THE CASCADE CAVER

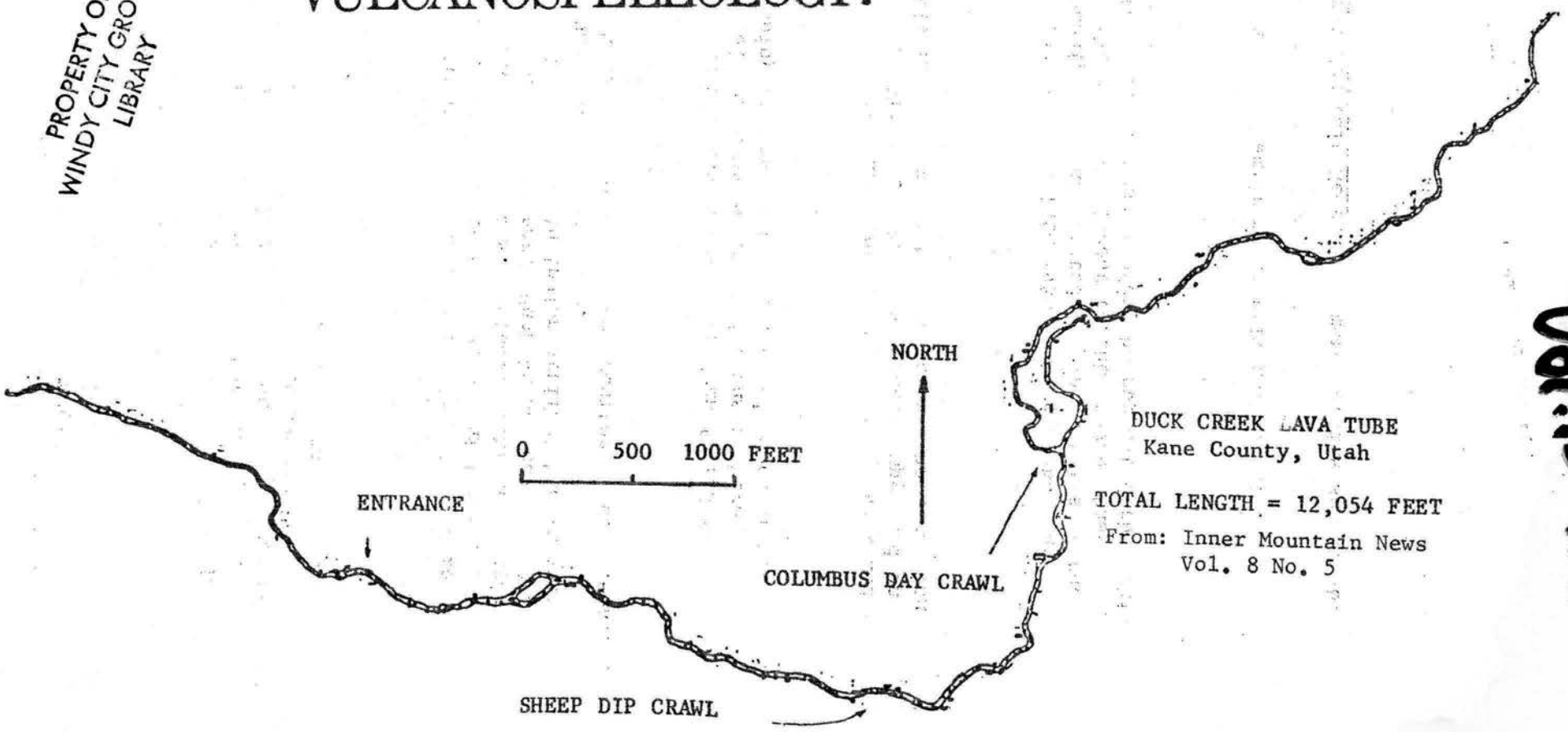
Official Publication of the
CASCADE GROTTO N. S. S.

Volume 15 No. 5
May 1976

Editor: Rod Crawford

ALSO THE

INTERPLANETARY JOURNAL OF VULCANOSPELEOLOGY!



Since this issue is being printed a month late, there will be no "Coming" events listed. Instead, this page will be devoted entirely to:

NEWS AND NOTES

The Northwest Regional Convention is still on for Labor Day Weekend at Nakimu Caves. B.C. Phil Whitfield has worked for two years to get this arranged, and it would be a shame if nobody came. So, if you possibly can, go!

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MORE ON TEOTIHUACAN LAVA TUBE CAVES: Kentuckian Don Coons writes that he recently stumbled across the Teotihuacan lava cave area northeast of Mexico City and was surprised to find a large number of caves there in addition to the one containing La Gruta Restaurant. He and others surveyed three of them with lengths ranging from 400 to 1,000 feet. A fourth has more than 2,000 feet of passage. He plans to return there soon, and is anxious to learn more about this type of cave.————————W. R. H.

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SPELEOHISTORICAL CORRECTION: In my introduction to Saint-Amant's 1852 lava tube visit in the April issue p. 28, I say that the text of Saint-Amant's book gives the locality of his cave as Mt. Adams. Actually, the text says Mt. St. Helens, but probably Mt. Adams was meant. Hank Ramsey has suggested that the cave referred to may be Deadhorse. An Indian artifact has in fact been found in the Masochist's Maze area of that cave.

The translation of the French text should have been credited to W.R.H.--R.L.C.

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Northwest Caving's finances are in the process of being transferred from Eatonville to Seattle. Supposedly an issue of NW Caving was to have been ready to type around the beginning of June, but yr ed. hasn't seen it yet.

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Sometime last month, a cave of the tree cast type over 100' long was found and cursorily investigated by Russ Turner at the Windy Creek Campground on the Tieton River. Perhaps this is the same as the one we have been getting rumors about for years.

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Speaking of rumors: We have heard that in late 1963, a Three Bears Cave was reported by Mr. Phillip Hennig as being located at Alpine Falls on the Tye River (in T26N R12E S26. The site is adjacent to the Stevens Pass Hwy). We would not venture to contradict any reader who suggested that this rumor might be just a fairy tale.

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We have learned that Ken Byrd and Liz Hamilton recently got hitched.

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Our cover is from the May Inner Mountain News. For more details see p. 48.

Apr. '62 #2

F E A T U R E S

The Cascade Caver, once again taking on its alter ego of the Interplanetary Journal of Vulcanospeleology, is pleased to reprint the following:

VISCOSITY OF LUNAR LAVAS

by
Tsutomu Murase and Alexander R. McBirney
Center for Volcanology, University of Oregon, Eugene 97403

Abstract. The viscosity of a synthetic silicate liquid with the composition of a lunar rock has been determined experimentally and found to be lower than that of any previously studied volcanic rock on earth. This fact suggests that lunar lava flows will be very thin and extensive unless they are ponded, and that lunar lava tubes should be common and of larger dimensions than those on earth. Coarse crystallinity can be a feature of rapidly cooled surface lavas.

Perhaps the most startling characteristics of the lunar samples returned from the Apollo 11 mission are their high contents of iron and titania, which exceed those of any known terrestrial volcanic rocks. The coarsely crystalline nature of many of the rocks suggests that the unusual composition was responsible for the low viscosity and for the ability of the rocks to flow and vesiculate but still to grow crystals of large dimension at the surface or at shallow depths where cooling is relatively rapid.

In order to investigate this possibility, we have determined the viscosity of a synthetic silicate liquid of lunar composition over a range of temperature above its liquidus. A 200-gram sample was prepared with the same composition (in percentage by weight), except for the last two components listed, as that given for specimen 22 in the report of the preliminary examination team of the Apollo 11 samples: SiO_2, 43; TiO_2, 11; Al_2O_3, 7.7; FeO, 21; MnO, 0.26; MgO, 6.5; CaO, 9.0; Na_2O, 0.40; K_2O, 0.21; Cr_2O_3, 0.41; ZrO_2, 0.14; and NiO, 0.04. A solution was prepared of nitrates of Al, Fe, Mg, Ca, Na, K, Mn, and Cr in a mixture of ethanol and water. To this a weighted quantity of tetraethyl orthosilicate was added, and a gel was precipitated by the addition of ammonia. Water and NO_2 were then driven off by slowly heating the sample at successively higher temperatures. Titanium dioxide was added and ground together with the sintered material, and then the combined sample was heated to fusuon at a maximum temperature of 1500°C.

On the basis of observations of the crystallization of samples cooled from temperatures between 1250° and 1500°C, we believe that the liquidus temperature is probably between 1300° and 1380° C. Magnetite, ilmenite, clinopyroxene, and plagioclase were the only minerals identified in samples heated in air; in argon magnetite was not crystallized. The rapid growth of crystals during quenching makes it difficult to estimate the liquidus temperature, but the fact that a sharp change of viscosity was observed near 1370°C, both in air and in argon, indicates that below this temperature the liquid was not homogeneous.

Viscosity-temperature relations for the sample in air and in argon are shown in Fig. 1, together with data for other common lavas. The viscosity of the synthetic lunar sample ranges from 4.5 poises at 1495°C to 10 poises at 1395°C in air and 5.0 poises at 1450°c to 7.1 poises at 1395°C in argon. These values are comparable to the viscosity of heavy motor oil at room temperature and much lower than any previously measured viscosity for volcanic rocks on earth. The measurements in air and argon are very close, and part of the difference may result from a surface layer of oxidized material

on the sample measured in air. Surface effects of this kind have been described for slags (*3*). The temperature range of the measurements was limited on the high side by the capacity of the equipment. At temperatures below 1395°C the behavior of the platinum sphere was erratic, thus suggesting that the liquid was no longer homogeneous.

The exceptionally low values of viscosity are consistent with those predicted on the basis of bridge-density relationships described by Murase (*4*) and are similar to viscosities measured in certain iron-rich blast furnace and welding slags (*5*). They can be directly related to the high-iron and high-titania contents and the low-silica content.

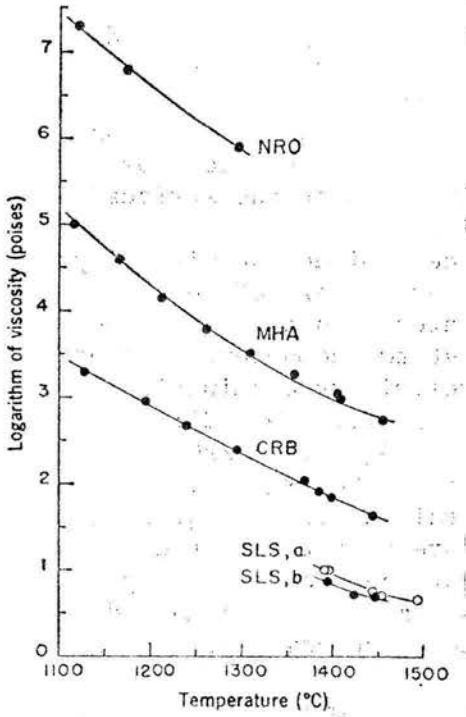

Fig. 1. Logarithm of viscosity as a function of temperature for a synthetic lunar sample (*SLS*) in air (*a*) and in argon (*b*). For comparison, data are shown for three terrestrial lavas, a rhyolite obsidian from Newberry caldera (*NRO*), an andesite from Mount Hood (*MHA*), and a Columbia River basalt (*CRB*). The viscosity of the NRO sample was measured by a bending method; viscosities for the other samples were measured by the counterbalanced-sphere method.

Recognition of the extremely low viscosity of lunar lavas leads to several significant conclusions about geologic features of the moon. Most obvious, of course, is the great fluidity of such lavas and the long distances they may flow as long as their temperatures remain near or above their liquidus. The distances lavas flow are a function primarily of their velocity and cooling rates. Velocity can be estimated from the Jeffreys formula for laminar flow

$$V = \frac{g \sin \alpha \, d^2 \rho}{3 \eta}$$

where V is the mean velocity, g is the acceleration of gravity, α is the slope angle, d is the thickness of the flow, ρ is its density, and η is its viscosity. Although lunar gravity is only one-sixth that of the earth, the fact that the viscosity of lunar lavas is at least an order of magnitude less than that of terrestrial basalts and the density is higher [about 2.95 as opposed to 2.60 at liquidus temperatures (*6*)] indicates that, for the same slope angle and thickness, the velocity of lavas on the moon will be about twice as great as that of a basalt on earth. The high velocities that would be attained in flows, even on very gentle slopes, would indicate Reynolds numbers of the order of 10^5 to 10^6. Under such conditions, flow would almost certainly be turbulent, and the velocity would become less dependent on viscosity and more a function of the roughness, shape, and slope of the channel.

Lavas of Icelandic volcanoes commonly flow more than 25 km on slopes as low as 1 degree and with thicknesses of less than a meter. Individual flows of a Columbia River basalt have been traced as far as 200 km on slopes that could not have been greater than a degree or two, but many of these lavas ponded in broad depressions and attained thicknesses of many meters.

Cooling rates of lavas are primarily a function of radiant heat losses at the surface, the losses from conduction to the ground and air being only enough to cool a flow 1° or 2°C per hour. Above temperatures of about 1200°C the radiant heat loss is very high, and, because of the fourth-power relation of the temperature, it falls off rapidly at lower temperatures.

The liquidus temperature of the synthetic lunar sample is somewhat higher than that of basalts, and, if the flow is extruded at or near this temperature, the radiant heat loss from the surface would be very large. A solid crust will form quickly, and the surface temperature will subsequently be governed by the rate of conduction from the molten interior. If we assume that the thermal diffusivity does not differ radically from that of other silicates, the heat loss will be greatly reduced by the insulating effect of the crust and the lava will remain fluid in its interior.

These relations favor the formation of lava tubes. On the moon the tubes will be broader than they are on the earth because of the higher stability of the roof in a low-gravity field and much longer because of the extreme fluidity of the liquid. It seems unlikely that the fluid part of a flow would be exposed except very close to the vent or for short times after the crust of a flow was ruptured.

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The above extracted from:
Science, 167: 1491-1493, 13 March 1970.

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TRIP REPORTS

McLoughlin Canyon Trip, April 23-25.
by Rod Crawford

Our second "official trip" was a great success, with three carloads of cavers driving over to the Okanogan country on Friday night: the Coughlins and Russ Turner in Chuck's van; the Caprons in Bill's car; and Chris Miller, Dave Walker and I in Dave's car. The latter three were the first to arrive at our trysting-place, the Okanogan City Park, where we set up camp and promptly went to sleep. The Coughlin party arrived slightly later and set up their tents without disturbing us. What did disturb us was an unexpected deluge (in Eastern Washington yet) which made things rather uncomfortable for we tentless ones. Chris and I holed up in the car, which fortunately has recling seats, while Dave slept on under his waterproof tarp.

Saturday was mostly nice, though there were periodic showers of rain and/or hail. Everyone eventually arrived at the cave area, some with plans for checking out some of the many unplumbed pits in the area. Walker, Turner, Capron, and Coughlin descended the first pit, which proved to have several levels and a total depth of nearly a hundred feet, with a moderate amount of horizontal passage. During one of the storms, Chris took refuge in a little hole whereof he couldn't see the end. He later led the rest back to it, but when Chuck and I checked it out it proved to go only about 50 feet. There were some small coralloids near the end. Later, Turner, Walker, and I went into the main cave. Russ and Dave went on to "bottom" it while I followed a bat down a side passage. It never would hold still for me, but another that Dave saw seems to have been a Myotis. Russ greatly enjoyed the cave, and expressed an interest in helping map it some day (all potential mappers take note). Finally, Turner, Walker, and Miller (yes, Miller) rappelled down the 60' or 70' free drop into what seems to be another, separate extensive horizontal cave. This is located about 100' west of the main cave, and has a horizontal entrance as well as the vertical one. The spray paint indicates that it is known locally.

The spider and scorpion collecting there was terrific, by the way.

Saturday night the Caprons headed east on personal business and the Coughlin party went home. Chris stayed in a motel (!) while we last two stalwarts tried the park again. This time it didn't rain water--just feathers from a rip in my sleeping bag. Sunday, instead of the planned scouting, we took Chris east to Republic to visit a friend while I spent the day collecting spiders. On the way home, we examined a slanting crack at the base of the limestone cliffs by the highway north of Riverside. We think it didn't go. The trip, however, certainly did--a great success in all respects.

Ape Cave, May 22
by Rod Crawford

On the above date, I had been persuaded to lead a field trip of the Geology 101 class taught at the U.W. by a fellow Museumite. Starting from campus at 7:30, we all (3 cars) eventually rendezvoused at Reese's Store--despite my having said in the dittoed instructions that it was located much futher west than it is. First stop was a gravel pit just west of Cougar where we viewed an exposed mudflow. Lunch was at the Lava Cast Picnic Area, where we showed the students various features of that place. Finally, we led (and were led by) the whole party through the lower end of Ape. Many of them were fairly impressed (shows what they know), but I don't think there were any potential recruits in the group. We used the Hyde and Greeley field trip guide reviewed in this issue.

I may note that Lower Ape seems a good deal cleaner than usual, no doubt a result of recent Oregon Grotto efforts. There is no sign of the former chain that blocked off the upper section of the cave. A brand-new sign is posted outside the entrance, revising the cave downward from the longest in the world to the longest in the Continental U.S., but it is still wrong (as yr editor will further report elsewhere).

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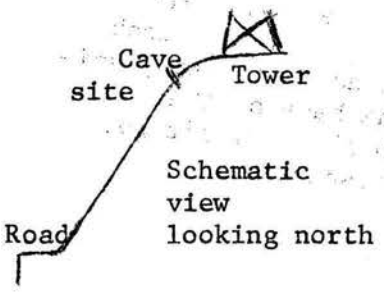
LOST CAVE, near Baring, Snohomish Co., Wa.

by Jan A. Roberts

History

This cave was reported by W. R. "Ted" Danner, geologist (currently teaching at U. of British Columbia) to Dr. William R. Halliday, noted speleologist, who lives in Seattle. Prof. Danner was conducting limestone deposit surveys of Ideal Cement Co. properties in Snohomish County; Ideal was operating limestone quarries across the river (south) from Lost Cave on Palmer Mtn.

The cave itself was partly explored by Floyd L. Richards and Ted Baldwin, employees of Ideal Cement Co., while Prof. Danner waited outside. (oral communication Feb. 27th 1974, from Mr. Richards). Mr. Richards described the cave as being a 90 foot long crawl to a "large" terminal chamber. His information is based on an old prospector (a former W.W. I veteran) who lived in Baring, Washington; I don't recall his name. He is now deceased, but well remembered by some local residents who associated with him. [His first name was Bill--ed.] Mr. Richards explored the cave for 30 feet in a low, broad crawlway. The exact date is unknown but supposedly before the Bonneville power line towers were built.



Schematic view looking north

The powerline towers figure prominently in this story. Apparently during construction of the tower just east and above (slope) of the cave, about 1949, the entrance of the cave was filled by debris of clearing the tower site. Interestingly enough, the surveys of the powerline route do not mention any cave entrance in that area (oral communication 1974 with Bonneville Power Administration).

Several attempts to excavate the "entrance" as pictured in Caves of Washington (taken by Ted Danner), the first of these in 1951, have resulted in nothing except proving that it isn't in any way the entrance. There are other possible sites to dig in within about 25 feet of the "entrance".

According to Danner the limestone deposit is about 10 feet thick and of undetermined size in width and depth. For those who feel this is a too small deposit, there are several caves in Indiana which are fairly big, in limestone beds ten to twenty feet thick.

Results of Investigation

Date: Feb. 24th, 1974. Participants: Ron Long, Rod Crawford and Jan Roberts.

We talked to Floyd L. Richards [Box 93, Skykomish WA 98288], who apparently has actually been inside the cave. Mr. Richards said that the cave was at least 90 feet long according to an old prospector.

Mr. Richards and Ted Baldwin crawled in about 30 feet. His flashlight showed that it continued onward. They both collected limestone samples (formations?). Waiting outside was W. R. Danner. Both Richards and Baldwin were employes of Ideal Cement Co., which operated limestone quarries across the river (south) of the cave, on Palmer Mtn.; Richards is retired and Baldwin is working for Kaiser Cement Co. in California at last report.

We were unable to find the exact entrance despite Mr. Richards' directions (he was unable to come along) and Prof. Danner's Limestone Resources book (with explicit maps and text). We dug in several interesting spots that looked like blocked cave entrances including the one shown in Caves of Washington. One thing for sure, the supposed entrance mentioned above is not the entrance to Lost Cave. I have personally dug in every nook and cranny for several years resulting in nothing but solid rock in all possible directions to dig.

To make up for it all, the weather was sunny and the view was beautiful when we took time off from our digging efforts. The mountains looked like powdered sugar had been dumped on them.

VULCANOSPELEOLOGICAL ABSTRACTS

Miscellaneous authors, 1973. Geologic field trips in Northern Oregon and Southern Washington [for the Geological Society of America Cordilleran Section Meeting, Portland, March 1973]. Oregon Dept. Geology and Mineral Industries Bulletin 77: 1-207.

Trip 2: Volcanic and intrusive rocks of the central part of the Oregon coast range, by MacLeod, Norman, and Parke D. Snavely. Pp. 47-74.

Pp. 70-71. Referring to a quarry in the submarine Eocene Siletz River Volcanics on the Siletz River, "filled feeder-tube composed of columnar-jointed basalt is exposed at base of quarry. The filled tube is surrounded on the sides and top by a carapace of elongate basalt pillows...the pillows and filled feeder-tube rest on fine-grained basaltic sandstone...feeder-tubes such as these exposed at Kaufman Quarry are common in the upper part of the Siletz River Volcanics. Lava flowed through these tubes below a self-formed protective cover of pillow lava." There is a good drawing of the filled tube.

Trip 7, Geological field trip guide: Mt. St. Helens Lava Tubes, Washington. By Jack H. Hyde and Ronald Greeley. Pp. 183-266.

190-192. Summary of Greeley and Hyde's laminar-flow theory and general description of the St. Helens tube system, as in their 1972 paper.

193-205. Very detailed description of Ape Cave, with detailed geologic logs of upper and lower segments (distances in paces) and 16 original photographs.

p. 200. Refers to "a small cave with a slight breeze at the entrance" 900' N of Rd N816 at the Lava Cast Picnic Area. This is not Hopeless or any other known cave as far as I can tell.

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Beginning a New Feature:
TWENTY-FIVE YEARS AGO IN THE CASCADE CAVE REPORT

The Cascade Grotto's first publication was Cascade Cave Report #1, issued on May 21, 1951. It included a Chairman's Report, a list of twelve two- or three-line trip reports, a list of known or rumored caves of Washington and Oregon, a membership list, and a constitution. Dr. Halliday was the charter chairman, and is therefore presumably the author of the following, which appeared on the first page.

CASCADE GROTTO
NATIONAL SPELEOLOGICAL SOCIETY
CHAIRMAN'S REPORT

The Cascade Grotto was first organized three months ago in the face of several distinct handicaps. First and foremost is the shortage of caves within reasonable distance of Seattle and Portland. Second is the impermanence of all current members. Thirs [sic] is the necessity for total inactivity each winter due to heavy snow in cave areas. Nevertheless we believe there is a distinct future for the Cascade Grotto in periods of intermittent activity. This is one of the forgotten areas of American speleology where not until 1943 was any cave known to the Society, and we believe we can uncover a great deal of previously unknown information for the N.S.S.

Membership in Seattle area 7, Portland area 3, with one other eligible. Eventually we hope to see gorttos [sic] in Seattle, Portland, Spokane, and Bend, and perhaps one in the Klamath Falls area.

Projects: locating, studying and mapping every cave in the Pacific Northwest. Under consideration is production of an 8 mm movie "Safe Climbing for Cavers," for all our Seattle members are also members of the Mountaineers. On the physical side, we are trying to increase the number of caves in Washington by digging one in Stevens Pass whose entrance is said to have been filled in about 10 years ago. [See the above report on Lost Cave--ed.]

To date we have listed 28 caves in Washington and 34 in Oregon, of every variety. We have been especially successful in obtaining data on the many lava caves around Bend, Oregon. The best limestone area to date is the Okanogan country of Washington, the southwest tip of Oregon excluded.

One of the great advantages of our trips is that even if we find no caves, we are still surrounded by the most beautiful scenery in America.

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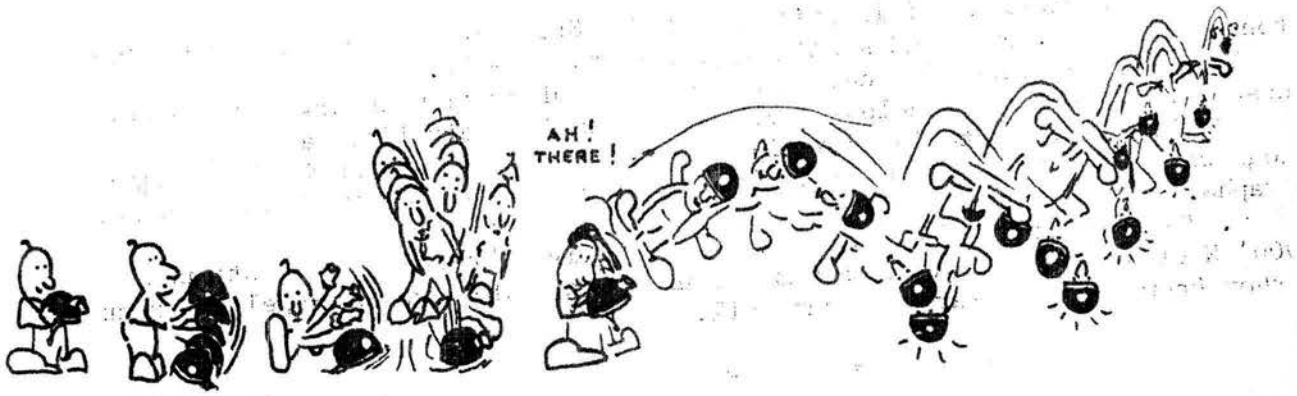

Breaking in a New Helmet

DR

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE

Gifford Pinchot National Forest
500 West 12th Street
Vancouver, Washington 98660

REPLY TO: 2720 Special Uses

May 4, 1976

SUBJECT: Dynamited Cave Research Permit, 9/30/64

TO: Washington Speleological Survey &
Cascade Grotto
1117 36th Avenue East
Seattle, WA 98102

Gentlemen:

District Ranger Paulson informs us that all conditions have been met on subject permit.

We are, therefore, closing this case on our records.

Sincerely,

Jerald N. Hutchins

JERALD N. HUTCHINS
Recreation and Lands Staff

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The above represents the end of a process that may deserve a brief recapitulation.

The Special Use Permit on Dynamited Cave was originally issued to the Cascade Grotto and the W. S. S. on September 30, 1964. The idea behind applying for this permit was that it would enable us to gate the cave and conduct photographic studies of the Sand Castles area. These studies were in fact conducted for several years on an informal basis, but have now ceased. None of the several gates constructed was completely successful.

The idea of relinquishing the permit originated during a conversation in Bob Brown's car last July 6. Our thought was that there was nothing further to do to justify keeping the permit, and in addition it involved a certain amount of liability. This was moved and passed at the September 1975 meeting. We notified the Oregon Grotto and the Forest Service; the former is making plans for a "cooperative agreement" about the cave. It is understood that this would in no way limit access to the cave by other groups.

For the present, then, the case is indeed closed.

The Editor

APE CAVE TAKES SECOND PLACE

A Vulcanospeleological Announcement

(Abstracted by the ed. from an article by Dale Green in Inner Mountain News 8 (5) 35-40.)

Up to September 9, 1974, Ape Cave was the longest unitary lava tube in the continental United States. On that date, construction crews broke into the Duck Creek Lava Tube, Kane County, Utah (see cover), giving it its first entrance and qualifying it as a cave. Salt Lake Grottoites found out about it on September 20 when it made the TV news. The story of the breaking-through is rather dramatic: "A large backhoe was routinely digging a sewer trench on the afternoon of September 9...when the scoop was banged down, the ground and backhoe shook, then with a roar the tube's roof collapsed leaving a terrified operator peering into a 25' chasm."

On October 4th through 6th, Salt Lake Grottoites mapped 7,400 feet of passage. October 12th and 13th brought the total up to 9,400 feet. After a final push on October 19, the final total was 12,054 feet. Ape measures about 11,500. So, we will just have to get out there and find a longer one.

The reason this story has been kept quiet for so long is that the Forest Service did not authorize its release until last month. This was because the stream flowing through the cave serves as a ranch's drinking water supply--a rather delicate situation. After any activity in the cave, the ranch spring becomes muddy. Because of this, the Forest Service has gated the cave (with a very solid gate, so the story goes) and is restricting access to the cave to "persons with bona fide scientific credentials," accompanied by Forest Service personnel and taking great care not to pollute the cave in any way. This is definitely not a cave for sport cavers.

The cave has a number of interesting features. A few hundred feet on the far side of Sheep Dip Crawl (a water crawl) is a 200' area of mud speleothems deposited by seepage from Duck Creek above. They closely resemble calcite formations. The next 600 feet is well supplied with real calcite formations from limestone talus covering the lava at the edge of the flow. Some of both had already been vandalized when the cave was mapped.

Farther on is a place where prospectors had drilled three holes through the cave roof and lowered dynamite in. The ceiling is blackened around two of them but the third did not explode. Length of the holes indicates that the overburden is about 41' at this point. There is also a pressure dome. Beyond the Columbis Day Crawl, the cave is a series of muddy duckwalks and crawls. This section contains large areas of contorted tubular lava stalactites (called helictites by the Utah cavers) and a few stalagmites.

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THIS IS THE LAST PAGE OF THE MAY 1976 ISSUE OF THE CASCADE CAVER.
THE NEXT PAGE IS THE FIRST PAGE OF THE JUNE ISSUE.

Collectors and librarians please take note----
we don't want any claims for missing pages.