Vol. 16 #1-2

THE CASCADE CAVER

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

SEATTLE'S ONLY GENUINE UNDERGROUND NEWSPAPER

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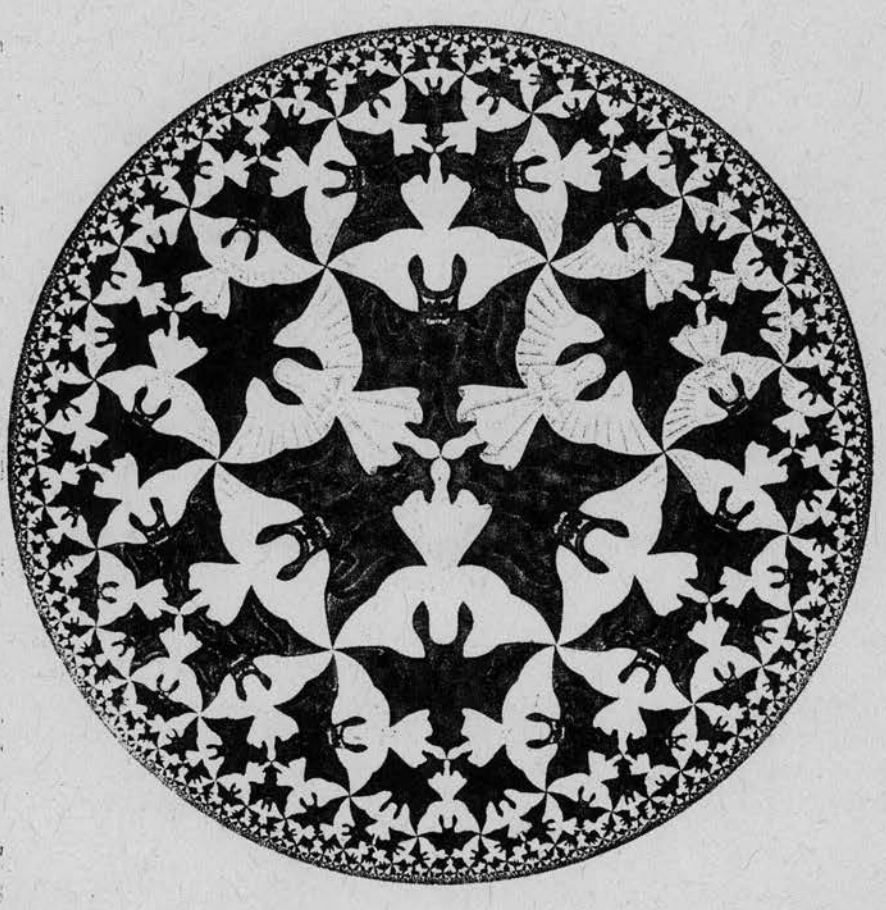

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COMING (AND IMMEDIATE PAST) EVENTS

Feb. 19-20. NSS Western Speleo-Educational Seminar, Vancouver, Washington. See within, p. 11.
Feb., 21, Monday. 8:00 PM. February Meeting of the Cascade Grotto, at the Hallidays', 1117 36th Ave. E, Seattle.
Tentative Trips Planned for Near Future, But No Date Fixed:
North Chuckanut Talus Caves. Call Rod Crawford late evenings, 543-4486.
Mt. Adams area lava tubes. Call Hank Ramsey, TA4-1807.
And if you feel like caving, call anybody! The mountains are accessible and the weather is beautiful. Why just sit there as if this was just a normal winter?
March 1. DEADLINE for the March Cascade Caver.
March 21, Monday. Regular monthly meeting. Same time and place unless otherwise announced.
July 1-4, Friday to Monday. NWRA Convention, Vancouver Island. See Bob Brown for details.

NEW SUBSCRIBERS

Dave Cowan 5313 North Ave., Carmichael, CA 95608
Rob Stitt 1417 9th Ave. W, Seattle WA 98119

LATE RENEWAL

Ellen Benedict 8106 SE Carlton, Portland OR 97206

NEWS AND NOTES

The Northwest Regional Patches are at last finished, and they are beautiful. Nearly half of our stock was sold at the NWRA seminar. They will be available at this and subsequent meetings.

* * * * *

Circumstances more-or-less beyond our control made it impractical to print this issue before the Seminar, so feel at liberty to ignore the announcement on p. 11. Sorry about that. * * * * *

RECENT DISCOVERIES BY VICEG: Scallop Cave, in the Memekay area of Vancouver Island, was first explored on Sept. 6, 1976. 1,252 feet have been surveyed, estimated to be less than half the total. Candlestick Cave, in the same area, was first explored on October 30 and bottomed on Nov. 6. The survey is incomplete and no figures have been published. The cave proved to be so fragile that it was immediately gated in a maration effort, November 11-14.

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At the seminar, yr editor got the real tune for "The Wild Caver" from Phil Whitfield, and exacted a promise of the tune for "Does it Go?" sometime in the future. They will be printed as space permits.

COVER: Circle Limit IV (Heaven and Hell), Woodcut by M. C. Escher.

F E A T U R E A R T I C L E

Cave Mapping: Get Out and Do It

By Steve Knutson
With additions by the editor and from the Cave Surveying Workshop
by Jerry Broadus and Ken Byrd at the 1975 NWRA Seminar.

[Based on an article by Steve Knutson in the Speleograph, V. 9 No. 3. Opinions expressed in this article are not necessarily those of the original author].

Introduction.

The most difficult aspect of cave mapping, by all odds, is finding the motivation to do the job. The process itself is fairly simple, but it takes real dedication to implement and see through to completion. When you are wet and cold and/or tired, mapping seems relatively unimportant. Also, the best of intentions go astray when, in the cave, one feels the ever-present lure to explore. Mapping is a rather mundane activity. But it is important. It is, at the least, the first step in the study of any cave. It would take a great many well-chosen words to do the job of a single cave map in describing a cave. So, I will end this introduction with this admonition--when you visit unmapped caves, go determined to do some mapping. Then you'll actually do it once in a while!

Equipment.

Nearly all cave mapping is done using a compass to determine the directions of cave passages. Distances are determined with a 50 or 100 foot steel (or fiberglass) tape. Assuming a cave to be other than horizontal, a vertical angle from one station to the next must also be determined, so that slope distance can be corrected to horizontal distance for plotting the plan view map of the cave.

Any compass which will allow one to aim it toward the next station and read the bearing or azimuth* to magnetic north indicated by the needle at the same time will produce accuracy sufficient for most caves. Such compasses include the Suunto, Brunton, and lensatic (or prismatic) types. All are reasonably expensive. Lesser compasses can be used, but their accuracy is suitable only for simple caves; but then many of our lava tube caves qualify as such.

Steel tapes are in standard use but suffer from the disadvantage of breaking easily if they are bent or kinked, which can result from stepping or crawling on the tape. The new fiberglass tapes are the thing to have. Cloth tapes are poor because they stretch.

Clinometers (to measure vertical angles) can come built-in, as in the Brunton, or be a separate device, as the Suunto clinometer. They can also be homemade, with a protractor and plumb device.

Survey Accuracy

It is possible to run a complete range in terms of quality and precision in mapping, and this range has been divided by the Cave Research Group of Great Britain into a series of grades. When a map is produced, it is always necessary to state the grade.

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*A bearing is an angle measured from North or South, never from East or West. An azimuth is an angle measured from a single base, usually North. Trigonometrically they are the same; hence the sine of S 10° W is the same as the sine of 190°, et cetera.

The C. R. G. grades are as follows:

1. Rough sketch from memory, not to scale.
2. Sketch-plan, roughly to scale; no instruments used; directions and distances estimated.
3. Rough plan survey; small pocket compass graduated in tens of degrees; lengths by marked cord or cloth tape.
4. Prismatic compass graduated in single degrees bur compass error not known; steel or fiberglass tape.
5. Calibrated prismatic or Suunto compass and clinometer, or Brunton; steel or fiberglass tape; bearings at least to nearest degree.
6. Calibrated prismatic or Suunto compass and clinometer, or Brunton; on tripod(s); steel or fiberglass tape.
7. Theodolite, transit, or specialized hand-held compass-clinometer devices such as those used by Stan Ulfield or Ellis Hedlund, for bearings and slopes; steel or fiberglass tape.

The Compass Scale.

Compasses, especially the Brunton, can come with several different scales. The 0 to 360 scale is best. The only human error that can result is reading the wrong end of the needle. When plotting the data, such an error becomes obvious and is easily corrected. A 0 to 360 circular protractor is helpful in plotting data from such a scale, if the data is to be plotted directly.

The quadrant compass is calibrated as shown in Figure 1 (facing page). Thus, a bearing of 320 degrees on a 0 to 360 compass corresponds to "North 40 degrees West" (N40W). I have noticed in working up data from a quadrant compass that it is possible to make an error, substituting E for W, as well as a 180 degree error resulting from reading the wrong end of the needle. This can be serious since a N5E read as N5W gives an error of 10 degrees. It may not be obvious which of several consecutive traverses is in error if the error is this small. Yet the error is large enough to be intolerable.

A third scale is graduated 0 to 6400 mils. This means that 6400 mils equals 360 degrees and every bearing must be converted to degrees by multiplying by the conversion factor, 36/640 or 0.05625. However, this step can be virtually eliminated when data is being reduced with an electronic calculator so this is not as serious an inconvenience as using a quadrant compass.

Perhaps the reason there are compasses around graduated in quadrants is that the owners didn't know what they were getting. The existence of Bruntons graduated in mils is easier to understand, since these may sometimes be had at auctions of Army property. But the lesson to learn is, when buying a new compass, specify a 0 to 360 degree scale.

Reading the Compass.

The azimuth or bearing is taken by aiming the compass at the next station using the sights (or whatever), allowing the needle to come to rest (toward magnetic north), and reading the indicated bearing.

With a Suunto the scale of azimuths is around a thin cylinder, the diameter of which is the needle of the compass. When you sight the compass on a station, the bearing appears in a window just under the sights, and it is very easy to sight the compass and read it. One disadvantage is that it is relatively difficult to sight on stations which are very far above or below the horizontal line of sight. It has also been reported, although I have not experienced this, that the window on the Suunto can fog up, rendering it useless.

The lensatic (prismatic) type of compass has a hinged prism or lens which is in line with the sights and as with the Suunto, the scale can be read while sighting the compass.

The compasses mentioned above are used with separate clinometers. The

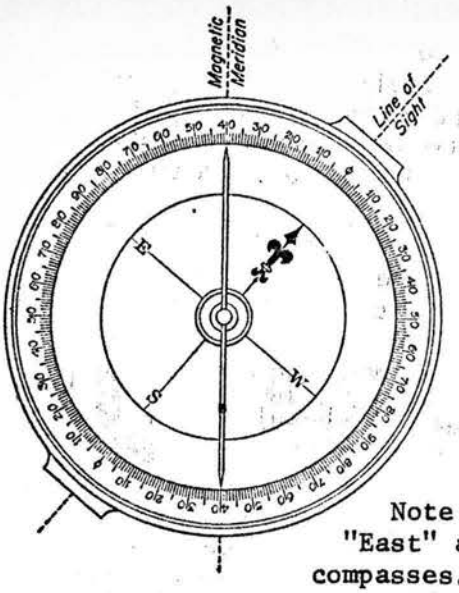


Figure 1.
Quadrant compass scale.

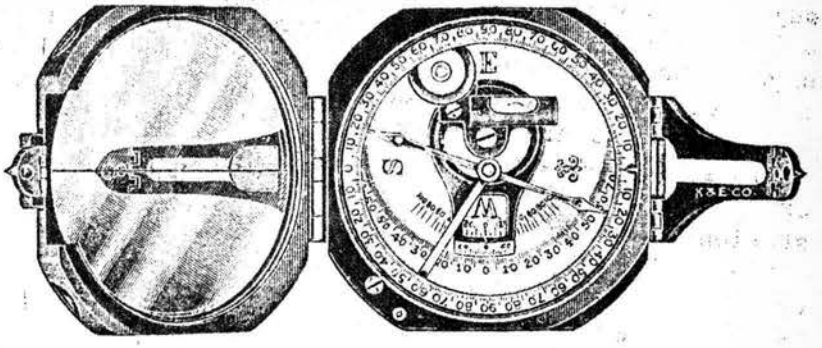
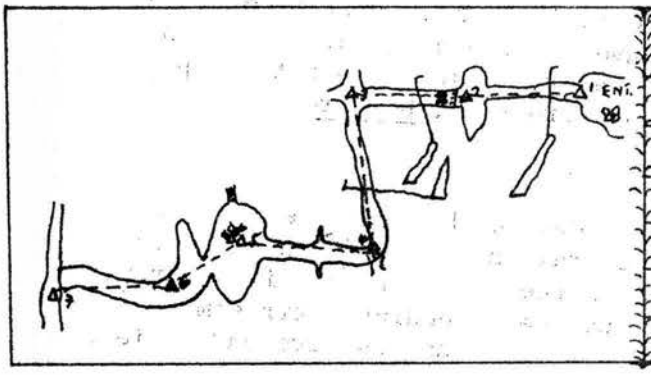


Figure 2. Brunton compass with quadrant scale. Note that sighting compasses have the positions of "East" and "West" reversed from their positions on simple compasses. This will give the correct direction of the station being sighted.

Below is a sample page of notebook entries, using the data from Windy Creek Cave. This is not an exact copy of the original pages. Arrows indicate the distances to walls, ceiling and floor from the station being sighted from.



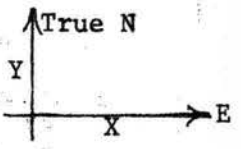
Declination set at 23°E.

Sta.	Azim.	Incl.	Dist.	←	→	↑	↓
1-2	242°	+8°	19.7'	.5	.5	6	2
2-3	238°	-17°	15.0	5	12	6	2
3-4	140°	+3°	24.3	-	-	5	5
4-5	234°	+8°	17.9	1	1	5	3
5-6	185°	-2°	14.6	4	3	5	1
6-7	240°	0	10.0	2	0	3	5

WORKED-UP DATA FROM SAMPLE ENTRIES

Below is the sample data corrected for slope and reduced to rectangular coordinates. In this case, Y is north when positive, south when negative; X is east when positive, west when negative; Z is elevation; all with respect to 0 at floor in center of entrance.

Station	X	Y	Z	Horiz. dist. to entr.	←	→	↑	↓
1	0	0	+2.0	0.	.5	.5	6	2
2	-17.2	-9.2	4.7	19.5	5	12	6	2
3	-29.3	-16.7	0.3	33.8	-	-	5	5
4	-13.7	-35.3	1.6	58.1	1	1	5	5
5	-28.0	-45.8	4.1	75.8	4	3	5	1
6	-29.3	-60.3	3.6	90.1	2	0	3	5
7	-38.0	-65.3	3.6	100.4	-	1	3	13



All data courtesy of Chuck Coughlin and Jerry Broadus. The crude sketch map may be blamed on the editor. For completed map see the last issue, p. 136.

Brunton has a built-in clinometer and is much more complicated to use (see figure 2). Usually bearings are obtained by looking down on the compass, adjusting the hinged mirror so that the next station (marked preferably by a light) is in view, and superimposing (lining up) the image of the front sight, the target station, and the hairline on the mirror. When these are in line, the bearing is read (you are looking down on the scale). Meanwhile, of course, you are keeping the bubble centered in the bullseye level.

To read the vertical angle, the Brunton is held on its side with the sight extended and toward you. The compass is held up to the eye and the target station is sighted along the extended sight and through the hole in the mirror. The mirror is angled so that the level in the compass can be seen while the object is sighted. The bubble in the level is then centered using the lever on the bottom of the compass. The vertical angle is read on the scale inside the compass body.

Correction for Declination.

The compass needle points to magnetic north. Since the magnetic pole is some distance from the true pole, a sizable correction must be made to convert a "magnetic" azimuth or bearing to a "true" one. Moreover, this correction varies with geographic position. In Washington, the differences in declination from place to place can be rather significant. In the Trout Lake cave area it is 21°; at the Mt. St. Helens cave area, 21.5°; at Cave Ridge and in the Gardner Cave area, 22.5°; at Concrete, 23°; at the Black Mountain Karst, 23.5°. The Brunton and some other compasses have a scale that can be adjusted to correct for declination. However, there is a great danger of leaving the setting from a previous trip in an area where it is wrong, or of using compasses with different settings in the same cave, so the best bet is to leave the compass set at 0 declination and correct later, or just draft the map according to magnetic north. If you do set a correction, be sure to indicate what correction you set in your notes.

The Mapping Team

The number of members in a mapping team depends on the character of the cave or passage being mapped. In constricted crawlways or difficult vertical caves, the team may be reduced to two, which is the smallest efficient party. Solo cave mapping is occasionally done, but must be exceedingly tiresome and tedious. In spacious caverns the team may include as many as five and achieve great speed and efficiency.

The various jobs include: (1) reading the compass, (2) taking the notes, (3) handling the tape, one man on each end, and (4) marking or indicating, and selecting the stations. If the clinometer and compass are separate, they may be handled by two men. The notes should, if possible, be taken by the same person who will later draft the map. The man taking notes should be given no other job. As the compass, tape, and clinometer are set up and read, the notes man must be sketching the passage as well as keeping the data straight. The tape handling is an important job since the marking and selection of the stations is usually done by the same person. The tape man opposite the compass man must have a light for the latter to sight on.

The In-Cave Process.

Once the team is organized, the process is simple*. An initial station is selected and the tape run to the next station. The latter must be carefully selected to maximize each subsequent station-to-station traverse. This does not mean just running the tape to the limit of visual connection with the last station. The new station must be positioned so that a maximum distance can be taped to the next new station. When the tape is tight between the

*You said it, brother! The problem is organizing a team of more than one. -ed.

stations, the distance is read, as is the compass and clinometer; the keeper of the notes makes his sketches and observations, and records the data. The tape men move on to another new station, and the data taking and recording is repeated.

The Data Book.

The data taken in the cave must be recorded. A small, inexpensive survey book with waterproof paper is best. Data can be recorded in such a book using a lead pencil even when the pages are covered with mud or water.

On each facing page in the notebook a sketch showing the configuration of the passage walls relative to the traverse line should be given. Stations should be positioned and numbered. However rough this sketch is, it will be a great aid when adding passage walls to the plotted traverse line. As much information should be tacked onto the sketch as possible; this includes cross sections, passage height between stations, and various features of the passage.

The data to be taken depends somewhat on the grade of survey being done, and on the personal preference of the surveyor. The practice of leaving a survey marker at each station probably litters the cave unduly. If a cave is complex, a few marked stations along a long traverse line will suffice for tying in future surveys of adjacent passages. If the cave is relatively simple, all the stations can be"imaginary". The main thing to remember is that the cross sectional dimensins should be fixed for each station, and the position of the station in relation to the cross-section must also be fixed. In one system, the maximum height and width of each station are recorded in the data book, with the station's position relative to the walls recorded in the sketch on the facing page. Or, the distance to each wall, floor, and ceiling can be recorded separately, as in the example given of the first few stations from Windy Creek Cave. Recording the height of each station above the floor is mandatory for CRG Grade 6. Passage widths and heights are often just estimated, though mappers vary widely in the accuracy of their estimation. The possibilities of optical rangefinder devices for determining ceiling heights should be explored.

When time, patience, and personnel allow, it is very desirable to take a backsight with the compass to the previous station at each successive station. The mean of the two azimuths is much more accurate than one azimuth alone, and this also allows a chance to eliminate errors in reading the compass.

Working up the Data

Upon arriving home, the raw cave notes should always be recopied nicely, while the identity of your muddy scribbles is still fresh in your mind. The original notes should be preserved along with the recopied notes so that any error noted later can be traced to its source.

The sooner one works up and plots the data, the better. If the cave is nearly horizontal, the raw data can be used and a plan view plotted directly (i.e., with a circular protractor). However, this method is very crude for a cave of any length, and provides several sources of error. Unless you are a perfect draftsman, you will not read exactly the right point on your ruler or protractor or make your dot in exactly the right place. These errors are multiplied with each station plotted. It is much more desirable to convert your original data, in the form of a distance and direction or polar coordinates, into rectangular coordinates, the distances along the two axes ("x" and "y") of a piece of graph paper.

When any vertical angle deviates more than a few degrees from zero, and in any case where precise vertical control is desired, it is necessary to calculate the horizontal distance and vertical change from the slope distance between stations. This is also done by converting the polar coordinates (in this case, the distance and inclination) to rectangular coordinates.

The first step in working up the data is reducing slope distances to a horizontal and a vertical distance. If your clinometer uses 0° for horizontal:

Slope distance x cosine slope angle = horizontal distance.

Slope distance x sine slope angle = vertical distance.

If your instrument uses 90° for horizontal, trade sine for cosine in the two formulas above.

Then, taking the true horizontal distances with their azimuths as polar coordinates, change to rectangular coordinates as follows:

Horizontal distance x cosine of azimuth = northing or southing.

Horizontal distance x sine of azimuth = easting or westing.

All northings and all eastings are + (positive); all southings and all westings are - (negative). The rectangular coordinates of each station are added to those of the last to give the coordinates of the new point. In a closed traverse the algebraic sum of the northings and southings should equal zero, as also with eastings and westings. If they don't, the remainder is your error of closure.

Sines and cosines can be found in a book of mathematical tables. However, many of the now widely available electronic calculators allow transfer of polar to rectangular coordinates at the touch of a single button. The accumulative addition functions of such calculators are useful in adding coordinates of successive stations, thus avoiding cumulative errors of rounding numbers.

Once the data is worked up, the points are plotted (usually on graph paper), and the walls and other features drawn according to the original sketch and the height and width data.

For technical niceties of drafting and reproducing the final map, see the article by Jim Nieland in Speleograph v. 12 no. 5, pp. 100-105.

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Montana Travertine Glacieres Reference

by Bill Halliday

Recently I acquired a 48-page paperback booklet entitled "A Guide to the Geology of Fergus County, Montana", by H. Leonard DeKalb, of Lewistown, Montana, printed by Argus Printing and Supply Co., Lewistown. It is dated only in the preface: July 18, 1922. On page 32, it gives some information on glacieres that I have not seen elsewhere:

"On the westerly slope of the top of the McDonald Creek Divide, on the Lewistown-Forest Grove road, to the north, lie several deposits of travertine. At the Charles Rich ranch you may obtain directions to some very fair types of ice caves found in the fissures of the deposits.

"...'the Park' at the southerly end of the North Moccasins can quite easily be reached. Ice caves are also found at this locality.

"Do not get the erroneous impression that our ice caves are all found in the travertine. The cave in the Judiths approached from about a mile down the canyon from the McEvoy ranch house is in the Madison [limestone].

"A simple explanation of an ice cave is an unventilated cavern into which the cold below-zero air of winter has descended. Percolating waters have congealed upon entering this atmosphere; hence ice; hence an ice cave. Without strong air currents to drive out the cold air, coupled with comparatively short summers, and a good conductor overhead, we have permanent ice caves."

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T R I P R E P O R T S E C T I O N *

*No trip reports
had been received by the
editor by press time.

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VULCANOSPELEOLOGICAL ABSTRACT

Simons, J. W., 1976. Leviathan Cave--a major lava tube in Kenya. British Cave Research Bulletin No. 14, November 1976, pp. 23-25 (Abstracted by W.R.H.).

"During Mid-April, 1976, a team of seven members of the Cave Exploration Group of East Africa undertook a ten-day, locally sponsored, expedition in what is at present claimed as the world's longest and deepest lava cave. [Ed. note: Since Leviathan is divided by collapse into three segments, it does not really qualify as longest by current definition. However, all three segments are over 2 kilometres long.]

"The cave lies in a magnificent wilderness of geologically recent ash-cones and vast lava fields which make up a 65 km long mountain range known as the Chyulu Hills, bordering upon Kenya's famous Tsavo National Park (West). Many lava caves have been discovered in the pahoehoe flows of this fascinating area by the CEGEA during the last decade, most involving extended foot-safaris through forest and game-rich bush to reach their entrances. Lava flows, some of which reach distances of 20 kilometres from their source volcanoes...

All major tunnels so far examined show evidence that they were formed by the extrusions cutting channels down into the underlying pyroclastics surrounding the cones, lining them with successive onion-skin layers of lava to form underground conduits feeding the flow snout. Progressive cowncutting, as demonstrated by lava verticals ('falls) representing nick-points of headward erosion, and lowering of the flow level within the active channel produced multiple passages one above the other. High-level, braided side-passage systems are now known to occur in the most recent discovery and are interpreted as 'feeder tubes' to the main 'drainage' tunnel, formed in the lava sheet overlying the pyroclastics...

"...Leviathan Cave was first 'discovered' through a study of aerial photographs and received its first CEG investigation in September 1975. It took CEG members five extended two- and three-day trips to explore the main tunnel line and some of its upper levels, bivouacs being made at the cave. Difficulties of exploration were aggravated by a 240 kilometre vehicle distance from Nairobi, a hike of 4 kilometres to the main entrance and by having to back-pack all water supplies in addition to foodstuffs and equipment. To

locate additional entrances over the cave it also became necessary to blaze trails through the forest on compass traverses, the last two collapse holes lying deep within the Kibwezi Forest a further 4 kilometres downflow of the main entrance. Supply-lines to the farthest reaches of the cave were, therefore, rather extended and it became apparent that to produce a high-grade survey of the entire cave would be a protracted affair involving many costly visits. The ten day expedition was organized principally, therefore, to establish the cave's exact length and vertical range as well as to investigate many upper levels which remained un-entered. Local sponsorship was sought and many Kenya-based companies came forward with generous donations of equipment and foodstuffs...

"The principal tunnel of Leviathan Cave, with many sections up to 10-15 metres in diameter and large enough to permit a bus, has now been explored from an ash-choke directly beneath the slope of the source volcano, downstream to a seemingly impenetrable boulder-seal for a single passage length of 8 kilometres. This great length is only broken in two places by collapse entrances, where linking digs through boulders had to be undertaken, dividing the passage into 3.5, 2.5 and 2.0 kilometre segments. Ten other collapse entrances are known over the cave line, but each of these provides entry to high passage sections, the otherwise continuous lower level passing beneath. Discontinuity of the upper levels or natural breaks in their floors provides access to the lower section.

"Vertical lava 'falls' are prevalent in the most upstream part of the cave--Lava Falls Way--there being one of 2 metres, three of 4 metres, one of 5 metres, and one of 6 metres (Scorpion Falls). A climb of 10-15 metres in a shaft passing from the lowermost level up through two higher level passages enabled the upstream survey party to exit at a small collapse 250 metres downflow of the source volcano. Downstream of the main (Bushbuck) collapse, the Mud Hall Series continues descending steeply downflow to Forest Collapse, a number of ox-bows and a braided side system being encountered mid-way along this series. From Forest to Compass Collapses, the angle of descent gradually decreases. Compass Collapse marks the first break in continuity 3.5 kilometres from the Terminal Choke and with a vertical range of 305 metres.

"The next 2.5 kilometres segment of the main passage--Goliath Passage--has some impressive canyon-like cross sections up to 15 metres high and though it drops only another 100 metres to Pottery Collapse, it is a very wearing section to traverse with its great slippery breakdown piles. It was along this series that several new and previously unsuspected side-passage systems of 0.3 and 0.4 kilometres were discovered running parallel to the main tube and connected to its upper levels.

Pottery Collapse marks the second break in continuity, downstream of which it is mostly easy walking for the next 2 kilometres to a 100 metre long liquid guano crawl in boulders marking the present 'end' of the cave. A disappointing finish to a magnificent lava cave, though it is suspected that the tube continues much further beyond this choke as many kilometres of lava still lie ahead.

"Geologically the cave exhibits some fine lava tube features. Not only are the passages of unusually large dimensions, varying from smooth ovals to high canyon-like areas often with 'key-hole' cross-sections rather reminiscent of vadose stream passages (which technically they are), but many lavatites and lavamites abound. Large 'box-work' areas of sharp pointed lavatite blades are common and the lower end of the cave contains a profusion of curly 'pipe-stem' varieties and weird lavamites built up of solidified lava pellet upon pellet. Lava columns are also present and some of an incredible blue-gray colour have been noted. Small ropy lava pavements, often forming solid seals in small passages, were of a fascinating salmon-pink colour. Of
[Continued at bottom of p. 13]

THE 1977 WESTERN SPELEO-EDUCATIONAL SEMINAR, as you have probably completely forgotten, will take place this weekend (Feb. 19-20) at the Marshall Recreation Center, Vancouver, Wash. (see map). On Saturday there will be ten papers and presentations of various interesting sorts, including one by yr editor, and the assembled cavers will hear from Eugene Vehslage, Dave McClurg, and the present NSS President. On Sunday will be a vertical workshop and nine papers. A caving trip is planned for the Monday holliday.

Registration is $3 at the door, dinner $1. extra. Sleeping bag space is available. Advance registration was $2, but now, alas, it's too late.

See you there!

IN CAVES, YET? WHAT NEXT?!

Nuclear waste: Experts look underground for solution

WASHINGTON — (UPI) — Experts hope to find a permanent solution to disposal of potent radioactive wastes by 1985 and nuclear-power officials say deep underground storage may be the answer.

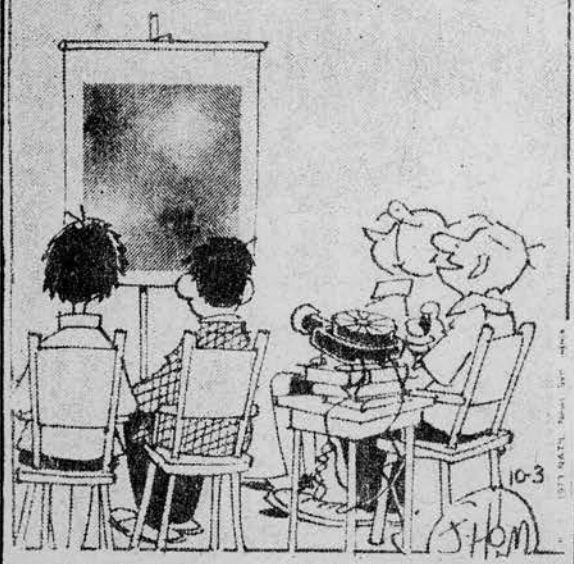
Dr. William Bishop, chief of the Waste Management Branch of the Nuclear Regulatory Commission, testified Friday before Congress' Joint Committee on Atomic Energy on public concern over the storage of military and commercial nuclear waste.

"A number of technologies are looking at it," and deep mines or caverns with special geological qualities seem to be the best answer, Bishop said.

"We have not come to a conclusion," he said, but added the commission hoped to have a long-term program developed by 1985....

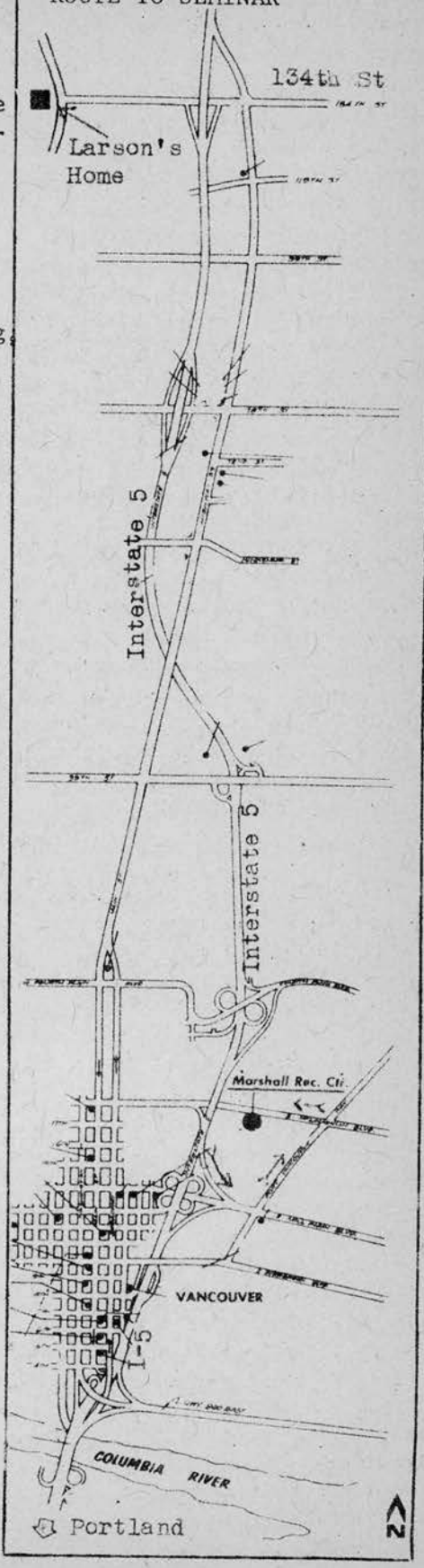
The Seattle Times **A 23**
Sunday, August 29, 1976

WOODY'S WORLD By J. Holm



"This is a picture of us in the caverns."

VANCOUVER AREA SHOWING ROUTE TO SEMINAR



BOOK REVIEW: by Bill Mixon

Depths of the Earth, Caves and Cavers of the United States, by William R. Halliday. Harper and Row, New York, 1976. 432 pp. $14.95. Revised and enlarged edition.

As I read this new edition of Bill Halliday's best-known book, I was impressed at how much of the lore of American caves he had managed to include. Just now have I realized how large a part of my store of cave lore comes from the 1966 edition of Halliday's book. So this new edition, which adds a lot to the old edition--and leaves out less--of course covers much of the same ground. The point is not that you needn't buy the new if you have the old. It simply illustrates the part Depths of the Earth has played in establishing American cavers' common fund of knowledge about their pastime. It and the older Celebrated American Caves, edited by Mohr and Sloane, are the two books covering the whole U.S. caving scene that have been kept in print over the last decade and have therefore been readily available to all current cavers who want to read. Their contents are, for practical purposes, the lore of American caves and caving.

The material in Halliday's book is wide in scope both in place and time. Halliday is interested in spelean history--he founded the Journal of Spelean History, which doesn't look like it's surviving his giving up the editorship--and some of the material in the book reflects that: Thomas Jefferson made the first map of a U.S. cave.

Deciding what to include in a general book such as Depths of the Earth must be quite a chore. Which stories of discovery and exploration are most important? Which will the reader enjoy most? Besides these judgements, the content of the book must of course depend on what information is available from various parts of the country and which cavers cooperate with the author in supplying information, checking for errors, and the like. Anyway, this new edition covers a lot of ground: Flint Ridge, Mammoth Cave, and the connection. The Floyd Collins tragedy. Famous caves of the Virginias: Grand Caverns, Luray, and Endless. The conquest of Schoolhouse in the early forties by rock climbers. Missouri Caves: Meramec, Onondaga, Mark Twain, Marvel, the long caves of Perry County, the pollution fight at Devil's Icebox, Devil's Well. Arkansas: Beauty Cave and Blanchard Spring. California: Winding Stair, legends, and archaeology. Carlsbad. Texas: Devil's Sinkhole, Ezell's Cave, Frio Cave and bats and rabies, Natural Bridge, and, of course, Sonora, "in my opinion America's most beautiful"--mine too. Northeastern caves: McFails, Skull. Southeastern: Anvil, Cathedral, Cumberland, Russell, Fern, Ellison's. Cavers' caves of the Virginias: Blowing, Butler, Breathing. Jewel and Wind, including the Windy City Grotto's work in the early Seventies. Indiana: Sullivan's, Blue Spring, Neffs' Canyon. The Devil's Hole and its pupfish. Florida spring diving. Caves in snow and ice: Paradise Ice Caves and the summit caves of Mt. Rainier. Lava tubes. Crystal Ice Caves, Idaho. And more.

If you've been keeping up on the U.S. caving scene over the past decade, you can tell from the list above that the 1976 edition is no token revision: a lot of the material concerns recent discoveries. (Inevitably, the book is already slightly out of date. Friar's Hole will "perhaps someday" be connected to Snedegar-Crookshank). What did he leave out? Not much, it seems like. There is nothing on caves in the Rockies; that is probably the greatest omission. It is a shame that he has restricted himself to the U.S., because the discoveries of the last ten years in Mexico and the Canadian Rockies surely deserve telling.

In my somewhat disappointed review of Halliday's American Caves and Caving, I stated that he was better at telling tales than explaining cave craft and

science. I am happy to report that his tale-telling is still just as skilled as it was ten years ago. The book is hard to put down. Some prominent cavers will perhaps be embarassed by the unstinting praise heaped on them, but they needn't be; Halliday wrote it, not they, and he's right. His style is lively, sometimes verging on the dramatic, but never quite objectionably so (except maybe in the obviously fictional paragraphs about the inside of Show Farm Cave during the Indiana drowning accident of 1961). And those who have criticized Halliday in the past for being insensitive to conservation should read his chapter on dams and caves.

I can't resist mentioning an error not corrected from the old edition; I mentioned it in my review in 1966, too. Dissolving 175 tons of limestone a day does not make a mile of 30- by 50-foot passage in a year. Nowhere near. Obviously.

Everyone but the NSS News staff who has followed American caving literature for any length of time has caught on to the fact that Bill Halliday and George Jackson will never have anything bad to say about each other's books, so you needn't pay much attention to the review of Depths of the Earth in the October News. On the other hand, an Eastern caver who reads the Speleonews once wrote that if even Bill Mixon likes a book, he knows he'll think it's great. I like it. And any caver who hasn't read the new edition is culturally deprived.

P.S. But what are those funny things at the bottom of the page, next to the page numbers?

From: The Windy City Speleonews, 17 (2): 12, February 1977.

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BOOK REVIEW: by William R. Halliday, M.D.

The Jewel Cave Adventure, by Herb and Jan Conn. 1976, Zephyrus Press, Teaneck, New Jersey. 240 pp., 89 half-tones, 16 maps, and two songs. $5.95 paperback, $10.50 clothbound.

The subtitle summarizes the book: Fifty Miles of Discovery Under South Dakota. With this, the N.S.S. publication program comes of age. The Jewel Cave Adventure in my opinion is destined to be one of the very few true classics of American caving, and at the very least will surprise the living daylights out of a lot of people around the world. It captures the feel of what caving is really like, what it's all about, and how cavers' dedication occasionally is rewarded far beyond their fondest dreams. The maps and diagrams especially help to take the reader along each miserable crawl, into each new breakthrough. Just as 1974 was the year of the how-to-do-it caving books, this unheralded little book completes 1976 in a blaze of glory as the year of the great American caving narratives. I recommend paying the added price for the hardback. This is going to be a collectors' item.

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LEVIATHAN CAVE, continued from page 10: "...particular interest are a series of unusual lava outgrowths on the edge of a bench which are dendritic in character and greatly resemble ferns. Burst blister formations were observed in both the walls and roof in certain passage sections, the former consisting of pockets surrounded by solidified jagged lava protuberances and the latter by deep pearl-shaped scoops where lava had trickled out at the lower end and down the walls. Long benches marked former levels of molten flow and in places coalesced to form natural bridges and tubes within tubes." [Editor's note: The Cascade Caver, in our Nov.-Dec. 1975 and June 1976 issues, virtually scooped the world with early reports on Leviathan Cave.]

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Bill Capron, Keeper: Phone 784-8497.
Price List, October 1976.

Cave Packs	$1.50
Carbide	50¢/1b.
Judson kneepads, pair	4.50
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Chin Straps	.85
Premier Carbide Lamps	8.75
Lamp Brackets	1.00
Lamp felts	2/15¢
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MSA Nickel-Iron Headlamps	*
Gibbs ascenders (spring)	8.50
Gibbs (quick release)	10.50
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Cascade Grotto Patches	1.50
Cascade Grotto Decals	.25
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*Contact Keeper for Information.
Quantities are limited in some cases.

If you want any caving-related equipment not listed here, please ask for it. The store is here to serve you, so take advantage of it. BC.

PROGRAM FOR THE MARCH MEETING:

A presentation by Curt Black on the subject of "Cave-Saving Techniques".

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THE JANUARY MEETING

was small, as befits the season. Our new officers (Russ Turner, chairman, Ed Crawford, V.C., and the incumbent Chuch Coughlin as Sec.-Treas.) took office. There was unfortunately no program, and the officers promised not to let it happen again. There were a few trip reports. The grotto voted $15 to the Oregon Grotto Library in memory of Charlie Larson's sons.

THE CASCADE CAVER
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Take
Nothing
But
Pictures
Leave
Nothing
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Kill
Nothing
But
Vandals