Recent Discovery of Secondary Mineral Deposits in an Idaho Lava Tube

David W. Kesner[6)]

ABSTRACT

Secondary mineral deposits of gypsum, mirabilite, thenardite, crisobolite have long been known and, in fact, are quite common in lava tubes of southwest Idaho. Until recently, calcium carbonate were found in a few tubes in very small amounts and were thought to be qu are. The recent 'rediscovery' of Helen's Hidden Hide - Away lava tube h significantly changed this thinking. The deposits in this lava tube are only quite extensive but extremely varied in structure. As this is a v recent discovery, only basic preliminary work will be presented in t paper. It is hoped this will stimulate intrest for further and more inte study of the lava tubes of southwestern Idaho.

I. INTRODUCTION

A large number of lava tubes in southwestern Idaho contain some extremely impressive secondary mineral deposits. Gypsum and mirabilite can be found coating entire lava formations and in some cases entire rooms. Thenardite and cristobolite can also be found throught Idaho's lava tubes, although in smaller individual concentrations. To a lesser degree iron and copper - based deposits have been found. On rare occasions and in very small quantities calcium carbonate deposits have been found.

The recent exploration of Helen's Hidden Hide - Away, (HHH), has uncovered an an extensive deposit of calcium carbonate, never before

6) 12567 West DeMeyer Street Boise, Idaho 83704

thought possible in an Idaho lava tube. Not only is there an impressive amount of deposition, but the individual structural variations could rival some limestone caves.

Since the study of HHH began several other lava tubes have been discovered that may also contain large calcium carbonate deposits. As the work on HHH has not been completed and the other tubes has not yet begun, this paper will deal with HHH as a truly unique find.

Only very preliminary work has been completed on HHH as there is not a large, knowledgeable, interested scientific base to draw on. It is hoped that this paper will stir interest in the truly unique lava tubes of southwestern Idaho.

II. BACKGROUND

The background of HHH has been hard to uncover and is based mostly on verbal information gathered from locals. The first known account of the cave's exploration came in the early 1930's when Helen Lee's, (for whom the cave is named), future husband took her to this cave on their first date. While they were in the cave they found some bones and altered the University in Pocatello, Idaho. They sent the bones to the museum there where they were identified as prehistoric bear. A team was sent down for preliminary studies. (Confirmation has not been made and further information is pending.)

The next account came less than a year ago when Jim Woods from the Herritt Museum in Twin Falls, Idaho made a few trips into the cave, presumably to also look for archaeological or paleontological artifacts. (Again confirmation has not been made and further information is

pending).

These are the only known visitatons to the cave. It can be assumed, though, that there have probably been many unrecorded visits by locals. This assumption is verified by the signs left behind of tin can kerosene lanterns and a barbed wire and wood ladder.

III. GEOLOGY AND HYDROLOGY

Helen's Hidden Hide - Away is located in the Central Snake River Plain next to, but not in, the Shoshone Ice Cave Flow. This flow is one of the youngest and least altered flows in the area. It starts at Black Butte Crater and flows generally southeasterly, covering almost 210 square kilometers. It was originally thought that HHH was in this flow but subsequent research has shown it to be from a much older flow originating in a shield volcano just to the east. The age difference is quite obvious when comparing the bare lava of the Black Butte Crater Flow to the soil covered area around HHH.

Less than sixty kilometers to the northeast is the Lost River Range. These mountains are predominately dolomite and limestone and probably account for a percentage of the soil make up in the area.

Less than 400 meters to tje north of the cave runs the Richfield Canal. It is a raised earthen structure and prone to a fair amount of leakage. This canal takes it's water from the Big Wood River and is the major source of irrigation water for entire area. The Big Wood River originates in the Lost River Range and has apparently changed it's course many times in the area around the cave. One of the presumed old courses, which is now an intermittent run - off, actually runs over the cave.

IV. CAVE MORPHOLOGY

Helen's Hidden Hide - Away is a lava tube that trends in a southwesterly direction for approximately 450 meters. Total vertical depth is 25.8 meters. The vertical depth is attained from a 2.9meter vertical drop at the entrance ; a 5.5 meter vertical deop 25 meters in ; and a 4.3 and a 3.0 meter sloping drop about half way in. Passage widths average two to three meters and passage heights from four and one half to less than one half meters with the majority under one and a half meters.

The first half of the cave is typical for majority of Idaho lava tubes : dry and dusty with the floor covered in small 'klinker' breakdown. About half to three quarters of the way in the tube starts exhibiting cavernous weathering features not seen in other Idaho lava tubes. These sculpted features look a lot like heavy water erosion in limestone and sandstone.

At about 375 meters in the cave the formations start appearing. At first they look old and dried and are scattered around the walls and ceiling. It is the last 25 to 30 meters of the cave that the formations completely take over and cover the entire ceiling, walls, and most of the floor. Here, the formations are actively growing with water constantly dripping everywhere.

The majority of theformations are a coraloidal structure, but draperies, rimstone, flowstone, conulities, and drip cups can all be found.

The cave appears to end in breakdown in the formation room, but has not been fully explored due to the tight quarters and fragile nature of the formations.

V. MINERAL ANALYSIS

1. Methods

Field testing was done using dilute hydrochloric acid. Laboratory testing was done using energy dispersive x - ray spectroscopy, scanning electron microcopy, cross section analysis, and atomic aborption spectrophotometry.

2. Analysis

All analysis was done on formations found on the floor, assumed to be from natural breakage.

Field tests showed fizzing when hydrochloric acid was applied to the formations. This lead to the assumption that they were calcium carbonate.

Energy dispersive x - ray spectrocopy, (EDX), was done on three structurally different samples : a drapery, a coraloid, and a round knob. The dralery showed a make - up of 58.53% calcium, 38.35% silica. The coraloid showed a make - up of 65.56% calcium and 34.44% silica. The round knob showed a make - up of 66.59% calcium, 28.95% silica, and 4.46% magnesium. These percentages are not the actual amount of each element present as EDX reports percentages based on total elements detected and EDX can only detect the elements sodium through uranium.

Cross section analysis was done to determine if the structure were helicites. The analysis showed concentric growth rings with no central capillary canal verifying they are coralodial formations formed from seeping or splashing water.

Scanning electron microscopy was done to analyze crystal structure. This was not successful as the preparation required descicating the sample

which destroyed the surface structure.

A sample of water was taken from the Richfield Canal directly above the cave. Direct aspiration atomic absorption spectrophotometry was done for five elements. The results were calcium 36.0 ppm ; magnesium 7.5 ppm ; iron 0.01 ppm ; sodium 5.7 ppm ; and copper$<$0.0 1ppm.

VI. CONCLUSIONS

Preliminary analysis shows these formations to be at least partly calcium carbonate. It is not known if the sillica content is bound with the calcium or is simply inter - dispersed.

The dats seems to indicate that elemental make - up may play some part in the different structual formations.

The source for calcium and magnesium is most likely from the dust deposited from the Lost River Range. As this dust is covering a vast majority of Idaho's southwest desert, and other lava tubes do not have these foramtion, the water source from the Big Wood River and the Richfield Canal must play a major role in dissolving and redepositing the minerals.

As research and testing, progresses on HHH and exploration and testing on other Idaho lava tubes it is hoped that more accurate and conclusive theories can be made about Idaho's 'limestone lava tubes'.

VII. ACKNOWLEDGEMENTS

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REFFERENCES

Greeley, Ronald (1982), The Style of Basaltic Volcanics in the Eastern Snake River Plain of Idaho, Idaho Bureau of Mines Bulletin, # 26, 407~421.

Hill, Carol A. and Fort, Paolo (1985), Cave Minerals of the World.

Larson, Charles (1990), Personal communication.

Lee, Helen (1990, 1991), Personal communication.

Maley, Terry, (1987), Exploring Idaho Geology.

Sorenson, Gordon gloria (1990, 1991), Personal vomminication.