population from each district make a pile of stones, each person depositing a stone, the size of the piles indicating the relative size of the population of the districts. A better trail to this point leads from the Pualehua station. It was formerly a wagon road, used for carting wool to the beach. A short distance below the *ahua*, N. of the Judd road, is a cave with an unfailing water supply. Another trail leads from Kainaliu, crossing the Judd road a few miles *mauka* of the upper road, to the Hualalai summit. It passes several craters. On the N. side of the summit is a blowhole, [page 15] known as the "bottomless pit." Still another trail runs from the Judd road to the summit. It passes a sandy plain which was used by the old Hawaiians for races and other sports. A trip covering all the points mentioned, can be made in a day. Hawaiian guides can be had at Kainaliu, from $2.50 to $3 a day. All the summits offer splendid views of the entire island, as well as of the other islands in the distance. [Kinney, 1913:16]

"Large Party Makes Mauna Kea Climb"

Eighteen Persons, Including A.M. Cabrinha and E. Vierra, Enjoy Ascent.
Hilo Tribune, June 29, 1915

Probably the largest number of persons to make the ascent together of ***Mauna Kea*** since the days when troops of Hawaiian warriors went there to hew out battle axes climbed to the summit of the mountain on Monday, June 24. In the final stage of the ascent the party numbered eighteen.

Superintendent A.M. Cabrinha and Deputy Auditor E. Vierra planned and organized the party, which was guided by Ikua Purdy, one of Hawaii's champion ropers, who is now manager of the ***Keana Kolu*** ranch.

Leaving Paauilo Sunday afternoon, Cabrinha and Vierra rode to ***Kukaiau***, accompanied by John de Ponte, where joined by J.S. Ramos and Manuel Nikola. From ***Kukaiau*** the first stage of the climb was started. In one hour and a half, they reached ***Umikoa*** ranch where Joaquin Pistona and five cowboys joined the mountain climbers. At 8:30 o'clock Sunday evening the party started for ***Keana Kolu*** ranch, making the ride by 10 o'clock. Here they remained over night until 4:15 o'clock the next morning when the steepest and last part of the mountain climb began.

Before leaving ***Keana Kolu*** the original party was added to by Purdy and six of his cowboys who he permitted to make the ascent. Six hours were required to make the climb from Keana Kolu to the extreme summit which was reached shortly after 10 o'clock Monday morning. As the day was an especially clear one, the mountain climbers were able to get a good view, it is possible to see the ocean in the direction of Ookala. When the party left the summit they rode down to the lake where a stop was made for lunch. While there was much snow on the mountain and traces of ice in the lake most of those in the party were more inclined to complain of the heat than cold.

One of the diversions of the trip was the rounding up of a number of sheep which had strayed up as far as ***Makanaka***. Although there were eighteen horsemen in the party the sheep were so wild that it took all of them to get the sheep back within the range of Keana Kolu ranch.

Besides Purdy, there were only two others in the party who had ever been to the summit of ***Mauna Kea*** before, although all of them had been raised on this island and most of the cowboys have been making their living for years above the 8,000 foot level.

One of the surprises of the trip to the members of the party from sea level was the vast acreage of level, rich soil, which in the form of tableland, from ten to twelve miles wide and

thirty-five to forty miles long, lies between the lava land above the plantation cane fields and the beginning of the steep slopes of the mountain. Like many who have never made the ascent they had supposed that the mountain sloped up from the sea to the summit as it does through the coast cane fields.

All of the party were enthusiastic about the beauty, and fertility of the land, much of which is covered with good timber or grazing grass. They believe that on account of its elevation this land will produce almost any fruit or vegetable raised in the temperate zone, if only some means of getting produce to market could be devised in order to make cultivations of the high tableland profitable. As it is now, the only possible method of transportation is by horse or mule back.

Both Cabrinha and Vierra were much pleased with their mountain trip and expect to make the ascent again, if for no other reason than to get the change of climate. [Hilo Tribune, June 29, 1915:1]

"Ke Alanui Mawaena o Na Mauna"

Ka Hoku o Hawaii, September 30, 1915

(Proposal to Build a Road between Hilo and Kona, Across the Mountain Lands):

In these days, there is much talk about building a rest house a little below the summit of Mauna Loa, as a benefit to those people who ascend and sightsee on the mountain, it will indeed be a good thing, but only for a few. Perhaps as a result of this conversation, there has arisen again talk of opening a road between the two Mountains, beginning in Hilo and going to Kailua, in North Kona. This road being spoken of these days, would not only be of benefit to the people who ascend the mountain, but also a great benefit to the people of the County of Hawaii, and a benefit to the people who come here from around the world to sight-see. It would be a road on which all visitors would travel.

But that is not the main reason that we support the idea of opening this road, it is that the road will lie between several thousand acres of Government Land, very good lands for the cultivation of excellent crops for our markets. There are only a few years remaining to the lease on the land from ***Piihonua*** to ***Puuoo***, and such a road across the mountain should be opened, then these fine lands could be made ready for homesteading, and they could plant the crops that will do well in such a place with the cold air.

We learned that someone knowledgeable about soil came to look at the land, and as he looked at the different soils between these Mountains, he reported that the soil was very good for planting the *ailiki* sweet potatoes, strawberries, corn, and the grass eaten by horses; that is the grass that's brought in for the feeding pens from other lands. There are between twenty and forty thousand acres of good Government Land in these places, that is in the Government Land of ***Humuula***, and if these lands are opened up for those people adept at cultivating, then the money shall be returned for the construction of this road across the mountain. This road across the mountain shall carry the produce of the planters to the market in Hilo which can also perhaps send it to Honolulu, and if it is also taken to Kailua, then there will be two good ports at which to take the goods grown on these fine lands. Thus the County of Hawaii shall move forward. Deputy County Attorney Heen has said that there are several simple ways to seek money to build this road without putting great pressure upon those who pay the taxes to the County of Hawaii. We shall speak again with Deputy County Attorney Heen about this and explain it to you further. [Maly, translator]

"A Great Land and Road Plan on this Island"

Hilo Tribune October 5, 1915

Direct from Hilo to Kailua, and Opening of Thousands of Acres of Agricultural Land.

The biggest road building and land opening project ever undertaken in the islands is one

which Representative Norman K. Lyman is contemplating and proposes to bring forward in the next session of the legislature. It is over land from Hilo to Kailua, by prison labor or otherwise, and the opening of twelve or fifteen thousand acres of mountain land which lies on a four to six thousand foot level, between the two peaks of Mauna Loa and ***Mauna Kea***.

The land which Lyman says should be opened to settlement is largely in the Parker and Shipman ranches. It is above the rain belt, and is declared to be good agricultural land. Corn, potatoes and other products of the temperate zone have been successfully grown on this land and it is thought that if it is once opened to settlement and a road constructed so that its occupants have easy access to a market, homesteaders will be able to make profitable use of it.

Thousands of Settlers.
"There is a Honolulu market for almost an unlimited amount of the products that can be raised on this land," said Lyman, "and Hawaii County ought to have the biggest agricultural community in all the islands if this land is offered to settlement. The construction of a road from Hilo direct should begin as soon as possible, as a preliminary to opening the land. Honolulu imports every month thousands and thousands of dollars of stuff this land will produce and as the army needs are constantly growing the demand is getting bigger all the time."

"The great, nearly level stretch between the two mountain peaks is good land and has a fine climate. It is about like that of the Volcano House in temperature and has not too much rain, like some of the lower regions. It is splendid land for many of the products of the temperate zone, which Hawaii is importing from Australia and the American Mainland."

"A big community of successful farmers settled on this land would make Hilo a great deal bigger and something to be worked for, and the first step is to build a road. That should be done I think by convict labor and I hope to work for it in the legislature."

The over land distance from Hilo to Kailua is 132 miles by the present road. The new road as planned would take a direct route *mauka* from Hilo and cut across the middle of the island, passing between ***Mauna Kea*** and Mauna loa and covering a distance of sixty or seventy miles. *Much of it might follow old native trails which crossed the island by this route.* Kailua, though reached by auto road by a circuit of the island now, is almost due west of Hilo across the north and south center of the island.

The land opening projected by Lyman is far bigger than any other one ever undertaken by the Territory of Hawaii, and if he is right in supposing that the lands can be successfully worked by settlers, the region back of Hilo might have more, many times more homestead farmers than all the other islands put together. [Hilo Tribune Oct. 5, 1915:1]

The project proposed by Representative Lyman failed in the Territorial Legislature, in part due to the interest of ranches in maintaining leases on the mountain lands.

"Sets Mountain Climbing Record, Prof. Bryan Ascends Four Volcanoes within Nine Days." (1916)

Hilo Tribune, August 30, 1916

All records for mountain climbing in Hawaii were broken last week when Prof. William A. Bryan, of the College of Hawaii, ascended three of the big mountains of this island within the period of one week. Prof. Bryan returned to Honolulu on the ***Mauna Kea*** from Hilo Monday afternoon and expressed his gratification over the success of his trip.