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THE CASCADE CAVER

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COMING EVENTS

Monday January 13, 1964

Regular Meeting, 8 P.M.  
Dr. Halliday's, 1117 - 36th Ave East  
Seattle.

VARIED VIEWS ON LAVA TUBES

When lava has been seen issuing from the side of a volcano during a flank eruption, it has been generally described as flowing out from a sort of "oven mouth". This is noting more than the terminus of a tunnel or gallery through which the lava has been horizontally conducted from a main central source to the surface. In most cases the walls of such a tunnel are simply the sides of a fissure which has breached the cone internally though not quite to the surface for most of its length, an arched to resulting from the convex form that the viscous liquid tends to assume. When reduction of flow occurs, the lava sinks to lower levels within the gallery, often leaving evidence by consolidation to the sides, after the manner of the ledges...at the sides of lava lakes; and its lowest final level before complete cessation forms the floor.,

Etnean Lava Tunnel

A tunnel conducted the lava of Etna's 1910 eruption and fed, through gas escape the long series of explosive vents along its entire course... These openings in the roof of the tunnel were as perfectly circular and the shafts as cylindrical as those of wells. The height of the tunnel itself varied from 3 or 4 meters to 10 meters. At one point far up within the tunnel a break in the floor revealed a passage where the very latest lava had flowed at a still lower level beneath the floor we had been walking upon. Salts collected from its roof were analyzed by Martin Henze as follows; sodium, potassium, magnesium, calcium, (barium?) the acids were hydrochloric and sulphuric.

Vesuvian and Hawaiian Lava Tunnels

Although the "oven mouth" has often been noted as forming the source of Vesuvian lava flows, tunnels have not so generally been seen at this volcano. But when a chased fox disappeared from view on a 1905 lava field below the observatory, an opening was found leading to the interesting specimen....

In Hawaii the extremely fluent lavas generally give a more cylindrical form to the tunnels...; and their low melting point is strikingly revealed by the fusion (generally refusion) of the tunnel's roof and the formation of different types of stalactites.

In the Hawaiian tunnels, sometimes a pure glass descends in pointed drops.... Often the melted surfaces form a continuous glaze which hangs from the roof in long icicle formations, with corresponding uprisings from the floor; but most interesting are the little vermiform stalactites having curiously twisted shapes... These rather complicated products of re-fused, crystallized and probably gas-impelled roof material have a tubular half-hollow, half-solid structure, the outer surface being of a finely granular steel gray and quite unoxidized except

when atmosphere air has entered the grotto during their formation. Much magnetite is present, and detached fragments are almost as magnetic as nails. That the stalactites are, in part at least, gas impelled is shown by the many interior cavities and also by their comparative rarity, for it would seem that only where, on the melting roof, a little gas cavity or tiny fissure exists, does the expanding gas initiate the downflow and development of the creations. In fact, instances are known when they have pushed upward against gravity. Stalagmites may be built up from the floor by the falling of large drops from parts of the melting ceiling just above them, or even by upbubbling of gas-lava driblets, after the manner of "spatter cones."

It would also seem that the vermiform stalactites grow from the base, not at the tip like an icicle, and it is probable that they are quite rapidly formed. With water infiltrations from above, they often become coated with beautiful saline incrustations in time which are mostly sulphates...

--Perrett, Frank A. Volcanological Observations  
Washington D.C., Carnegie Institution, 1950

Uncollapsed portions of lava tunnels such as have already been mentioned still exist abundantly in most basalt fields even where activity has been long extinct. Many have been explored--for example, at Auckland, New Zealand, at Byaduk, Victoria, and in the basaltic volcanic fields of Idaho, as well as in the lava flows at Kilauea, Hawaii, and on Savaii and Upolu Islands, Samoa.

Among the features of tunnel interiors are crusts on the walls and miniature lava benches which mark temporary surface levels of the subsiding lava at the time when the supply was no longer sufficient to keep the tube full. Wall crusts that have partly peeled off have arched over under their own weight while still plastic.

At this time, when the river of melt bubbling along the tube lowers so that the upper half of the tube is full of gas or air, the walls are of bright yellow incandescence and the gases escaping from the lava are continually burning to maintain a very high temperature on the ceiling of the cavern. With this temperature above 1200 C. the air being sucked in below as the hotter gas escapes through the cracks and windows in the roof, there is set up a blast-furnace condition....This melts the tunnel walls to a glaze of quite different crystallinity from the normal lava....On these walls, stalactites, some like currants, some like grapes, some like walking sticks, and some like worms take form. They are the material of the gas-melted glaze. These stalactites are sometimes two feet long.

(from T. A. Jaggar, "Lava Stalactites, Stalagmites, Toes and 'Squeeze-ups!', The Volcano Letter, volume 345, 1931)

The lavas erupted by volcanoes are not less diverse than the fragmental products. Their characters are controlled, likewise, by the chemical composition, gas-content, and temperature of the magma. Other things being equal, lavas poor in silica and rich in lime, iron and magnesia, such as basalts, are more fluid than lavas like dacite and rhyolite in which the proportions of these constituents are reversed. Indeed, the most fluid of basalts may pour along at the speed of a mountain stream, while rhyolitic and dacitic lavas crawl forward sluggishly. Hence it is not surprising that basaltic flows are usually much more extensive than siliceous ones. Besides, basaltic lavas are generally much hotter, their temperatures ranging mostly between 1,000 degrees and 1200 degrees C., while rhyolitic and dacitic lavas vary normally between 600 degrees and 850 degrees C. Andesitic lavas tend to have intermediate temperatures. Cooler and more viscous rhyolitic and dacitic flows, therefore, form thick and stumpy tongues or steep-sided mounds, and they often solidify to the volcanic glass known as obsidian.

No one can travel through the volcanic fields of Oregon without noting that the surface forms of the lavas are extremely diverse. Some flows, especially the basaltic ones, have smooth, satiny skins of glass that glisten in the sunlight. Others have crusts marked by ropy and cordlike corrugations of the kind known in Hawaii as pahoehoe. It is in such flows that tubes and tunnels, like the Malhuer tube and many others in central Oregon, are best developed. Some of these tunnels are too small to crawl into; others measure 50 to 80 feet across and can be traced for a mile or more.

Their origin is easy to understand. Lava solidifies first at the top, bottom, and sides, so that the interior continues to flow along after the marginal parts have come to rest. Hence, when the supply of fresh lava is checked or cut off at the source, the liquid interior may be drained by discharge at the snout of the flow, leaving the solid casting behind. The ceilings of many such tunnels are lined with slender stalactites caused by dripping of the lava remelted by hot gases rising from the moving currents below. If the ceilings are thin, they may collapse to produce pits and elongated depressions on the surface of the flow....

Williams, H. The Ancient Volcanoes of Oregon.  
Eugene, Oregon: Oregon State System of  
Higher Educ, 1948.

#### PROGRAM ON SPELEOTHEMS SET FOR JANUARY 13TH MEETING

Caves of California, Halliday, 1962, Pages 12 thru 21 will be the text for a lecture and discussion on speleothems, especially those found in limestone. A study of the text in advance of the meeting will be valuable. Copies of Caves of California will be FOR SALE at the meeting, as usual.

#### SHALL CHELAN ICE CAVE BE ELIMINATED ?

Below is the letter the Cascade Grotto sent to the State Highway Commission concerning the Chelan Ice Cave, and their reply.

Gentlemen:

November 12, 1963

At its regular monthly meeting last night, our organization voted to protest the suggestion of the Chelan Chamber of Commerce that Chelan Ice Cave be eliminated from state highway maps.

Several speakers suggested strongly that that organization didn't know what it was talking about. We would refer you to data on the cave in Caves of Washington,

It was a concensus that an interpretive program at Chelan Ice Cave was badly overdue, and that this geological phenomenon is of unusual interest and accessibility to tourists.

Please do not hesitate to call on us if we can be of assistance in any way.

W. Van York, Chairman

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Cascade Grotto, N.S.S.

Olympia, November 27, 1963

Thank you for your letter of November 12, 1963, recommending retention of the Chelan Ice Cave identification of the state highway tourist maps issued by the Department of Highways.

The suggestion that this identification be removed was taken under advisement by the Highway Commission at the time it was received but no action has as yet been taken in the matter. It is possible that further consideration will come at such future time as the map is revised for the purpose of bringing it up to date.

The Commission respectfully suggests that any organization interested in this question acquaint itself with the current condition and status of the caves as an attraction to tourists.

Receipt of your organization's recommendation is very much appreciated.

Washington State Highway Commission

By; Lorenz Goetz, Secretary

CORRESPONDENCE

Dear Dr. Halliday:

I am writing in regards to the exploration of the McLoughlin Caves just south of Tonasket.

As Chairman of the Tourist Committee of the Tonasket Chamber of Commerce, I would like to further the mapping of the caves as a possible tourist attraction for this area, however, this being something new to the committee we are at a loss on who to contact to do this work. We thought that perhaps you may be able to give us some suggestions.

Until the caves are mapped and explored we have no idea what the potential of the caves would be to this area.

Any suggestions you may be able to give us will be appreciated.

A. J. Callison, Chairman  
Tourist Committee, Tonasket C. of C.

(reply)

Dear Mr. Callison, Seattle, Dec 18, 1963

Thank you very much for your recent letter. I will be glad to do all I can to help with your project. The cave area has all the makings of a very nice park, perhaps even a state park.

I will discuss the matter with the Cascade Grotto of the N.S.S. at its meeting here in Seattle on January 13th. It seems very likely that the group could spend a weekend with you next Spring. There has been talk of meeting briefly with the State Highway Commission at Chelan Ice Cave for a similar purpose, and perhaps the two could be combined into a single trip, since the latter is right on the highway to Tonasket.

Sincerely,  
W. R. Halliday

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Dear Dr. Halliday,

I don't know if the Mt St. Helens cave area includes a cave I visited in 1922. We were camped at timber line above Spirit Lake. A group of us started out to the left of the mountain as you look at it and traveled about two or three miles counter clock wise. We came to this cave and went into it. I thought you would be interested in this as the map you have shown of the cave area is quite a distance from the mountain, while the cave we visited was right on the side of the mountain.

Sincerely,  
Leo Gallagher