

**GEOLOGY OF THE ISLANDS.**

An Interesting Article By Prof. Albert S. Lyons.

**WHAT OUR COUNTRY IS MADE OF.**

A Lava Formation, Surrounded by Coral Reefs—Two Parallel Lines of Volcanic Vents—A Paper Read Before the Social Science Club.

In its broad features the geology of the Hawaiian Islands is exceedingly simple and obvious. A line, or rather two approximately parallel lines of volcanic vents in mid-ocean have heaped up mountains of lava, mostly poured out in generous floods, and have studded these more or less thickly with cinder cones and planted at their base in some instances tufa cones; great faults have occurred here and there, giving rise to lines of perpendicular cliffs. The ocean beating on the coast lines, driven by almost perennial trade winds, and rains of tropical abundance among the mountains have carried away portions of the new made land, forming bluffs, ravines and water courses. Finally the coral polyp has surrounded the land with fringes of reef, which in a few instances have been elevated sufficiently to form areas of dry land. Few of our geological formations have a history which includes more than two or three epochs. Pick up a pebble on the beach. The waves have worn it to smoothness as they have played with it for the last hundred years—or a few hundred years. They received it from a streamlet in which it may have been the sport of the running water a few decades or centuries, having been torn away from where the original lava flood left it either by the steam itself, or by the weathering of the valley side. The grains of divine sand on Waikiki beach might tell a somewhat longer story—how they had been separated by the action of the waves from the more earthy part of the tufa in which they had been embedded, the tufa fragment itself having been a part of the cone of Diamond Head blown to pieces by a steam explosion, cemented into a conglomerate by lime deposited from boiling springs—detached again by a torrent caused by a December shower on the steep bare side of the mountain. Before it was tufa, it may have consisted partly of new lava from the molten source, partly of material torn from the fissure through which it had been ejected, and this may have included besides lava not only coral reef rock with shell fragments and other organic remains, but portions of sedimentary formations having a history similar to that of the pebble just spoken of. It is possible that some of the divine grains have passed through the whole of this series of changes, although the majority came no doubt from the lava through which the fissure opened. Because in most cases the geological facts are so easily comprehended and so illustrative of the elementary principles of dynamical geology, the study may seem (to some) to lack the keen interest which attaches to the solution of such complicated problems as present themselves in other older countries. Besides we may not hope in our study here to get any glimpses back through the long vista of geologic ages which elsewhere so broadens the thought of the student. Yet is the subject sufficiently full of interest to claim a share of attention from every one who loves to read the book of nature and the very simplicity of the study should be encouragement to those of us who can devote little time to such diversions of mind, since it is possible for us to gather items of information hitherto unnoted which may form a really reliable contribution to science; this we should be much less likely to be able to do in either botany or zoology. Details of fact carefully observed and recorded can not fail to be of value when the time comes to write the full geologic history of the islands, and to connect that history with that of other lands. Even apart from this permanent value, the study has a popular interest of its own, to say nothing of possible utilitarian results, such as the locating of artesian reservoirs, etc. It is no reproach to the science to say that everywhere the geologist is an eager and persistent fossil hunter. Even in Hawaii he cannot be content to allow that such a quest is a vain one. It is true that organic remains can be but seldom preserved in volcanic formations. Yet now and then even molten lava will take wonderfully sharp impressions of objects over which it may flow, and such impressions may in rare instances be preserved for ages unchanged, and so reveal to the patient searcher important facts regarding our ancient flora or fauna. There is in the Bishop Museum a remarkable specimen that illustrates this possibility, which otherwise might be thought wholly fanciful. It is lava from Mauna Kea—therefore, not very recent. Thousands of years have passed since it molded itself into the intricate pattern of the charred tree trunk over which it flowed, but every line is as distinct as though the casting had been made last week, and the fidelity with which even minute details of structure have been presented is

amazing. There is also in the Museum what appears to be a large cast of a cocoon tree trunk. I have not examined this closely and may be mistaken about its origin, but it is easy to see how such a cast might be formed. Tufa formations, more frequently than lava, may preserve impressions of organic remains, or even the objects themselves, "petrified" in the usual manner. There is in Makiki valley, at the base of Mount Tantalus, (Puu Oia) a deposit of volcanic sand which has become partially compacted into a coarse-grained sandstone. This contains many fragments of wood partially silicified. I doubt whether the species of the plants represented could be determined, but they are at least veritable fossils. The formation is so recent and superficial that it may be safely assumed that the remains are those of such plants as still grow in the neighborhood. In the tufa near Moanalua there are found numerous remains of a similar character, mostly the stems and roots of shrubs. The woody structure has been very imperfectly preserved, and the formation is again unquestionably quite recent, but we are encouraged to hope that specimens may be found more perfect in structure and of greater age. One must guard against mistaking for the remains of roots or branches of trees certain curious products resulting from the action of inorganic forces. I have been not a little puzzled myself to account for the origin of some of these pseudo-fossils, which I find under such a variety of conditions that I am forced to conclude that they may be formed in several different ways. The most common form appears to be produced by the penetration, following the course perhaps of a decayed root, of water charged with animal matter. Sometimes the root itself seems to have acted chemically on surrounding material, causing it to become cemented together. Escaping steam may sometimes produce a like effect, and it is not impossible that lightning strokes may have been, in some instances, the cause. Sedimentary formations are not wholly wanting even in these volcanic islands, and it is in these especially that we might hope to find occasionally included fossil remains. The greater part of the clay formations that have resulted from the weathering of our lavas, have been deposited, owing to the steepness of the land slopes, in the ocean where they are beyond our reach. When such deposits have been made on land, it has been always where they are liable to be carried away again as erosion progresses, and besides the material of sedimentary deposits in our streams consists chiefly of rock particles which, however fine, have not reached a stable condition yet chemically, as those of the clays and silicious sands of older countries have. We can scarcely hope, therefore, to learn much from this source of the extinct fauna and flora of the Islands. Of the marine fauna, we may learn more possibly, since the lime-stone formations, which include them do preserve for an indefinite time the remains imbedded therein, but these lie for the most part where they were formed at a depth that makes them inaccessible. Calcareous deposits on land have occasionally preserved remains, especially of shells which may possibly hold some of the secrets we have sought in vain elsewhere. Such deposits have been formed occasionally on a somewhat large scale, as, e. g., in the crater of Diamond Head, where the crusts are some times several inches thick, but the conditions of their formation were such that they were not likely to include organic remains very frequently, and I question whether there exist such deposits of any considerable antiquity. I have myself found interesting fossils in a fair state of preservation in several places. One of the most remarkable localities is at Moanalua, where a stratum of sandstone made up of disintegrated tufa fragments is filled with leaf impressions which are, some of them, exceedingly perfect. It would not be difficult to distinguish by the veining and other characters of the leaves the species to which they belong, for they must be such as are still extant. The tufa conglomerate at the base of Diamond Head, which seems to have been formed by the action of water flowing from calcareous hot springs higher up, is rich in fossil shells, which belong to species that now seek the shelter of cool, damp woods. We cannot imagine them living under conditions any thing like those now prevailing there. It is possible that the dampness of the rocks over which water constantly trickled might supply all that was needed without shelter of shrubbery, although that is not probable, but whence could have come the parents if the surrounding country were as arid and barren then as now? The numerous remains of extinct land shells of the same or similar species on Rocky Hill confirm this evidence, and Rocky Hill is again also of comparatively recent origin, and the shells here are, most of them, not imbedded in rock. Another singular locality for fossil land-shells which I have noted is in a railroad cutting between Pearl City and Ewa Plantation, in a formation which seems intermediate between tufa and alluvium. This rock has a distinctly stratified character, and appears to have been found under water, and salt water probably. What is curious is that a large number of land shells (Amastra) occur in one small portion of the formation which elsewhere contains only a few scattering specimens. Of course the

shells may have been brought in a freshet from the mountains, but they resemble specimens found in the alluvium near the salt lake and at the mouth of Nuuanu valley, at low altitudes, and evidently there in the situation where they had lived. The crowding of the specimens into one spot, I suppose, was merely an accidental result of the action of currents or winds. The occurrence of land shells in former times at low altitudes seems to indicate that the climate was once more humid than at present. But how could there occur here in mid-ocean any notable changes in the amount of rainfall? Obviously, only by some change in the prevalent winds. We are now just within the belt of the northern trade winds, one rainy season being coincident with and dependant upon the annual migration southward of its northern limit, placing us temporarily in the belt of calms immediately beyond. That such a change actually took place at the time of the great ice age appears to me altogether probable, and it is perhaps possible to co-ordinate our geological history with that of North America by this clue. The configuration of the land on this island suggests the possibility that there may have been a change in the prevalent winds. The older half of the island prevents its abrupt face, not to the north or northeast, as is elsewhere the rule, but to the west or southwest, as though formerly the prevailing winds were from that direction. I believe the older part of Kanai shows the same peculiarity. Does this mean that the Hawaiian Islands lay at one time in the belt of the return trades? And if so, is it to be interpreted as evidence that that belt has retreated polewards, or as an indication of a shifting in the position of the pole itself? Let us not reject the latter hypothesis too hastily on the ground that the axis of a rotating body cannot be shifted by the application of a force from without. It is not necessary to assume that the earth's axis of rotation has changed, if we admit the possibility that the earth's crust is not rigidly connected with the rotating spheroid, and that forces seizing, e. g., upon its protuberant equatorial portion may change its relation to the fixed axis of the spheroid within. Would not this account, too, for the remarkable phenomena of circumpolar oscillations in land level which marked the beginning and end of the ice age? Another query may we connect the change of land level which took place on this island, leaving portions of its fringing reef high and dry, with the oscillations just alluded to, and if so, is there evidence that the elevation of land here was preceded by depression or by a series of oscillations? I incline myself to think that there is such evidence; at all events, the possibility of this should be taken into account in all study of the details of the succession of geological events here. (To be continued.)

**A NARROW ESCAPE.**

A Boat Upset in a Heavy Surf at Hamakua.

HONOLULU, Jan. 5.—The steamer Waiialele arrived yesterday forenoon, bringing a pretty heavy mail, and the mail carrier, Master Walter Greenfield, not expecting so large a mail, only took down the wharf and finding the mail unusually heavy, he had to pack the large bags on his horse and foot it up the hill.

The steamer Kilauea Hou arrived today but brought no mail. The steamer Hawaii left for Honolulu on the 3d, with 6000 bags of sugar. A serious accident, which nearly resulted in the death of a number of boatmen occurred on the day before she left. In the morning of the same day she began loading sugar, there being a heavy sea, the men had all they could do to prevent the boat from being dashed on the rocks near the landing. Unexpectedly a heavy sea broke over the boat while near the landing and the craft being heavily loaded, turned on one side on a big rock. The men in the boat jumped out and quickly grasped at the two life buoys thrown out to them. The boat and cargo were luckily saved by the presence of mind of the landing overseer, Mr. M. de Brito, who threw out a rope, and the next heavy sea that came turned the boat nearly over. Fortunately it righted again and was hauled out into the open sea.

The Holomua says that the clock in the tower of Kawaiahao church has not been going for some time past, and has been allowed to stay in that condition by the trustees, probably on account of "the clock's royalist proclivities." This is, perhaps, so. Very few people will give a royalist "tick" nowadays.

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Departure of the Nearly Wrecked Miowera for the Coast.

**SEVERAL STOWAWAYS ON BOARD.**

The Steamer That Was So Nearly a Total Wreck Leaves for the Golden Gate—One Unfortunate Sent Back by the Kaala.

After being on the reef for forty days, at the mercy of the wind and waves; after lying at peace in the harbor for almost two months; after having passed through trials and tribulations enough to have ruined almost any steamship in the world, the Miowera left Friday for San Francisco, where she will be repaired.

She left her berth at Brewer's wharf 1 o'clock in command of Captain Stott. A large number of people were present on the wharf to witness her departure. During the morning several lady friends of officers Cleveland and Stuart sent beautiful bouquets of flowers to the steamer which made the recipients beam with smiles.

Among those who departed on the Miowera were Mrs. Stott, wife of the commander, and Captain Wawn. It took Pilot Lorenzen about twenty minutes to get the vessel's bow pointed seawards and at 1:30 P.M. the ship steamed slowly out of the harbor. When she was quite well out to sea the pilot and Mr. Wildridge came ashore.

At about 3:15 P.M., when half way between Koko and Diamond Heads, one of the stowaways, who had been hiding in the coal bunkers, made his appearance on board. As the Kaala hove in sight, the Miowera blew her whistle. Soon afterwards a boat was lowered and manned by a crew in charge of the second officer, and rowed towards the Kaala. The second officer handed the stowaway over to Captain Thompson. The Kaala then headed for Honolulu, and the Miowera soon afterwards resumed her voyage to San Francisco.

The stowaway told the officers of the Kaala that there were four more men of his ilk on board the Miowera. As soon as the Kaala touched the wharf, the fellow left the vessel, and disappeared up town. No one seems to know his name.

It is expected that the Miowera will be at least ten days on her trip to the Golden Gate.

**A FAKE DISPATCH.**

Another Private "Tip" From Cleveland for the Royalists.

The Yomiuri prints a telegram which arrived at Tokyo on the 27th of November from Honolulu, via San Francisco, which states that all arrangements are now completed for the restoration of Queen Liliuokalani to her throne. The Provisional Government is preparing to dissolve immediately. The prospects of peace are assured.—Hongkong Gazette.



Mrs. A. A. Williams, Lynn, Mass.

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Rev. Mr. Williams heartily endorses Hood's Sarsaparilla. We are pleased to present this from Rev. A. A. Williams, of the Silbess Street Christian Church, Lynn, Mass.: "I see no reason why a clergyman, more than a layman, who knows whereof he speaks, should hesitate to approve an

**Article of Merit** and worth, from which he or his family have been signally benefited, and whose commendation may serve to extend those benefits to others by increasing their confidence. My wife has for many years been a sufferer from severe **Nervous Headache** for which she found little help. She has tried many things that promised well but performed little. Last fall a friend gave her a bottle of Hood's Sarsaparilla. It seems surprising what simply one bottle could and did do for her. The attacks of headache decreased in number and were less violent in their intensity, while her general health has been improved. Her appetite has also been better. From our experience with **Hood's Sarsaparilla** I have no hesitation in endorsing its merits. HOOD'S PILLS are the best family cathartic, gentle and effective. **HOBBRON, NEWMAN & CO.,** 3336 WHOLESALE AGENTS

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