Speleo Digest
1980

NATIONAL SPELEOLOGICAL SOCIETY

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EDITED BY

THE SPELEODIGEST COMMITTEE

NATIONAL SPELEOLOGICAL SOCIETY

ISSUE # 25 OF

THE SPELEODIGEST SERIES

SERIES EDITORS

WILLIAM MIXON

JOHN C. HEMPEL

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FOREWORD

For almost 30 years, the Speleo Digest has been one of the largest annual projects of the N.S.S. This project has grown from producing approximately 100 pages of text in 1956 to producing over 300 pages today. All work on this publication has traditionally been done by volunteers. The society's large reserve of volunteers has made this possible. With this issue, many new volunteers have begun working toward our goal of producing a digest within two years of the year material first appeared.

We have selected several individuals to edit our Digest through 1985. These editors will be working closely with our contributors to improve the quality and readability of the publication. I urge all contributors and readers of the Digest to contact any of our editorial staff (list herein) to make contributions or to relate ideas on how to improve the Digest. Occasionally one of our volunteers has a problem that delays the timely completion of their project. In this case the rest of us pitch in to help. This issue was delayed 3 years because of editorial and production problems and I apoligize for the delay. The 1982 is also delayed by a few more months but should be out shortly.

The staff of the Digest has arbitrarily assigned articles to sections and sub-sections within this issue. Special articles have been included in the sections that they best fit. Some exceptional articles have been reproduced in their original form and the format of these may differ from that of the Digest's.

The reader is cautioned that the material contained herein has not been reviewed by any expert or technical review commitee. Material reprinted here is not necessarily correct or safe in no way represents the opinion or recommendations of the National Speleological Society.

Since 1980, many caves described in this publication may have become sensitive or off limits to cavers. Whenever possible, contact cavers or grottos active in the areas you wish to visit prior to going. Current addresses of local clubs and grottos are available from the National Speleological Society, Cave Ave, Huntsville, AL 35810.

John C. Hempel

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We apoligize for not getting this issue out three years ago. Our Editor got lost in a cave!

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WOMEN CAVE
YORK GROTTO NEWSLETTER, YORK GROTTO

CAVING COURTESY

Almost entirely due to inconsiderate acts on the part of cave visitors, popular caverns are being closed to caving. Going to caves involves crossing property which the caver enters as a guest and is expected to respect. But, unfortunately, all many owners get from their cave traffic is bother and headaches. The owner does care about discourtesy. Before visiting anyone's cave, here are a few ideas you might consider.

The people of the surrounding community as well as the individuals who control the cave entrance and its access routes may feel affected by cavers. Almost anybody can get a cave closed if you stimulate him to do so. So, keep in mind the fact that fouling up laundromats with mud and raunchy good fun in the restaurants, can do just as much harm as horse tail pulling and corn theft.

People rarely own or lease land they do not care about. Regardless of the rumors you hear, or the current practice in a certain place; regardless of the owner's ability to observe you entering the cave - ASK FIRST. Disrespect really is an irritant. Before entering any cave, be sure you have the permission of the owner. Even when a "standing invitation" has been extended, you should contact him before each visit.

Many caves are situated on public or commercially owned land. There will be a management of one sort or another and possibly a policy towards caving. Caves are controlled and frequently closed on Federal and State lands. You should contact a ranger or superintendant and adhere strictly to their regulations. Cavers should expect to be asked to in some way show qualification to enter difficult caves. Further, you may have to prove some interest other than recreation in some cases. The eventual opening of closed public property caves depends partially on our cooperation now. On Indian reservations, frequently you will not be allowed to cave. Seek out an assistant to the Chairman of the Tribal Council for permission. On commercially owned property such as quarries, logging areas or the like, you can expect management will dissuade caving. Cooperation and friendly dialogue may eventually lead to a change in policy. Sneaking in will lead to an adamant closure.

Regional situations vary, but in general, one of the biggest problems is that so many owners are rural people and many out-of-town cavers are from urban centers. "City" people frequently know little of what to expect from livestock in the way of behavior, nor do they "instinctively" know how to avoid damage to crops and fields. Care and consideration on the part of spelunkers will result in warm invitations to return. However, when an owner feels that caving is a threat to his property, livelihood or community standing, he will close his caves. One of the best ways to foster good relations and atune yourself to rural caving, is to stop to talk awhile with the owner and his family.

While visiting with the owner, keep in mind some of the things you want him to know about yourself as well as those you must learn about him. You should put the owner into your safety picture with information on your whereabouts and whom he can contact should problems arise. In this vein, expect that due to publicized accidents, owners in heavily caved areas may be apprehensive about your visit. In some areas it will be to your advantage to carry release or liability waver forms. You should make a point of learning of any laws in his area which protect him from liability during your visit. You should try to find out exactly whom you are speaking to. In this way you gain a name for your Christmas card list and know how to pronounce it. Further you will gain an insight into the family structure hinted at by the names on the mail boxes. Possibly you will hear of a neighbor's new sinkhole. Possibly you will hear of problems your host is having with cavers. Possibly some fantastic cave lore may be related to you. Needless to say, attention paid to the LOR problems first will pay off both in the short and in the long haul. Before leaving the owner, you should inquire about such things as what to do with your car and how to reach the cave . . . and possibly, camping.

You need a car to get there but . . . farmers are constantly moving machinery or livestock about, so check on parking to be sure your car will not block a lane which is in use. Drive on the existing trails and roads to prevent rutting, scarring and erosion in fields. This is particularly important on hills and in wet weather, as a slight spin of the wheels can lead to problems maintaining the road after it ruts. By all means, remember your host does not really enjoy towing cavers' cars out of muddy dirt roads or fields, and he probably prefers you change your oil in town.

Eventually, you will get out and walk. Keep any children with you out of the sheds and off of the machinery. When you cannot avoid climbing a fence, do so at its strongest post and make sure that you do not leave sagging wires or missing rails. Ranching and farming people don't consider chasing animals fun. If there are grain fields, the owner will appreciate it if you ask which route he'd prefer you use to reach the cavern. Walking through grain fields can result in permanent damage to the crop, ($).

Gates are frequently encountered in rural areas. The owner expects you to close and securely fasten any gates you pass through. Again, in speaking with him, you may learn of some he prefers open on a given day. Entering and leaving a cave, replace any barriers that may have been put there to keep animals out. In warm weather, the cool air and water in the typical entrance will attract cattle. Around the entrance, you may see piping and pumps. If cave water is being used on the farm for irrigation or drinking, you can expect that its quality is a sore point with the owner. You must use a great deal of care to avoid muddying or spoiling his water supply.

An owner frequently is familiar with his cave and is interested in conserving it. His interest in its lore, wildlife and formations may date from his own youthful explorations. While telling him of new discoveries will interest him, showing him how to protect his bat population or shouldering bags of extracted trash will please him more. While enjoying a cave, remember that the owner, his relatives or friends may visit it next. It is in your own best interest that you leave nothing inside a cavern that does not naturally occur there. Lifter, carbide, food, plastic wrappers, photographic debris, names or hometowns sooted on walls or formations, all detract from the natural appearance of a cave. Further, many unlikely items will wreck the life cycle if allowed to contribute food or poisons into the delicate balance found there. Cave fauna are extremely hard taxed just to survive and should be allowed to remain in their natural habitat undisturbed. Probably, all cavers realize they should not "collect" or vandalize formations. However, few of us can manage to keep the accidental breakage under complete control. Remember, a single nudge of your hard hat or helmet will destroy practically any small formation. Where you have an owner who is interested in his cave, you have an individual who will be upset at its deterioration.

After exiting, cavers have on rare occasion dumped spent carbide around cattle. Not only is this a form of littering, but most ranchers and farmers regard carbide as poisonous, and livestock deaths have been blamed on cavers. ALL carbide and spent carbide must be removed from the premises.

Work involving surface mapping, measuring or electronic equipment could upset an owner who had not been briefed on its uses. Cavers using fluorescein dye for water course tracing should first talk with area residents. Once the tap water has turned green, a tardy "it's harmless," will not improve your caving prospects. Perhaps, avoiding an officious or hurried demeanor is one of the best ways to show an owner that your visit is for innocent recreation. If you do get a report or map published, by all means see that your cave owner gets a copy.

After caving, we all feel grungy and groady. But, don't mess up your Land Owner Relations by leaving local public restrooms muddy. In the woods, do not use soap directly in a body of water. Do your soaping and dishes in a bucket and discard it at least fifty feet from open water.

Keep in mind the nearest public restrooms and plan accordingly. In the field, use whatever sanitary facilities the owner has already provided. If the need is great and facilities nil, choose a spot at least fifty feet from open water and bury excrement in the topsoil layer no more than six to eight inches deep.

Far from home you will need a place to stay over night. Why run the risk of offensive camping manners messing up your "in" at the cave? If you can reasonably go elsewhere, never camp at the cave. But, if you must camp and are granted permission to do so, stick to the golden rule.

Use whatever campsite exists already. Don't build structures, drive nails, break branches or otherwise deface the camp. Any trash, even small items such as cigarette butts, are potential irritants to a sensitive owner. Use a small stove for cooking since it leaves no mark. Toasting marshmallows means specific permission for a fire. Keep a campfire small, since a brush fire could make cavers unpopular locally. Use dead wood instead of maiming live trees. When you are finished, check for live sparks by mixing copious amounts of water into the ashes with a bare hand. Leave the camp cleaner than you found it. Idealistically, a campsite is so clean as to disappear into its surroundings.

Try and leave the landowner happy with your visit. After all, he need not always give us access to the caves we enjoy.

National Speleological Society
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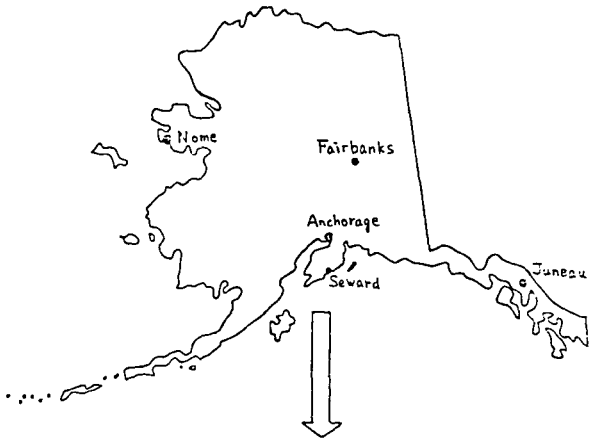
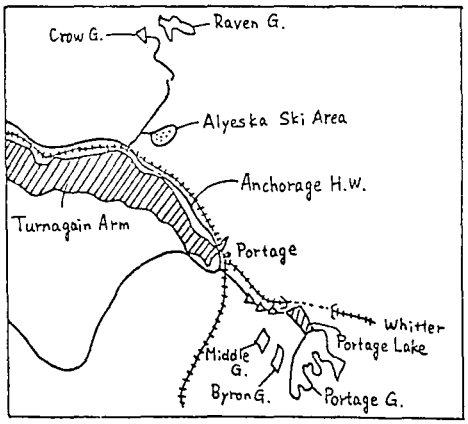
Huntsville, Alabama 35810

Alaska

JAPANANESE TEAM EXPLORES ALASKAN GLACIERS
Alaskan Caver Vol.5 No. 1

During July 21 to August 11, 1978, nine students from Kwansei Gakuin University Exploration Club of Hyogo, Japan visited Alaska to explore glacier caves. They were intrigued because glaciers are uncommon in Japan. They managed to find and document two previously unreported caves. This article is derived from the English version of their official report.





Although they realized that autumn to early winter is the safest season to study glacier caves, like everyone else, they had to travel when time allowed them. To make up for this seasonal problem they did most of their surveying at night because it was cooler. As they report, "In spite of our effort, many blocks of ice fell. By good fortune, we could finish the activity without any accident." Although their intention was to survey all of the two caves, due to unstable conditions, some passages were only measured visually.

The group consisted of the following club members: Hiroshi Matsuzaki, chief leader; Kazup Ikuta, subleader; Manichiro Iwao, public relations; Yoshiaki Takamoto, equipment and medical care; Toshiki Kitano, accountant and provisions; Toyohiro Okuda, surveying; Syuzo Kondo, photography; George Oshima and Takane Fujiki, advisors.

ICE WORMS

On a visit the previous year, some members of the club had seen ice worms and one intent of their trip was to take some back to Japan as they were very rare there. They therefore brought appropriate tweezers, test tubes, and formalin for their capture and preservation. They found plenty of dark brown, 2-cm-long, *Mesechytraeus solifugus* on Byron Glacier. They supposedly come out of the ice at night to feed on pollen and algae.

CRESCENT CAVE

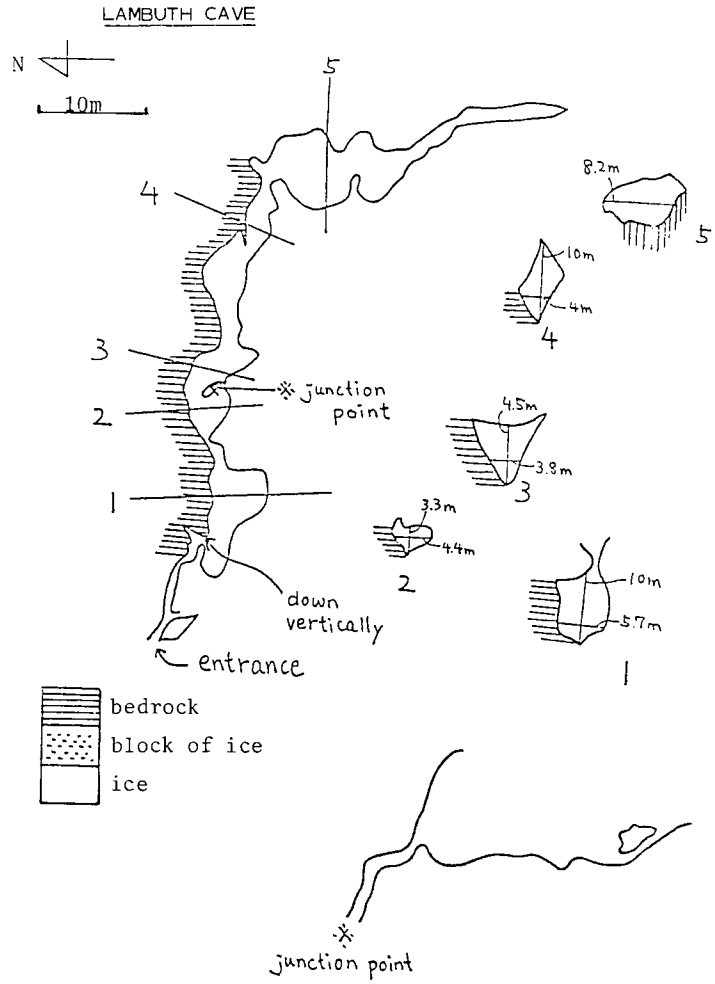
The entrance to Crescent Cave is 10 m high and 11 m wide above a pile of ice and snow. After climbing up the ice you immediately descend through a narrow opening and down a 35 m passage between bedrock and the glacier which opens into a junction room. From this room a passage goes left along the bedrock and another passage goes right between two walls of ice, one of which again becomes bedrock. The total length of this obstruction cave was surveyed to be 162 m.

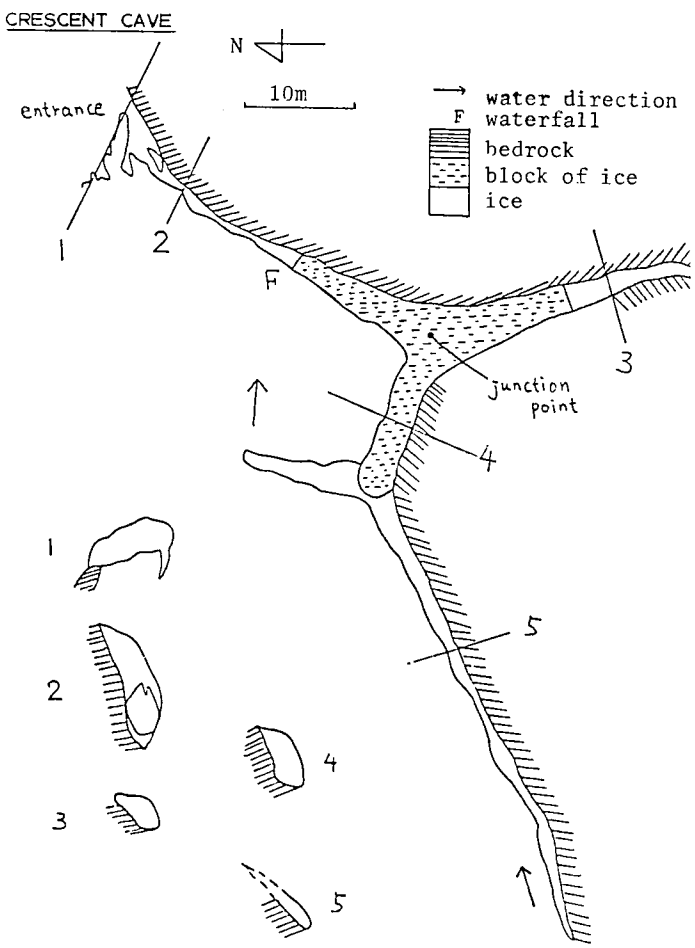
To get to this cave, follow the Byron Glacier trail from the back parking lot at Portage Lake and hike the 1.4-mi trail past the two snowfield caves more commonly visited by local cavers and up the glacier from the Byron Glacier Cave entrance. The Japanese cavers had attempted to enter this cave but found the entrance entirely collapsed. The entrance to Crescent Cave is on the right side of the bedrock portruding well above the Byron Glacier Cave entrance at 1,000 ft elevation. The location on the map is USGS Seward D-5 Quadrangle at 60°45'30"W by 148°51'N.

LAMBUTH CAVE

Although they returned to Crescent Cave on several occasions, usually discovering that conditions were too hazardous, they turned their attention to Crow and Milk Glacier north of Girdwood. In Crow Glacier they discovered Lambuth Cave which, although it looked like just another crevasse on top, contained 90-plus m of cave inside. The cave is rather vertical, contained many beautiful speleothems and had two levels of passage. It is created by an obstruction under the ice pack which leaves a pocket before the ice settles down to bedrock again.

To get to the cave take the road from Alyeska to Crow Pass trail and then 3.5 mi on the trail to the Crystal Lake cabin. A one-mi walk up to Crow Glacier from the north side of the lake brings you to a patch of blue ice in the glacier. The entrance is just above the patch of blue ice.





ANAKTUVUK CAVES

The Alaskan Caver 5(6?):5-6 Fire & Karl L. Flaccus

On July 25, 1977, under heavily overcast skies, we located and explored Old Peoples Cave (USGS Chandler Lake A-3, Alaska, quadrangle) then found two othe others to the east which were less spectacular, refe eferred to here as Coral Cave and Karl's Cave. As o one faces north toward the mountains which form one side of the Anaktuvuk River Valley, the cavernous entrance to Old Peoples Cave is easily spotted, as it lies approximately 1/3 the distance between the two prominent drainages. Coral Cave is to the east of Old Peoples Cave about 200 yds. All three have similar elevations of approximately 2,500 ft.

OLD PEOPLES CAVE. The ~~initial~~ mouth of Old Peoples Cave is an estimated 60 ft wide, 15 ft high, and 25 ft deep. In the base of the back wall is visible an opening--a horizontal crawl--which for only a narrow section is large enough to allow passage. Immediately upon entering one sees a triangle full of ice stalagmites that extend into the cave 30 ft. They are up to 12 inches tall and 5 inches thick and are mostly clear, smooth, and gently rounded, although those farthest in are sometimes pyramid-shaped and a few are extremely narrow. Some of the narrow ones are pointed inward away from the opening.

All of these formations are thinly rooted on the dirt floor and one must proceed very cautiously to prevent knocking them over. Their glossy crystalline appearance is startling and very beautiful. On the ceiling are large crystals which toward the rear of the cave diminish substantially in size and eventually end. We saw one 1½-inch-long hexagonal crystal. Many of the larger crystals toward the front of the cave resembled multifaceted candle ice. At cracks in the ceiling no crystals formed and we were unsure of the reason. In some places a section of crystals had peeled off from the ceiling and hung in a 10-12 inch arc.

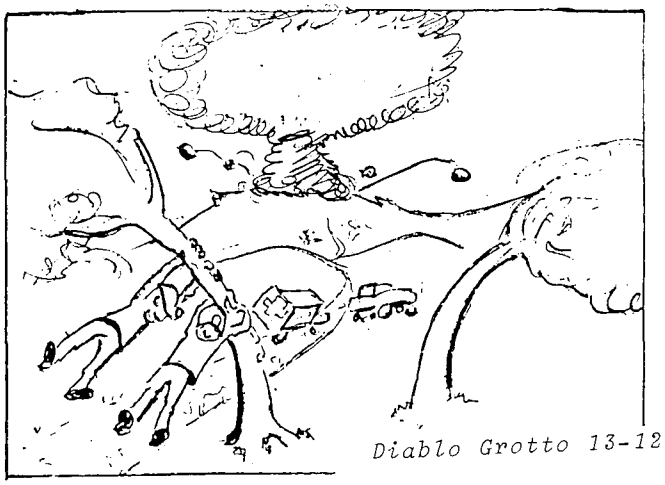
We found evidence of rodents in the cave: hair, gnawed bones, wood, and scat. Two of the back rooms may have been used as a rodent's den, as we saw a large amount of scat and hair and a depression in the floor.

The cave is fairly level and is up to 4 ft high, though in the further reaches it becomes barely high enough to crawl through. It is dry and dusty inside, but wet just outside the entrance.

CORAL CAVE. Coral Cave is about 150 yds east of Old Peoples Cave at the base of the cliff and above the scree. It is about 50 ft wide, 15 ft high and 20 ft deep. It is possible to descend 10 or more feet among the large boulders and rubble, at which level are small pools of water and ice. This may have been the opening to a larger cave at some time which is now blocked and is therefore of only limited interest. (Jay Rockwell points out that there are some coral fossils in the walls after which the cave is named. *TAC* ed.)

KARL'S CAVE. Karl's Cave, however, presents a possibility of further exploration. If one proceeds east from Coral Cave approximately 200 yds at a similar elevation, crossing a large fan-shaped rock slide, one can spot an obvious hole, at the bottom of the cliff which faces SW. The hole is also apparent through binoculars from the valley floor. Above and to the east of the hole 10 ft is the opening, into which one must ascend. It is a vertical crack, perhaps the result of a huge flake breaking away from the cliff. From the mouth it extends 60 ft up. There is a 45 slope one can ascend and eventually reach the cave's most westerly limit. From there the cave extends another 35 ft up.

Although we attempted a chimney climb up between the narrow walls, it proved dangerous without proper protection and we quite before exoploring its upper reaches.



"Damnedest rescue effort I've ever seen."

DRIP GRIND CAVE (and others)

White Mountains, Alaska

The Alaskan Caver 5(5):5-7 Rich Hall

Are there caves in the White Mountains? Yes, there are. Our trip there from July 20-27 confirmed that there are solution caves in the Tolovana Limestone although no major caves have been found yet.

Pierce and Emily McIntosh, John Foster, Sarah Forbes and I drove to Fairbanks on Saturday... Herman Bucholtz, a retired trapper and guide in the White Mtns., had some good advice for us on where to go and how to get about in the mountains but said he was not aware of any caves there. It was a beautiful sunny Sunday as we hit the old BLM White Mtn. Trail headed for the Borealis LeFevre cabin.

From the cabin, a 3-hr hike down Beaver Creek will get you to the most southwesterly peak of the White Mtns. Actually, our first attempt followed the southernmost meander of Beaver Creek and took 4 hrs with lots of grueling crawling through brush and slogging through bogs, but we found that by taking the northernmost branch and by crossing and recrossing the stream in the right places you can make the trip in less than 3 hrs, and more enjoyably.

The Tolovana Limestone has been described in a paper entitled "Preliminary Results of a Survey for Thick High-calcium Limestone Deposits in the United States" as "99 percent calcite with no dolomite or deleterious rock types, 1,500 to 3,000 ft thick" and was discussed in the *Alaskan Caver*, 5(2). The best book for a general geologic introduction to the area is USGS Bulletin 872, "The Yukon-Tanana Region, Alaska" by J. B. Mertie, Jr., 1937. More specific to the White Mtns. is a 1960 master's thesis by Richard Church and M. Charles Derfee entitled "Geology of the Fossil Creek Area". It describes all the rock units in the middle section of the White Mtns. and postulates that extensive faulting has caused the limestone to weather in two main ridges and several irregular outcrops. The double ridges referred to by Church are not evident in the area where we were. There was only a single ridge and all of the rock was slanted at an angle of about 80° with the strike running about N-NE, the same direction as the mountain range in general. The slope of the mountainside on the east side (our direction of approach) is about 60° but is not quite as steep as the west side. The east is covered with trees dead from a forest fire which makes it difficult at times to climb the slope. Thickness of the beds according to Church range from 2-20 ft near Fossil Creek; examination of the rocks in this area show the bedding variable from one inch to over 10 ft.

Church and Durfee measured the thickness of the limestone near Fossil Creek at 3,215 and 4,225 ft in two different places although the base is not exposed due to faulting and the upper contacts have been removed by erosion. The Tolovana Limestone only crops out as a band up to a few miles wide and 90 miles long; however, it is suggested that it is part of a much broader limestone deposit ranging from the Kuskokwim Valley to the Porqupine River.

All told we found three caves (defined as larger than body size) and a number of smaller solution and karren features. We saw our first cave, Drip Grind Cave, through our binoculars from

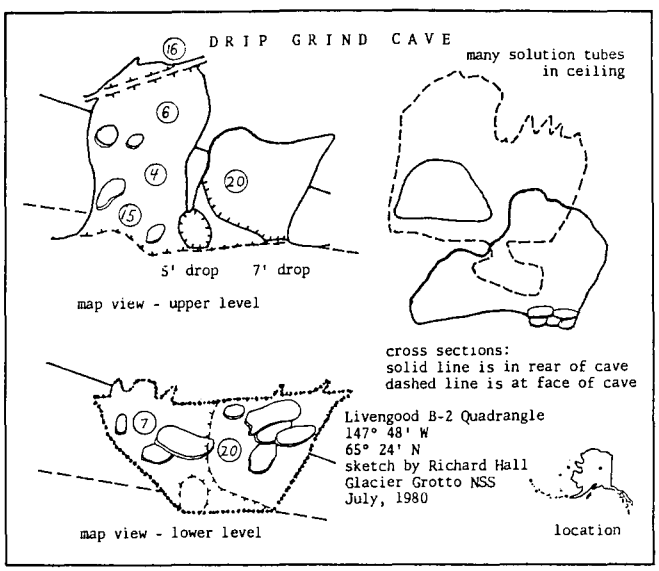
a half mile away which is why we decided to explore that part of the mountain. It consists of three rooms, one on the right that stretches the entire 20-ft height of the cave and two on the left, one above the other with the entrance to the upper from the cave face and the entrance to the lower via the righthand room. There are many small solution tubes up to 6 ft long around the walls of all the rooms and in the ceiling of the upper rooms. These may or may not be related to the vadose seepage patterns but water does, or has, run down the 80° bedding plane, into the upper part of the cave, then through the ground between the floors, into the lower room and out through the dirt and breakdown in the bottom of the cave, still following the bedding plane--much as water drips through a drip grind coffee pot, hence the name of the cave. The breakdown in the bottom of the righthand room consists of a pile of boulders with space underneath them but no effort was made to move the rocks and there was not enough room to fit between them.

There are also several other places on the mountain where solution (too small for humans) follows the bedding plane. There are two cases near Drip Grind Cave where these tubes form tunnels through peaks of some spires.

A small (18x24-inch) cave was discovered by John on Wednesday to the left and uphill from Drip Grind Cave. It went in for at least 12 ft before turning down and out of sight. He did not explore it due to the volume of marmot droppings on the floor.

I found another cave on Wednesday about 200 ft to the right of Drip Grind Cave and almost at the summit of the mountain. It consists of one big hole, 15 ft high and wide by 10 ft deep; more typical of a large frost pocket cave than a solution cave although there was a small solution tube in the back of it. It also was favorite animal shelter as it contained a large amount of animal feces.

The potential for caves in the White Mtns. is huge and it will take years to cover even a small part of them. To save time it would be better to do several things differently: Fly in rather than take four days hiking in and out.



Camp nearer the mountains rather than take a minimum of 6 hrs a day hiking to and from the rocks. Investigate the mountains further north where the limestone is thicker and there is less vegetation. Take a fishing pole. Note that travel earlier in the season could be hampered by higher water on Beaver Creek and by more mosquitoes.

GRAPEFRUIT ROCKS CAVES

The Alaskan Caver 5(2):3-6 Richard Hall

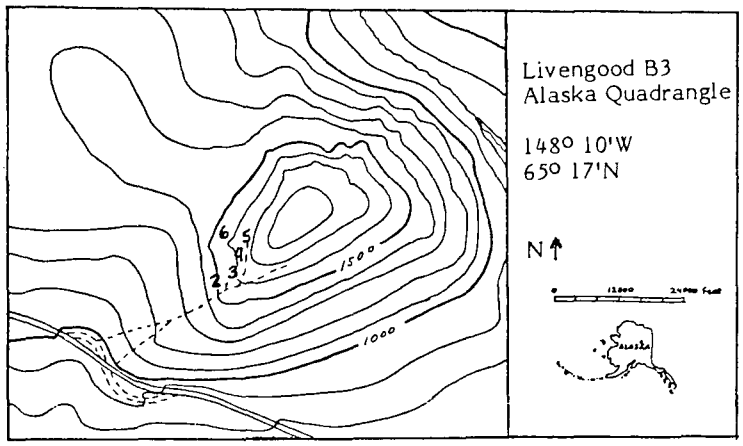
...Tom and Nancy Hallinan, their daughter Susie and I set out on the Elliott Highway toward Livengood. A few years ago the Elliott Highway was a quaint two-rut road to the Yukon River until the oil pipeline was built; it is now being widened, straightened, leveled and "modernized". This of course means that mile 39, where Grapefruit Rocks was supposed to be, is no longer mile 39, nor were there any mileposts that we were sure were accurate but we managed to find what had been referred to as an orange rockwall, right above several large earthmoving machines. So we parked up the road a bit, got out our gear and headed up the hill.

...Some climbers on their way down told us that the hill we were climbing had three major outcrop areas. The nearest was a series of small rock outcrops while the one to its north was mostly composed of one large piece of solid rock with several smaller ones near it (see map with cave locations). The third area is uphill and east of the first area but was not visited by us that day.

The Caves. Caves, of course, are all in the eye of the beholder; or should I say that the size of hole you will accept as a cave is inversely proportional to the length of time since you last went caving. With this definition of caving in the back of my mind, we began our search.

Three hours of searching produced five caves and one "too small" solution tube. Two of the caves appear to be of solution origin although frost action has modified them. The other three are rockslab caves. The first outcropping provided the three solution features noted here although some evidence of solution was seen in the second as well. The caves marked on the map as "1" and "2" are each about 6 ft deep but only the first was really wide enough for me to enter. The solution tube was only about 8 inches across but showed that there definitely was solution activity here.

The prominent feature of the second outcropping is what had been referred to as the "orange wall"; it is a sheer semicircular cliff ranging up to 100 ft high with orange stains on it. On its top side we found two places where 8-10 ft-long boulders had formed tunnels (caves #3 and 4). We all tried #3 but since the tunnel in #4 was a bit tight at one end, we let Susie Hallinan do the honors of climbing through; she said it was a "squishy-squashy place" though it looked like solid rock from outside. Definitely the largest cave was #6; it was formed by a huge piece of rock, 40 ft high, that had broken off and slid down the rockface forming a 25-ft-long, 25-ft-high tunnel ranging in width from 2-10 ft.



Location of Grapefruit Rocks Caves

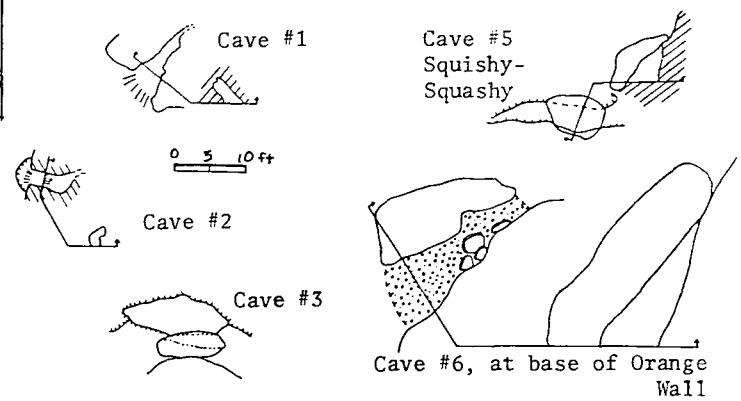
Tolovana Limestone. There were obviously no important caves found that day, but this one hill is a very small piece of an important geological feature of the area, the Tolovana Limestone. The main problem is that this is the only part of the Tolovana Limestone that is accessible by road. Also, there isn't much known about the limestone or its cave potential. A USGS Open File Report entitled "Preliminary Geologic Map of the Livengood Quadrangle, Alaska" by Robert Chapman, Florence R. Weber and Bond Taber, 1971, describes it as follows:

"Limestone is light to medium gray, rarely dark gray, and weathers white, very light gray, and yellow to buff, predominantly finely crystalline, thick bedded and massive, less commonly thin bedded, blocky jointed, locally greatly fractured and recemented and veined by calcite and quartz; locally some dense dolomitic limestone. Fossils are rare, and include corals, crinoids, brachiopods, and *Amphipora*; some have been identified as Silurian and others as young as Middle Devonian. Rocks are the same north and south of Beaver Creek Fault. Thickness is unknown but may be several thousand feet."

A paper entitled "Preliminary Results of a Survey for Thick High-Calcium Limestone Deposits in the United States with a Section on Possible Alaskan Sites for Nuclear Reaction Experiment in Limestone" (USGS Trace Elements Investigations Report 780) refers to the limestone as 99% calcite with no dolomite or deleterious rock types, 1,500-3,000 ft thick. It also says that the SW end of a particular ridge near Minto Flats is "probably cavernous." There are at least five major pockets of the Tolovana Limestone in or near the Livengood Quadrangle alone. The largest areas are in the NE portion of the quadrangle, in the White Mtns. (4 x 20 mi) and 20 mi north of the White Mtns. (6 x 12 mi). The area that includes the hill we explored is a mile wide and 10 mi long. The area referred to for the nuclear experiment is a miles by 6 mi and the last area is in the Dugan Hills west of Minto, just SW of the Livengood Quadrangle.

There are two other bands of limestone in the Livengood Quadrangle; neither is named. One of similar age to the Tolovana Limestone is evidently highly dolomitic, silicified, and has thinner beds so the chances of caves is less; however, the fact that it also crosses the entire quadrangle in a width that varies from 1-15 mi and that its largest concentration is less than 20 mi by road is of interest. The other band is of Cambrian age, is in bands up to a mile wide and scattered, mostly in small pockets, all over the quadrangle with one area of concentration in the NE corner.

All in all, the Livengood Quadrangle seems to have some cave potential, although it is virtually unchecked. Much literature research and field study is necessary if we are ever to find out if any sizeable caves exist and where they are.



PRINCE WILLIAM SOUND CAVES

The Alaskan Caver 5(6?):6 Frederica de Lagune

(This article is abstracted from a letter from Frederica de Lagune, Prof. of Anthropology at Bryn Mawr College to Dr. Warren Smith of the Dept. of Chemistry and Chemical Engineering, Univ. of Alaska in College, AK, on June 6, 1971. Ed [Rich Hall])

As a speleologist, I'm afraid you will find the "caves" in Prince William Sound disappointing. They are nothing like the deep caves you find in limestone country, such as caves in southern France or the Pyrenees. These Alaskan caves are really rock shelters, and, while I am not a geologist, I think they occur either in highly metamorphosed sedimentary rocks or in basalts, where either of these is layered and folded in arches. I'm familiar with prehistoric caves in France and Spain, as well as with the rock shelters in those countries.

The rock shelters in Prince William Sound were used for burial purposes, and I was, of course, disappointed to find that most had been rifled by pothunters or untrained persons. In Cook Inlet (Kachemak Bay and the west side of the inlet--Tuxedni Bay), there are also rock shelters. These, like some in Prince William Sound, have been utilized for paintings in my *Archaeology of Cook Inlet, Alaska*, which I assume would be in your library.

Aside from these shelters, the only other one I know is on the Yukon, west bank, right below the mouth of the Koyokuk. A rock inside the cave looks

something like a woman with a bowed head. The crevice in the basalt goes way back; apparently the narrow crack peters out upward, for there seems to be no draft through. I explored the floor of this cave but found no signs that it had been utilized by the Indians as a camping place.

Alabama

A New Find in Finley Cove
BEAR-HANNAH CAVE

Jackson County, Alabama

The Huntsville Grotto Newsletter 21(11):89-91 Marion O. Smith

During January, 1980, Tommy "Teddy Bear" Thurman (GA), Elwin Hannah (TN), and Elwin's non-caver cousin, Kenneth Robbins (IN), conducted a five-day backpack ridgewalk through much of the Paint Rock Valley. In addition to relocating a number of known caves, they discovered several holes that were high on the mountain and which took large amounts of water.

Among their more intriguing water insurgences was a particular hole in Finley Cove. But, due to scheduling problems, no trip materialized to check this lead until Oct. 11. On that day 'Bear, Elwin, Jim Youmans, Merilyn Osterlund and I congregated at the entrance from two points on top of the plateau...

A 70+-ft pit had already been found just inside the cave and was being rigged when Merilyn and I arrived... A walk-in entrance led immediately to a small dome, at the base of which was a crawl/squeeze to a 40-ft-long stoop passage to the pit. I was last down after Jim, Elwin and 'Bear, in that order. At the bottom Jim and Elwin crawled forward an easy 60 ft to a second pit of about 35 ft. Air movement into the cave was fairly strong and expectations were high. We rappelled this second drop (order: Elwin, Jim, 'Bear, and me) to find a surprise, a dead-end sump pool!

Disappointed, we prusiked back up to check for other possibilities. Youmans took the initiative, straddled across the top of the pit, and found a dome on the right side and then a short crawl on the left to a parallel 25-ft pit, with all the airflow. I joined him to confirm what he was shouting and next got 'Bear to send across the other pit some vertical gear and a rope.

The drop was rigged and Jim encouraged me to descend it. I soon saw why; it was rather tight! At the bottom there was only one way to go, a crawl which turned out to be some 15 ft long and quite snug at the far end. The squeeze ended at a 7-ft climbdown into a stream passage. Upstream a few feet was a sump pool, probably the other side of the pool at the base of the 35-ft pit. Downstream led some 250 ft through mostly easy crawls to an estimated 50-ft pit.

Returning to the squeeze, I relayed the news and encouraged others to bring the two remaining ropes. Elwin had already exited the cave to find Debbie and Donovan [his girlfriend and her son who had gotten lost on the ridge]. 'Bear found the squeeze at the bottom of the 25-ft pit tighter than expected, and after two tries also exited the cave. Youmans negotiated this obstacle successfully and we proceeded to the 50-ft drop, which we rigged and descended. Thirty Thirty or forty feet further was a 15-ft pit, which we half freeclimbed before decided to rig because we weren't sure we could get back up without a rope.

At the bottom Youmans led about 400 ft through predominantly easy crawl or stoop passage to a spot where, at a quick glance, it appeared the passage was going to become a grubby crawl. Since a flowstone passage existed on the right about 6 ft above the main stream level, a check for a bypass was attempted. I did a tight squeeze to about 30 ft of passage which seemed to dead-end, and in the process I got three-quarters soaked. Our attention now turned to the "grubby" crawl.

As it happened, after only 25 ft of easy crawl, we entered about 100-150 ft of 10-12 ft-wide, 8-ft-high walking passage to a 10-ft unclimbable shale pit. After failure to find a bypass we resolved to return to the previous 15-ft drop, and if we could freeclimb it, get the rope rigged there.

At the drop we succeeded in proving to ourselves that we could climb it, and thus removed the rope to the shale pit and descended it. Almost immediately there was a 12-15 ft pit for which we still had rope.

Less than 100 ft further, after a squeeze underneath breakdown and a couple of short stairsteps in the streambed, we reached a 20-ft pit. We stepped across and searched for a freeclimb route down, but failing in this, we had no choice but to call it a day and head out. We had explored about a thousand feet of passage and had reached a depth of at least 230 ft. 'Bear and Elwin had been justified in their high hopes for this discovery.

Two weeks later 'Bear and Elwin, accompanied by Youmans, Debbie Grimwood, Jill Dorman, Jim Smith and myself, returned to the cave. En route I found a virgin pit (named On the Way to the Cave Pit) which consisted of a 20-ft climbdown, rope drops of about 65 and 15 ft, and a total length of about 70 ft. Jim S., Jill and I (with Debbie topside) took time to explore it.

Meanwhile, the others had continued to the main objective and had begun rigging it. We caught up with Elwin at the traverse across the 35-ft pit, and soon all of us were at the crack just past the parallel 25-ft pit. There, after repeated and determined efforts, both 'Bear and Elwin were stopped cold. They were simply too big to fit! So, reluctantly, they and Debbie left the cave while the rest of us continued to the virgin 20-ft pit.

The order down this drop was Jill, me, Jim S., and Jim Y., after which we moved forward some 100-150 ft to our next obstacle. I followed the stream crawl while the others tried a dry overflow route. Because the others had to dig, I got ahead and found a 7-ft climbdown to a 40-ft pit.

Upon descending (order: me, Jill, Jim S., Jim Y.) this drop we immediately found a second 40-ft pit (order down: Jim S., Jill, me, Youmans) which led some 300-400 ft through more walking, stooping and crawling passage to a 10-ft pit. En route, we took time to explore a 150-ft-long upper side lead to a flowstone plug.

At the bottom of the 10-ft pit were six feet of climbdown and then the cave leveled out. But it was an estimated 1,500 ft before we reached the end. The passage continued to be easy, predominantly hands-and -knees crawl or stoop. About 500 ft from the end it got too wet for Youmans, who had no wetsuit, and he sat it out while the rest of us continued ahead. When we started seeing blind cave fish (we saw six) we began to lose hope that we would exit via a lower entrance (at least three known caves are at or near the base of the mountain). And this proved to be the cave. The end was a sump pool sort of dissected into two small rooms. The pool seemed quite deep since our electric lights wouldn't reach bottom!

We retreated to where Youmans was waiting, and then slowly all of us moved toward the entrance, derigging as we went. No one knew when we exited, but our guess was that our trip had lasted between 10 and 12 hours.

Our exploration in this cave was done during drought conditions when virtually no flowing water was present, only pooled areas. But there are indications that during the wet season great amounts of water flow through the passages, and judging by the mud, it appears that much of the lower passage backlogs with water and floods.

This cave, which as yet has no official name*, is in general one of Alabama's easiest multi-drop caves, but it does have a tight squeeze and somewhat dangerous traverse over a 35-ft pit. It has ten drops which ought to have a rope (70-80, 25, 50-60, 15, 10, 12, 20, 40, 40, and 10 ft), a total depth of at least 400 ft, and a minimum length of 3,500 ft. Altogether, it is a fine discovery and those who reached the bottom felt somewhat guilty in exploring passages which the discoverers couldn't reach because of their size. Hopefully, some of 'Bear and Elwin's other leads will "go" and they will be the ones to explore them.

[*A postcard from Marion O. Smith dated Oct. 5, 1984, indicates the name is Bear-Hannah Cave.]

BLOWING NAT CAVE, AL2025

Jackson County, Alabama

The Huntsville Grotto Newsletter 21(10):80-81

Eric Batchelder

For many years cavers have contemplated the potential for big cave in 140-ft-long Little Nat (AL942) The large entrance passage ending in a debris fill, combined with the cave's proximity to Fern, have led to speculation that Little Nat is a disjunct segment of the canyon development of Fern itself. If so, a breakthrough at Little Nat would open a new section of Nat Mtn. to cave exploration.

Little Nat is located in a 30x30-ft sink in a streambed on the west flank of Nat Mtn. The sink is located about 1,500 ft south of the Morgue entrance to Fern Cave. The Little Nat entrance is an impressive 8-ft-high by 20-ft-wide opening that leads northward down a rocky slope into a 30-ft-high by 30-ft-wide passage. About 100 ft into the cave a dirt and debris bank begins rising to the ceiling, blocking further progress at 140 ft into the cave. Water entering the cave flows around the west side of the debris mound for 40 ft before draining through rubble in the floor.

Efforts to find new passage have concentrated across from the cave entrance on the south side of the sink. Reasoning was that if Little Nat is a disjunct segment of canyon, the canyon passage should continue on the other side of the sink. Digging there also appeared easier than attacking the giant debris mound inside Little Nat. Early efforts involved the futile use of dynamite, and a day-long dig by Bill Torode that ended underneath a ledge at a solid rock wall.

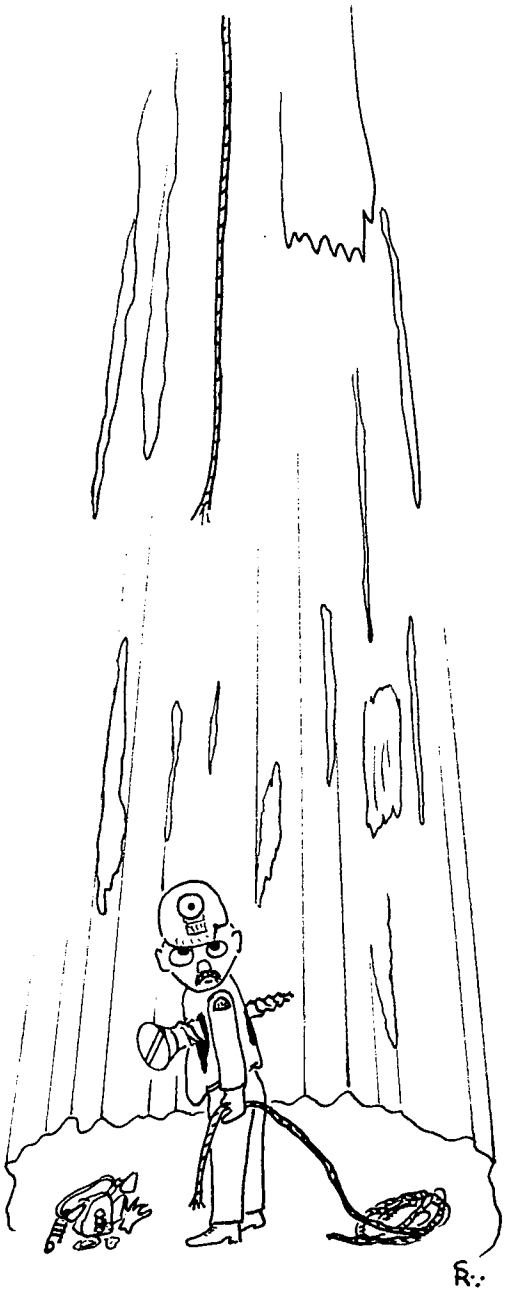
In the fall of 1979 I initiated several digging trips to the top of the debris pile inside Little Nat. Participants included Dick Sears, David Cass, Randall Blackwood, and Candy Batchelder. On the last trip Randall and I dug to a point where we could see ahead in a 4-inch-high space for about 20 more feet. This, combined with no noticeable airflow, led us to abandon the dig. On the way out of the sink, Randall looked at the site where Bill had dug years earlier and noticed a large volume of air coming up through a jumble of rocks. That night I called Bill and he said that where he stopped digging there was a dirt floor and no airflow. Apparently water had since washed the soil away and allowed the passage of air.

Several weeks later Bill and I returned to the site. After digging for several hours Bill was able to squeeze through a tight crawl into a disappointing 3-ft-high by 2-ft-wide passage leading south up a small stream. Bill pushed the stream for about 100 ft before turning around in disgust. The downstream passage ended immediately in breakdown.

In August 1980 Randall and Bill returned to the sink and mapped the crawl, which has since been named Blowing Nat Cave (AL2025). The passage continued for 75 more feet before being blocked by a flowstone plug. Bill noted that an exceedingly skinny caver could possibly squeeze around the plug. Before leaving the sink Bill and Randall remapped Little Nat.

Discovery of Blowing Nat indicates that the Little Nat sink is not a segment of pre-existing canyon where the roof collapsed. Instead this new find points to another theory, that Blowing Nat was once a continuous passage and that the creek overhead cut down into it. Water from the creek was pirated downstream by the passage and was responsible for eroding the large but short passage in Little Nat.

If this theory is correct, then two areas would merit further exploration. One would be the possible northward continuation of the old Blowing Nat stream passage at the ceiling in the back of Little Nat. As noted above, this would require at least another 20 ft of digging. The second area would be the present drain in Little Nat. Dye tracing could be used to see where the water in Little Nat goes. If it flows into Fern, then a digging effort might be warranted. In any case, the discovery of big cave in Little Nat is going to require a lot more work.



HGN

DOG GONE PIT

DeKalb County, Alabama

The F.R.O.G. Croaks 7(3):5 Jim Harrison

Mike Smith called and wanted to know if I could go ridgewalking with him. OK. Se we checked out a few outcrops on Big Ridge on I-65 in DeKalb Co. Having no luck, we decided to go over to Kelly Girls Cave in Collinsville to check on the amount of water coming out of the cave. This is a very beautiful cave that Mike and I have been mapping, but due to a rise in water level the stream passage access has been cut off since November. As we expected, there was a lot of water flow.

I entertained Mike with the idea that since there was quite a bit of airflow in the cave, there might be an upper entrance. Thus we set out to walk above the cave near the sandstone interface. Within 15 minutes Mike found a pit entrance. After pitching stones in we conservatively estimated the depth at 20 ft. Having no rope and being short on time, we headed back to Gadsden.

Five days later, on Feb. 15, we returned to the pit with 150 ft of rope. Since Mike had found it, he descended first. The pit was a double-drop with the first at 45 ft, followed by the second at 20 ft, slightly offset from the first. Mike reported from the bottom that there was a dog down there. Everyone started putting in orders for the parts they wanted, hoping Mike would not devour the best parts.

All five of us (Mike, A. Stelle, Dave Teal, William Gannett and I) yo-yoed the pit with the only mishap being William getting his glove stuck in his rack and stopping his rappel. William stayed calm and overcame the difficulty.

There were two things outstanding about the trip. One, it was the first time I had helped drop a virgin pit, and second, it gave an answer to that old song, "Where, oh where has my little dog gone?"....

ENGLE SINGLE PIT

DeKalb County, Alabama

The F.R.O.G. Croaks 7(3):5 Jim Harrison

My father and I, ignoring the cold weather and rain, drove up to Collinsville, AL, on March 1 to do some ridgewalking near Dog Gone Pit. After about 30 minutes of looking near the standstone contact, we found a pit in the sandstone itself! Having no rope, we left, but returned the next day.

I went down the estimated 50-ft pit, but found no leads at the bottom, which persuaded the others who had joined us that day not to descend. Really wasn't much other than yet another pit found in DeKalb Co.

EQUINOX PIT, AL2027
JUNIPERUS PIT, AL2026

Madison County, Alabama

The Huntsville Grotto Newsletter 21(9):69-70

Eric Batchelder

Common sense tells you certain things just are not done. Ridgewalking in north Alabama in the summertime is a good example. In addition to the dripping heat, lush jungle-like undergrowth reduces visibility to near zero and at time physically bars passage. So imagine our continuing surprise when week after sweltering week we return to Vernal Cave only to find more and more virgin caves--six so far, bringing the total of known caves in Pelletier Hollow to nine.

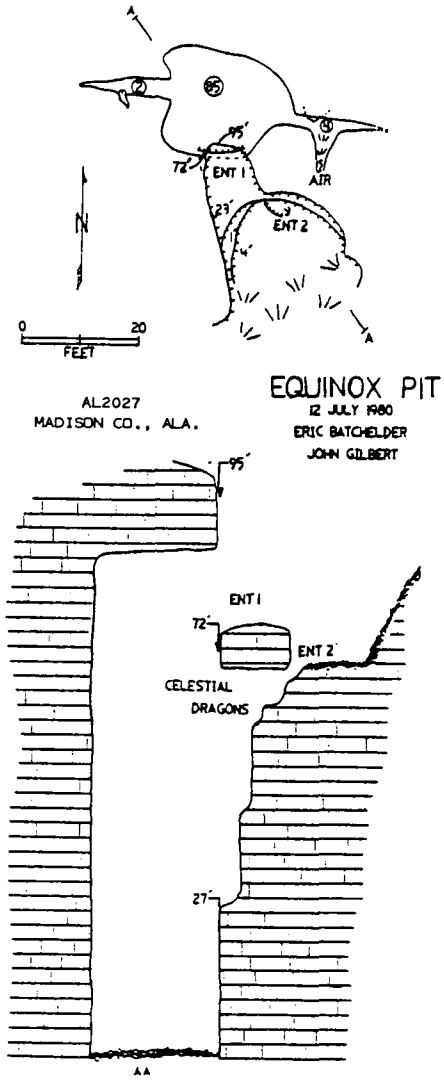
On June 28 Carl Craig, Tom Cleland, JV, John Gilbert and I returned to the hollow to begin exploration and mapping. We received permission from the landowner to go in from the bottom, with his only restriction being not to "git yer ass bit by a g.d. rattlesnake." JV managed to drive us close to Vinson Cave (which we had, according to Bill Torode, wrongly been calling Saturday Cave) and from there we climbed up to the bench where Vernal is. While walking along the bench, JV found a small pit that we left unchecked, and and just before we got to Vernal we stumbled across a large sloping crack that dropped into what seemed to be a 100-ft pit. This pit was also passed by with the consensus being that it would be entered from the bottom through Vernal.

Carl, Tom and JV began mapping Vernal while John and I went down to the creekbed to map the real Saturday Cave (which I had been calling Gilbrant Cave). We climbed down the 13-ft drop just inside the entrance and then mapped across a small room to a miserable drain crawl. At one point in the crawl I thought I heard rocks rattling down a void somewhere beneath us. On the way out John noticed a stiff breeze coming up from a small hole in the floor near the same area. Attempts to dig the hole open resulted in the discovery that the cobbles we had been belly-crawling over were actually wedged over the top of the pit. After some discussion as to whether further digging would cause the entire floor beneath us to give way, we dug into the top of a 17-ft-deep canyon. Chimneying down, we found another belly crawl that led to some water. We decided to leave it for wet-suiters who enjoy such things.

We returned to Vernal to find the rope still rigged, so we went down to have a look. The gaping m maw to Vernal is technically horizontal but is best entered using a 150-ft rope and a ranger rappel, the type you always see pictures of but never find the opportunity to do. The view from the bottom was spectacular, but we soon ahd to leave because JV appeared yapping about "Wonder Dome" and "Exhilaration Window" etc., etc.

On the way back to the truck we found a third virgin cave--a 50-ft pit that was saved for later.

The weekend after the SERA Cave Carnival at Russell Cave, a bunch of us returned to the hollow. Word of Vernal had gotten around at SERA and cavers from Birmingham, Atlanta, and Knoxville were represented. Bill Torode and Doug Bryant set off to look at Vinson and Saturday caves, while the rest went up toward Vernal. JV rigged the large drack previously found to the side of Vernal as Merilyn Osterlund, Tom Cleland, Joe Skipworth, Letitia Korbly and Jill Dorman prepared to check it out. John and I went on to Vernal and began surveying over to Equinox, which turned out to be less than 200 ft away. While we were mapping, Dan from Atlanta rigged Equinox and went on down.



The Equinox sink, which lies in a seasonal creekbed, is surrounded on three sides by 20-ft bluffs and is enterable by a steep slope on the downhill side. At the bottom of the slope is a shallow sink bordered on the back side by a rock saddle. On the other side of the saddle a pit opens back into the hillside. When the creek is flowing, according to Carl Craig, the resulting waterfall into the sink obscures the pit. Water flowing into the shallow sink in front of the saddle exits through a crack which leads underneath the saddle and into the main pit.

When rigged from the top of the now-dry waterfall the drop is 95 ft. Except for the first few feet, the drop is a freefall. The rope passes next to the saddle, allowing one to rig while standing and then simply step into rappel.

Two leads at the bottom quickly pinched out. The east lead going toward Vernal was taking air into some breakdown rubble, but further exploration seemed

treacherous. So much for the catchy-sounding Vernal-Equinox Cave System.

John and I finished mapping and started out... On the way out I noticed several intricately sculptured limestone figurines hanging by the barest of supports from underneath the saddle. They most closely resembled oriental monsters floating out in space, and I figured if JV could have his "Exhilaration Window" then I could have my "Celestial Dragons."

Back at Vernal we threw Letitia a handline to help her up the slope; a new entrance to Vernal had obviously been found. While everybody was exiting Vernal (they were all covered with mud for some reason), Merilyn, John and I went over and looked at the 50-ft pit discovered earlier. It was actually 45 ft deep and had no passage leading from the bottom. We called it Juniperus Pit after the generic name of a large cedar growing at the edge of the pit. We then made our way back down the sweltering mountainside.

KIRK CAVE, AL1896
FORT HOLLOW CAVE, AL1895

Marshall County?, Alabama

The Huntsville Grotto Newsletter 21(2):13 Doc Owen

On Cot. 7, 1978, John Van Swearingen IV and I checked out two caves in Fort Hollow (Grant topo) at the invitation of a fellow office worker, Bryce Click, who said he had a cave on his land. Both caves were located in a bluff not far apart with a spring at the bottom of the bluff. We designated the shortest cave as Fort Hollow Cave--it just barely qualified as a cave. The second cave showed more promise, starting out as a crawl and eventually opening up into a big room only to pinch back down. We had no mapping gear this day, so we returned home.

On Jan. 5, 1980, we returned to Fort Hollow to map the two caves. We found Fort Hollow Cave to be impenetrable beyond 17 ft because of lack of airspace above the flooded cave, so we mapped Kirk Cave at 765 ft total including a 90x40-ft room. The cave contains various fossils and small rimstone formations. It too was quite damp this day.

LOST STREAM CAVE

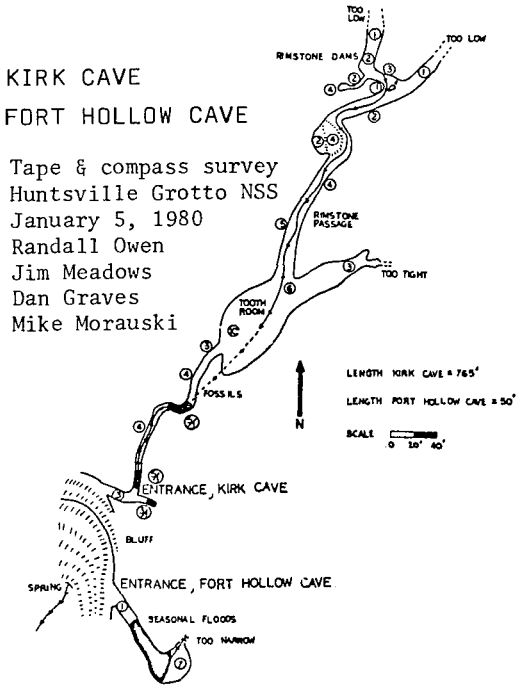
Morgan County, Alabama

The F.R.O.G. Croaks 7(3?):8 Bonnie Nestor

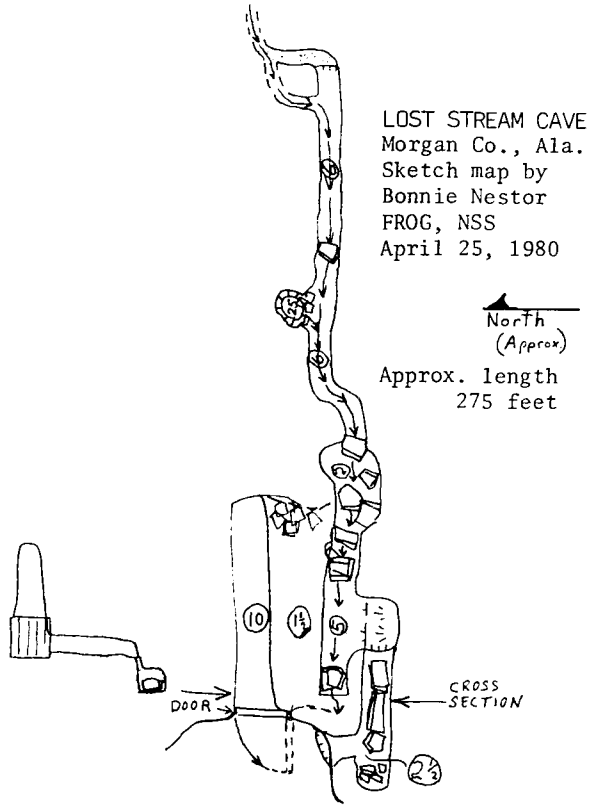
It was late in the afternoon; after driving all night and finding one dead-end cave after another, it seemed as though this trip to Alabama was somewhat of a flop. And now here we were on top of a foothill asking permission to get into some caves on the Bill Burleson property. Hope was almost gone of doing some really hard caving today, because he said what was on his property didn't amount to much. But we decided to go in and have a look around. Paul Boyer stayed behind to rest and the rest of us went over the cliff.

The first hole we got into had possibilities, but needed a lot of digging. Don Jarvanon and Mike Lancaster looked into another hole and Randy Nesmith and I went the other way. We found a door mentioned by Bill and went inside to a room which had apparently been used for coal storage in earlier days. Standing room was quite narrow, but a shelf alongside was wide enough to crawl on--which we did. When you get to the edge of this shelf you can see that what yu you are crawling on was once the ceiling which, needless to say, gives you an eerie feeling. Finding a hole which could be dug from the outside, it was soon cleared enough for me to enter and have a look around. Excitement surged through me as I peered under a ledge to discover a stream and a room about 5x5 ft. I didn't want to stop exploring even through I could he hear Randy calling to me. When I didn't return right away, Randy began whittling the entrance to get in, and by the time I returned he had succeeded.

We followed the stream for about 275 ft during which we could see layers of slate through which water had carved a path by years of erosion. Further upstream we found a dome about 25 ft tall in the bot-om tom of which was a lot of rubble which appeared to be



breakdown and therefore could perhaps be dug through and into new cave underneath. A ledge 20 ft up one side could perhaps be a lead to another level. Just before turning around I crawled onto a sandy ledge which led back to the stream again and then got very tight. Nevertheless the cave continued so we didn't get to the end of the cave. Since it was after 1800 we left, spending some time concealing the entrance from any vandals who might happen by, and climbed the cliff to rejoin Paul. It was a lot of hard work digging out the entrance, but the thrill of discovery was worth the sore muscles we would have tomorrow.



RICKETT'S CHASM

Marshall County, Alabama

The Huntsville Grotto Newsletter 21(7):53 Eric Batchelder

Not a major cave, but Rickett's Chasm is unique in at least one aspect--it was at its discovery probably the only virgin cave in Alabama within 50 yds of a major highway and having a trail leading right to its entrance.

In had discovered the cave on a solo ridgewalk b back in March. It was in sight of Hwy. 431 and the next week I returned, this time pulling off the road at Rickett's Gap into what I presume was the Rickett's abandoned homestead. Behind the outhouse (two seater) was a trail that led right to the entrance. I imagine the Ricketts spent many summer hours cooling off in the cave's sink.

The cave takes water from both a creek and a nearby spring. There are actually two entrances, both steep climbdowns. The passage is a narrow canyon leading down an unstable 45° rock-strewn slope. A 50-ft wet drop is at the bottom of the slope.

On the mapping trip, JV Swearingen, Clark Mikkelson and I crawled out on a mini-Surprise Pit-like ledge and rigged the drop dry from a little alcove. The bottom consisted of three 50-ft domes, one with a crack leading off. It dropped down to a good-looking walking-sized tunnel, but the passage dead-ended just around the corner. (Well, a tight bore-hole did lead into a stream crawl, but JV "Stringbean" Swearingen said it was too tight for him.)

The cave did take its toll. On the way out, Clark's pack opened while he was on the ledge, spilling its contents back down the pit.

SALTPETER CAVE, AL1900
INDIAN CAVE, AL1899
POWELL COVE CAVE, AL1897

Cullman County, Alabama

The Huntsville Grotto Newsletter 21(2):12-13 Doc Owen

In Nov. 1978 Jim Meadows told me of a cave he had found south of Hartselle near Lacon. The location he indicated was in an area of no known Alabama cave. On Nov. 11 Jim and I went to the area just west of Lacon and proceeded down the creekbed past a very nice waterfall to the walk-in entrance of the cave just off the north side of the creekbed. The walk-in entrance very quickly became a low, sometimes wet, crawlway for 100 ft or so before opening back up into a relatively high maze-like area. There was a shallow stream running through the cave and disappearing at the entrance. The cave contained no notable unique features other than a curious signature dated 1842. We emerged from the cave, and knowing our location on the topo, proceeded across the creekbed and slightly east to find another cave. We had indeed located Saltpeter and Indian caves on the Falkville topo, but not where indicated by the geological survey. (These caves had been presumed lost until now.) The caves actually occur in Sec. 34 in Cullman Co. and not Sec. 27 in Morgan Co. Indian Cave is a short crawlway in a very large cliff/distortion area. From Indian Cave we proceeded to embark on some ridgewalking which produced a new cave that we designated Powell Cove Cave, a small cave but nonetheless a cave. From here we hiked back up to the top of the ridge to the Jeep and did not return to the area until Sept. 22, 1979, at which time we returned to map the cave, and of course take some pictures of the very nice waterfall near the cave. We mapped almost 800 ft of cave.

Finally on Jan. 6 of this year Jim and I returned to the cave to finish up the mapping in the maze area at the back. Also I wanted to take a picture of the 1842 date and signature: "1842, Steven Hart". The signature indeed looks very old and appears to be burned in by carbide or candle and is distintively different from the other "normal" graffiti appearing just inside the cave. Nearby we found two other signatures, "Daniel Hart" and "Gary Hart", but they were undated. After photographing the date and finishing up the mapping with 795 total feet we

returned home.

Research into the name and date resulted in some quite interesting facts. Based on the 1830, 1840 and 1850 U.S. Census of Alabama:

1. Thomas Hart (originally from Kentucky) and his wife Sarah (originally from Tennessee) lived in Morgan Co. from about 1818 to 1845 before moving to Coosa Co. The Harts resided in the community of Bell Springs, which is just SW of Lacon and within 1½-2 mi of the cave.

2. Thomas Hart had at least nine daughters and at least five sons.

3. The sons' names were Joseph, John and Thomas; the others' names unknown.

4. The daughters were:

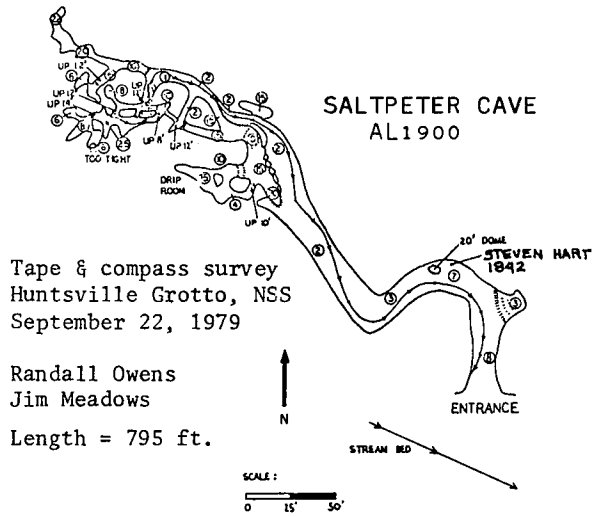
Lutilia,	who married	Joseph B. Nunn	on	1/5/1835
Sophia	" "	Alex F. Patterson	"	12/10/1835
Sabrina	" "	James B. Wilhite	"	11/7/1838
Gradith	" "	Gibson Wolfe	"	1/24/1840
Sarah Ann	" "	Wiley W. Wilhite	"	1/17/1844
Leotha	" "	William G. White	"	?

5. All the Harts except the married daughters moved from Morgan Co. by 1850.

6. The name Wilhite appears on the Falkville topo as Wilhite Cove and Wilhite Station just SE of Bell Springs.

7. The name Powell (reference topo) also is referenced in this time frame.

In summary, the authenticity of the "1842 Hart" signature seems likely based on the facts presented here, namely that Harts did reside in the immediate area at the right time and two sons' names are not readily known. Any readers are invited to research this more thoroughly in order to verify this as one of the oldest signatures in any Alabama cave.



SCOTT CAVE, AL58*

Madison County, Alabama

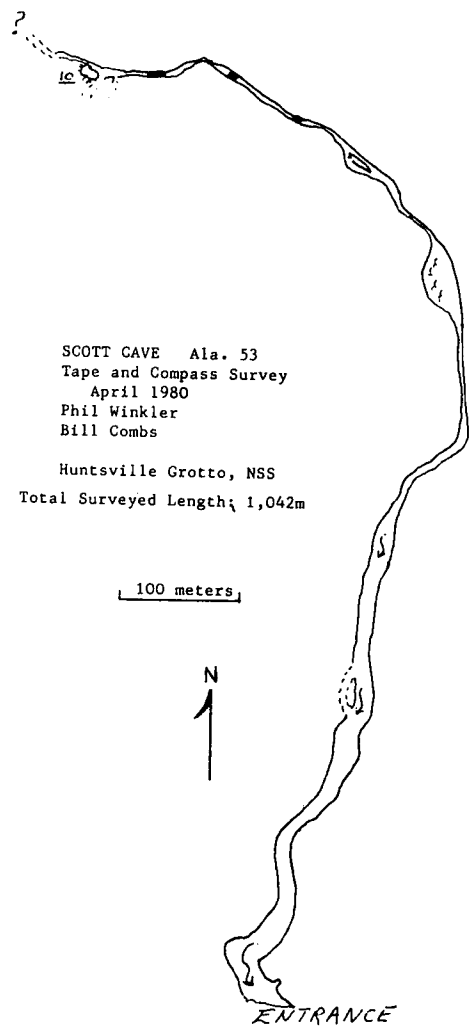
The F.R.O.G. Croaks 7(3):2-3 Phil Winkler

Bill came out from Texas to do some good old pit caving, but I talked him into bringing his wetsuit as well since there was this old lead I just wanted to poke into. Alabama 58, Scott Cave, has been visited for years and is marked on a topo map. The owner has gotten his water from the cave for over 15,000 years and it has never gone dry. Some five years ago he told me several stories of cavers spending hours and hours in the cave, but the current survey showed only 355 ft mapped by Torode over 10 years ago and ending in a stream crawl.

Now, I had been past this point several times and just didn't consider it a crawl; this was going cave!! So, armed with survey gear, we told Mr. Salters we'd probably be gone awhile and headed for the cave, entering about 1430.

It had rained terribly hard the previous night and also that morning, so we looked carefully on the way in for escape routes and high water marks, of which there were both.

We photographed a very angry white crayfish who had demonstrated to Bill his ability to pinch through wetsuit gloves (snicker, snicker).



The cave proceeded in very long, straight sections. Water flow was constant. The cave was almost level, only rising at rimstone dams which varied in height from 0.2 m to 1 m. The dams were followed by large, sometimes deep lakes. In two places we saw large high passage, perhaps at a confluence of another stream, since, although we followed a stream the whole way, later plotting of the map indicates a good chance of another stream at one of these big rooms.

In the first big room were thousands of gray bats and a few pipistrelles inhabiting what appeared to be a large upper room, but their commotion was quite unpleasant and we chose not to disturb them further.

Another standing-room room was beautifully decorated and here we saw the last evidence of any other cavers. From this point on it appeared all virgin, although it was hard to tell since we didn't seem to be leaving many tracks in the water, either.

We reached what appeared to be a sump and rested to take a picture and remove some gear. Bill started talking about things like this in England and asked me to hold his helmet while he pushed this wee little passage over here.

Once on the other side (just barely audible) he asked me to bring his helmet to him. The passage was about 10 m long and at its lowest spot there was less than 3 cm of airspace. In fact, my nose got lacerated from forcing it to the ceiling.

We then passed two more larger siphons and came to an area of domes containing large, sharp breakdown. I climbed up one dome for about 10 m, but the rocks were so unstable that it was not safe to continue (after all, it was a long way back, wasn't it, Bill?).

The cave pinched down here to very low water crawl, but it does continue! We surveyed out from here, making many 30-m shots. At the entrance we were met by several deputies holding a large ball of string and about to attempt a rescue. A few explanations calmed them and we all went home.

*[Listed on Winkler's map originally as AL53, but he assures me it is really AL58. --*SD* Ed.]

VERNAL CAVE

Madison County, Alabama

The Huntsville Grotto Newsletter 21(7):52 Carl Craig

This "new" cave was discovered on the first day of spring this year but was not entered due to extreme wetness--of the caver, not the cave. A monstrous rainstorm was in progress at the time and all thoughts were directed toward getting back to the car before the whole mountain was washed away.

The weather on the first Sunday in May was too nice to waste by doing any kind of useful work so we decided to spend a leisurely afternoon checking out the new discovery. By about 1 p.m. we were trudging across the face of Keel Mtn. through luxurious growths of poison ivy, armed with a couple hundred feet of rope and great expectations.

The entrance to the cave is, to say the least, impressive. A great gaping hole slopes downward into the mountain at an extremely steep angle. It can be easily climbed but a slip could send the unfortunate caver tumbling more than 100 ft into a rockpile. The rocks didn't look very inviting and the slope continued unabated beyond the twilight zone so we rigged a handline to make sure we all didn't bounce off into oblivion. At the end of the 90-ft line I was nowhere near the bottom of the chute so a 120-ft rope was substituted. This allowed all of us to at least reach the loose rock slope and better footing.

At about 150 ft from the surface we came to an intersection where we split for a quick look. Nancy (Craig) went up to the left in a big dry passage to an apparent dead end. Dottie (Alexander) went straight on down the slope to the bottom of a small waterfall and a definite end. It was an end, that is, unless one wanted to try to climb the waterfall. No one did.

To the right of the intersection the passage just just kept going down and down. Nowhere was there a level spot but neither did we encounter any dropoffs. Shortly we came to a limestone wall with a small crack at the bottom with inflowing air. After kicking a few rocks out of the way we wiggled on down into a small solution crawlway, complete with a nice little pool of ice water. Beyond the water the passage opened into a big walking canyon with a small stream.

Just when we thought the cave might really go it stopped. The stream disappeared into the rubble floor and the passage pinched out. The only way to go from there was up through (through, not over) an unstable looking pile of rocks into what appeared to be the bottom of a dome room. The climb looked too hazardous for what it promised in the way of more cave so we decided to expend our energy elsewhere.

Once back outside we went over 100 yds to a pit of undetermined depth that had also been discovered on the earlier trip (Equinox Pit). Unfortunately the waterfall that disappeared into the drop was still of such proportion as to exclude any possibility of entry without a complete soaking. After scrambling about a bit to find a way around the waterfall we gave up the idea as hopeless. If it's left to us, this one will have to wait until the dry season.

The two caves are almost certainly a part of the same system and probably drain into Saturday Cave [Vinson Cave; see Equinox Pit report by Eric Batchelder.] (AL563) which is below them in the creekbed of Pelletier Hollow. Dottie and I had rediscovered this cave on a grotto ridgewalk earlier this year. Al-

though it was obviously a going cave, we didn't spend much time exploring because we knew that it was already on the survey, or at least we thought so. A later check of the records gave almost no information on Saturday Cave...

Pelletier Cave was positively identified using Bill Torode's sketch map, but the location data on Pelletier and Saturday caves are confusing...

(Carl has got to be credited with the year's best ridgewalking results. Seven of us returned with Carl to Pelletier Hollow on June 21 to see what the crazy old man was babbling about. Now we know. The entrance to Vernal Cave is everything Carl says it is and more. The far side of the sink is a 120-ft-high rock face with a half-eroded shaft in perfect cross-section running its entire height--one might say a real "open air" pit. Also, Equinox Pit is now dry. The waterfall that stopped Carl in the spring plunges down a large 50-ft-deep borehole shaft.

We found two more virgin caves while in the Hollow, bringing the total number of caves in the area to seven. All but one are unmapped. Looks like a lot of time will be spend working this system out. --Ed. [Eric Batchelder])

* *

The Huntsville Grotto Newsletter 21(10):79-80 John Van Swearingen IV

On June 28, 1980, I met with Eric and Candy Batchelder for our usual pre-cave breakfast at Gibsons's. Eric had already described the previous week's trip to the area of Vernal Well. Carl Craig had initially discovered Vernal Well and several other leads in the area. Most of us were already immune to Craig's usual statement about his latest find being Alabama's biggest and best, but Eric had already stated, "I think the old man has something this time." Hence, on the testimony of at least one reliable witness, I had agreed to accompany them on the trip.

Once we arrived in the area, a cave on Keel Mtn., we decided to try to locate the landowner. We lost about an hour, but finally ran him down. As it turned out he was totally unconcerned about the presence or absence of anyone on his land. The totality of his attitude could be summed up by one quote: "Don't get your &*#(@&$! (expletive deleted, connotation hind quantem) bit by a &#*$&! rattlesnake." We followed his request to the letter.

From the owner's home we next proceeded to Horse Cave by Keel Mtn. After about a half-mile of 4WD, the road slanted to veer away from our destination. So we parked and climbed up about 300 ft on the mountain to a wide level bench. We immediately discovered two new pits, both about 40-50 ft. I was informed that there already existed another virgin pit of about 40-50 ft on the mountain. Since our destination was Vernal Well and we also knew that it had virgin passage, we elected to continue to it.

Shortly thereafter we all reconvened at Vernal Well. The entrance can only be described as one of the more impressive in our area. One side is a sheer drop of over 100 ft while the other side (over 200 ft across) is a steep 51° slope leading to the bottom of the shaft. The impression is that of a cutaway of a pit--something generally only seen underground.

We decided that Eric and John Gilbert would begin mapping a small horizontal cave nearby while Tom Cleland, Carl and I would begin mapping Vernal. Although the entrance slope is climbable, we decided to rig it at least for mapping purposes. In retrospect this entrance should probably always be rigged with at least a 150-ft handline, since if one slips there is absolutely nothing to stop a rolling fall down to the rocks below. We quickly mapped down to what could be called the technical entrance to the cave. It was somewhat interesting to be 104 ft below the edge of the sink staring up a sheer 100-ft shaft and only be at the entrance to the cave.

The next shot brought us to a junction where the passage pushed both to the left and right with the main slope continuing its downward trek with somewhat abated slope. We decided to take the left fork which ended after about 100 ft in a 10-ft pit. Carl had already informed me that the main slope had a definite end so we returned to map it down to a level of -143 ft. The view back out to the top of the sink was truly impressive.

Proceeding down the right fork which was steep but easily climbable we encountered a large offset room with a small window back to the main slope. We quickly ran into two other passages. One passage started with very sttep slope out of this room while the other was a 4-ft climbup and seemed to be heading up. We chose to go up.

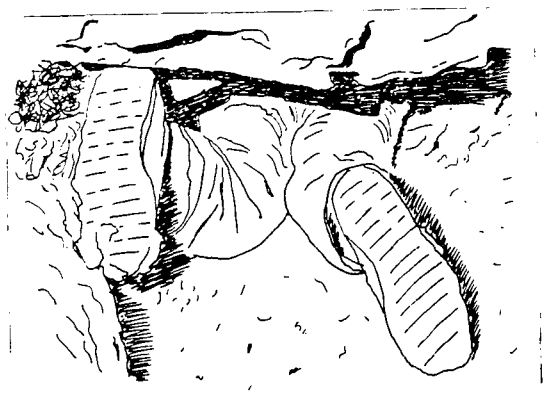
A series of short climbups led to a very nicely decorated room. At the edge of the room we found ourselves staring into a deep drop. Tossing several rock rocks enabled us to estimate a depth of 100 ft, although we really could not be certain since the shaft seemed to be offset. We explored around the balcony of the drop, noticing a small crawl blowing hot air. Since Carl had to leave us, we decided to return to the large room with the other lead.

Tom and I mapped down the crawlway going out of this room for about 60 ft and it opened up into walking passage. We quickly came to an abrupt end with a window into a high dome. I climbed up, followed by Tom. Noticing fresh impact marks, we immediately concluded that this dome was the bottom of the deep drop that only a few minutes before we had gazed down.

Wrapping up this part of the survey, we proceeded to head out. We met Eric and John in the large room and all agreed to leave the cave.

Vertical gear proved entirely unnecessary to get up the slope, since it could be quickly climbed using the rope as a handline. We rapidly made our way through the thick underbrush back to the vehicle. On the way out we paused to graze on some nice, ripe, luscious blackberries.

Eric was right. The old man really did have something after all.



California

CAT CAVE

San Bernardino County, California

The Explorer (Feb. 1980):22-25 Russ Harter
The Explorer (Jul. 1980):121-123 Ben Moon

[NOTE: The following is compiled from the above reports. The initials of the person writing appear at the beginning of each segment.]

(RH) Several factors combined to make this (29 Dec. 1979-1 Jan. 1980) an outstanding trip to Pisgah Cave in the Mojave Desert. Present were Ben Moon, Frank Turner, Kevin Plaxco (and his parents), Liz Harter and Russ Harter.

There seemed to be an abundance of obvious cave life, possibly due to higher than normal humidity in the caves. (To my knowledge, none of the cave biota have ever been studied at Pisgah.) A heavy rainstorm seems to have hit sometime during November, evidenced by dust cave floors that have been cut recently by running water. In Glove Cave, a white bug with a body length of perhaps 1/16 inch, and six long legs, was found clinging to the underside of the register. The insect was obviously adapted to the dark since it had antennae 1/4 inch long. A year ago, Sam Hails and Jim Proffitt reported seeing two pale 1-inch scorpions in the small room at the lower end of the loop crawlway. About 10 years ago, I saw a couple of pale spiders about 3/4 inch across the legs in the loop crawl.

In 012 Cave, we found a pale spider (about 1 inch across the legs) and a 1/2-inch silverfish-like bug. A silverfish was also noted here on 1 Jan. 1972.

Evidence of mud soda straws has returned in SPJ, including a mud helictite about 5 inches long and numerous fragments on the floor below. The last mud soda straws were formed, and soon afterward disintegrated, eight years ago. It appears that the mud comes in through cracks in the roof from a small sink on the surface. When the mud dribbles in, it dries quickly leaving hollow soda straws composed of silt and slightly more than 1/8 inch in diameter.

...Ben and I cased several likely-looking spots uphill from QQ Cave, hoping we could find a natural entrance into the cave that I was sure would lie below. Meanwhile, Frank and Kevin checked out a few "known" caves and discovered a connection from QH to QZ. Energy soon gave out, and they wandered over to a lava mound, where the warm midday sun soon had both of them napping.

Ben and I came back for lunch after deciding that the most likely spot to dig would be the featureless lava mound where the other two were. Soon a hole a few inches across had been opened up. Looking inside with a flashlight, I could see a dusty floor 7 ft down. Off to one side, directly below where Frank had been sleeping on the 6-inch-thick lava roof, was a black pit!

We had no desire to do more digging in the top of the mound since we might remove the keystone and fall through. Another dig was immediately started, this time through the side of the hill roughly opposite the pit. This dig proved much more difficult than the first. We had to penetrate about 1½ ft of lava, the lowest portion of which is very dense, hard, and in very large blocks. After three hours of hard work we had a hole that I could barely squeeze through. I took a look at the pit from inside, decided it looked about 20 ft to the bottom, and went for my gear... Ben went in first. As soon as I was on rappel, my estimate of the pit depth jumped to 35 ft. Later rough measurement of the rope gave a drop length of 47 ft from the surface to the bottom of the pit and a rappel distance of about 30-40 ft. At least the bottom 35 ft is completely free.

(BM) I found myself in a large teardrop-shaped room. The very front of the large end was fairly clear of breakdown and 8-10 ft lower than I was. The back of the room had a lot of breakdown and was 8 ft or so higher than I was.

(RH) The pit room is about 35 ft wide and 60 ft long with a breakdown floor. To the north, a passage continues to an impassable tight opening a few inches high that I estimate to be 80-100 ft from a similar spot in QQ Cave. Near the end of this passage is a miniature alluvial fan of dust washed in through a crack in the wall. Near the head of this fan is a mud stalagmite 3/8 inch in diameter and about 2½ inches high.

(BM) The back [north] of the cave was a short tube curving in a crescent and pinching out. We could see a lower level through a couple of large holes. We climbed down and explored the lower tube. This one ran for about 90-100 ft, and it was going toward QQ! It pinched down but not out. It also looked like it expanded on the other side of the tight spot, and it was tight. It looked like an aa choke and felt like an aa choke.

We backed out and checked the front of the main room. There was a passage down low at the head of the room. This turned out to be the continuation of the lower level, the main tube. It led for 80 or so ft further up flow. At its end is a classic breakdown choke and a small dome with a passage at the top. (RH) A passage leading to the SE from the pit room ends in a breakdown choke that had a small amount of lava run through and weld it all together. This is the finest example of this type of plug that I have seen anywhere. (BM) This [small dome] bears in the same direction as the main passage but was not climbable.

When we returned to the main room we found yet another tube about 20 ft up the wall which also led upstream. We climbed up and pushed it. There were a couple of small side leads we decided to leave for later. This passage had a small room with a lot of breakdown to clamber over. Once in it, we found a spacious room with a breakdown floor, about 15 ft wide, 40 ft long, and 10 ft high at the highest point. There was, maybe, a small lead out of the bottom.

The tube continued upward and started narrowing. At the top of what became a crawlway, we found a circular room and the dust-covered remains of its last occupant. A cat of some sort had found its way into this cave, found the softest place in the cave, and then died. The bones have been there a few

hundred years, judging from the amount of dust washed into the room.

(RH) A passage leading to the SW from the pit room ends in a belly crawl where there is a small pile of bones. These appear to be the remains of a cat only slightly larger than a house cat. Lacking any better name, the new discovery is "Cat Cave." Its total horizontal length is about 500 ft.

Just before climbing out, I saw a pale spider (¼ inch across the legs) beside its web.

(BM) In Feb. 1980, Russ and Liz Harter took some So. Cal. cavers and BLM people on a tour of Pisgah flow. I went along for the ride. We met Kevin Plaxco and his parents at Pisgah.

I showed Kevin around Cat Cave. When we reached the Cat Passage we checked out the two side leads. The first is a 10-15 ft crawl, hands-and-knees, to a small room. The lava in here is very dark and has many patches of thenardite crystals. These patches are snow white and very clean. The effect is somewhat like stars at night--thus, the Starlight Room. One end pinches down, but not out. From the number of mouse tracks, I would guess the tube connects to the surface.

(RH) The dust, or dried mud, is extremely fragile and easily disturbed. Also, thin, wispy mats of tiny thenardite or gypsum needles are present on the breakdown blocks. These won't even be seen if someone uses a dim light. There are two rafts of thenardite (Na_2SO_4 [sodium sulfate]) in the cave, each about 2 inches by 2 ft by 3 ft. A much larger thenardite deposit in Glove Cave unfortunately lies on the main trail and is now thoroughly trampled. It was once a mass of fluffy cotton balls like the ones in the new cave. Additional traffic through Cat Cave is bound to cause degradation unless cavers are very careful about where they step.

(BM) The second lead is located at the base of the slope leading to the cat bones. The start is a belly crawl across hunks of aa (the last flow had aa "in" it) with remelt hanging from the ceiling. It's tight enough to require removing one's hardhat. Many pieces of junk needed to be removed before entry was feasible. I have done crawls on lava with remelt, so I let Kevin give me a report on the room. It's called the Rat Room from the rat (?) bones he found. The room curves back beneath the Cat Passage and has many clinkers in it.

The third trip included Russ and Liz, Ben, Ray Hardcastle, Debbie Gogatz and Lee Blackburn.

We proceeded downstream toward the pinched end. We worked at clearing the loose stuff and managed to clean up a surprising amount.

We checked for side leads in the breakdown but found none.

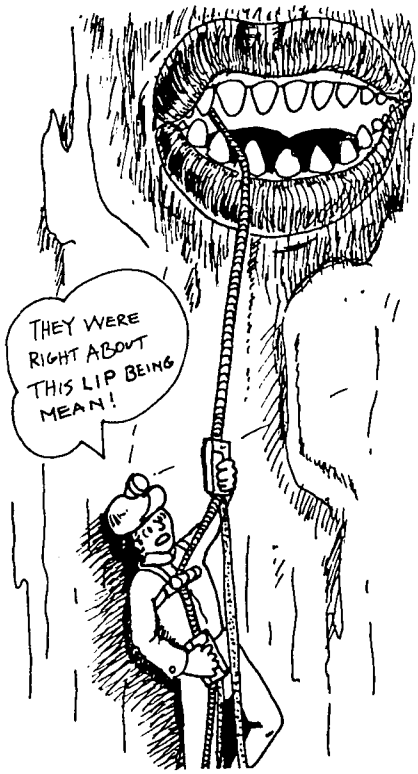
The third trip included Russ and Liz, Ben, Ray Hardcastle, Debbie Gogatz, and Lee Blackburn.

We entered the cave and headed for the pinch. Russ and I guessed there might be 80 ft between Cat and QQ. We wanted to try to get a visual connection between the two caves. Russ brought his tools with him, as we figured we had a good chance.

After a few eternities of hard work moving rocks I could see the ceiling sloping upward--by daylight! I'd broken into QQ very close to the Black Hole entrance.

As of this writing, there remains only one more lead to push; we will probably have to build a ladder in the cave to get to it.

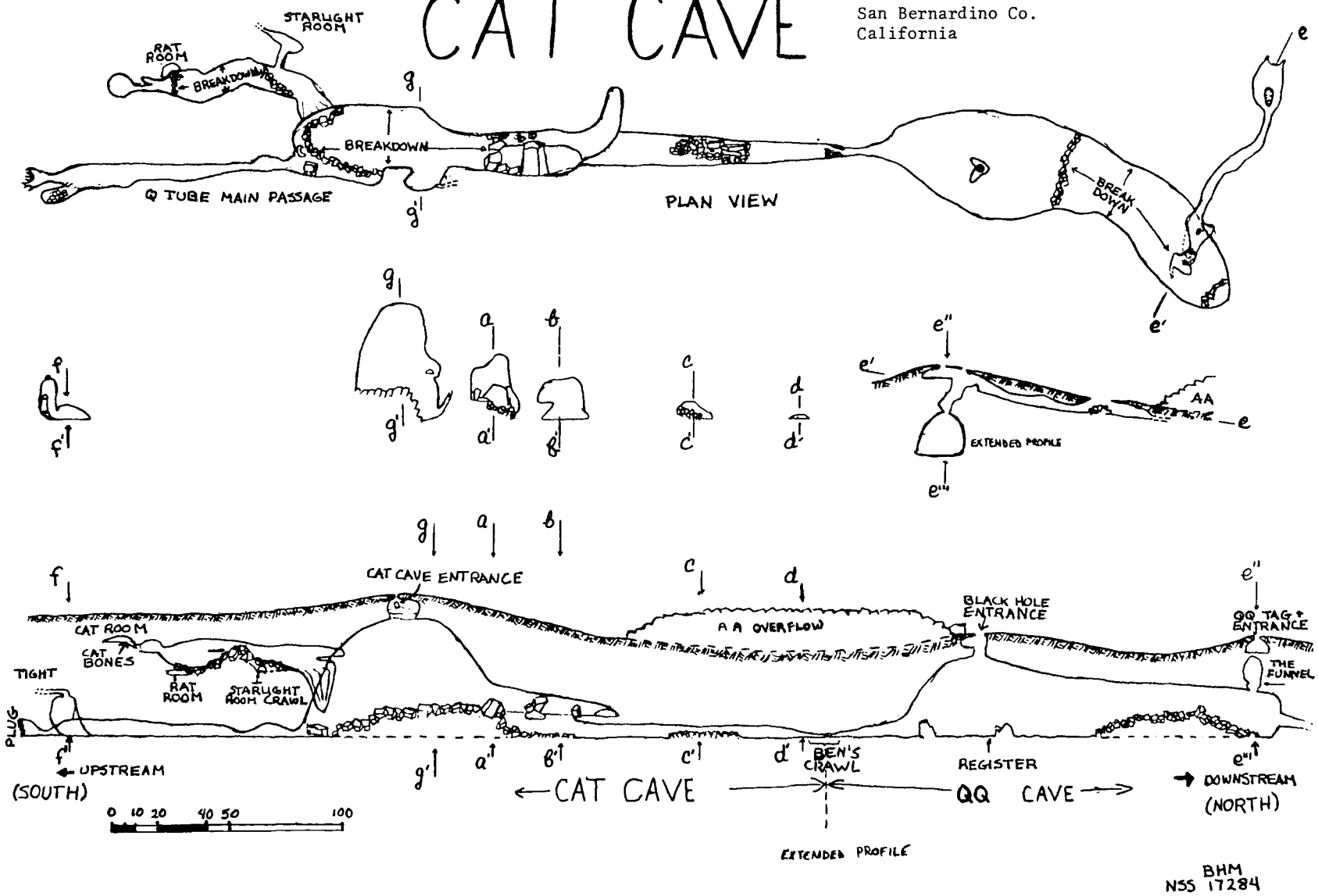
But there's this other overflow dome.....



Speleo Type volume 13, #1

CAT CAVE

San Bernardino Co.
California



BHM
NSS 17284

Colorado

ALPHINE TWISTER

Garfield County, Colorado

Virgin Passage 4(4):4 Gene Dover

On July 5, a new cave was found. The entrance is impressive. In the entrance room an angular passage with a ice floor was observed. The passage got tighter due to the ice. Harry Haddan volunteered to make the squeeze.

Harry slid on through to find that the passage went to the left and right and another passage went off off from the main passage to the left. He proceeded to crawl to the right. He then found himself in another small room with two leads.

He chose the right passage, as it was a stooping, twisting worm tube. After leaving this room we lost contact with him. I told him not to go too far because if he ran into trouble, we would not know if he needed help. I gave him 15 minutes.

As we waited, a good breeze could be felt, which led us to believe that maybe we had found something. As time rolled by, we couldn't help but think of Harry getting stuck or sliding down an ice slope. Finally, he returned. He was quite excited and wanted to go back in and check more leads. We talked about it but we finally decided to wait until August to give time for the ice to melt. The cave is colder than Powerline or Bonnie s Hall.

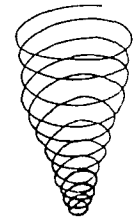
The name, Alphine Twister, was decided on after several days in Pueblo.

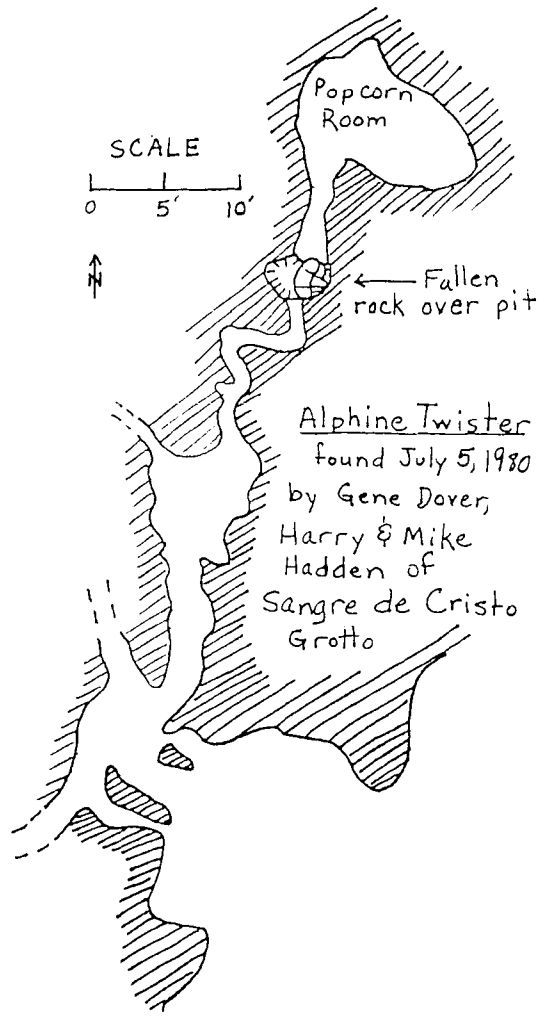
[*SD* editor's note: In reply to a letter asking about the spelling of "Alphine," I received the following additional information from Gene Dover:

"'Alphine' was simply preferred over 'Alpine' as a change in normality as the cave did not strike us as an ordinary alpine cave in that particular alpine caving area... We have had several trips since then and a side passage has been dug into and more than 200 ft of sloping walking passage has been found up to the point of a dirt and small rock choke. It is at this point a very small stream of 5-6 inches is encountered which makes the digging miserably wet. However, it has been dug open enough to allow a small type caver through. Jerry Hassemer, who squeezed through, thought that maybe a handline might be needed to get back through which wasn't available at the time so the passage was not pushed, however he did say that the passage got bigger and was still sloping. Alphine Twister is scheduled this summer to be mapped and pushed. The pit shown on the sketch map is about 8 ft deep."]

areas. There's no telling what I might find.

ALPHINE TWISTER





SMALL CAVES NEAR FIXIN'-TO-DIE

Garfield County, Colorado

Virgin Passage 4(5):1-4 Rick Rhinehart

On July 4 Dave Allured, Dale Wilson and I decided to visit Wednesday Afternoon Cave, Roybol's Cave, and whatever other little holes we could find along the way.

...I noticed that a north-trending passage from the main entrance of Wednesday Afternoon had been cut in half by the incutting of the cliff. A small amount of diggin in this bisected passage produced several chunks of flowstone and one good-sized broken stalactite. I propped these up against the one remaining wall so persons passing below on the way to Wednesday Afternoon could see the pretties of Tourista Grotto, as I named it...

The next morning Mary Safford, Rich Wolfert and I set off in search of discoveries in the limestone block north of Fixin'-to-Die Cave. Before we could even get to the base of the Leadville Limestone, we stumbled upon our first discovery of the day.

At first glance, it appeared to be only a natural bridge with no side passages. But after climbing down onto the natural bridge for a better look, I could see that there was an alcove in the cliff face and at its base was a pit. I tossed a few rocks into it and, judging by the clatter they made, we determined it had to be 20-30 ft deep. There was no way to climb down down to the pit itself; we would have to leave it for another time.

Backtracking slightly to a climbdown we had seen before the discovery of the pit (named Guardian Pit for a rock pinnacle nearby), we were surprised to find another small cave. I explored its 25-ft length quick quickly, finding nothing of real interest, and, after naming it Gooseberry Cave, we proceeded down the gully to the base of the cliff.

We traversed this cliff for the next hour, discovering five more caves along the way.

Breathless Cave had to be dug open by myself to enter and although it extended into total darkness, it smelled very foul.

Another Cave was reached by a very short climb and and had about 30 rock-floored feet of passage, all of it walking.

Boost Cave presented us with a problem. With its entrance being 9 ft off the ground, none of us was tall enough to look into it to see if it went. I tried climbing an aspen tree about 20 ft away, but couldn't get high enough for a good view. The rock below the entrance was quite smooth and offered no easy way up. It soon was evident that the only way we would see that cave would be by boosting someone up. Mary, being the lightest, was the obvious choice so Rich and I boosted her up. It didn't go, of course.

Disappointment Cave was next and it was rather disappointing after a fairly large and impressive entrance. It did have an interesting but blind 12-ft deep pit.

No Go Cave was little more than a large shelter cave.

Two weeks later, Rich, Larry Fish and Tom Strong returned to Guardian Pit with vertical equipment and rope. The interior pit turned out to be only 10-15 ft ft deep, dropping into a good-sized dead-end room which Tom said echoed a lot. That would explain why dropped rocks sounded like they fell down a deep pit. Larry and Tom used rope to reach two other cliff entrances but neither of these caves were very long.

Meanwhile, Brian Donahue (a former Colorado caver now living in Montana) and I were bringing a mutual friend from Boulder, Greg Wright, on his first caving trip... As we traversed the ledge to Fixin', Brian and I kept an eye out for any hidden caves...

Further along the cliff, Brian spotted a low, wide entrance that needs to be dug open. By shining a flashlight into the passage, we could see it extended a good 15 ft into the cliff. It appeared it might open up at that point but we couldn't tell for sure. There was no air movement, however.

Leaving that dig until a later date, we moved on to Animal Dung Cave. Near its northern entrance, I found a round, dirt-clogged hole 5 ft off the ground. Digging a bit, I was surprised to feel air issuing from it... Although it was very tight, Greg said it definitely went. We had to pull him out of it, though, proving it needs a great deal more digging before it can be explored.

Next we decided to see where the upper passage in Animal Dung Cave goes... Brian and Greg were very willing to explore it. I stayed below to provide assistance in their climb up, plus I wanted to see if the upper passage might connect with the little hole we had just dug in...

I left Animal Dung Cave, went around the point of the cliffs and into an entranc there known as E 2. Sure enough, Brian and Greg soon appeared in an upper passage, confirming the rumor that Animal Dung Cave extended through the point. The other lead, it turns out, leads to the hole we had just dug open. One tight lead remained but our speculation was that it leads to Cosmic Banana Cave, which would explain the air flow in it.

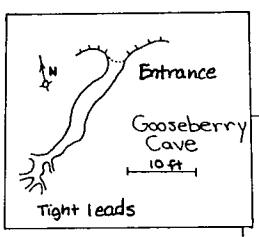
If that can be proven, the Animal Dung-Cosmic Banana System would have four entrances and over 500 ft of passage. That would also mean that sometime in the past, the system was also connected to Fixin'-to-Die and Wednesday Afternoon caves because of their proximity.

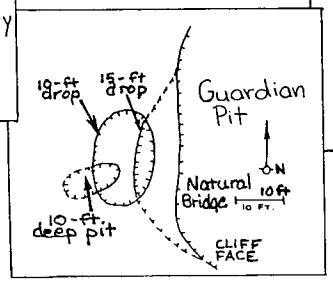
Heading back to the car that night, I was surprised at how much we had discovered in areas that even I had looked at before. I guess it depends on how thoroughly you want to check a cliff or a region. One person's checking may consist of merely walking the base of the cliff, looking for the obvious entrances. Another may walk the same cliff and consider it unchecked, as nothing has been dug. Yet another may not consider it checked until all the holes high up on the cliff have been looked into. It's all a matter of how much you want to put into it. I for one plan to continue checking "checked" areas. There's no telling what I might find.

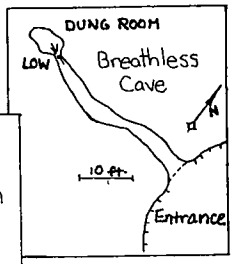
* *

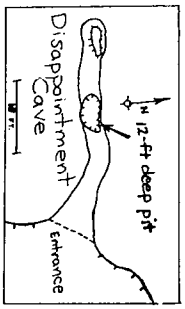
Virgin Passage 4(5):4-5 Rick Rhinehart

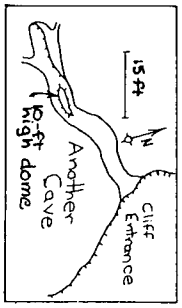
There had to be something in the Guardian block, we reasoned, studying the 7½ minute quadrangle of the area. With a minimum of seven small caves along the east rim of the block and a good half-dozen holes spotted in one small section of the north rim, we decided that something big had to be hiding along the west rim.

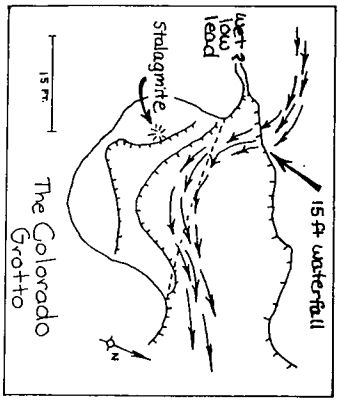

N
Entrance
Gooseberry Cave
10 ft
Tight leads

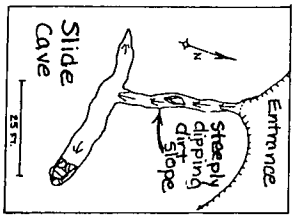

19-ft drop
15-ft drop
Guardian Pit
N
Natural Bridge
10 ft
10 FT.
10-ft. deep pit
CLIFF FACE


DUNG ROOM
LOW
Breathless Cave
N
10 ft
Entrance


N 12-ft deep pit
Disappointment Cave
Entrance


15 ft
N
Another Cave
10-ft high dome
Cliff Entrance


15 ft waterfall
Stalagmite
15 ft
The Colorado Grotto
N


N
Entrance
Steeply dipping dirt slope
Slide Cave
25 ft

Knowing that no one had even looked at that part of the block, Vi and Dave Allured and I on Aug. 2 set down across the grassy meadow that dips steeply to the breakover into the canyon...

A game trail led down into a small side canyon and, following it, I found myself at a splendid overlook of Deep Creek Canyon. Looking through the binoculars, I could see several holes in the limestone cliffs across the canyon. None appeared too promising, so I put the binos away and headed back to look for Dave and Vi...

We set off to check the Leadville Limestone cliffs that we could see below us and to the right. Dave headed down past the viewpoint I had earlier used, while Vi and I went down a lush valley that was full of seeps and springs.

We eventually joined up just above the Leadville and found an easy way down to the base of the cliff. Traversing the cliff to the east, we soon came upon the little valley that Vi and I had started down...

As we turned the first corner, we saw what we were looking for: a large black hole in the cliff with the stream appearing to come from it. Hurrying up to the cave, we were disappointed, for it was only a large shelter cave and the stream didn't issue from it at all. Rather, the water cascaded down the limestone next to the cave in a scenic 15-ft waterfall. All this was very photogenic, so while Vi took photos, Dave and I took a look at a low, wet lead next to the waterfall. It needed digging (and drying out) but about 5 ft into the lead was a very nice orange-colored stalactite.

The one other formation in the grotto was a large stalagmite that looks like it is being redissolved. There is also some partially redissolved flowstone, giving rise to speculation that the cave predates the valley and is being cut into by the stream.

Dave suggested that the cave be named Colorado Grotto, not so much for the play on words but because the cave and its location are so scenic. Vi and I agreed it was scenic so the name stuck.

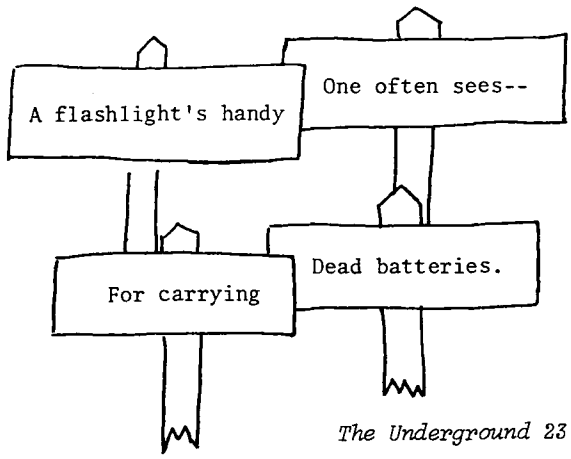
Leaving the grotto and the side canyon, we proceeded along the base of the cliff. Dave discovered a very small hole which he could barely fit into and while pushing himself out of it, I continued along the cliff around a bend where I discovered Slide Cave.

About 70 ft long, Slide Cave is basically a steeply dipping tube connected at its top to a walking passage which quickly ends in both directions. Digging on either end might be worthwhile, for the cave ended in fill and breakdown...

The next morning, we returned with Larry Fish...

Back in the main Deep Canyon again, we found some interesting flowstone and drapery on one cliff and a small cavelet I named Land's End Cave. It was so named because just past it, the ledge shrunk to 6 inches wide...

While we did not make our hoped-for major discovery that weekend, I feel we did prove that those persons who want to go out and look for caves can still find them. As for me, there is nothing like knowing your footprints are the first on the dirt floor of a cave, no matter how long it may be.



The Underground 23(1,2):23

Florida

BOBBY HALL'S CAVE

Jackson County, Florida

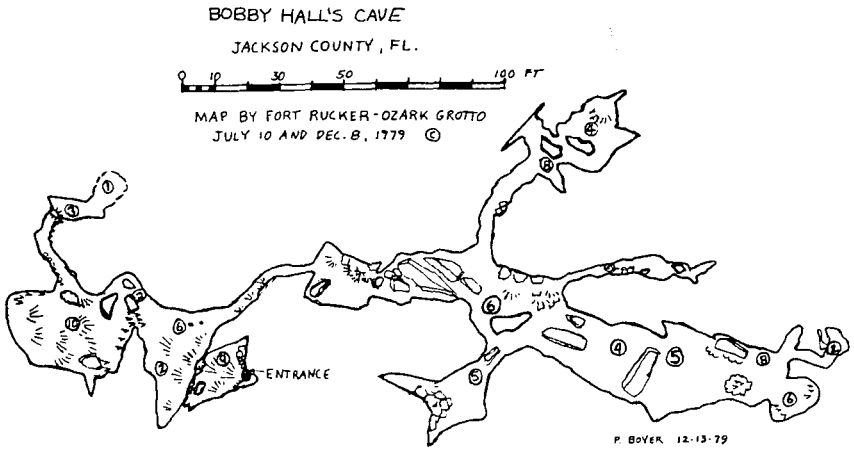
The F.R.O.G. Croaks 7(2):16 Paul Boyer

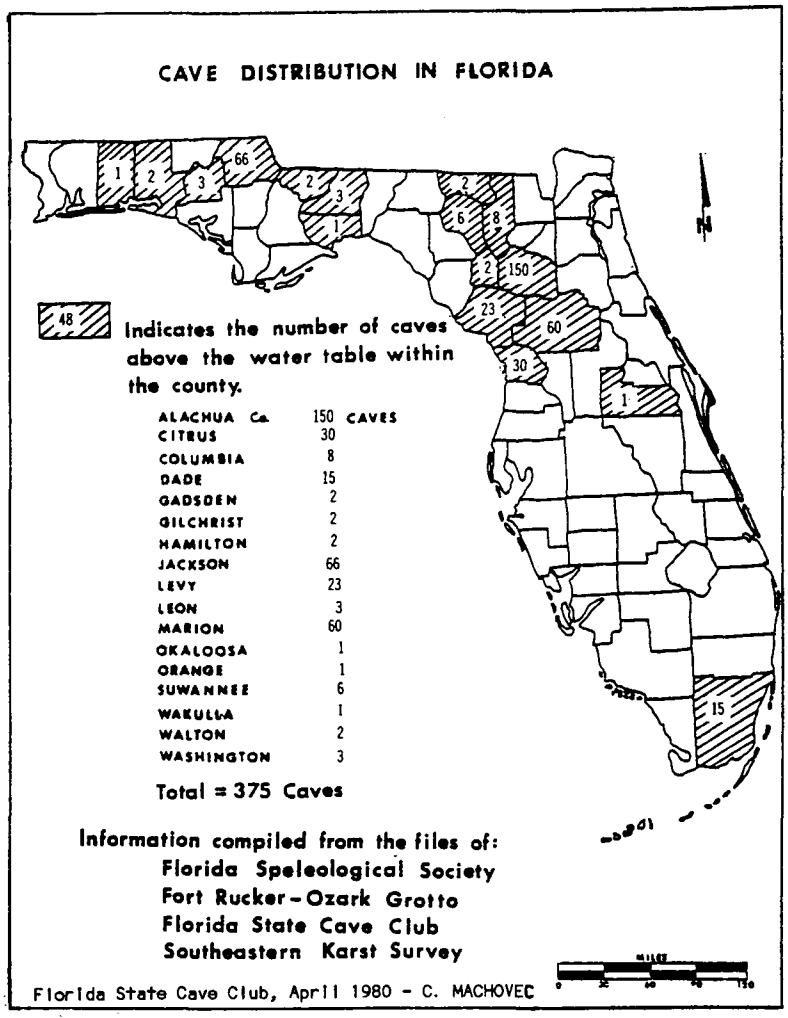
This small but pretty cave was first explored by four members of Fort Rucker-Ozark Grotto on June 10, 1979, previous to which it had not been entered. The entrance is in a pile of loose-looking rocks near the edge of a park road. Previously, park rangers* had been digging in this pile because of the air blowing from the rocks, and had opened up a small pit. Tom Coshatt was the first of us to enter. He dug out the remaining rocks and dropped feet-first into a room about 10 m long by 5 m wide with a ceiling up to 3 m high. A pit led below the floor of this room about 4 m into a still larger room. After a handline was rigged, Steve Hodges, Pam Hobby and Paul Boyer followed. They then exited the cave and notified the park superintendent of what they had found, and ranger Bobby Hall accompanied them back into the cave. He had been the one who decided to dig there in the first place, and he had been instrumental in exploring parts of Florida Caverns during its mapping in 1974. After a short conference with Park Superintendent Capt. Albert Smith, we decided to give Hall's name to the cave.

The cave is basically about a dozen rooms connected by crawlways and breakdown piles. The rooms total 560 ft of passage, and are well decorated with speleothems. The total vertical relief of the system is about 40 ft from entrance to lowest portion. As no part of the cave contains standing water, it is difficult to tell how far above the water table it is, but judging from the relief of the hill, probably not more than another 5 ft of depth would expose water. Some of the rooms show signs of a watermark on the walls, but there are no obvious washed-in places. The cave system lies about 300 ft south of Windy Crawl System, but extends northward, away from it, and deeper under the summit of the hill.

From the entrance, down the pit to the second room, one may proceed either further down the slope ("A" passage on the survey) or to the right along the slope ("B" passage). The B passage extends as a vertical fissure and crawl into a room with a breakdown pile along the left wall. A restriction in the far end of this room leads past some very striking white columns to a large room full of breakdown. From the breakdown room one may proceed downward and to the right to a hundred feet of large rooms, or left or right to shorter leads that end in breakdown rooms. The room to the left ("E" passage) is extremely treacherous, expecially the ceiling, which is fractured and poised to fall. In the E passage room, a smoothly curving structure in the limestone has been reported that resembles a large vertebra (about 12 cm across) which may be a nautiloid shell impression.

The park service has gated the entrance to protect the delicate formations and fossils for further study, and permission to enter must be obtained from the park superintendent or the state district naturalist in Tallahassee.




CAVE DISTRIBUTION IN FLORIDA
48
Indicates the number of caves above the water table within the county.
ALACHUA Co. 150 CAVES
CITRUS 30
COLUMBIA 8
DADE 15
GADSDEN 2
GILCHRIST 2
HAMILTON 2
JACKSON 66
LEVY 23
LEON 3
MARION 60
OKALOOSA 1
ORANGE 1
SUWANNEE 6
WAKULLA 1
WALTON 2
WASHINGTON 3
Total = 375 Caves
Information compiled from the files of:
Florida Speleological Society
Fort Rucker-Ozark Grotto
Florida State Cave Club
Southeastern Karst Survey
Florida State Cave Club, April 1980 - C. MACHOVEC

BOYER'S DISCOVERY

Jackson County, Florida

The F.R.O.G. Croaks 7(3):7 Paul Boyer

Discovery. Feb. 2 we invited the Florida State University Caving Club to meet us in the parking lot to check out some little leads that we had found, among which was that tiny little crawl with the large bones in it that we had opened up last month* (actually we had mapped about 90 ft of the crawl and I was feeling that it wouldn't go anywhere without a lot of hard digging in tight places). We met Bill Gagnon and took a long time to change our clothes, while Karen Witte, Marianne Korosy and a guy named Pat went on in. I had just decided that we ought to send someone in the tight entrance to meet them as they gave up and direct them over to the cave in Cottondale, which was 300 ft long and needed a crew to map it.

As I reached the first room below the entrance I could hear rumors being passed up the crawlway, something about a B I G room just beyond a tight squeeze. Looking at my calendar, I decided April Fool didn't account for it, but that someone was trying to get me involved in a long crawl to a medium sized room. I shouted back, "How big izzit?" and Karen assured me it was "a hundred feet long and thirty wide with plenty of formations and BEAUTIFUL HEADROOM." I wouldn't allow myself to believe it until she led me back down the tight crawl to a tiny squeeze to the right. I had to exhale as I pushed through, into squatting room in a good looking passage which went promptly into a BIG ROOM. It sure was. Karen underestimated its size a bit. It has three extensions over a width of about 120 ft. The back section on the right side is curtained with a line of large white curtains, columns and mounds, but large columns are found at several other places in the room as well. The most amazing formation is a 9-ft-high totem pole stalactite in front of a 20-ft-wide flowstone mound. Marianne and Karen had already established paths by which we could cross the room without stepping on flowstone areas. People wandered around in a state of ecstasy for awhile and then got down to some serious exploring of the leads. One group climbed up a steep breakdown slope behind the totem pole into a breakdown dome. They spotted a well casing in one edge of the room, and could hear the pump leading to a small stone hut about 150 ft from the entrance supplying water for the golf course sprinkling system. Another group went into the north and west sides of the room. Mary Kelly and I climbed over breakdown in the west corner of the room and down a steep 15-ft slope into a series of lower, muddy passages which ended in a pool surrounded by deep, sloppy mud in about 75 ft. Bill Gagnon carried the mapping into the Big Room and established several base stations for further surveying, and began the first sketch of the whole system, which contained about 257 m (850 ft) of surveying at the present time. 'Twas he that named the cave after Boyer, but who am I to complain?? All my life I've considered attaching my name to some discovery, only to have it fizzle in a dung-covered crevice. This time it goes.

More Discovery. Feb. 18, a fellow instructor at the local junior college and Chris Pederson called me up on Sat. afternoon and said, "Let's go caving and see this new discovery of yours. Get your stuff and be ready by four." Ahem, I said, let's think this over. But we just drove like hell and reached the gate of the park just as the rangers were about to lock up for the night, set up tents, and had a rather cool night...

Sunday morning we talked to the rangers, who had finally gotten into the crawl, and had widened it quite a bit. Therefore our return to the Big Room was not the desperate fight it had been the first time, and all three of us had cameras to record the beautiful sights. After expending all our film that way we explored the mud passage to the west, and Chris, being a complete novice in caving, insisted on pushing a muddy crawl behind a rock. "Aw, it doesn't go, I'll bet," said I, "but go ahead and push it; we'll follow. It went about 50 ft through sloppy go gook, past a couple of pools, and opened into a respectable room with standing space!! Not nearly as large as the Big Room, but it continued as a good tub tube crawlway to another room. A crawl to the right of that led to a series of formation-filled rooms with deep pools and gooey mud. At the last room, Pederson's Paradise, Chris and I swam through an arch in 5-ft-deep water with a foot of headroom, and into a large passage beyond, leading to a room about 18x18 ft, with a large white column along one wall, Chris' Castle. It was there we finally turned back, having exhausted ourselves and most of our batteries in six hours.

Bonnie's Discovery. So we returned March 2 with a really big group, about 15 people, to map and photograph the hell out of the cave. When it came time to map, Steve Hodges held the compass, Tom Coshatt and Bonnie and Bill Gagnon also ran stations and explored while I made the sketch of the west passage that we had found on the previous trip, reaching Pederson's Paradise in about 6 hours. At that point Bob Larson and Mary and Davy Larson had been doing some swimming and discovered a side connection to the same point. As our group melted toward the entrance, Larson and Bonnie swam through the arch, and the long anxious wait began. They returned by a different route, and Bonnie was describing another BIG ROOM, 100 ft long with white formations, etc. But she had a weak flashlight and bare feet, so she couldn't explore the leads by herself. I was fagged and the others were running low on light, so I reluctantly bid adios. A week later it started to rain and the whole west lead remained underwater for more than a month. What we glimpsed that day, like the seven cities of gold, still eludes discovery by the known world.

But we know it's there.

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*Probably the "small blowing hole" found on Jan. 1 and further excavated on Jan 5 (reported in trip log in *The F.R.O.G. Croaks* 7(2):18), although no bones were mentioned in those reports.

[Postscript: Shortly before his death, Boyer reported in a letter printed in the Special Memorial Issue of *The F.R.O.G. Croaks* that Boyer's Discovery was about 1,600 ft long, as of a mid-June trip.]

THE CAVES OF COTTON PLANT RIDGE

Marion County, Florida

The Florida Speleologist 16/17 Frank Spirek

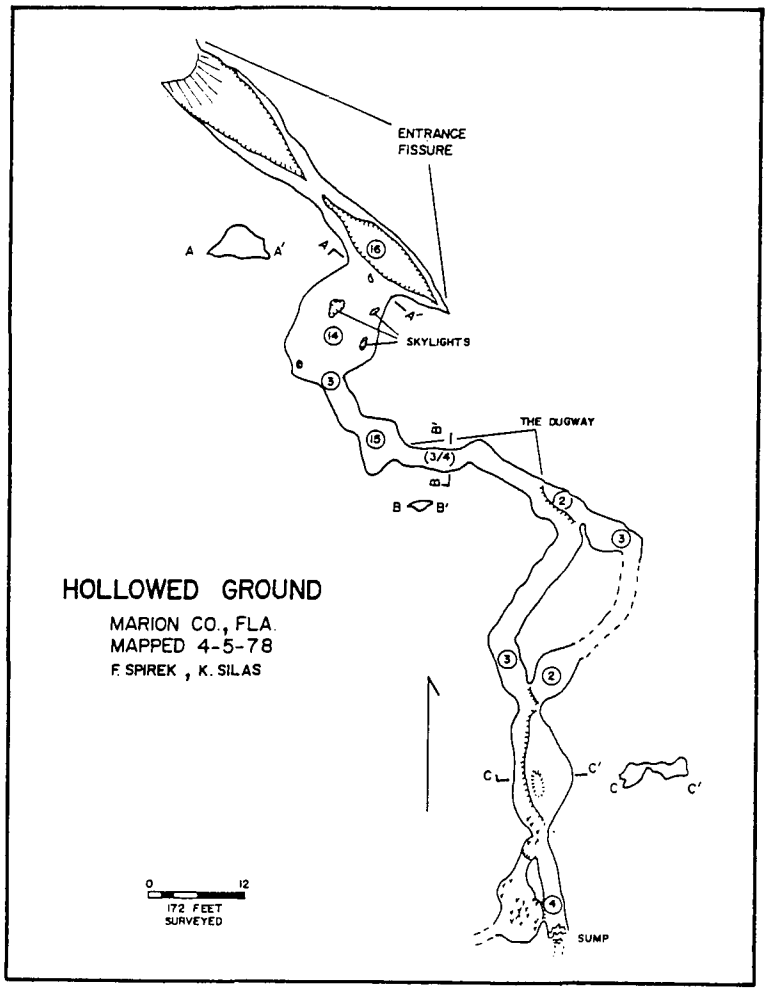
(*TFS* Ed. note--This article was written to be published in the 1978 issue of *The Speleologist*, but was mistakenly omitted. Sorry!)

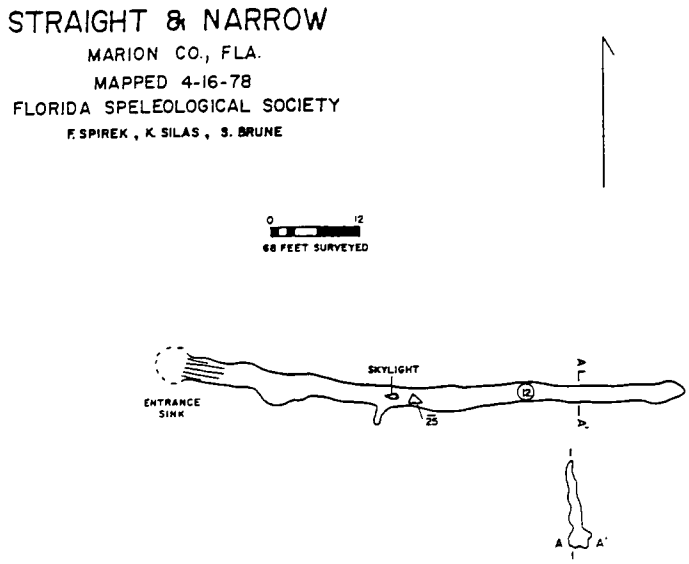
Marion Co. continues to be one of the most important speleological areas of Florida. Cotton Plant Ridge, a small rise in the western part of the county, has been known many years for its caves. Yet, up until April 1978, only four caves were known, two of which were "floating around in the woods."

On April 5, while hunting for a reported cave north of God's Gift Cave, Keith Silas and I stumbled across a new cave--Hollowed Ground. With a little enticing, we managed to scrape up four volunteers: Art Nix, Ray Pfaff, Paul Smith, and Al Stoops, for a full scale ridgewalk.

On April 8, Paul Smith, using some old notes and a Suunto compass, led the group of six into an area that seemed like Swiss cheese. That morning, caves and sinkholes were found and explored with the enthusiasm of an Easter egg hunt. Yet, by the afternoon, a new discovery was greeted with a yawn. On this Saturday, five new caves were discovered and two "lost" caves were pinned down, bringing the total of caves on Cotton Plant Ridge to ten.

The only thing the ten caves have in common is their short length (all less than 300 ft); otherwise, each cave is different.





The Baptismal. Found by the FSS on April 8, 1978, but has graffiti dating back to the late '50s. This is a small cave with a single lake room.

Cathedral Cave. Discovered April 8, 1978. Two passages meet at right angles to form an almost perfect cross. This cave also has a 20-ft-high, 18-ft-wide room.

Davis Cave. Known by the FSS in the '60s, Davis is a narrow cave formed along a chert vein. This cave has two levels, the lowest being water passage.

Enoch's Cave. A short, 6x5-ft tube that was discovered April 8, 1978.

God's Gift Cave*. Discovered in the early '60s. A narrow, twisting entrance leads to a low ceilinged room. This soda straw-covered cave has been heavily vandalized.

Hollowed Ground Cave. Found on April 5, 1978. An interesting entrance fissure with a large, 15-ft-high ceiling that quickly becomes ½ ft high. This 6-inch passage was dug to 9 inches, and leads to an active (and probably virgin) formation chamber.

Indian Cave*. Known to the Indians? Historical graffiti says 1916. This cave is mainly one large room with a crayfish infested [*sic*] pool.

Jericho Cave. Discovered April 8, 1978. Passage is around the perimeter of a breakdown cone, which was once the ceiling of a large room.

Straight and Narrow Cave. Discovered April 8, 1978. A 56-ft straight shot, 12 ft high and 3 ft wide.

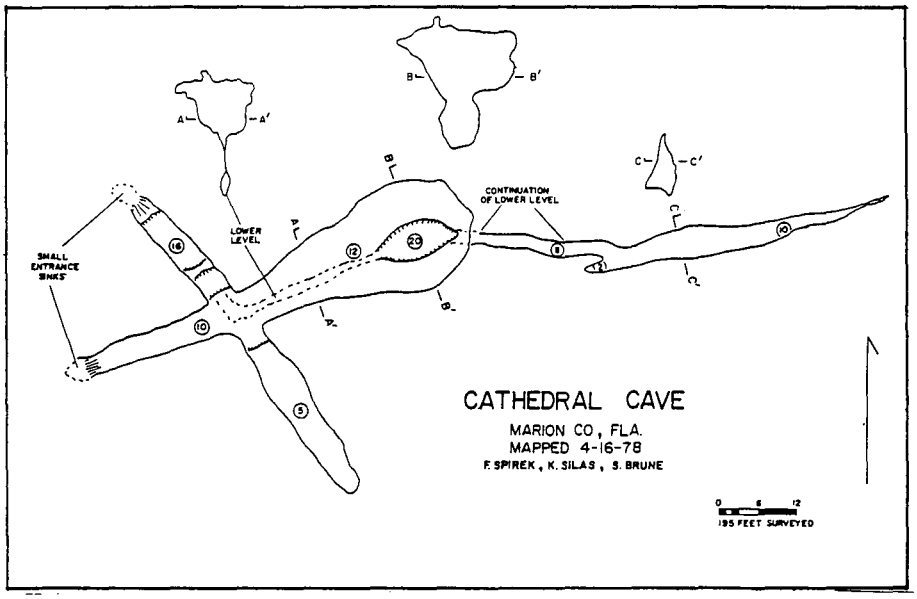
Trinity Cave. Discovered in 1971 as Roach Cave, but renamed because of the many Roach Caves already in the state. Trinity has three entrances and three levels. The lowest is a tight, water-level passage. With a few formations, this is the longest cave yet found in Cotton Plant Ridge.

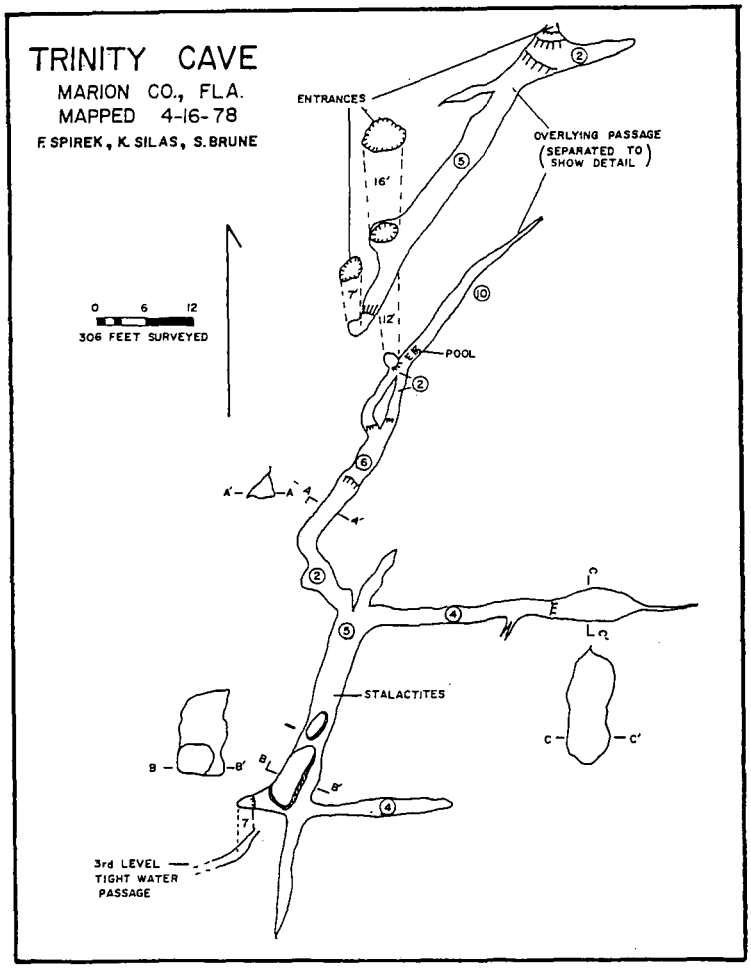
*God's Gift Cave and Indian Cave were originally named Dixie Lime Caves #1 and #2. (see the *Florida Anthropological Society Newsletter*, Sept. 1964.)

After water levels dropped in 1979, Davis' lower level was mapped, bringing it to 440 ft, the longest on the ridge. Baptismal and Indian were all but dry at this time.

All caves except Jericho have been mapped. Some appear in this issue.

Isopods discovered in Hollowed Ground were a type not previously known in this area.


CATHEDRAL CAVE
MARION CO, FLA.
MAPPED 4-16-78
F. SPIREK, K. SILAS, S. BRUNE
0 6 12
195 FEET SURVEYED
SMALL ENTRANCE SINKS
LOWER LEVEL
CONTINUATION OF LOWER LEVEL


TRINITY CAVE
MARION CO., FLA.
MAPPED 4-16-78
F. SPIREK, K. SILAS, S. BRUNE
0 6 12
306 FEET SURVEYED
ENTRANCES
OVERLYING PASSAGE (SEPARATED TO SHOW DETAIL)
POOL
STALACTITES
3rd LEVEL TIGHT WATER PASSAGE

HELICOPTER CAVE

Marion County, Florida

The Florida Speleologist 16/17 Keith Silas

The map of Helicopter Cave is the Florida Speleological Society's first attempt at computer graphics. The base lines and lettering were printed at the Northeast Regional Data Center's Gould Plotting Facility. The FORTRAN program was written by Frank Spirek in June 1980. The outlines of the passage were drawn in by Paul Smith. Computer graphics produce much more accurate maps than hand plotting, with a substantial savings in time and effort.

[*SD* Ed. note: Helicopter Cave has been cemented shut.]

WHITE CLIFF CAVE

Marion County, Florida

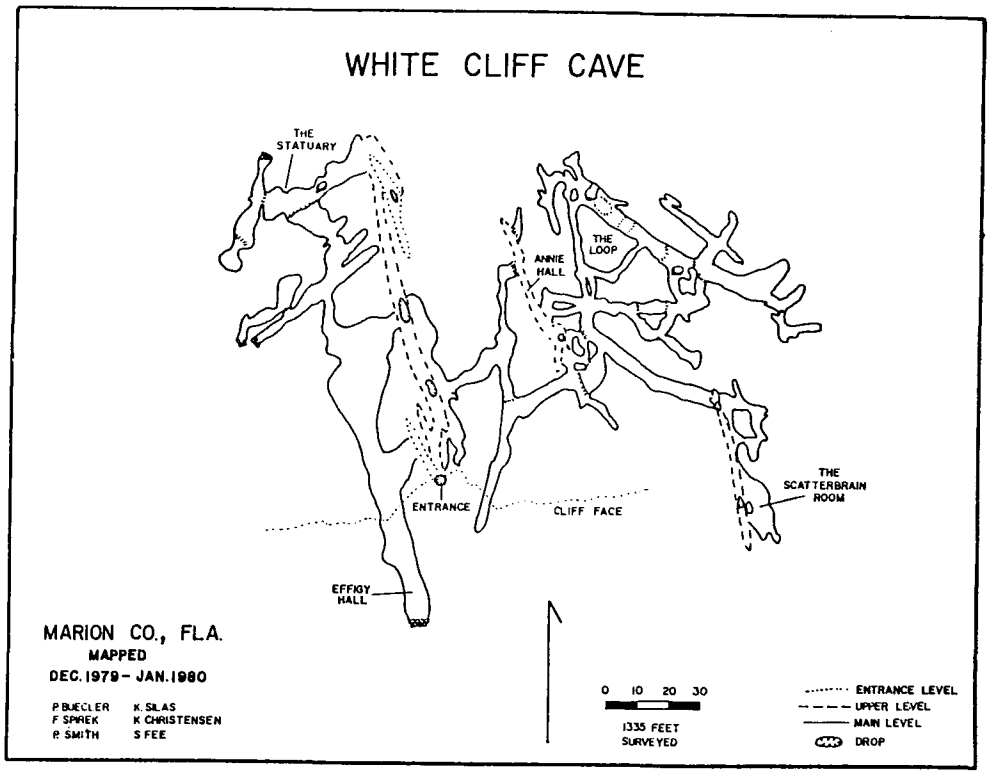
The Florida Speleologist 16/17 Keith Silas

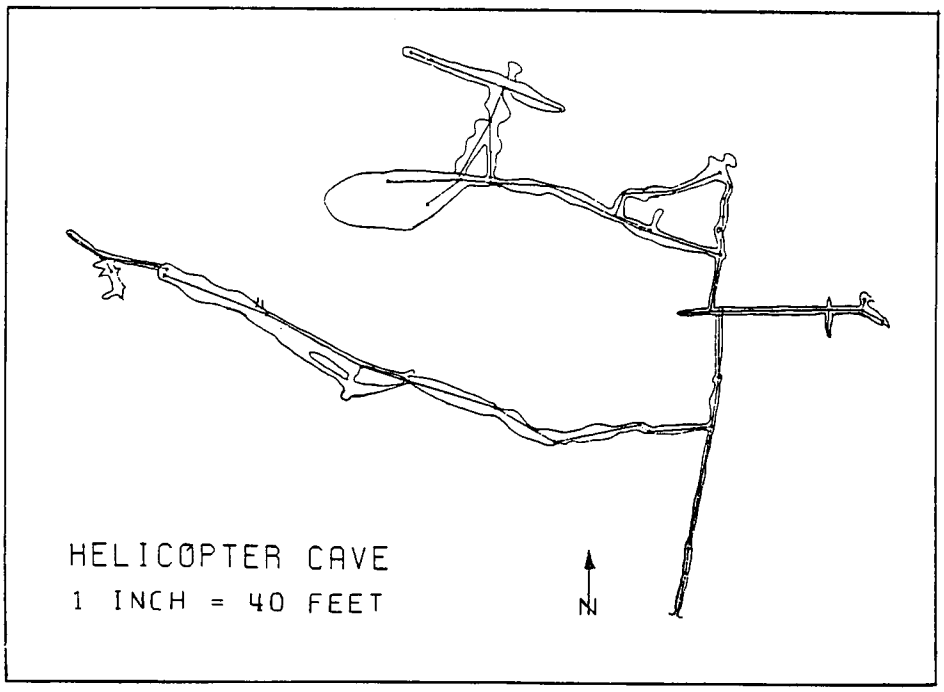
The entrance to White Cliff is at the bottom of an old quarry wall. There is a short crack at ground level shooting straight into the cliff, but the actual entrance is right below this, heading under and into the wall. The entrance passage is relativelv straight and at its end is access to an upper level room and passage.

The main level is entered through a hole in the floor of the entrance passage about 20 ft into the cave. This level is an extensive joint-controlled maze. One of the most interesting parts of this cave is the Effigy Hall, a 5x8-ft dead-end passage. It got its name from some apparently satanic mud figures found there on several occasions, including hermaphrodites, satan heads, dolls with their heads burned off, and other rather strange graffiti.

The Statuary is near the Effigy Room and, although nothing so sacrilegious is found there, there was some impressive artwork at one time. Near The Statuary is access to a water-level bellycrawl which has not been mapped.

The main level has several connections to passage at entrance level, among which is Annie Hall, a tall, narrow crack which is about 15° off vertical.





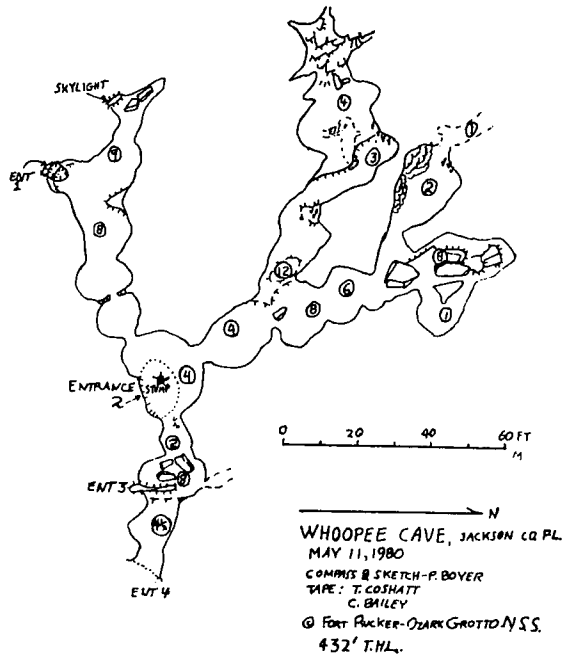
WHOOPEE CAVE

Jackson County, Florida

The F.R.O.G. Croaks 7(3):3,4 Paul Boyer

This cave has three entrances and two skylights along an escarpment east of the Chipola River and south of Florida Caverns State Park. Opposite the west entrance (#1) is a spacious room which leads to the left into a collapsed room with a large old tree stump in it. This second entrance is surrounded by a large dry rockshelter undoubtedly used by the Indians as a residence. Several shards of plain brown pottery were found, together with bones of deer, rats and other critters. At the back of the second entrance room a short crawl leads to the most extensive room in the cave, about 60 ft of walking passage. Two crawls lead left from this room and one to the right. The first crawl to the left, about 3 ft high, leads through a flat-ceilinged area decorated with small active stalactites, many of which have been broken. At the end of this passage is a room of standing height, with a breakdown slope leading toward the surface. On the slope at the back of the room were found several evidences of early human occupation, which may have washed in from the surface: deer bones, fresh-water mussel shells, and a flint chip.

To the right of the second entrance, a crawl leads to a large room with a narrow ceiling fissure skylight, and another entrance just beyond. In this area many more deer and small animal bones were found. Just to the right of the big room, almost under the skylight a very low crawl leads back under the hill, and blows air. It looks like a promising dig for future exploration. The total surveyed length of the cave is about 430 ft.



Georgia

CLIMAX CAVE

Decatur County, Georgia

Florida State Caver 11(2&3):21-22 Chuck Machovec

This black-out map represents over ten years of surveying and mapping by the Florida State Cave Club. The last published black-out map of Climax Cave appeared in 1976 in Vol. VII, *Florida State Caver*. Both the 1976 and the 1980 versions are at the same scale for easy comparison.

The 1980 map contains blue coloring (see map key) [not evident on printed map] to indicate surveyed passages that are underwater, *i.e.*, surveyed by cave divers. The blue areas enclosed by solid lines indicate pools of deep water that might be significant to cave divers. There are many water areas that are not colored because they didn't "appear" to be significant for divers. NOTE: Some deep pools were inadvertently left out.

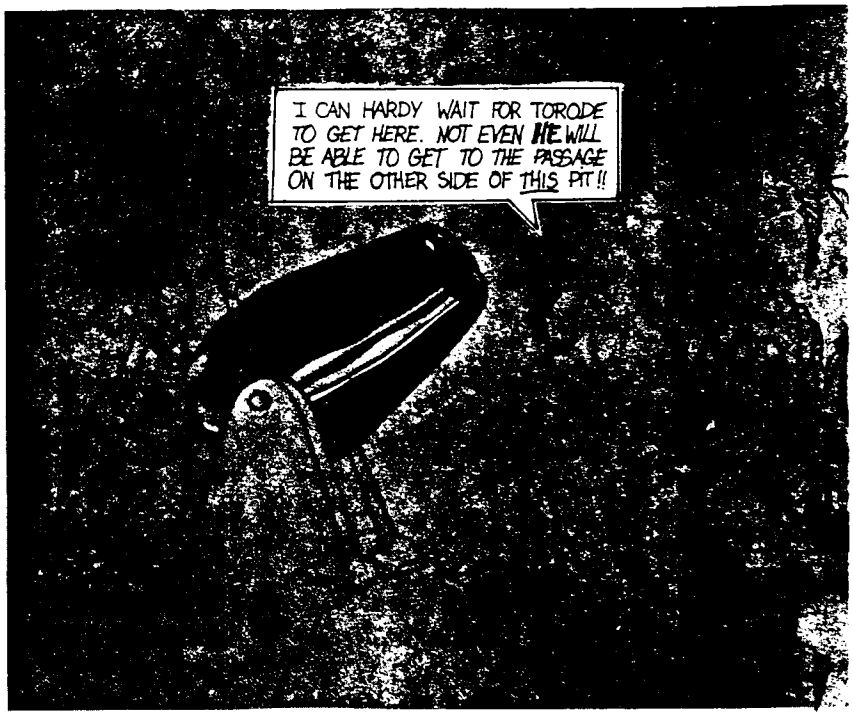
Hawaii

CAVES ON THE BIG ISLAND

Hawaii County, Hawaii

The Cascade Caver 19(4):41-45 Bill Halliday

...We spent Sunday morning, Nov. 18, 1979, in a vain attempt to find a way into the Puna cave area where the roads weren't flooded. When we caught up with the Allreds, however, Kevin mentioned waterfalls in Kaumana Cave, a county park right on the city limits of Hilo, so we all took off for some photography there. It was raining so hard in the cave that all our flash equipment quit working before we got to the waterfalls, unfortunately. They were truly spectacular, spurting from cracks in the walls 8-10 ft from the floor and cascading along steep pitches in the floor. When we got back with dry equipment a couple of days later, they were much



CLIMAX CAVE

(Restricted)

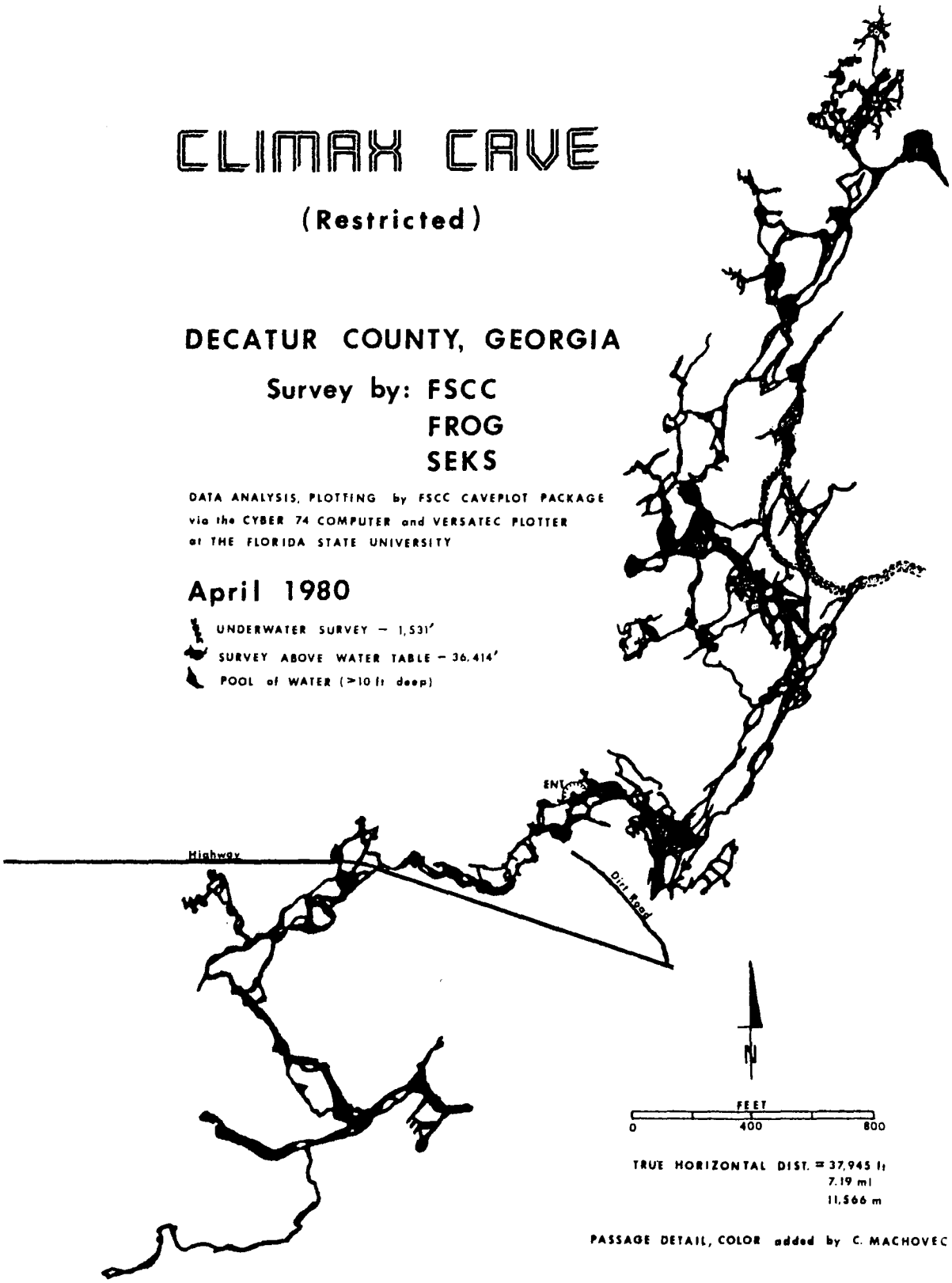
DECATUR COUNTY, GEORGIA

Survey by: FSCC
FROG
SEKS

DATA ANALYSIS, PLOTTING by FSCC CAVEPLOT PACKAGE
via the CYBER 74 COMPUTER and VERSATEC PLOTTER
at THE FLORIDA STATE UNIVERSITY

April 1980

UNDERWATER SURVEY – 1,531'
SURVEY ABOVE WATER TABLE – 36,414'
POOL of WATER (>10 ft deep)



TRUE HORIZONTAL DIST. = 37,945 ft
7.19 mi
11,566 m

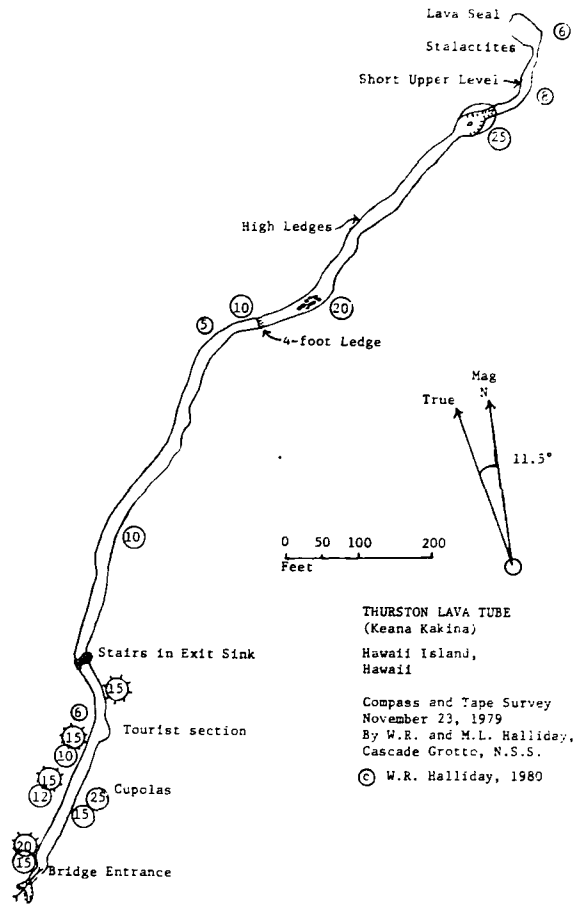
PASSAGE DETAIL, COLOR added by C. MACHOVEC

reduced but still photogenic. We never got around to mapping the cave, which is quite varied with big rooms, duckunders, handsome flow features, and a braided section uptube from the main entrance. Development here consists of a metal stairway leading into the main entrance, after which visitors are on their own. The cave shows it, but vandals don't seem to go too far from the entrance.

Monday morning we drove up to the national park and made the loop tour of Kilauea, including photography of a wonderful pahoehoe trench. The lava is much glassier and more crumbly than any I've seen in other parts of the world, and surprisingly prickly. After touching base with the Chief Park Naturalist, we had a look at the Devil's Throat, a volcanic pit more than 200 ft deep, and decided not to drop it as we could see that there were no openings at the bottom and the walls were very crumbly. The Allreds then took off to check out a lead in Kona, while we had a look at South Point. South Point Cave is the southernmost cave in the U.S., and is surprisingly pretty. It is a littoral cave with a wide but funneling overhung entrance on the west side of the point between two boatsmen's hoists. Late in the afternoon, sunlight reaches the rear of the 50-ft cave, and purple shelves of marine life can be photographed through a hole in the roof. About a mile farther north is an impressive collapse sink with two short caves, one with a crawlway leading steeply downward through very muddy breakdown, which I left unchecked. This is Makalei Caves. Several large caves are reported elsewhere in the extensive flows which form this long promontory. That particular cave, however, lives up to its reputation as the muddiest garbage dump on the island.

The rains were slackening, and after photography in Kaumana Cave, we found our way to the upper main entrance of Kazumura Cave next day. It is well hidden in head-high orchid grass and scrubby ohia trees. First we went up-tube about 3,000 ft to the upper end--a lava seal--then down-tube to Entrance 12, about 2 mi away. Here we tried to find our way back via road, but in the swampy jungle we couldn't even find the road, so back through the cave. Along the way we did a little remapping for Chris Wood, and stopped often to photograph the fine flow features and dripstone. Red tubes-in-tube were particularly impressive.

On Wednesday, we started with some surface work, locating what may or may not be Doc Bellou's Cave and Hawaiian Acres Cave #1 (at opposite ends of a collapse sink much like the upper main entrance of Kazumura, with much more dripstone and decidedly different flow patterns than in the main passage beneath. Doc Bellou's Cave, however, is supposed to have been the site of a commercial muchroom operation, and I found no trace of it in the cave we were informed was his; I think it may be Entrance 12 of Kazumura instead. More sloshing through head-high orchids and I could see an orange flag I had left near Entrance 12 on the previous day; I just hadn't gone far enough through the swamp. From here we charged about 2 mi to a breakdown choke which is currently the lower end of the cave, and brough back Chris Wood's last paper survey station as a trophy or contribution to cave conservation, whichever you prefer. Again we did much photography, and remapped one area for Chris. We did not venture into the largely unmapped right-hand terminal passage where Howarth's



Lost Passage is rumored to lead back up-tube for 2,000 ft. Just not enough time. Along this section was much more dripstone than in the upper part, a Hawaiian burial, a large elevated platform of breakdown fragments which may be a heiau (ancient temple site) and a circle of rocks surrounding a stone altar which may be recent. Part of the section of the cave is braided and some upper level leads extend to other entrances. Chris Wood's map includes 11.5 km, and the cave is not segmented. Thus it is currently the longest lava tube cave in the world and is still going.

Next morning was Thanksgiving Day. We celebrated by mapping Blair Cave, hidden in more orchid grass and ohias near the road to the national park. It is a bit over 3,000 ft long. While smaller in length and diameter than Kazumura, it has fine flow features and is a nice cave to visit...

At that point the Allreds and John Martin went off to have a look at John Martin Cave... I thought I would have a quick look at Thurston Lava Tube... [which] has a tourist section about 300 ft long... Thurston, incidentally, is about the most featureless lava tube I have ever seen--nothing but cupolas and traces of flow ridges in the tourist section. It impresses me as being the upper level of a large, unknown cave system, contrary to present theory. Rather than a pit crater as currently believed, the large sink at its main entrance looks to me like a jameo-type collapse sink.

THURSTON'S LAVA TUBE: A 1962 REPORT*
by Don Rimbach

Thurston's Lava Tube is located in Hawaii Volcanoes National Park on the island of Hawaii. Its entrance is in the eastern wall of a small, long-extinct, jungle-filled crater called Kalau Iki, about ½ mi east of Kilauea Iki crater which erupted in Nov. 1960. [Cascade Grotto reconnaissance in 1979 indicates this is a collapse sink rather than a crater.]

A short walk across the base of the crater and up a small hill of breakdown brings one to a 40-ft long footbridge, which crosses a "pit" formed by the breakdown hill on one side, and the crater wall on the other. The roof of the cave, which is only 10 ft below the surface, extends out over the pit some 20 ft. After crossing the footbridge and passing an electric-eye counter, the visitor finds himself inside the cave's entrance and looking down a well lighted passageway which slopes gently away from the crater. The asphalt pathway which led the visitor across the crater floor continues through the commercialized section, which consists of the first 400 ft of the cave and lies between the main and rear entrances.

The cave's ceiling is 15 ft above the floor at the entrance. The section which overhangs the pit contains a dome about 6 ft wide and 5 ft deep. It is circular, and appears to have been formed by a large gas bubble.

Several cracks, formed by the contracting of the lava as it cooled, criss-cross the dome. This dome and others like it near the entrance are referred to as "cupolas" in Sidney Powers' description of the cave.

The passage slowly decreases in size until, at 260 ft from the entrance, one must duck under a low spot only 4 ft wide. This is the smallest cross-section in the cave and it appears that the last lava flow had been backed up behind this constriction, forming a high lava mark on the wall some 2 ft higher than the mark beyond the constriction. This high lava mark before the constriction is 8 ft above the floor of the cave, and it can be traced back to the entrance along each wall. It is harder to see the farther one gets from the entrance, until it is just a trace as one approaches the constriction. The lava mark reaches the floor level exactly at the edge of the pit at the entrance. This shows the general action of the lava during the last time the cave received a deposit of lava from the crater. The crater at the entrance rapidly filled with lava, filling the tube, too. Somewhere far down the tube the lava nearly plugged it, and only a small amount of lava was able to pass through.

Then the lava eruption subsided in the crater, and the lava in the tube that was above the level of the floor at the entrance flowed back out into the crater, as it was unable to drain out through the nearly closed tube. This lava was still very hot and viscous and therefore left only a small layer of solidified lava on the upper walls. The lava still in the cave stood in a pool, whose level now was even with the high floor at the entrance. Being exposed to the air, now in the upper part of the cave, and to the solid cave walls, the lava began to cool. This cooling made it much more viscous than the lava which had drained out, and thus it left a much thicker layer on the cave walls and floor. The top of this layer is the high lava mark which was previously mentioned, and the reason it was only a trace near the constriction is that there the lava lake was 8 ft deep and therefore held its heat and left only a little deposit, while the lava in the vicinity of the entrance was only a few inches thick and it cooled rapidly, leaving a large deposit behind. After this pool had stood for some time, the lava drained out through the tube rather quickly, as the plug that had been holding it must have broken loose, allowing the lava to drain.

Sixty feet beyond the constriction there is a large room 200 ft long, 12 ft high, and 20-23 ft wide, with the cave's rear entrance at its far end. About 75 ft before the rear entrance, the cave is crossed by a joint which runs nearly perpendicular to the direction of the passage. It varies in width from 1-3 inches, and allows one to see the thickness of the lava deposit. The joint passes through a cupola and a lava ledge. This lava ledge is the only example in the tube of that particular feature which is so common in Washington lava tubes. This ledge was composed of lava entirely from the last flow, as the joint showed it to be one single layer over 5 ft thick with no contraction cracks whatsoever. The joint also showed the lava deposit from the last flow to be 2½ ft thick on the floor and from 4-12 inches thick on the walls and ceiling.

The 1,000 ft of the cave beyond the rear entrance was not studied in any detail. The cave continues at a slightly greater slope and remains about the same size as the commercialized portion. On the floor of the "collapse room" there are "lava volcano" stalagmites. Powers' theory as to how they were formed seems reasonable. On the ceiling of the same room, at 1,280 ft, there are lava stalactites 8 inches long and ¼ inch in diameter. The cave ends with the ceiling going from 5-6 ft in height down to the floor rather abruptly. Whether this end is caused by the lava filling the rest of the tube entirely or just from lava solidifying in a constriction in the passage is not known.

In comparing Thurston's Lava Tube with the tubes of southern Washington, a sharp contrast is seen. Many of the structural differences are based on the fact that Hawaiian lavas are much less viscous and much more subject to erosion than those which formed the tubes in Washington.

The Washington tubes were much larger in average cross-section, both in width and height, even though much of their length contained lava ledges on either side between 10 and 15 ft high.

The color of the lava in both caves was the same: black. Both areas also had small isolated deposits of a deep red, highly porous, lava which were amazingly similar in appearance and texture.

The Washington caves have suffered extensively from breakdown and stream deposition of mud and gravel, while Thurston's Lava Tube has no stream deposits or any stream, as the water which enters the cave seeps right on through the floor. [Ed. note: From the above, it is easy to conclude that the author had visited Ape and Lake caves, Washington.]

*Previous publication, if any, not cited in my copy. --Ed.

The Cascade Caver 19(4):35-39

[*SD* Ed. note: All other editorial notes and footnotes are those of the *Cascade Caver* editor.]

A LAVA TUBE AT KILAUEA*

by Sidney Powers

Introduction. Thurston's Tube, Keanakakina, is one of the longest and most accessible tubes thus far found near Kilauea. This tube is named in honor of its discoverer, Mr. L.A. Thurston of Honolulu, through whose interest in Kilauea vulcanological research has been made possible on Hawaii for the past ten years. It is situated about 3 mi east of Halemaumau, the active pit of Kilauea, and 1,000 ft east of the rim of the pit crater Kilauea Iki. It opens into the Kilauiki [sic] pit crater at the junction of the old Heauhoa road with the road from the Volcano House to Halemaumau and runs in a northeasterly direction. It is one of the channels by which Kalauiki was drained not long before the lava lake finally disappeared and the crater became filled with a tumble of blocks from the walls. The lavas surrounding this crater and the original tube represent flows from the volcano Kilauea.

Kalauiki is one of the pit craters along the long row of pit craters, cone and pit craters, cones, and finally lava flows which extends along a line of weakness from the former summit of Kilauea to the sea at Kapoho, south of Hilo. Along the same line the volcano split again in 1840 with renewed activity in the lower pit craters and below them.

Thurston's Tube is described in order to give details of the size and shape of a long Hawaiian lava tube for the first time, to emphasize the comparative rarity of large tubes [remember this was written in 1920!--ed.] and to call attention to concrete examples of "blow-piping" according to the gas fluxing hypothesis of Professor R.A. Dale. The writer is indebted to Dr. T.A. Jaggar for correcting the manuscript. With the 1918-20 activity of Kilauea and with the lava flow in Kau on Dec. 22, 1919, many similar tubes have been formed which unfortunately cannot here be described.

Description. Measurements of Thurston's Tube were made with a tape and a small transit using azimuth angles, checking direction with a compass and elevation with barometers. Magnetic variations of 10 degrees were noted. The length of the tube is 1,494 ft, or in a straight line from entrance to end 1,360 ft. The maximum height, excluding the cupola at the entrance and a collapse of the roof, is 20 ft, the maximum width is 23 [?illegible] ft. The difference in level of the entrance and end of the tube is 73 ft, representing an average drop of 4.9 ft per hundred feet or 2½ degrees.

Liquid lava completely filled the tube at the initial stages of filling just as was the case of the Halemaumau tube above referred to. Gradually the level of the lava fell, as shown by numerous benches at different parts of the tube. Finally the viscosity became so great that the surface froze. A final spurt of lava from beneath the crust is recorded near the end of the tube. The present end represents either a low place in the roof, or the level to which the pre-existing tube was filled. Hot lava ram down the walls in the form of poorly developed stalactites and welled up from the floor at the far end of the tube in many small volcanoes a foot or less in height.

During the time the lava almost completely filled the tube there was a great release of gas, especially near the entrance--the same phenomenon which may be watched in the splashing "caves" at the sides of the Halemaumau lake or lakes and just as must take place as proved by recent soundings of the Halemaumau lake by Dr. T.A. Jaggar, which showed that only the surface of the lava lake is a liquid, and that this liquidity is developed by surface chemical reactions. The gas collected against the roof of the tube and "blow-piped" more than a dozen small conical cupolas in the original overlying lava, searing the surface of the cupolas as formed. The peaks of these cupolas are one to eight feet above the general roof level and the basal diameter is about the same as the height. Farther down the tube the narrow cupolas are replaced by large rounded cupolas as well as high rooms which have evidently been formed by stopping of lava blocks together with fluxing of the surface. Still farther along, missing roof blocks must have fallen into the lava. Blow-piping was intense at the mouth of the tube where the gas release was greatest and decreased in proportion to the distance from the mouth.

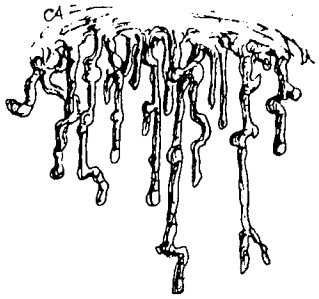
Since the cessation of activity at Keanakakina, earthquakes have jarred loose portions of the roof, making an opening to the surface at one place and causing a collapse further along the cave which exposes a directly superimposed tube of the same dimensions, but of shorter length. The resulting cavity is 30 ft high.

One of the interesting recent developments in the tube is the penetration of long, pale yellow, filamentous roots through 4 to at least 8 ft of roof. These roots are very abundant. Many of them are over 9 ft long below the roof and the longest measured 12 ft. One root, 9½ ft long, has penetrated to the floor.

[Powers gives a three-page, foot-by-foot log of the cave's features which is not reprinted here. His map of the cave is omitted in favor of the more

His map of the cave is omitted in favor of the more detailed 1979 Cascade Grotto map...]

*Originally published in the *Bulletin of the Hawaii Volcano Observatory*, March 1920, pp. 46-49. Portions of the original report not reprinted here.



CAVING IN PARADISE

The Cascade Caver 19(4):45-49 Kevin Allred

Carlene and I had decided several months before that we would go caving in Hawaii and accordingly left Nov. 13 for Oahu... Most of our time on this island was devoted to visiting old friends...

Maui. We only had a one-day caving reconnaissance there and after frantic car and babysitting arrangements decided to shoot for the crater of Haleokala where there are a few reported caves. At Haleokala National Park headquarters we talked with personnel and were shown directions to the closest lava tube, which is Long Cave. We were requested not to map it on this trip. After 5 mi in pouring rain, it was getting dark, and while Carlene waited in a shelter cave with another wet backpacker, I went on to the cave. There is about 1,800 ft to map. A nearby collapse sink known as Na Piko Hauna was apparently used by locals who had a custom of throwing or stowing baby umbilical cords in such places (see *Haleakala Guide* published in cooperation with the National Park Service)...

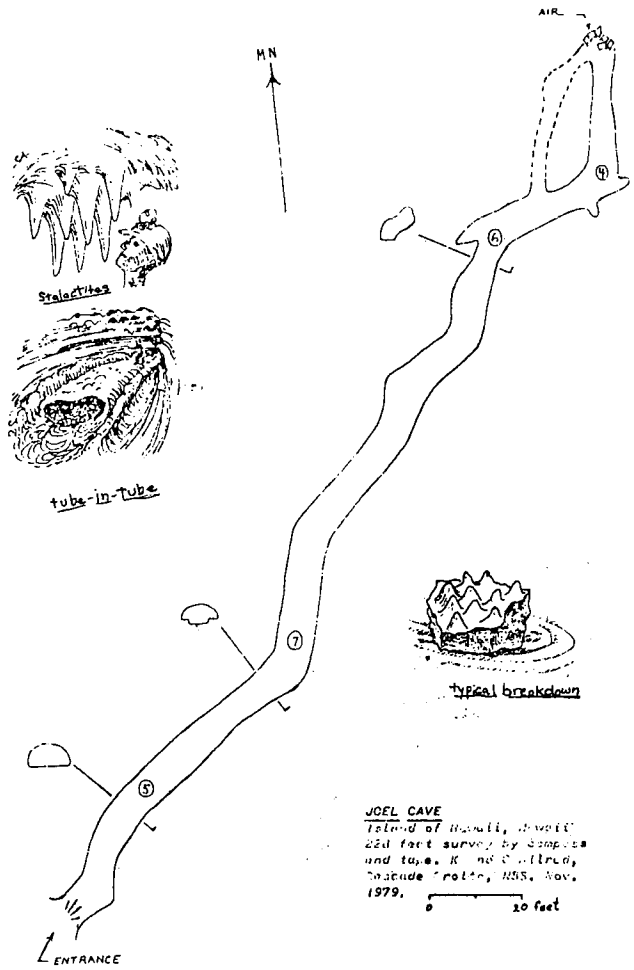
Hawaii. Much to our amazement, the first volcanic eruption in two years began the same morning we arrived from Maui. As soon as possible, we headed for the eruption site in hopes of seeing lava tubes actually forming. We arrived there about 45 minutes to an hour after the Park Service opened the site to visitors... Because of a roped-off area, I wasn't able to see where the majority of lava was flowing and where a small lava tube was forming (which we didn't know about then)...

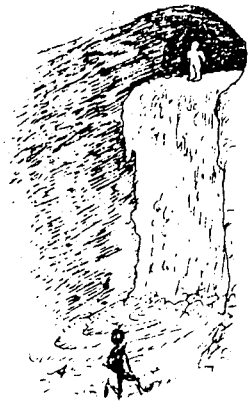
The next morning saw me at Kaumana Cave trying to map it alone with a raging torrent rushing down the passage from the 15 inches of rain which fell in three days. Needless to say, little was accomplished. We saw Thurston Lava Tube at the Park that evening and learned that the eruption was over.

Sunday was relaxing, as Bill Halliday and Carlene photographed in Kaumana Cave a short while.

Monday...we drove to Kona on the west side of the island where we were to meet a contact. On our way we were delayed by a short, 500-ft, partially virgin roadside tube, and went on past a second opening. Joel Garon, our contact, was kind enough to drive us up in his 4WD to his cave area, and even though we didn't find the big entrance he had seen years before, we mapped a smaller cave (Joel Cave, about 200 ft long) located in a sugar cane field.

From Tuesday on, a wonderful babysitter took care of Lehi, so we were able to zoom through the caves. Tuesday was also our first day in Kazumura Cave. We saw the upper 4 mi, making our walk through cave passage a total of 8 mi. Much of the cave was coated with glaze, and some lava features looked like calcite deposits. We helped Bill clarify a question some British cavers had on the new map they are working on. We photographed back out. We also photographed waterfalls in Kaumana Cave that day.





lava-fall

The National Park was next on the agenda, and we hoped to use our 300 ft of rope to drop Devil's Throat or other reported deep pits with possible lava tubes at the bottom. Devil's Throat is about 150 ft deep, 50 ft across, and looked too unstable, so we went on to the recent eruption about ¼ mi away. A stream of lava some 40 ft across had crossed the Chain of Craters Road, and where it had been bulldozed out of the way a small surface tube was exposed. The thing was very warm inside; jumpin' catfish, a totally virgin roadside cave! Bill crawled in. John, Carlene, and I left Bill at Thurston Lava Tube and after leaving a sleepy Carlene at his place, John and I headed back into the cave (now named John Martin Cave) near his house to see if we could get down past the previous limit of John's exploration downtube; he had stopped at the top of a 15-ft drop, and heard from his two other caving friends that they had gone down once but the cave soon ended. We climbed down and after a crawlway walked until we were very tired. The cave continued on as big passage, but we had to turn back because of time. On the way back, I paced off 7,700 ft of what is certainly unitary passage!

Friday was scheduled for a long hike to a cave, but it turned out I was the only one still capable of it, as the others had torn up boots, blisters, or sickness. The cave was well worth the 16-mi hike.

We flew home without seeing your typical tourist sights, but to us, the hidden paradise underfoot was the chance of a lifetime, and very extraordinary.

SHOWERS

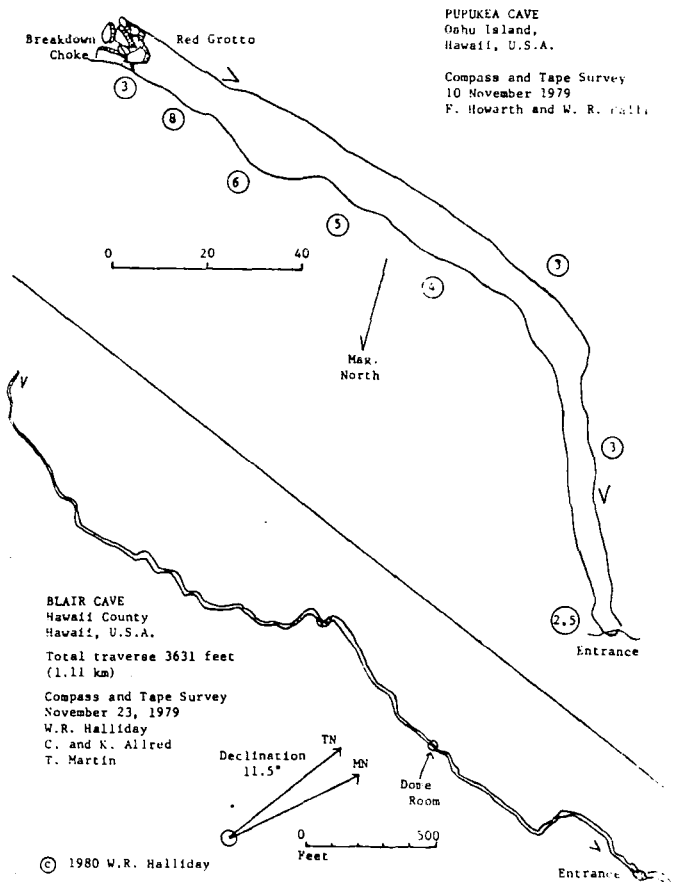
PUPUKEA CAVE
UNIVERSITY OF HAWAII QUARRY CAVE

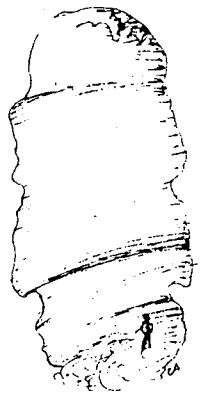
Honolulu County, Hawaii

The Cascade Caver 19(4):40-41 William R. Halliday, MD

The last time I had gone caving on Oahu was in 1955. Some things had changed; Frank Howarth had found a few more caves, for example, including a lava tube opening at its lower end on a roadcut in a steep hillside on the NW side of the island. So he met us at the airport on Nov. 10, 1979, and soon we were parked on Pupukea Road near Pupukea Cave. From the number of bottles and cans, it is well known locally (although not littered nearly to the point that led me to name one passage in Makua Cave the Beer Can Crawl in 1955). The entrance section is a low crawl but af after about 100 ft it is possible to stand erect and admire the sequence of flows and red clay microgours that make the cave interesting. Some speleothems have been broken, but there are ribbons, straw and tapered stalactites, and small stalagmites of lava, and the red clay minerals make the cave quite pretty. A black glazed flow sequence is especially interesting. Total length is about 180 ft. It ends with a breakdown choke.

I was in Honolulu for an important medical meeting, so couldn't do much more caving. On the follow-



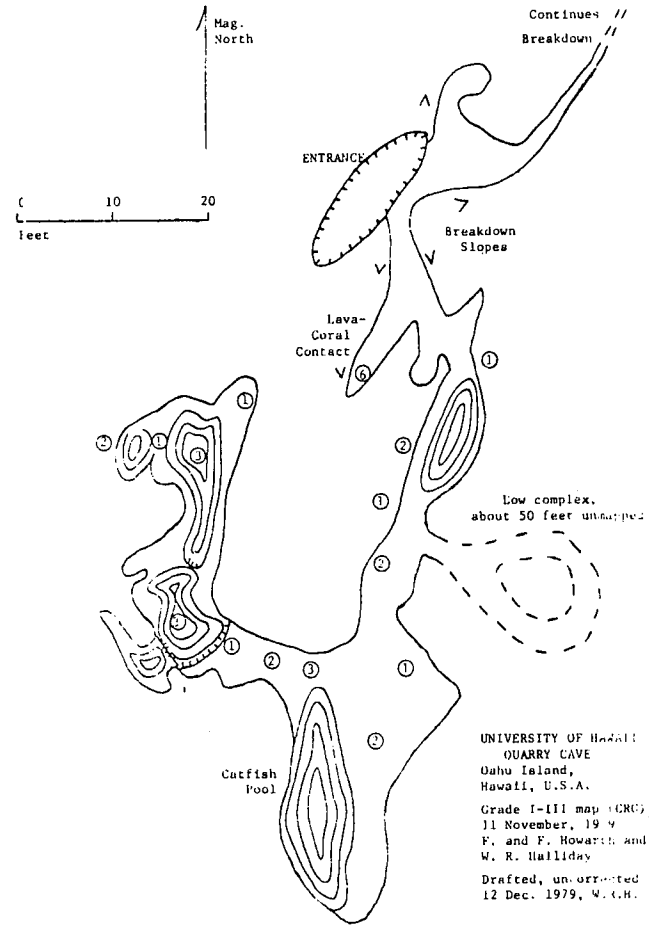


Passage cross-section

ing day, however, there was a short break in the progrma, so Frank and Frankie Howarth showed me a phreatic limestone cave on the Univ. of Hawaii campus nearby: University of Hawaii Quarry Cave. It is a miserable little maze just below the coral-lava disconformity, recently opened as a result of collapse beneath the office then occupied by Congresswoman Patsy Mink. Frank says that a number of similar collapses have occurred in this neighborhood since the Alawai Canal lowered the local water table, but usually they are filled at once. This one would make a nice little natural ecology laboratory, but nobody seems interested in saving it. In most places there is a maximum of 3 ft of airspace above the water table at low water (as when we were there) and the water is more than 8 ft deep in places, in a series of ponds connected below the water table in small rooms. No speleothems were present. Frank had fish traps in the cave because of rumors of cave fish, and this time Frankie spotted a small catfish--not in the trap, unfortunately. The cave is about ¼ mi from the nearest stream. We tried to map it, but Frank is such a joker that I thought he was exaggerating the muddiness and tightness of the cave and didn't come properly prepared for the job. He estimates a total of about 300 ft of passage, none of which is very far from the entrance.

A couple of days later the Allreds and I made a quick return trip to Pupukea Cave for some photography but that was all I had time for on Oahu this time. There is a little sea cave in emerged coral, about ¼ mi north of Pupukea Road, that Frank has traversed at low surf, which we barely entered, and a small sinkhole in a coral flat a little farther north, that surges with the surf, so future visitors to Pupukea Cave may want to check that area more thoroughly.

Passage cross-section



WESTERN CONE CRATER

Hawaii County, Hawaii

The Cascade Caver 19(4):49 Phil Whitfield

(Reprinted, much abridged, from *VICEG News* 9(12): 116-117)

Bill Halliday caught wind of Dave Jones' and my pending trip to Hawaii and somehow talked us into taking with us a virtual "shopping list" of caving projects, as well as our vertical gear. It seems there were these virgin craters of indeterminate depth in the midst of the Kau Desert in the Hawaii Volcanoes National Park. The three craters might be connected by a large lava tube...

The craters proved impressive: the western and middle ones were about 50 m across and apparently well over 50 m deep, and the eastern one was set in a small cinder cone with a throat only about 20 m across but obviously deeper than the others.

After my usual hemming and hawing in the presence of heights over 5 m...I found a reasonable-looking large rock anchor just below the rim of the western crater at the top of a sand slope leading down to the main drop. I gardened my way carefully down some 30 m of sand slope and inched down the considerably steeper rock-studded, clay-like slope to a small ledge at the edge of an obvious void. From the ledge I could see to the bottom of the crater, perhaps 30 m below. The pit appeared blind. With the knotted end

of my rope dangling awkwardly at least 10 m above the floor of the drop, I completed my observations from the ledge and cautiously retreated...

Next day, Dave and I teamed up with a crew of USGS types from the Hawaii Volcanoes Observatory for a return trip to the Cone Craters. This time, the rope reached the bottom of the pit with some 5 m to spare. The descent was pleasant, with no really sharp edges or loose rocks to worry about. Norm Banks and Dave quickly followed me down, and we spent over an hour looking around, surveying and taking notes.

The floor of the Western Crater sloped some 60 m westerly from the foot of the rope to a point some 15 m lower. Massive breakdown covered most of the floor area, which measured about 85 m long by 30 m wide. No connection with the next crater to the east existed, and a remnant lava tube some 13 m up the east wall was blocked. The freefall climb to the ledge turned out to be 30 m and the linear distance from the ledge up to the rope anchor was about 46 m. Altimeter readings top (915 m) and bottom (830 m) indicated a total depth of 85 m (280 ft). I hope to complete the survey drawing before too long, and to obtain Norm's geological notes on the crater for a more formal report.

With one crater explored, the other two remain. The middle one is probably deeper than the western crater, although it is most difficult to estimate accurately how far the shadowy bottom is below the rim (especially when one is trembling with fright!). The Eastern Cone Crater looks more interesting, though perhaps no easier to rig. One suspects that it may be the deepest of the lot, and who knows whether the conjectured lava tube may not lie below?

Idaho

GYPSUM CAVE EXTENSION

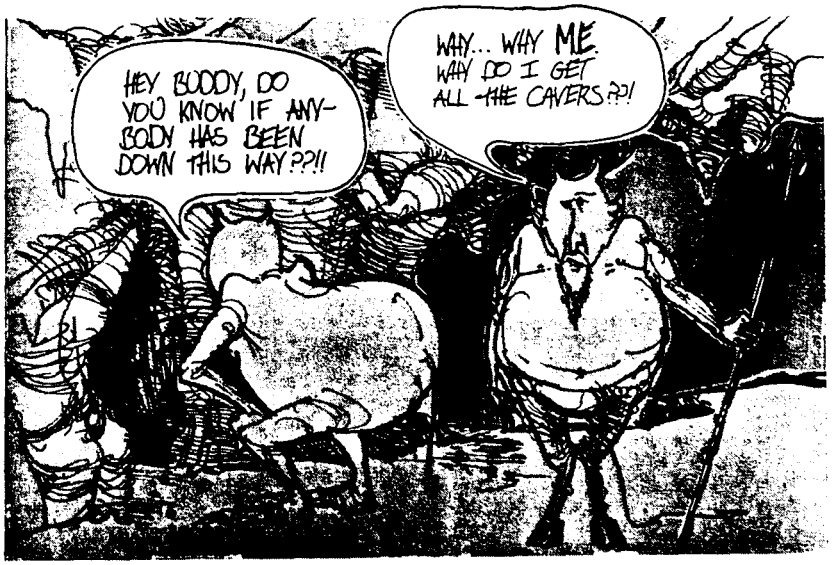
Lincoln County, Idaho

Gem Caver 13(6):47 Frank Ireton

...Bill Colvin had crawled into another level of Gypsum Cave and come out ooohing and aaahing, saying we should take a look, Skeptically, I headed down and dropped down two levels, into a lower level with a silt floor. This was a new level, not previously mapped, adding to the cave both length and depth.

There are now six levels in some places and possibly seven. We didn't tape the lower level, but it extends in both directions for some distance. The lower portion ends in a silt plug. After some burrowing by all of us, Chuck managed to push for a short distance, but crawled back out. The upper portion ends in a plug that possibly could be dug out. The lower level is interesting in several ways, including the shape of the passageway, which suggests that it is a secondary or branch of the main tube. The trend, however, is along the same line as the main passage, so probably it is the result of one of the later lava flows in the tube. The same type of smooth walls are seen in other encased tubes.

Another intersting point is the presence of smooth silt floor deposits, indicating that this is the bottom level, where water has stood in place. Other evidence to support this hypothesis is the presence of mud lines on the walls, formed by standing water at various levels. The most tantalizing idea is the possibility of digging the other end out and extending the passageway. From surface topography, other tubes should be found in the area, especially to the northern end.



GYPSUM CAVE

Illinois

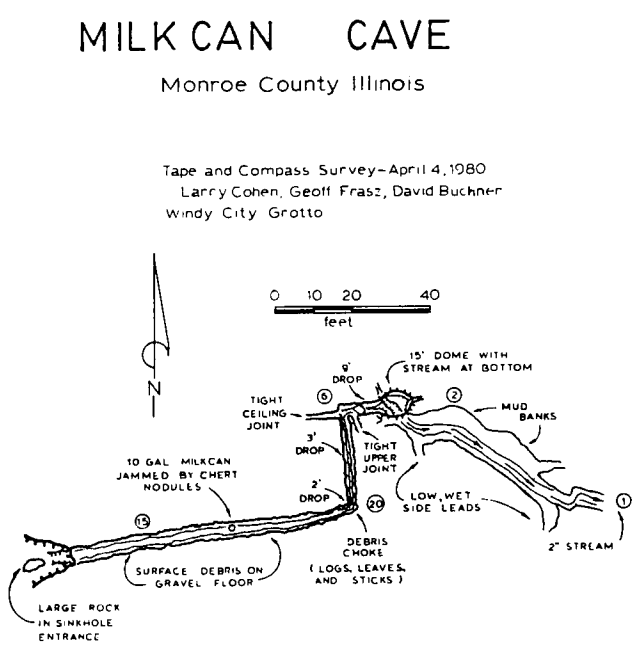
MILKCAN CAVE

Monroe County, Illinois

The Windy City Speleonews 20(3):47 Larry Cohen

Located in a very large, wooded sinkhole between LL and Tipton roads, Milkcan Cave drains a large area just south and SW of surveyed passage in Illinois Caverns. Deep gullies weave through the sink to the much-widened joint entrance, where large tree trunks and other surface debris are found. A SW-trending side passage near the sump in Illinois Caverns is believed to be the outflow for Milkcan Cave, but this is yet to be proved.

Milkcan Cave received its name from a prominent 5-gal Clover Farm Dairy Co. milkcan wedged in the passage about 40 ft from the entrance hole. The upper level of the cave is joint controlled. Two right angle bends and two short drops lead to the stream level. The last drop, about 6 ft, is itself evidence of a widened joint. Beyond it, the cave immediately changes character; the stream passage widens to a 10- to 15-ft-wide bedding-plane crawl over the gravel and stream. After 35 ft the passage splits, with most of the water flow taking the left route. Both directions are wet and very low, but the passage to the right might be traversable.



Indiana

CORNCOB CAVE

Monroe County, Indiana

Speleo Tymes 8(2):11-12 Randy Jackson

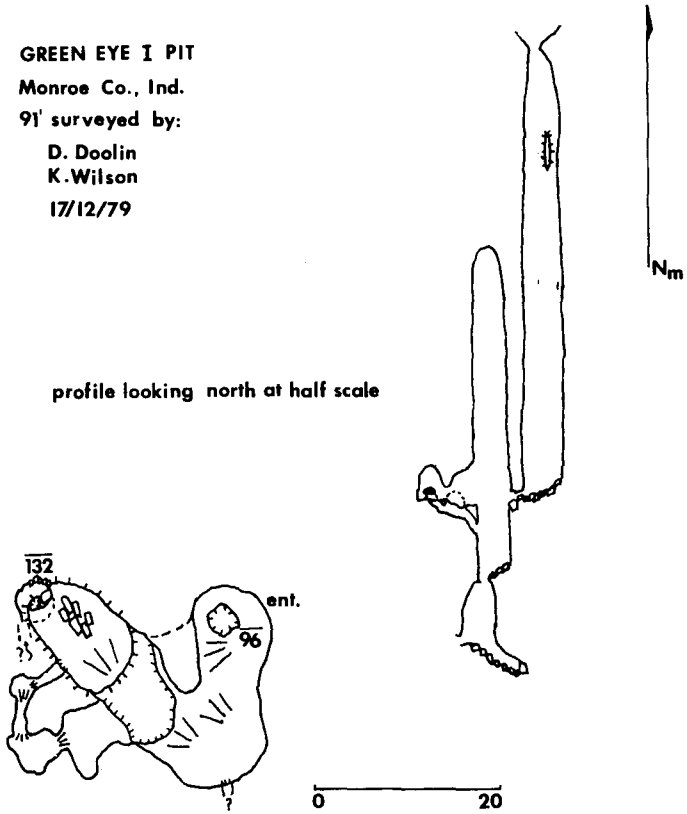
Tom Fritsch and I had been hillhopping around the Saltpeter Cave area on Nov. 3, 1974, when we came across a little rock-faced sinkhole near the edge of the woods. It looked promising, so we started digging. We moved a little dirt and had to manhandle several large rocks, which took both of us pulling to move them. Soon we had an opening big enough to enter. Since I had never been in virgin cave before, Tom agreed that I could go first. I carefully climbed down the 11-ft cherty entrance pit and saw that I was in a room big enough to stand up in. It was about 12 ft high, and I could see a crawlway taking off on the other side. I told Tom what I had found, and he told me to go on, that he would stay outside (in case something happened he could go for help--I guess). Well, I kinda took a big gulp, and slowly headed across the room towards the dirt-floored crawl.

I didn't make a sound, and I tested every step. After all, haven't you heard that breakdown in virgin passages is so unstable that sometimes even the sound of a voice can bring the ceiling tumbling down on your head? (It doesn't matter how solid it looks!) Or about false floors which crumble under a person's weight, sending the unwary caver plummeting to his death into a pit hundreds of feet deep? I proceeded with great caution, inching along the untouched crawlway, amazed at being the first person to ever see this cave. The walls were clean, there were no scuff marks or footprints ahead of me, no trash left by ignorant speleoboppers. I was seeing for the first time a cave in its true natural state. The crawl went for about 30 ft, then turned a corner and pinched out. It could probably be dug out, but that might be more trouble than it's worth. I had noticed several corncobs, either washed in or brought in by animals so, lacking anything else to call it, we named it Corncob Cave, my first virgin cave.

C G N March

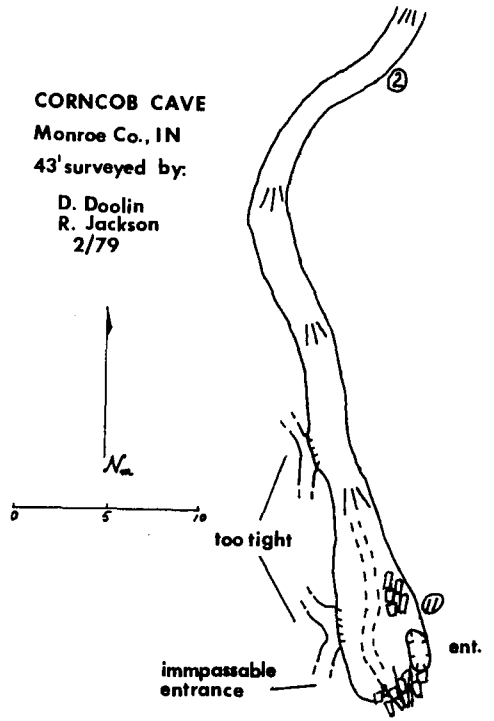
GREEN EYE I PIT
Monroe Co., Ind.
91' surveyed by:
D. Doolin
K. Wilson
17/12/79

profile looking north at half scale



dmd

CORNCOB CAVE
Monroe Co., IN
43' surveyed by:
D. Doolin
R. Jackson
2/79



dmd

Resurvey: DOG HILL-DONNEHUE CAVE SYSTEM

Lawrence County, Indiana

The Bloomington Indiana Grotto Newsletter 16(1):34-39 David Bolton

In May 1978, members of the Bloomington Indiana Grotto and Indiana University Spelunking Club began a resurvey of the Dog Hill-Donnehue cave system. This system is located near Bedford and was surveyed in 1958-59 by members of the Central Indiana Grotto (*BIG Newsletter* 5(1)). It was felt that this map lacked the detail that should be accorded a cave of th this size; in addition, there are several large passages in the Dog Hill section which were not on the old map. For these reasons the cave was resurveyed.

Although much of the surveying was drudgery, one of the most exciting points in the project was Dave Black's and Sam Frushour's rediscovery of the downstream portion of the Dog Hill section. After a 150-ft-long near-belly-crawl in water (Black's Damp Passage) and a very tight "pop-up", they entered some of the largest passage in the entire system. This 1,500-ft stream gallery averages 15 ft wide and 30-40 ft tall. Parts of it are beautifully decorated with flowstone. The passage ends in breakdown near a spring spring which is close to the White River. The relationship between the Dog Hill stream and this spring remains to be defined.

A running map was drawn between each survey trip at a scale of 50 ft to the inch (anyone care for an 8-ft-long piecemeal map?). The corrected coordinates of the survey stations were plotted in a Mylar grid at 100 ft to the inch, and this was subsequently reduced to approximately 240 ft to the inch with the aid of a Saltzman projector.

Logistics. The surveying involved 16 people, 7 of whom made several trips to the cave. There were 13 mapping trips and over 200 people-hours of surveying took place. Approximately 480 survey stations were set.

(lengths represent true horizontal cave)

	feet	meters	miles
Donnehue (up to Berg squeeze)	9,312	2,839	1.764
Dog Hill (up to Berg squeeze)	7,846	2,391	1.486
Total Length	17,158	5,230	3.250
Total Vertical Extent	85		

Based on a current (3-6-80) list of long caves of the U.S., the Dog Hill-Donnehue Cave System is currently the 122nd longest cave in the U.S., and the 8th longest in Indiana.

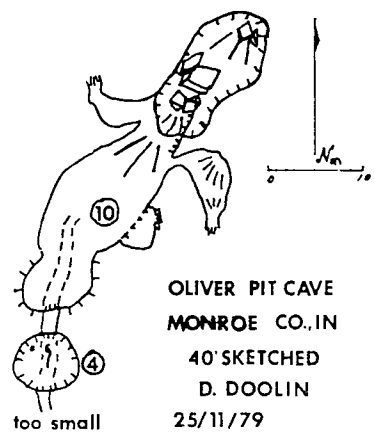
This cave is a fun, challenging, and scenic underground diversion. It has a little of everything with the exception of rope drops. Parts of it are very wet, parts are dry, parts are beautifully decorated and parts are 'safe' (Dave Black's euphemism for crawlway). Perhaps the nicest part is that all the entrances are on friendly territory. Permission for entering the Dog Hill entrance should be obtained at the landowner's house, and the Donnehue Spring entrance is on the property of a boating club (permission should be obtained for parking). No permission is needed to enter via the culvert entrance.

GREEN EYE I PIT

Monroe County, Indiana

Speleo Tymes 8(2):11 Dave Doolin

Green Eye I is a nice 96-ft pit in southern Monroe Co. There is a small amount of cave passage at the bottom, and there is potential for a deeper or more extensive system than what is now known. The total depth is 132 ft, from the lip to where the water sinks. There is a side dome and some eroded flowstone deposits, in the side passage and along one wall of the pit. At about the 100-ft level, the cave intersects a bed of massive chert nodules, which can be seen for another 25 ft of depth. The pit also breathes, with the air steaming 15-20 ft into the entrance, then reversing, emiting a plume into the air. The entrance drop should be rigged on the east side to provide a clean, free drop, as well as an easy lip.



OLIVER PIT CAVE

Monroe County, Indiana

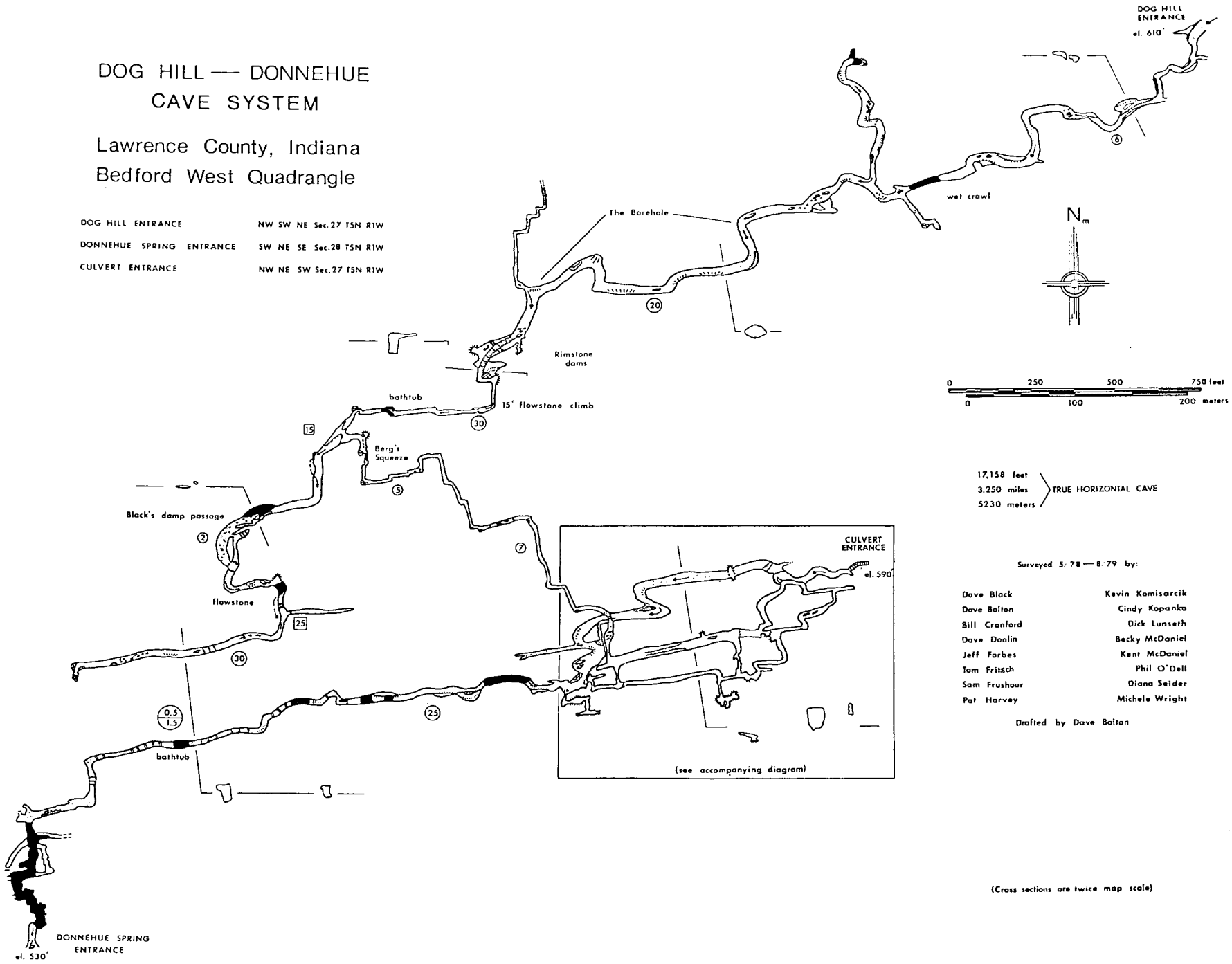
Speleo Tymes 8(2):10 Dave Doolin

Oliver Pit Cave is a small climbable pit about 20 ft deep. There are some small crawls which don't go anywhere and a pit in the back, which is reached by climbing up to the ceiling and into a small crawl. This pit takes a small amount of water. Nothing of severe interest was noticed.

DOG HILL — DONNEHUE CAVE SYSTEM

Lawrence County, Indiana
Bedford West Quadrangle

DOG HILL ENTRANCE	NW SW NE Sec. 27 T5N R1W
DONNEHUE SPRING ENTRANCE	SW NE SE Sec. 28 T5N R1W
CULVERT ENTRANCE	NW NE SW Sec. 27 T5N R1W



17,158 feet
3.250 miles
5230 meters
TRUE HORIZONTAL CAVE

Surveyed 5/78 — 8/79 by:

Dave Black	Kevin Komisarcik
Dave Bolton	Cindy Kopanko
Bill Cranford	Dick Lunseth
Dave Doolin	Becky McDaniel
Jeff Forbes	Kent McDaniel
Tom Fritsch	Phil O'Dell
Sam Frushour	Diana Seider
Pat Harvey	Michele Wright

Drafted by Dave Bolton

(Cross sections are twice map scale)

OLD TOWN SPRING CAVE

Crawford County, Indiana

Bloomington Indiana Grotto Newsletter 15(1):8-10 Kevin Komisarcik

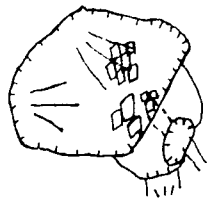
This cavern in Ste. Genevieve Limestone is located in the northern portion of Marnego, known locally as Old Town. The cave has been a major source of water for the town and in fact is still used by a few people. During heavy spring rains the cave floods and flows across the road to a depth of 2 ft. The road is 8 ft above the cavern mouth. When this occurs a portion of Old Town is flooded.

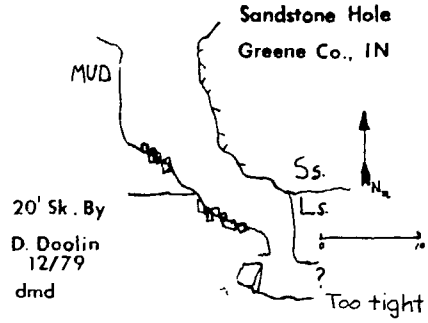
The cave is, for the most part, a single water conduit which is almost entirely walking size. The cave is very clean with relatively few mud banks. In fact the bedrock floor is exposed in several places. The first 700 ft is a walk along a shallow stream until a breakdown room appears on the right. This chamber quickly leads to several crawls, one of which connects with the main gallery at ceiling level. At the end of this room are several 19th century signatures, the earliest being "M. Stewart 1854".

Continuing down the stream gallery, one soon comes to a point where the water has cut a new passage, the older one being partially filled with gravel. About 1600 ft from the entrance is a short passage which has terminated in gravel. This is the second signature room which contains many dates from the 1870's. Just around the corner the bathtub begins. This body of water, about 1200 ft long, is impounded by a large gravel bar. The water depth averages about 3 ft but there are several spots where the water is over 6 ft deep. Also, in the first 200 ft much organic debris has been deposited. When one walks over this detritus large amounts of methane bubble up. It is a good idea to use an electric light source in this section of the cave. At the end of the bathtub is what appears to be a submerged passage. The water is 4-5 ft deep at its entrance. Past this point the water is much shallower. Large flowstone masses are encountered and about 500 ft beyond the bathtub a side passage appears. This blows much air and is full of broken glass and rusted cans. This is obviously another entrance. In fact this entrance lies beneath a large swallowhole. The owner of it has said that on occasion when it is not blocked people have emerged from this entrance.

The main passage soon comes to a near abrupt halt. The ceiling dramatically lowers to allow only a few inches of airspace. It soon opens up again and the next 300 ft is mostly crawling with about a foot of airspace. The cavern finally ends in breakdown with no apparent way to continue.

The cavern is a major drainage system in the area. It pirates water through many swallowholes in the Whiskey Run Valley. Whether most of its water comes from the ridge which contains Slush Tube Cave to the north or from farther up Whiskey Run still remains to be determined.





SANDSTONE HOLE

Greene County, Indiana

Speleo Tymes 8(2):9 Kent Wilson

A man reported to me in May 1979 that a "big hole" had opened up suddenly behind his house. He said it was definitely a cave. In that same month, I checked it out, confirming existence and location.

In Nov., Dave Doolin and I returned with compass and paper. Though it isn't comparable to the Colglazier collapse, it is big enough to make one wonder what was beneath all that rock pre-collapse. At present, the cave consists of a 20-ft pit in sandstone and mud which is underlain by the Beech Creek Limestone. To one side of the bottom of the pit you can s see a small 3-ft crevice in the top of the Beech Creek. In May, I noticed some water flowing out of an enlarged joint, but there was none in November. It is unfortunately probable that the collapse filled solid whatever cave there was below.

SOUTHEASTERN INDIANA CAVES

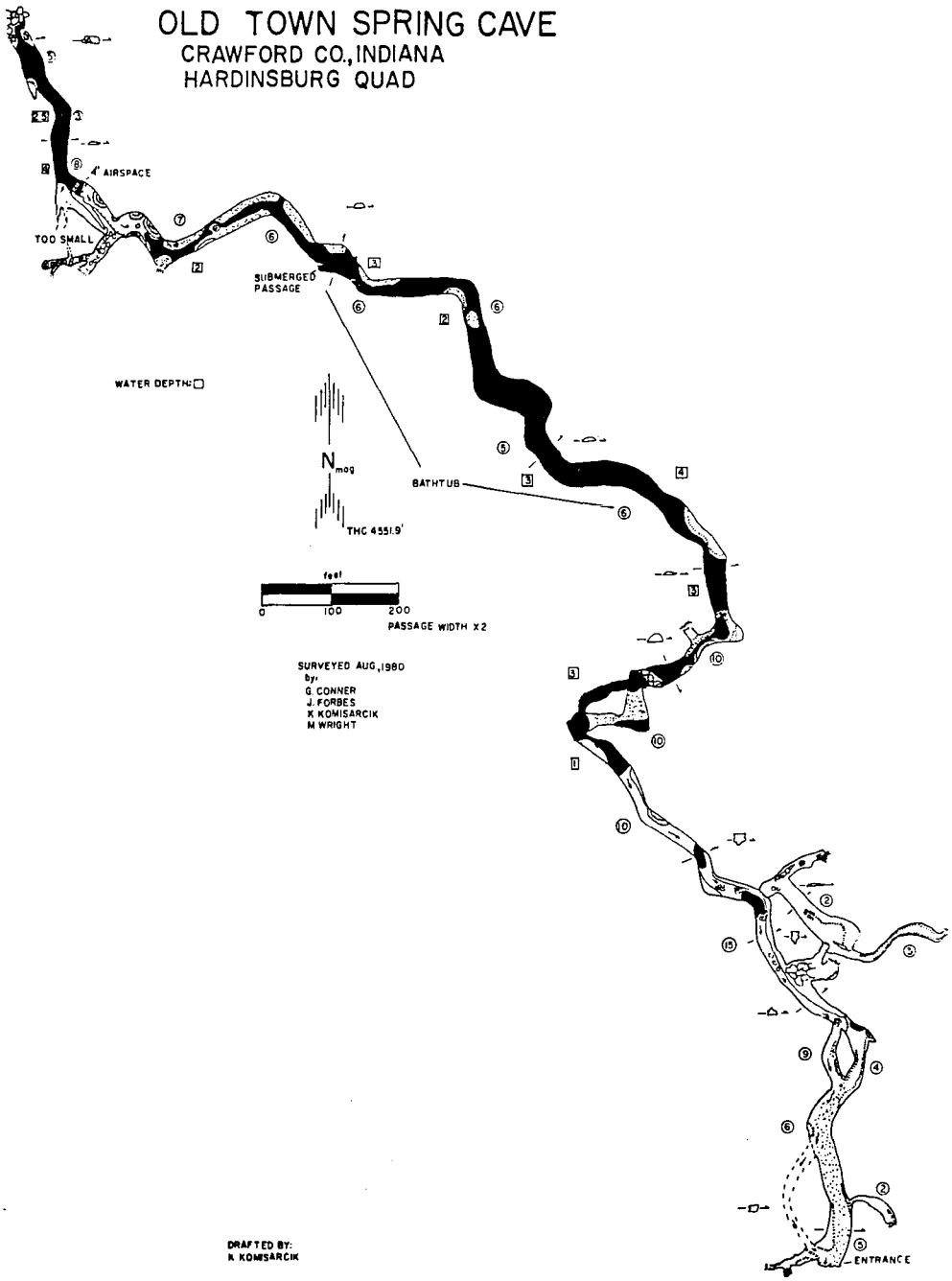
Jefferson and Jennings Counties, Indiana

Bloomington Indiana Grotto Newsletter 15(1):4-8 (authors as noted)

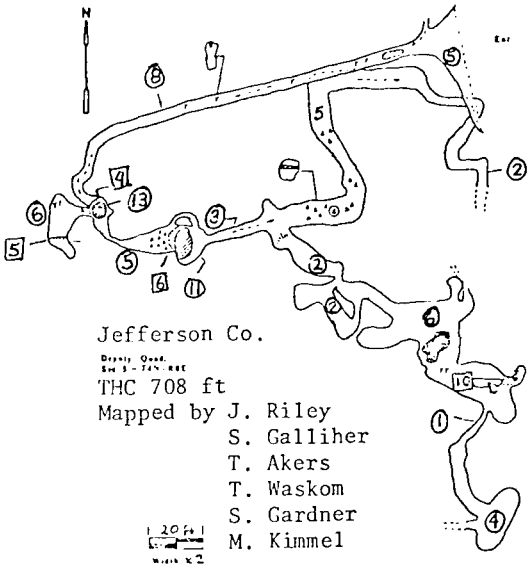
These maps and descriptions were given to us by the folks from the Southern Indiana Grotto. Many thanks.--*BIGN* Ed.

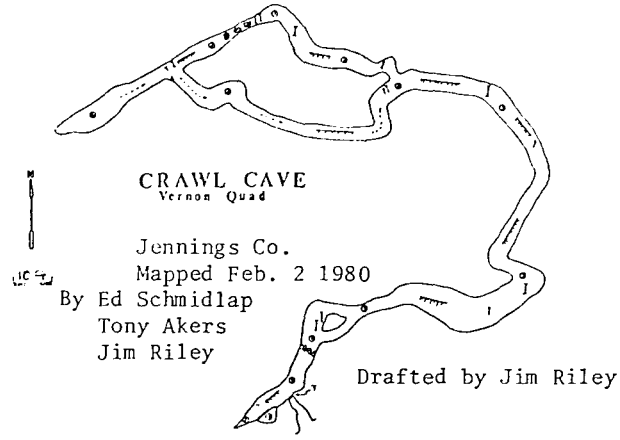
Plunger Cave was found during a ridgewalk last winter. The entrance is in a shallow sink just to the west of a fire trail. Just inside the entrance a small stream enters from a side passage. As you go downstream you will notice formations on the ceiling that are broken. Further down the passage you come to a small drop in the floor; there is a small room off to the right. Following the stream, you come to a room that has a chert floor and a 6-ft waterfall. At the bottom of this is a pool of water and a short crawlway. About 30 ft down the passage, it will take you to some mud-filled rooms, a small pit and some formations. The floor in this crawl is sandy.

Continuing downstream, the chert forms several natural bridges. After some meandering, the passage pinches down. --James Riley


OLD TOWN SPRING CAVE
CRAWFORD CO., INDIANA
HARDINSBURG QUAD
4" AIRSPACE
TOO SMALL
SUBMERGED PASSAGE
WATER DEPTH:
N mag
BATHTUB
THC 455.1.9'
feet
0
100
200
PASSAGE WIDTH X2
SURVEYED AUG., 1980
by:
G. CONNER
J. FORBES
K. KOMISARCIK
M. WRIGHT
DRAFTED BY:
K. KOMISARCIK
ENTRANCE

PLUNGER CAVE





Crawl Cave is approximately 800-900 ft SW of the main entrance to Cox Cave. It lies in a small bluff near the bend in Graham Creek. The entrance is small, about one foot high and 2 ft wide.

Upon entering the cave there is a 7 ft drop into a small room. From here, there is one small passage that leads off. The ceiling soon comes down to an average of about 2 ft. There are many soda straws and other formations. At the back of the cave is one room 6 or 7 ft high. Along one ledge in this chamber is a bed of chert. There is no real stream in this cave although there is evidence that water does flow at times.

This cave cannot stand much traffic because of the low ceiling and many formations. --James Riley

Orrie's Cave. The entrance to Orrie's Cave is in a karst window. Downstream from the window there are several small formations. In one place water enters near the ceiling. At the end the stream disappears down a crack in the floor.

Upstream, the ceiling height is around 3 ft till you come to the first pool of water. Further upstream there are several more pools and a lot of low crawls. There are also three more karst windows. These three windowns some out in section 17.

This cave was found some years ago by Steve Galliher. --James Riley

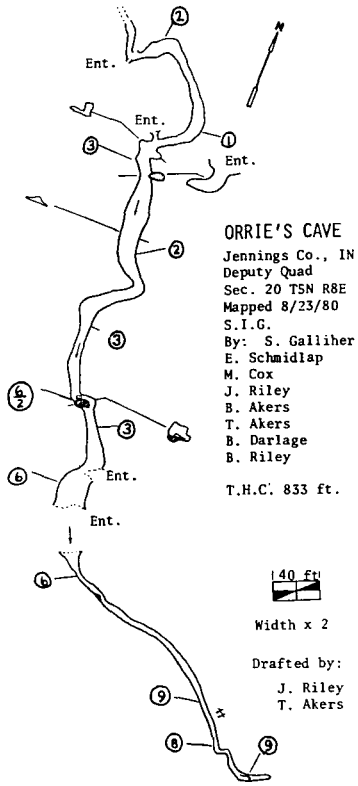
Paris Spring Cave. The spring entrance is located on the west side of Graham Creek in Jennings Co. The entrance is 15 x 15 ft. Approximately 280 ft into the cave is the largest room which has a 23-ft ceiling. To get to the rest of the cave you must climb up to one of the four holes in the ceiling.

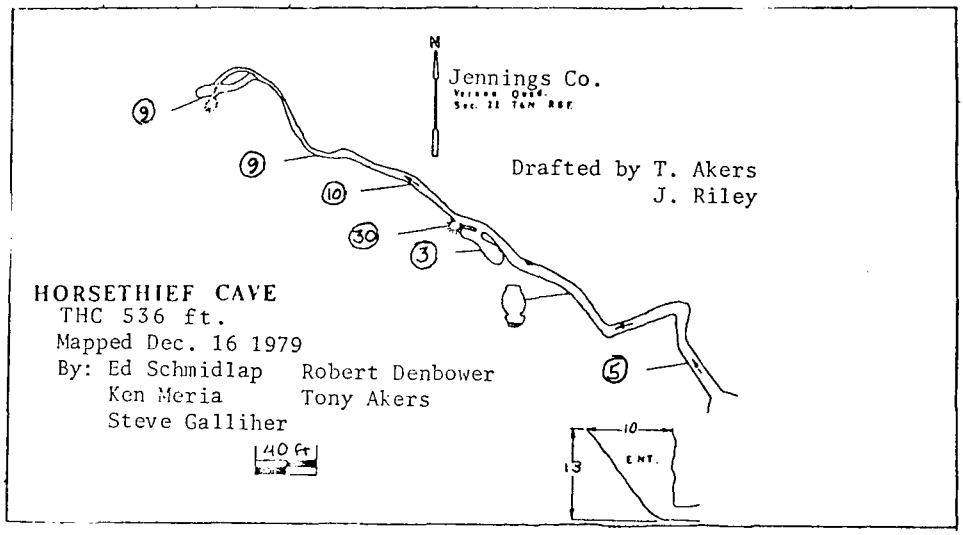
The upper passage is dry for 70 ft. The you come to the stream where it enters the lower passage by going through a hole in the floor and cascades down the side of a rimstone dam.

The stream is for the most part ankle deep through the rest of the walking passage in the cave, but even if you don't push the wet crawl toward the last 300 ft of the cave you'll probably get wet going through the Shower. Here the walls seem to grab your hips and hold you under the shower of water coming down the ceiling.

The cave has formations but is widely known for its great number of rimstone dams. [It is developed in Jefferson Limestone and Geneva Dolomite.] --Tony Akers

ORRIE'S CAVE





Horse Thief Cave is located in a large sink on the Crosley Game Preserve. The entrance is in a steep-sided sink and a small stream runs out from under some breakdown. The stream flows for the entire length of the cave, which is all walking. About halfway through there is a dome that is 30 ft high. Past here the cave has many formations, some of which are broken and lying on the floor. --James Riley

STORM PIT

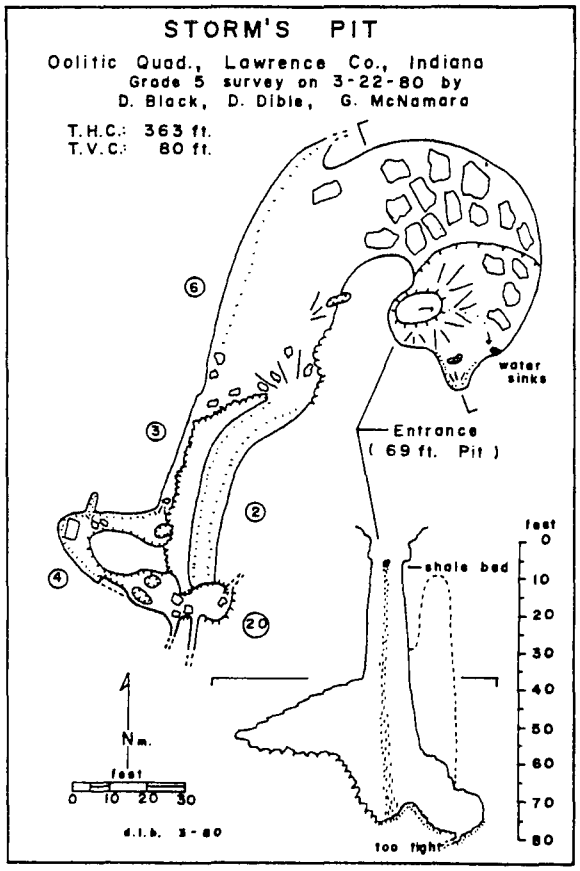
Lawrence County, Indiana

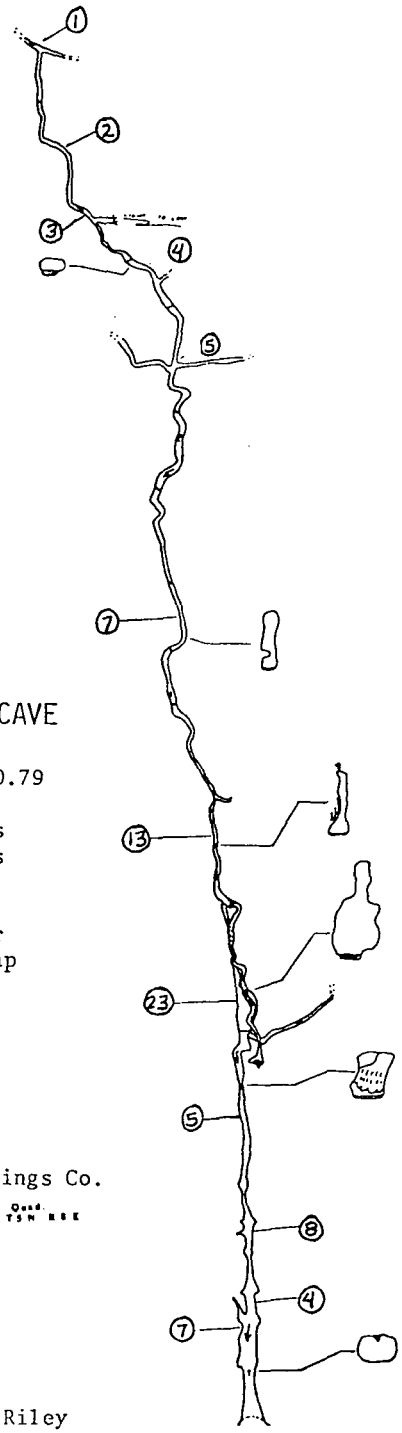
Bloomington Indiana Grotto Newsletter 16(1):33 David Black

Storm Pit (Paoli and Ste. Genevieve Limestones) is located on the east side of Hog Hollow just north of a smaller side hollow on a heavily wooded hillside. The entrance is nearly covered by fallen timber. By running the rope over one of the logs the drop is totally free. The top half of the pit is a nearly circular shaft 10x15 ft in diameter. Halfway down, it opens into a large room. At the base of a small talus slope is a small hole one can crawl into for 10 ft. It quickly becomes too small but one can roll rocks down a steep slope for at least 20 ft. It is a good lead which moves a little air. To open it up a rock hammer, shovel and determination are necessary.

At the other side of the entrance room is a 20 ft climb up over large breakdown boulders. At this level are two passages to the south. One is a narrow crawl between breakdown and the bedrock floor. The other is a low muddy crawl. Both join at a small dome at the southernmost part of the cave. At this point the passage begins to cross under the small valley.

About 10 ft below the entrance is a 2-ft thick shale bed which could be the mid-PaoliiShale. Just above the shale is a small stream entering the pit by way of a 6-inch diameter hole. This water sinks at the base of the talus slope.





PARIS SPRING CAVE

THC 1655 ft
Surveyed 12.30.79
By S.I.G.
A. Childers
S. Childers
J. Riley
T. Akers
S. Galliher
E. Schmidlap

N Jennings Co.

40ft

Drafted by J. Riley

The Wyandotte Cave Area

Crawford County, Indiana

INTRODUCTION

Bloomington Indiana Grotto Newsletter 15(4):fc, 54-59

David Black and Steve Maegerlein

History: Deep in the woods of the Harrison-Crawford State Forest of southern Indiana, caves have been entered and explored since the days of early man. Wyandotte Cave was first entered by aborigines who mined epsom salts, flint, and also excavated calcite from the Pillar of the Constitution. Later Indians entered the cave a short distance to gather flint from the cave walls. F.I. Bently was the first white man to leave a record of his 1801 visit to Wyandotte.

During the War of 1812, Dr. Adams ran a saltpeter operation from Wyandotte Cave and nearby Saltpeter Cave. After the war ended, the saltpeter operation became unprofitable and Dr. Adams gave up his claim on the caves.

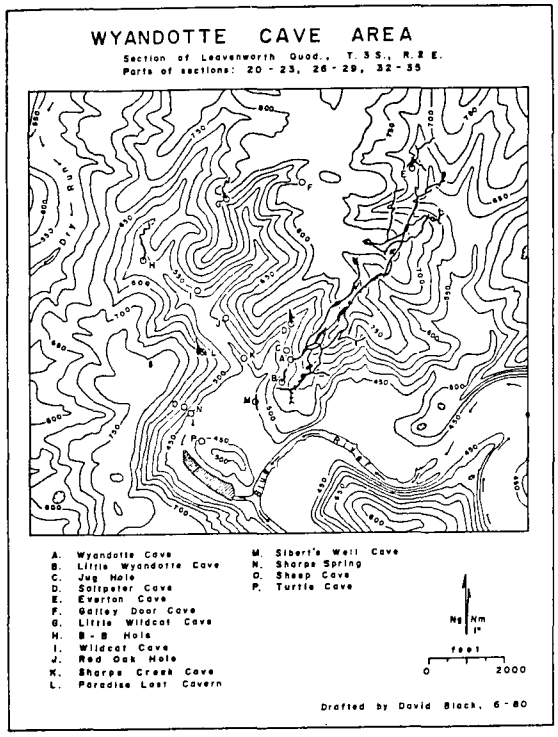
In 1819, Henry Peter Rothrock purchased the land on which Wyandotte Cave is located and started a lumbering industry. They harvested the virgin timber on the hills along the Blue River. The Blue River itself served as a source of energy to power several sawmills built along its banks.

Discovery of the "New Cave" section of Wyandotte in the 1850's made the cave famous as "the second largest cave in the world, second only to Mammoth Cave." This attracted many more visitors, and the Rothrocks started to commercialize the cave. Many early cavers came to the area, including H.C. Hovey, who visited both Wyandotte and nearby Sibert's Cave, presently called Little Wyandotte Cave.

In the first half of the 20th Century, George Jackson, Bob Louden, and several others kept pushing and digging in Wyandotte. When not working in the cave, they were out looking for new caves; B-B Hole was opened up in 1956. Bill Walters penetrated the breakdown in Everton Cave the same year, discovering the black void of Windigo Dome.

The 1960's brought the mapping of Wyandotte Cave, Little Wyandotte Cave, Saltpeter Cave and several other nearby caves after the State purchased the land. Several small caves were discovered, but none led to the big, dry Wyandotte-type passage that everyone was seeking.

Steve Maegerlein dove Sharpe Spring in the 1970's [see p.], reaching a large room. The room was only partly explored because of lack of time and inadequate footwear (wet suit booties). The main stream sumped again on the side of this room. This discovery convinced Tom Fritsch that a large cave must exist in the ridge west of Wyandotte Cave between Sharpe Spring and B-B Hole. During the winter of 1978-1979, he and John Danovich did extensive ridge walking in this area. They found several large sinks near the limestone-sandstone contact, but only one good blow-hole. They spent several weekends digging and hammering out the boulder-filled sinkhole; at the bottom was a small



room and a 13-ft climb. At this point, there was only a 2-inch crack. It took another trip to enlarge this crack. On this trip they penetrated the cave to the large room.

Hopefully, the 1980's will bring more ridge-walking; the area is large and boasts Indiana's biggest ridges. More cave is out there--but we will have to work to find it.

Geology: The area surrounding Wyandotte Cave is located in the eastern part of the Crawford Upland. The characteristic rugged topography of the Upland is developed in the Chester Series, composed of alternating strata of shales, sandstone and thin limestones. These differing strata have varying erosional resistance, causing the numerous small cliffs and benches in the upper parts of the nearby ridge.

Below the Chester Series are the thick limestone formations of the Blue River Group, consisting of the Paoli, Ste. Genevieve and St. Louis Limestones. These strata outcrop along valley walls and floors of the Blue River and its tributaries. For this reason, almost all tributaries to the Blue River are dry stream beds, their water being pirated underground through the underlying limestone and emerging as springs along the Blue River.

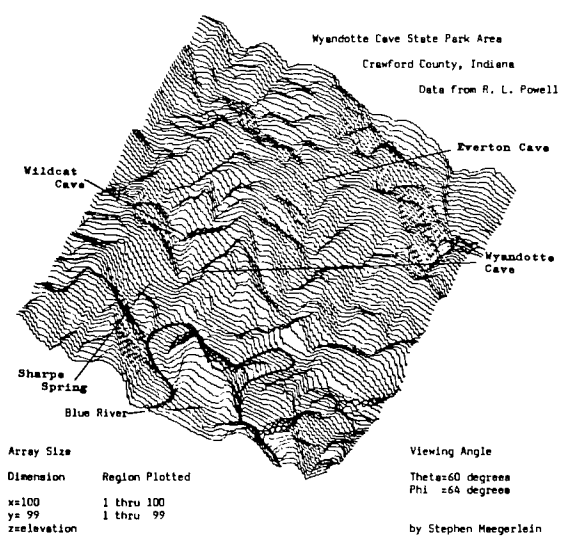
The erosional history of the area can be seen and studied in the Wyandotte Cave area; it is the key to understanding the associated karst development. At least four distinct erosional surfaces are present. The highest is the top of the surrounding ridges occurring at an altitude of 800-850 ft. At this elevation was once a plain with only a slight amount of relief. This erosional surface

is called the Lexington Peneplain and is of the Tertiary age.

Eventually there was a lowering of base level with respect to the peneplain, and the meandering streams flowing across the peneplain started downcutting to an elevation of 525 ft. At this level, a temporary base level occurred. The smaller tributaries and the Mitchell Plain to the east became graded to this level. During this period several caves developed along the newly formed ridges; the upper levels of Wyandotte date from this period. Many surface features were formed at this time, including benches and abandoned meander loops. An abandoned meander loop may be seen to the south of Greenbrier Knob, with its small hill between the Knob and the high ridges to the SE; also the small hill to the NW of Wyandotte Lake is from this period. This erosional level is called the Blue River Strath and is of the late Tertiary or Pleistocene age.

The base level lowered again, causing the Blue River and the other larger streams to rapidly downcut below the meandering levels of the Blue River Strath to an elevation of 420 ft. During this period the smaller streams and the Mitchell Plain were left perched above the major streams. With this difference in elevation a sinkhole surface developed on the Mitchell Plain and the smaller tributaries became dry because of subsurface piracy. The abandoned meander loop at Wyandotte Lake is of this age, which was early to middle Pleistocene.

The Blue River eventually downcut to its maximum depth during the middle Pleistocene period. Later in the Wisconsin glaciation period, the downstream end of the Blue River was ponded while the Ohio River received the glacial meltwaters. Lake deposits formed in this ponded water to an elevation of 450 ft. The present Blue River is incised into these lacustrine sediments which were left as terraces from Harrison Spring to the mouth of Blue River.



An understanding of the erosional history of the area is important for a better knowledge of cavern development. The only cave in the area that has been studied is Wyandotte Cave. Dr. Richard Powell has worked in the cave, relating the various passages to the different erosional surfaces and rock strata. With more studies of the nearby caves one can understand what factors are the most important in cavern development and relate it to a general model for karst and cavern development in this area. It may be easier with this knowledge to find more caves with Wyandotte-type passage that should exist in this area.

Other Things To Do: The area surrounding Wyandotte Cave has many other things that a caver can do instead of entering a wet, muddy wild cave. Wyandotte Cave is worth going to at least once; most will keep on coming back. It is very impressive and makes a caver wonder why Indiana does not have a wild cave like it.

In the surrounding State Forest, many miles of hiking trails exist. The major one is called Adventure Trail. It is 30 mi long and goes from just north of Wyandotte Cave to the Ohio River, forming a large loop around the major portion of the State Forest. In its meandering, Adventure Trail passes by several caves. In the Wyandotte area, it passes just west and uphill of Paradise Lost Cavern; at Everton Cave it misses the entrance by only a few hundred feet. The trail nearly goes over the entrance pit to Red Oak Cave...There are also several other smaller trails that can take a hiker anywhere he wants to go in the area. Anyone interested in a trail map should pick one up at Wyandotte Cave, since they carry some periodically, or write to Stream and Trails Section, Div. of Outdoor Recreation, Indiana Dept. of Natural Resources, 612 State Office Bldg., Indianapolis, IN 46240.

In addition to hiking, one can see many springs by canoeing down the Blue River...

This area surrounding Wyandotte Cave is rich in history, scenery, and caves. With the many things a caver can do, it is worth exploring. Who knows--maybe with a little luck one might find a new cave.

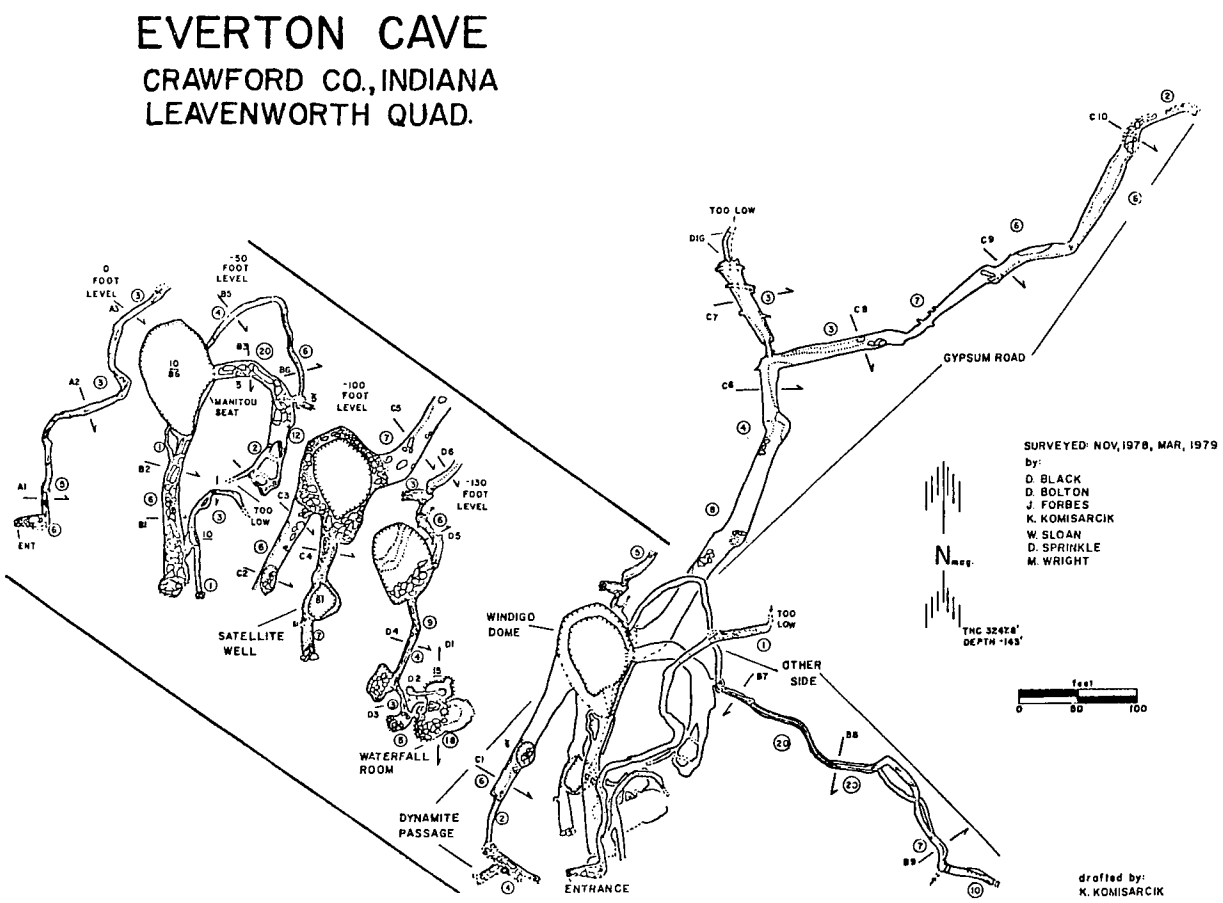
UPDATED SPELEODEFINITIONS:
"TUBE WITHIN A TUBE"

Becky Taylor
The Speleograph 16(3):40

EVERTON CAVE

BIGN 15(4):76,79 Kevin Komisarcik

Everton Cave (Paoli and Ste. Genevieve Limestones) is a truncated portion of Wyandotte Cave which lies only a few hundred feet to the south. The cavern is well known for its unstable entrance and large abyss, Windigo Dome. For a detailed report, see *BIG Newsletter* 14(3), 1979.

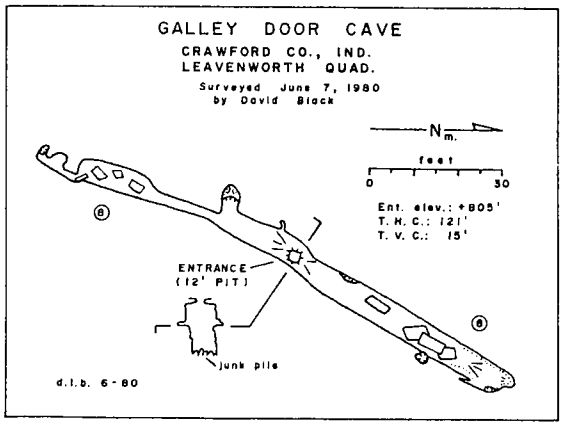


GALLEY DOOR CAVE

BIGN 15(4):63-64 David Black

The entrance is located near the top of Wyandotte Ridge in a small dry stream bed just 30 ft inside the forest. To enter the 2 ft x 3 ft entrance one needs a rope or trust in a rotten log. because the 11-ft pit opens into the ceiling of a passageway. At the bottom is a pile of old trash and egg cartons. The walking-size passage extends in both directions for 60 ft. Any water that enters the cave sinks in breakdown at several points throughout the passage.

The passage is developed in the Beech Creek Limestone member of the West Baden Group. The entrance is in a one-ft-thick sandstone bed. Below this is thinly bedded limestone. Halfway down the pit a one-ft-thick shale bed occurs. Below this the cave is developed in massively bedded limestone.

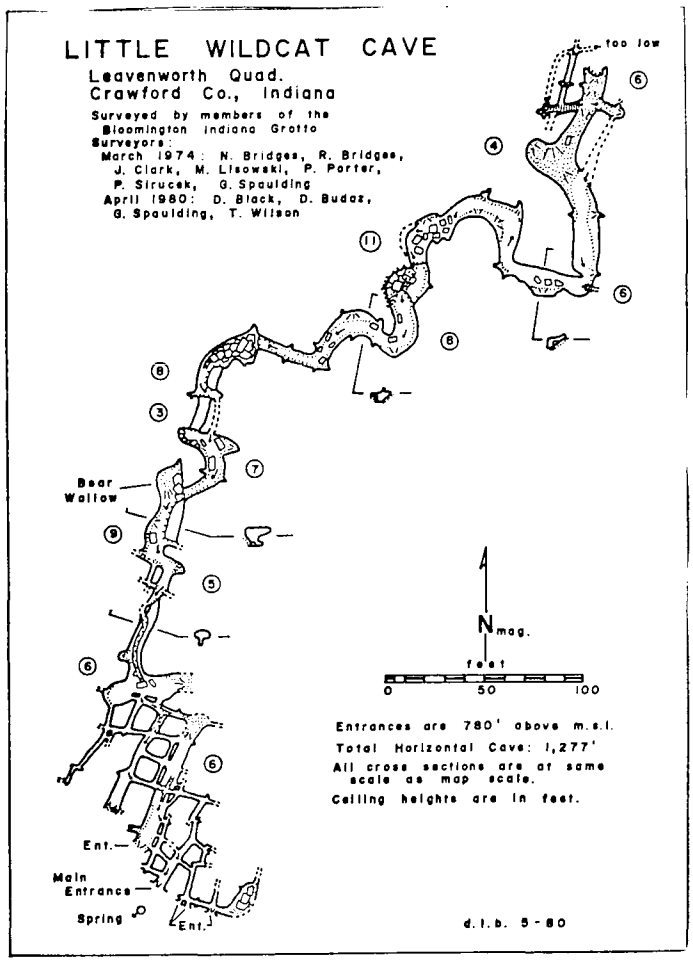


LITTLE WILDCAT CAVE

BIGN 15(4):71-72 David Black

The main entrance to this cave is at a small spring near the top of Wyandotte Ridge. The entrance passage is a narrow crawlway that leads to a maze area. Passages in this maze intersect the hillside in several places to form many smaller entrances. After crawling around in the maze nearly lost, one finally finds oneself in walking size stream passage. By following this passage one leaves the maze and enters the main portion of the cave. Along the way is a mudbank which contains a bear wallow. This passage finally muds up. One can still continue upstream by way of a low stream crawl, but in a short distance even this becomes too small. This point is near a small surface ravine.

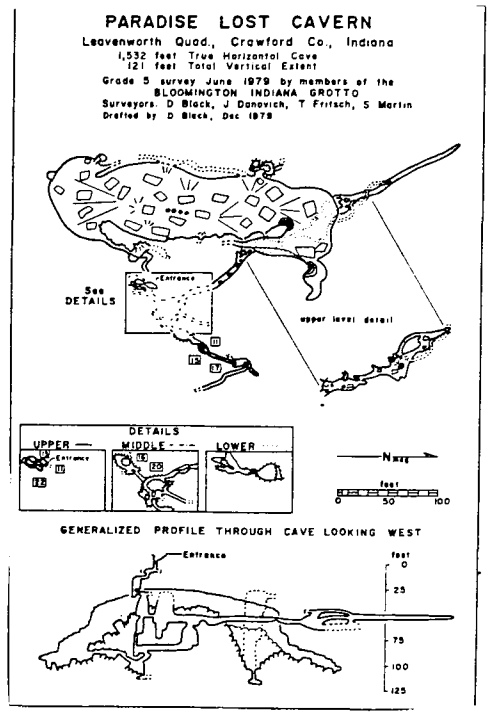
The passages are developed in the Beech Creek Limestone member of the West Baden Group and are joint controlled. The water from the cave flows along on the surface only a short distance before it sinks. This water must come out as a spring along Blue River or at Sharpe Spring.



PARADISE LOST CAVERN

BIGN 15(4):60-63 Tom Fritsch, Dave Black

Discovery. On the weekend of Feb. 25, 1979, John Danovich and I were checking out some leads from Dick Powell and Steve Maegerlein. We went to the ridge above Sharpe Spring looking for a pit, but all we found was a short cave that blew some air. We decided to ridgewalk to see what else we could find.



About ¼ mi of walking brought us to one large sink and a line of smaller sinks; one was blowing air and looked like a good dig for warmer weather.

We came back on May 5 and began our dig. After digging about a half-ton of rock out of a 6-ft pit, we entered the cave and climbed down a 10-ft pit. Here we encountered a crack that was about 2 inches wide and a foot thick. We almost had the crack open when we dropped the chisel. So we came back on May 20 and finished the job with a new chisel. John got through first and dug out a shale bed to 18-ft Shish-Kabob Pit. I freeclimbed down first and John followed; after walking down a passage, John found the large room in the cave. One week later we returned on our first survey trip. --Tom Fritsch

* *

Description. Just downhill from a hiking trail, the small entrance is nearly hidden on the heavily wooded hillside. To enter the cave, one must climb down a body-size 11-ft pit. At the base of this pit is a small room 7 ft wide, 15 ft long, and 3 ft high. On the far side of the room is a 13-ft climbable pit, at the bottom of which is a narrow crack that Tom Fritsch and John Danovich enlarged. Squeezing down this crack leads the explorer into a belly crawl. Luckily, after 10 ft, the crawl opens into the top of a 22-ft pit. This pit is freeclimbable, but use of a rope or cable ladder will facilitate getting down and back up. One person has already fallen while climbing the pit; he broke a bone in his hand.

At the base of this pit is a small room with two passages leading off of it: one is a 16-ft climbable pit, the other is a 5-ft-wide, 2-ft-high muddy crawl. Both ways lead to the large room. Most people will do the crawl, which is only 15 ft long and opens into the Junction Room. In this room is a 20-ft climbable blind pit. To the left is a canyon passage that opens into a duckwalk after about 100 ft. In another 50 ft is a hole along the left wall that drops 5 ft. This leads to a large room. The passage continues past this hole for an-

other 250 ft, most of which is a crawl; it ends in mud fill with some small tree roots and earthworms.

The large room is very big by Indiana standards: 300 ft long and 60 ft wide. The ceiling is always at least 15 ft high. In the middle of the room is a large breakdown mountain on top f which is a row of stalagmites. On the west side of the room is a 75-ft-high dome with a small stream that sinks in breakdown. The point at which the stream sinks is the lowest point in the cave, 121 ft below the entrance. In the NE corner of the room is a small, well decorated grotto. In the SE corner is a passage formed between the breakdown mountain and the bedrock wall. This leads to a 12-ft climbup into another passage consisting of a 30-ft crawl into a small room. Off this room are two leads: the one on the left ends in a 10x20-ft dome; the other is a narrow crack that leads, by way of a 25-ft climb, back to the bottom of the 16-ft pit below the 22-ft pit near the entrance.

In the Junction Room to the right is a walking passage that leads past a small dome to a flowstone-filled canyon. A person can chimney up this canyon for 15 ft to the top and crawl 30 ft to a 17-ft rope drop which is very sporting. One must rig the rope off a mud bridge at the beginning of the crawl and drag the rope and vertical gear through the body-size crawl, then try to get on rope going out of the crawl head first. At the bottom is a small room with two leads below a flowstone curtain. The one to the left ends in a narrow canyon. Tom Fritsch tried to enlarge it but it is still too small to get through. The passage to the right is a narrow crawl. Along the wall in one area are a few pretty heligmites. This passage becomes too low in 50 ft.

Geology. The cave is developed in the upper units of the Blue River Group. Several key beds can be observed in the cave. The entrance is in the Paoli Limestone. At the top of the 22-ft pit is a 2-ft-thick shale bed which could be the Mid-Paoli Shale Break. Below the 22-ft pit is a sandy cross-bedded limestone which is the lower unit of the Paoli. Also right below the shale strata is a vertical chert nodule formed in the joint perpendicular the pit. The passage from the Junction Room to the big room is formed just below a dolostone that is a bed in the upper part of the Ste. Genevieve Limestone. These rock strata seem to control the position of the various pits. The passage to the big room is formed at an elevation of 535 ft and is related to the Blue River Strath.

The large room seems to be a collapse into a large passage occurring just below the breakdown floor at each end of the room. The elevation there is 465 ft and is only a few feet above the valley floor.

At the base of the 75-ft dome are a few large breakdown blocks which contain a zone of pyrite cubes altered to limonite-goethite. This could be a key marker bed if other nearby caves also contain this zone.

The cave seems to be related to the theoretical stream passage that goes from B-B Hole to the north and Sharpe Spring to the south. What little water occurs in the cave should emerge at Sharpe Spring.

Conclusions: Paradise Lost Cavern was a major discovery by Indiana standards. It filled a gap between the downstream end of B-B Hole and Sharpe Spring, where a cave was thought to exist.

The cave is very satisfying--it is a caver's cave with very few formations, only a lot of breakdown and mud. When one is in the cave, it leaves an impression that large cave is nearby. With more work, the ridges near Wyandotte Cave will yield more of their underground secrets. The potential is there.

RED OAK HOLE

BIGN 15(4):74-75

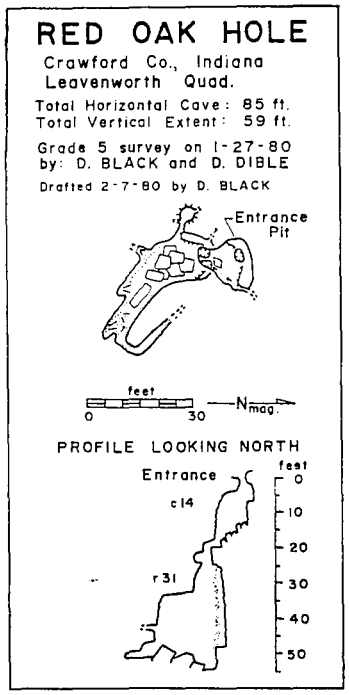
David Black

The entrance to this cave in Ste. Genevieve Limestone is a small hole 2 ft in diameter at the base of an oak tree in the dry, rock-floored gully. This hole is a 14-ft freeclimb to a small room. In the NE end of this room a small stream enters and flows along the wall a short distance before dropping into another room 31 ft lower. In the south end of the entrance room are two small holes, one which the stream enters and the other which a caver can enter. To reach the floor a rope or cable ladder must be used. It is a free drop and after 5 ft the two holes merge and the caver on rope must get slightly damp.

At the bottom is a room nearly filled with large breakdown and mud. Two passages lead off this chamber. The one to the right, a narrow crack, leads to a small dome and the lowest point in the cave. The other passage only doubles back on the room.

The reason for all the mud in the room is that a sinkhole 30 ft south of the entrance has recently opened up and debris is being washed in.

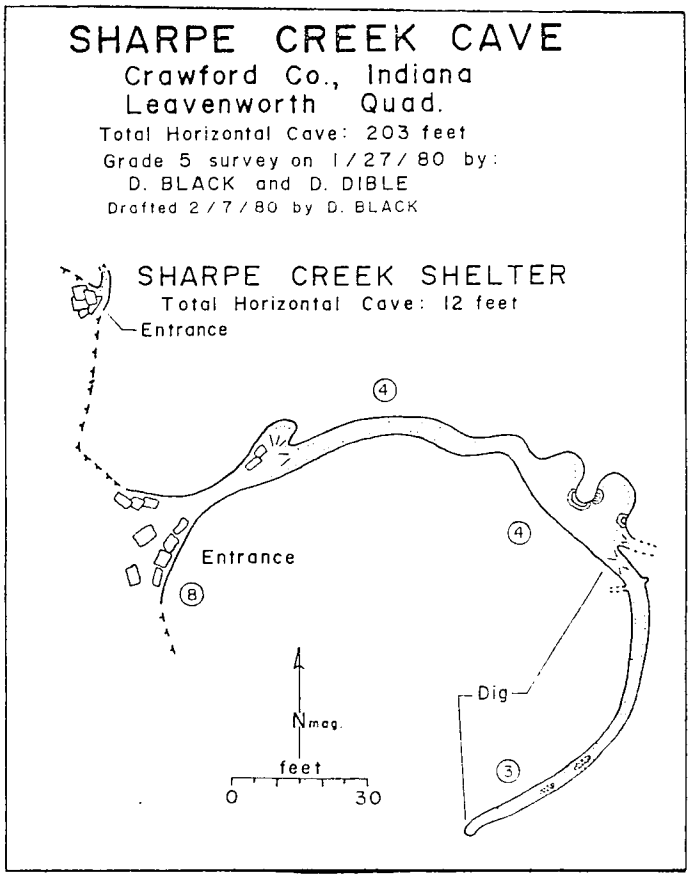
The water in the cave could be the same water that is found in Sibert's Well Cave and should emerge as a spring along the Blue River a mile away. This would be a good place to do some dye tracing.



SHARPE CREEK CAVE

BIGI 15(4):80,82 Kevin Komisarcik

Sharpe Creek Cave (Salem Limestone) is located at the base of Wyandotte Ridge in a small alcove. This cave will probably never make it as one of Indiana's finest. The cavern is a 200-ft crawl, half of which has been dug. The lure of big cave will drive men to many extremes.



SHARPE SPRING CAVE

BIGN 15(4):65-70 Stephen D. Maegerlein

Sharpe Spring, also known as Wyandotte Spring, is one mile west of Wyandotte Cave.

In the book *Wyandotte Cave* by George F. Jackson (1953, p. 15), reference is made to excavations by Mr. Frank M. Rothrock: "...he engages bulldozers and similar equipment to move whole hillsides in his search for new and unexplored caves." It may have been Mr. Rothrock who had the entrance of Sharpe Spring dynamited in search of a new cave. An open cave was not found and Sharpe Spring was left with large slabs of limestone across its entrance.

The next known attempt to explore Sharpe Spring Cave was over 15 years later. A letter received by Richard Powell from C. Kent Brown of Clarksville, IN in May 1962 indicated that Kent, Don Smith of Jeffersonville and two other cave divers had been asked to explore Sharpe Spring by Bob Louden, the manager of Wyandotte Cave at the time. Mr. Louden wanted the divers to see if there was a connection between the spring passage and a cave on the ridge above the spring. The cave dive was attempted in October 1961. Kent, the only diver slim enough to go through the sump entrance opening, penetrated about 30 ft before turning back because the passage was low.

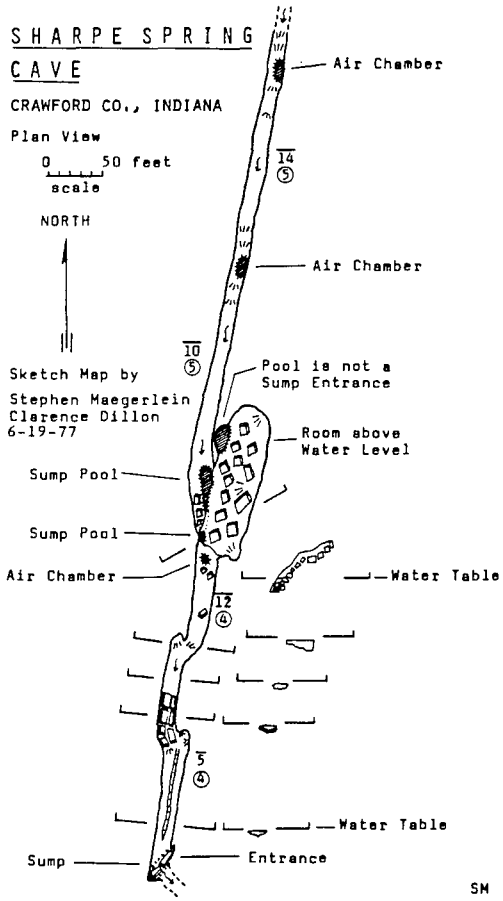
There was increased exploration activity during the 60's and early 70's in the caves up the valley from Sharpe Spring. Roger Sperka is reported to have made a dye trace from B-B Hole Cave through Wildcat Cave to Sharpe Spring, a total distance of over 1.3 miles. Greg Spaulding and other members of the Crawford Harrison Underground Group mapped B-B Hole Cave in November 1972 and found that both ends of the water route were blocked by breakdown. Don Ash and other CHUG members mapped Wildcat Cave in March 1972. They reported an open pool of water at the resurgence from B-B Hole. The stream exits Wildcat Cave through breakdown. Therefore, there does not appear to be much of a chance of making a cave diving connection between Sharpe Spring and Wildcat Cave, considering also that the cave is over a half mile north of the spring and on the opposite side of Sharpe Creek Valley.

Sharpe Spring was visited by Jim Fishback on March 3, 1976 to determine if the entrance was large enough for a diver to enter. The spring did not look easily accessible. Two large blocks of limestone laying across the entrance formed a shallow dam against the back wall of a low grotto. A triangular slot between the blocks and the back wall exposed the only open water where a diver might enter. Jim reported the entrance was tight but probably divable. The entrance could not be easily enlarged. He also obtained flow data on Sharpe Spring from the U.S. Geological Survey. The USGS has measured water flow as high as 40 cfs during wet weather. The spring flow is less than 0.3 cfs during dry weather (see histogram).

Richard Powell and Jim Fishback helped me carry diving equipment ½ mi through the woods to the spring on May 30, 1976. To our irritation, we discovered that easier access was possible via a road which had been bulldozed from near the spring to the other side of the valley. On seeing the spring, I was discouraged by how small the opening appeared. The rock strewn floor of the underwater opening was a mere two feet below the water surface. There did not appear to be room to maneuver in such a small opening. Since we had carried my equipment so far, I decided I might as well try to enter the slot. I crawled backward over the top of the slot and under a large limestone block--a very awkward maneuver when wearing scuba tank and fins. I now lay face down in a shallow pool at the wide end of the triangular slot ready to try entering the opening. On the first try, the opening seemed too small. I backed out of the slot and waited while Jim broke away several small limestone projections. I then slid head first into the opening pushing my head down against the rocks below. After each advance into the entrance, I backed out of the hole memorizing how I was going to make my exit. By twisting my head and shoulders to the right I was able to slide under the back wall and enter a 3-ft-high passage which headed north. Visibility was at least 10 ft, very good for a cave spring in Indiana. I was convinced, after exploring 30 ft of passage which was 15

ft wide, that this was worth a full expedition.

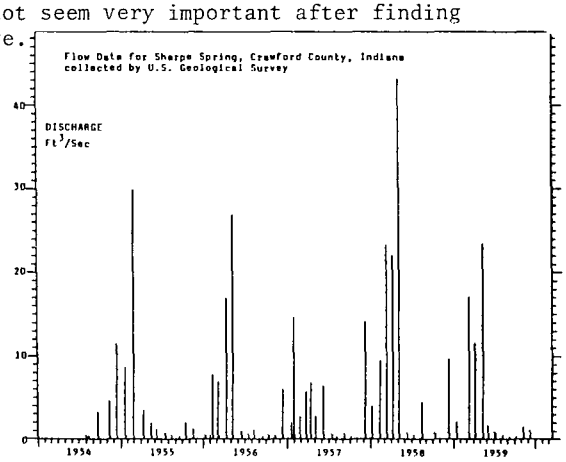
Getting back out of the cave was more difficult than squeezing into the entrance. Although I knew how to back out of the hole, I wanted to get out head first. Several tries were necessary before I realized that I had to turn on my side and slide the scuba tank out from under the ledge into the opening. Then I rotated my body under the tank and into the entrance slot. Coming out head first was relatively easy this way.



Bud Dillon and I made the next expedition on December 29, 1976. The air temperature outside the cave was near zero. I entered the spring first and started following a shallow channel in the limestone floor. The ceiling height gradually increased to 5 ft within 75 ft. The passage then abruptly ended in a mud bank. I could see breakdown to the left and a wall to the right. Bud came up on my left side and signaled that he saw a route over the breakdown. I passed the safety reel to him and he swam into a 3 ft high space above the breakdown, disappearing quickly in the silt laden water. Visibility was only 6 ft when we entered the spring, but now I could only see a few feet around me. I was making my way through the low passage with some difficulty because equipment was snagging on the breakdown. The safety line led into a lower ceiling area with slabs of breakdown forming an unevenly paved floor. The safety line must have been pulled sideways out of the main flow channel into this low area where the silt was thicker on the rocks. Visibility was now down to a foot, and while I had been in a passage 3 ft high my tank was now scraping on the ceiling. I put my arms out in front and pushed against the breakdown with my fins. The result was a bone jarring thud as my tank valve caught on an over hanging ledge.

An instant later I felt the grip of a rock slab dropping on my head and extended arms. My head was forced down between my arms. The first thought was "Damn! It might be 10 minutes before Bud would come looking for me." My head was pinned between my arms with my face mask against the floor. Fortunately the mask had not flooded but I did not know where the light and safety line were. I raised my fins to the low ceiling applying leverage against the slab. "No!, the ceiling might fall!," came a screaming thought. My muscles went limp. The slab moved! It slid forward a few inches. I rested and regained a steady breathing rate. Tightening my shoulder and back muscles allowed me to raise the rock a few inches. I again relaxed, trying to pull away from the slab with my knees. I gained a few more inches. One more muscle flex and my head was free. I could feel a corner of the slab digging into my right arm. Shifting the rock again allowed me to slide my right arm from the side of the slab. The other arm was freed by raising the rock and moving backward again. I could see my discarded hand light dimly glowing ahead of me to the left. I recovered the light and began groping for the safety line. It was under the slab. The slab was 4 inches thick, 2 ft long and 2.5 ft wide. It was awkward freeing the safety line while hugging the floor. As soon as the line was free, I moved slowly to the right to get into a section of passage where the ceiling was higher. Within a short time I caught up with Bud. He signaled OK and there was no reason not to return an OK. My tank gauge indicated a good air supply.

In a short time Bud found a chamber with air space, although there was no accessible passage with air space leading from this chamber. Another 20 ft of underwater passage lead to a second air chamber with a room at an upper level. We could see a steep sloped mud bank leading up to the NE but decided to leave it until another trip. Bud cut the safety line and tied it around a block of breakdown. The line would be left in the cave for future trips. I mentioned the rockfall, but it did not seem very important after finding open cave.



The construction road back to Sharpe Spring had overgrown with weeds by the time of our next trip on May 30, 1977. There had been very few vehicles on the road since our visit in December. The spring flow was low, perhaps less than 1 cfs. Bud entered the spring first, carrying the safety line reel. Visibility was 5 ft, average for diving springs in IN. We headed down the safety line tied about 5 ft inside the passage. I took compass bearings along the line that indicated we were heading slightly east of north. The ceiling height was about 4 ft.

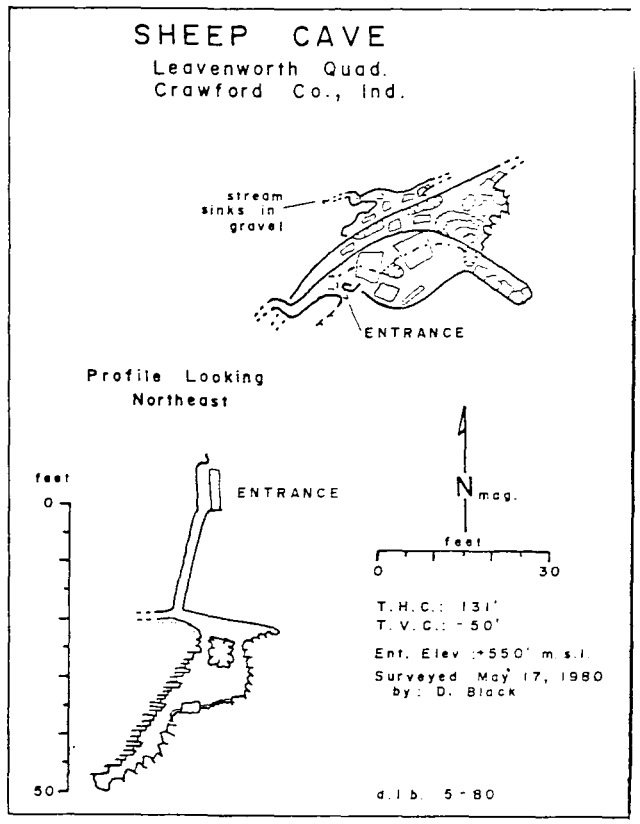
I swam across an adhesive-tape-wrapped safety line splice and was surprised to see that the tape was badly frayed although the line knot was not damaged. Crayfish had probably been tearing at the tape looking for food.

Approximately 200 ft from the entrance we reached a tie off point at the end of the breakdown passage. The passage was offset to the east where we entered a mud-floored section of passage at a water depth of 10-12 ft. The passage sloped upward after 75 ft and opened into the air-filled chamber. Bud found my nylon belt and knife that I had lost on the previous dive laying in the shallow water of the chamber. A small frog watched us from a niche in the wall. Bud removed his diving equipment and climbed up the breakdown into a room to the east. Bud saw several bats in this upper level. Air was blowing out of the breakdown on the sloping east wall. Meanwhile, I checked out leads underwater below the air chamber. The passage ahead was blocked except for a small shallow underwater opening that appeared to lead upstream. After several tries I squeezed through the hole and entered an air chamber that connected to another open pool below where Bud was exploring. He came down to a balcony 10 ft above the pool where I was wading.

At pool level, the passage continued north for about 50 ft before ending in mud and breakdown. Bud said he could see another pool at the north end of the room. I noticed that the west wall was undercut a few feet below water level. I handed Bud the safety line reel which he tied off in the room above. He handed me back the reel and I submerged under the west wall exploring to the north looking for the open pool which Bud had found in the room. There were *Amblyopsis spelaea* swimming among the submerged breakdown blocks. The submerged passage was about 10 ft deep with a soft mud floor. I could see Bud's light through the breakdown and attempted to ascend to the pool, but the opening was too small.

I backed out and continued to the north. Soon there was solid roof and walls around me and I seemed to be heading away from the room where Bud was waiting. The passage was 5 ft high and 10-15 ft wide. I was beginning to chill after 2 hours in the 53° F water. I returned to Bud in the air chamber and we proceeded to exit the cave. We spent 3 hours in the cave.

Bud Dillon and I made another dive in Sharpe Spring on June 19, 1977. We went through the first two sumps without difficulty. Line was laid from the sump below the balcony. Bud led, following the left wall. We initially swam down a steep rock to a mud floor at a depth of 10 ft. The floor beyond sloped gently upward and became sandy as we proceeded upstream. Within about 200 ft we surfaced in a small air pocket. Beyond the air pocket the passage sloped downward to a depth of 14 ft and then gradually rose again to another air pocket within 200 ft. The passage floor again sloped down to a depth of about 14 ft. The line was tied to a rock projection in this section of submerged passage. I believe the passage was still heading east of north, although compass bearings were not recorded in this section of passage. A total of 850 ft of safety line has been installed from the cave entrance thus far.



SHEEP CAVE

BIGN 15(4):71,73 David Black

Located in Ste. Genevieve Limestone at the base of one of the small cliffs above Sharpe Spring is the entrance, a small rift that angles down at 80° for 22 ft. At the bottom of this climbdown is a 35x25-ft room. A climbdown through the breakdown-covered floor leads to another room below the first. In this room is a signature: "Carl Shaw 1830 Boonesboro Kentuk". Off this room is a climbdown between the sloping talus floor and ceiling until it ends in a gravel choke.

It was hoped that there was a way through the breakdown to the room in Sharpe Spring Cave which is only a short distance away. While in this cave, one has the impression that a large cave is very close.

SIBERT'S WELL CAVE

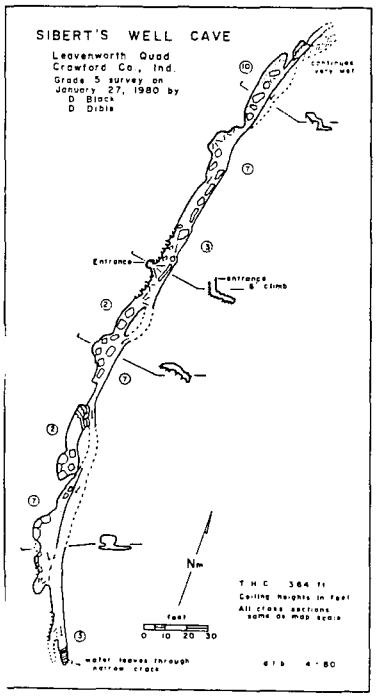
BIGN 15(4):74-75 David Black

The cave is entered by way of a 6-ft hand-dug well walled by flat limestone rocks. This well intersects the cave passage on the west wall, while the stream enters from the east. At the turn of the century the water from this cave was used by the Sibert family.

One can travel upstream in walking passage for a little over 100 ft to where the stream emerges from under a rock wall. There was approximately one ft of air space above the 2-ft-deep pool. We didn't push it due to the sub-freezing temperatures at the time.

Downstream, one can avoid getting wet by taking crawlways above the stream for nearly 200 ft. At this point the stream disappears through a narrow crack.

The cave is developed in Ste. Genevieve Limestone at the base of the ridge containing Wyandotte. The stream should emerge as a spring along the Blue River several thousand feet away. The source of the stream could be Red Oak Hole to the north or Wyandotte to the east.

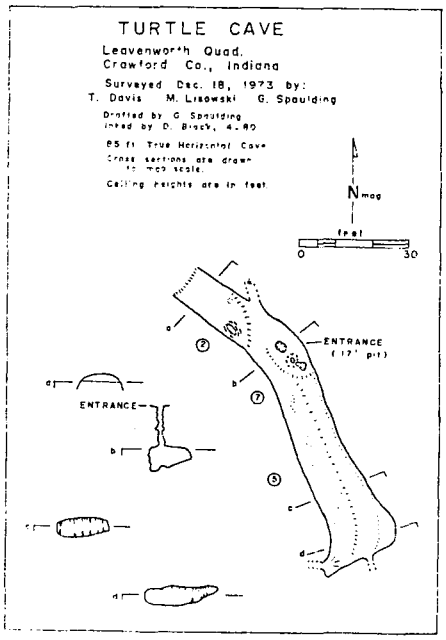


TURTLE CAVE

BIGN 15(4):71,73 David Black

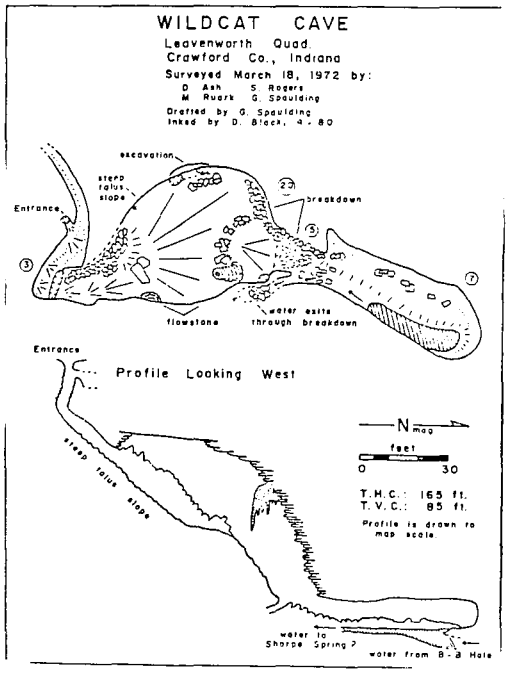
The entrance is located on the north side of the small hill just east of Wyandotte Lake. The small entrance is a 17-ft freeclimbable pit. The passage at the bottom continues for a few feet before silting up.

The cave development in Ste. Genevieve Limestone is probably related to the period when the Blue River flowed around the north side of this small hill. South Branch in Wyandotte is also at nearly the same elevation and is related to the same period.



WILDCAT CAVE

At the base of a cliff is a small hole through breakdown which drops into the cave. Once inside, one climbs down a large talus slope into a room. At the base of this rubble is a pool. From a dye test it was found that this water comes from B-B Hole. The water exits through breakdown and has been traced to Sharpe Spring. [The cave is in Paoli and Ste. Genevieve limestones.]



Kentucky

27-80 CAVE

Pulaski County, Kentucky

The Cave Cricket Gazette 5(4):45-46 Joe Saunders

There is a cave underlying Kentucky Hwy. 80 just east of its intersection with U.S. 27 on the west side of Somerset. The entrance lies halfway down the bluff to the east of the highway junction, on the same level as the nearby spring at the head of Sinking Creek. The actual cave entrance is into a flood route for waters which usually discharge through collapse at the spring. The entrance section involves hands-and-knees crawling over gravel, until about 200 ft from the entrance, where a low squeeze to the left is encountered.

A short distance beyond this the main stream is reached at the point where it sumps under the south wall. Upstream the passage continues for over 300 ft as a 4-ft-high elliptical tube over 20 ft wide. Beyond that the passage splits and ends where the stream enters through collapse in a low passage. At least one old car tire was seen in the cave. This is an interesting cave for people passing through Somerset to visit because of its closeness to the road. According to the USGS geological map of the area, the cave is located in the upper Salem Limestone near the contact with the St. Louis Limestone. Base flow for the cave stream appears to be about .5 cfs.

SINKS OF LITTLE BRUSH CREEK

Green County, Kentucky

The Wisconsin Speleologist 17(1):14 Joe Saunders

For much of the year Little Brush Creek, draining over 15 sq mi, sinks into a cave cutting through the neck of a former meander. A passage averaging 10 ft high and 25 ft wide extends 250 ft through the meander. In low flow, all of Little Brush Creek sinks into a bedrock floor north of the cave's eastern entrance. In very high flow, overflow waters move on the surface the long way around the meander. The southern branck of the cave is a higher level which probably represents an older cutoff through the meander.

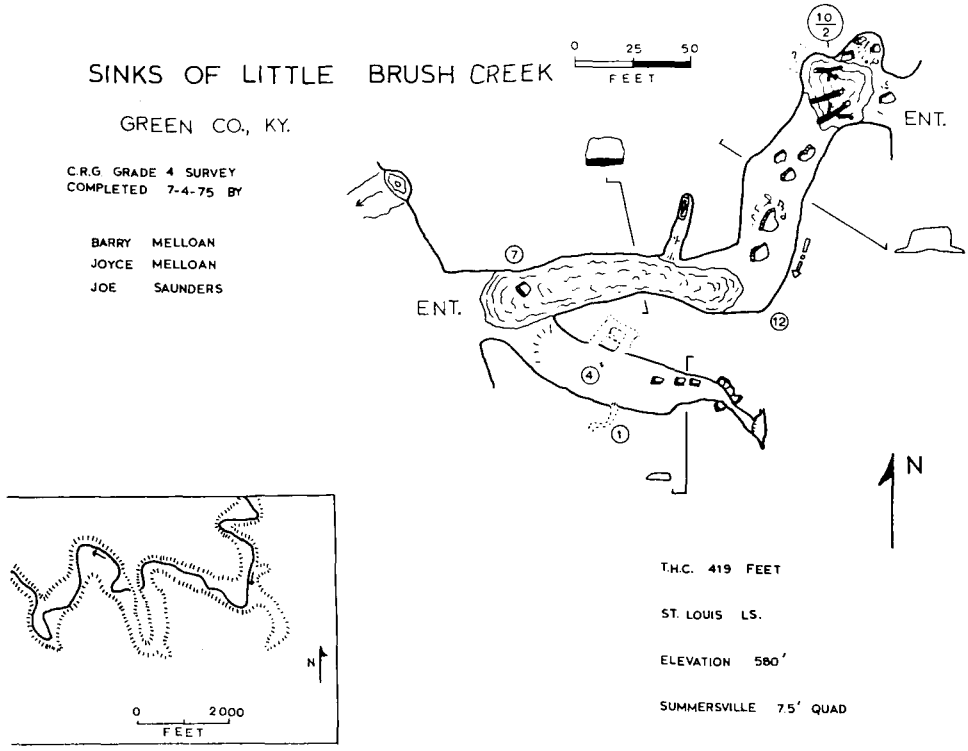
PITS IN SUGARTREE HOLLOW

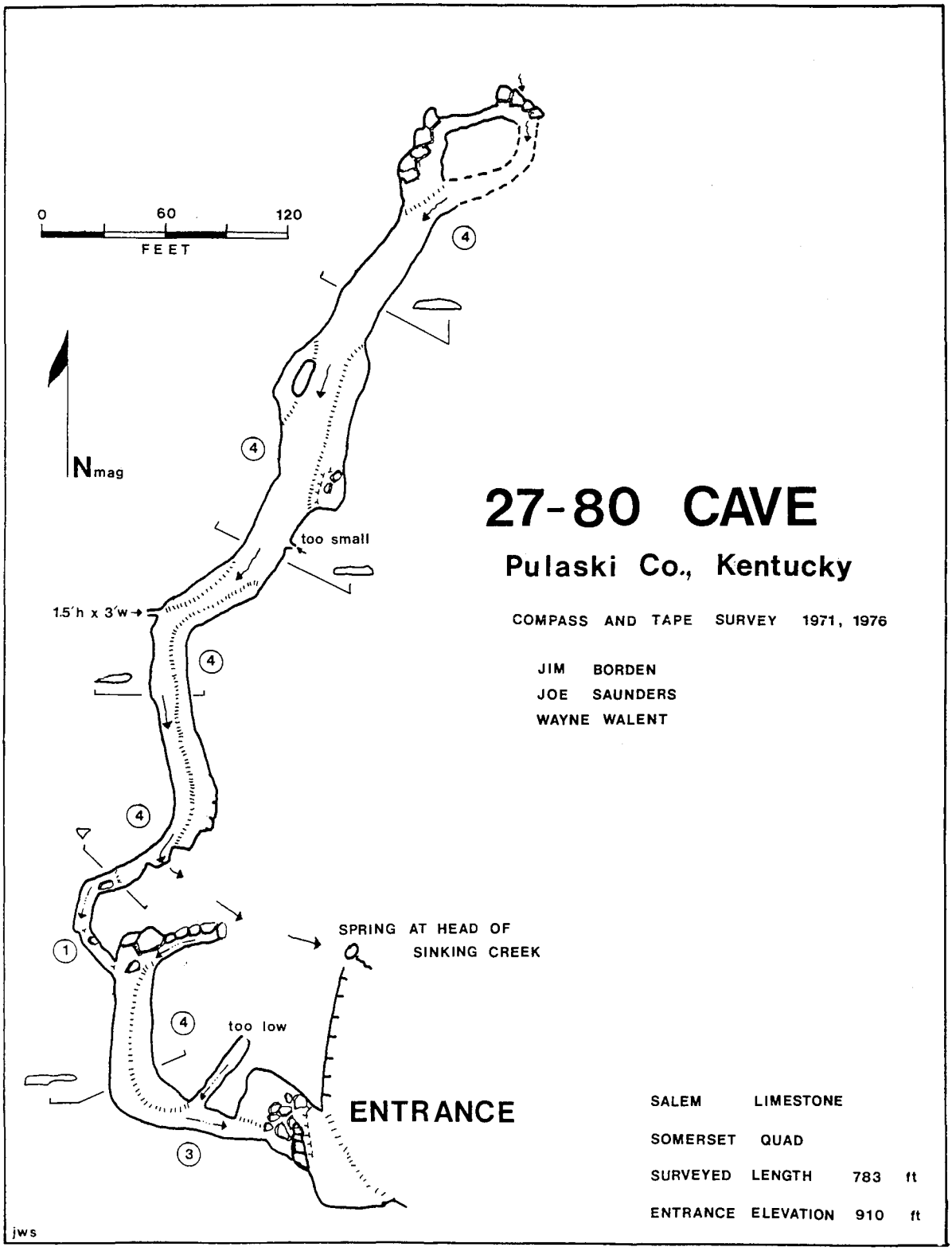
The Kentucky Caver 14(3):24 Brian Baker

On March 21, a local youth showed Terry Anderson, Steve Mollett and me some caves in Sugartree Hollow.

After a short uphill hike from the road, we came upon a cluster of four sinks. One led into a cave with a short, narrow canyon ending in a formation choke. Three other entrances were too steep to freeclimb, so we decided to return later with a rope.

I rappelled about 20 ft itno a large sink. Climbing through breakdown, I came to a 25-ft-high dome with a large waterfall. The water rushed through narrow passages and collapse, which could be pushed in dry weather.





27-80 CAVE

Pulaski Co., Kentucky

COMPASS AND TAPE SURVEY 1971, 1976

JIM BORDEN
JOE SAUNDERS
WAYNE WALENT

SALEM LIMESTONE
SOMERSET QUAD
SURVEYED LENGTH 783 ft
ENTRANCE ELEVATION 910 ft

A smaller opening about 100 ft away was a 60-ft pit, 6 ft by 3 ft at the top. It immediately belled out, and I saw that I was on the edge of a 100-ft-long by 20-ft-wide by 100-ft-high dome. I landed on top of a steep talus slope. I got off the rope, and scrambled 40 ft down to the floor of the dome. I saw no passages down there. While climbing back up, I noticed a small hole intersecting the dome about 70 ft below the entrance. I climbed into it, and rappelled 10 ft into a large canyon. Getting over this lip was very difficult because the rope kept sliding into a narrow slot. Once down, I followed the canyon to where it ended in a small dome. Back at the rope, I noticed a small lead heading down out of the canyon. Crawling under a ledge, I popped into a narrow, 10-ft-high stream passage. I started down the passage and my light quit. After I got my light working, I decided to head out. Climbing back up was even more difficult, because my lamp quit again.

This cave is very interesting because it is less than a mile from the Sloans Valley System. It deserves another trip, and a much harder push, preferably in drier weather.

PRECINCT #11 CAVE

Rockcastle County, Kentucky

The Electric Caver 16(8):91-95 Gary Bush

As all old cavers know, the best leads in a cave are almost always the least obvious...or the most disagreeable. This truism can also be carried over to cave entrances. It's certainly true for Precinct #11 Cave, now under study by the Greater Cleveland Grotto. The only entrance discovered so far is very disagreeable, but the effort expended is certainly rewarded by the cave beyond. The cave now measures over 3 km and large trunk passage still reminas to be mapped. But, I'm getting ahead of myself.

During the summer of 1978, four of us walked the areas along Crooked Creek above and below Arthur Singleton's Cave in Rockcastle Co., KY. This area, in particular, has never been well explored for caves. The group included Jack Hissong, Barry Pitcher, Tim Schafstall, and me. We found five or six promising entrances. The best one had a stiff breeze blowing out, but also was a low, pooled entrance. There was no way around the water, estimated then to be several feet deep. There was about ½ m of airspace. We weren't in caving gear on this trip, so we couldn't probe more closely. With our flashlights we could, however, see a mud bank on the other side of the pool, with what appeared to be open passage beyond. We planned to return several weeks later to check out all the entrances...

With this, that, and other things, we didn't return to this area for two years. However...my curiosity finally re-emerged. Several of us decided to explore the entrances the weekend of June 21, 1980.

On a trip in the early spring to Endless Cave, we'd talked with the owner's son, A. L. Singleton. He mentioned this one particular entrance with the pooled water. He claimed the entire ridge above this spring was drained there. "There are no other drains for five miles up the creek," he said. His stories of large sinkholes, on the ridge above, added spice to the "suck-in." He also remarked how he'd told other cavers of the entrance, but none had ever gone in.

June 21 was nice and hot--a good day for a wet cave! My trusty Scout easily 4-wheeled to the entrances. We suited up and checked both entrances. The first, nearest the road, is a sumped spring, constantly flowing. Up the meadow, the second obviously only runs during very high water. The water pool is 2.4 m below the overflow point. Reluctantly, we waded into the cold pool, thigh deep, fully expecting to walk out on the other side into dry passage. The airspace was about 70 cm, so you could keep your entire upper body dry. Six m or so into the pool our hearts fell. We discovered why no one else had entered the cave. The mud bank was just a sandbar; there was no big passage on the other side. Instead, the passage, now about 12 m wide, split into two routes, one at a 45° left turn, the other a 90° right turn. Each side was about 5 m wide. But the ceiling dropped down, almost to the water. The left route had 8-10 cm of airspace, while the right side had a whopping 15 cm. The right side was also blowing air so hard, the surface of the pool was rippling wildly--almost with whitecaps. (Laugh all you want--I was there!) There were five of us on this first trip: Dennis Green, Shelley Page Ralph Mann, Joe Paul, and me. Ralph and I were kneeling in the water at this point, trying to decide if the passages sumped out or whether we should push it. I must admit we had pretty well convinced ourselves it was hopeless! But, that air! It had to indicate volume--big volume--of airspace beyond. I was ready to back out, when common sense prevailed and I plunged forward. To my chagrin, the ceiling dropped lower--to about 12 cm. But everything on me was now completely wet and the breeze was even harder in the lower airspace, so on I went. About 10 m further, the ceiling rose again and I was in kneeling-deep water with a full meter of airspace above it.

I told the others to wait until I checked out the passage to make sure it was worth the others making the low, wet traverse.

The water passage ended at a sandbar. Beyond, I reentered the stream passage. The sound of the others at the entrance was clear to my left. I realized this is where the Entrance Room's left lead came out in the main bore. Upstream was to my right, so off I went.

Through pools, over gravel, then back into pools; the ceiling and the passage were slowly getting larger as I went. After stoop-walking for some 200-300 m, I was finally in walking passage--getting larger in front of me.

It had been at least 10 minutes, so I returned to get the others. This was obviously a going cave.

Back near the entrance, Dennis and Joe had already come to get me, concerned by my long absence. When I told them of 5-m-high walking passage going off into darkness, I was greeted with the usual, "Sure there is! You're just trying to suck us into this water!".... etc., etc. When they saw I was serious, we all regrouped and headed into the cave.

Beyond the point where I had turned around, we found larger walking passage with occasional flowstone and formation sites. There were occasional side leads, some with incoming streams. We reached a high ledge room after about an hour or so of poking our way upstream. The ledge was well above the stream level and was full of nice formations, including some almost clear flowstone, looking almost like ice on the floor. The bellycrawl beyond it led off into darkness. Ralph and Dennis crawled back to nose around while the rest

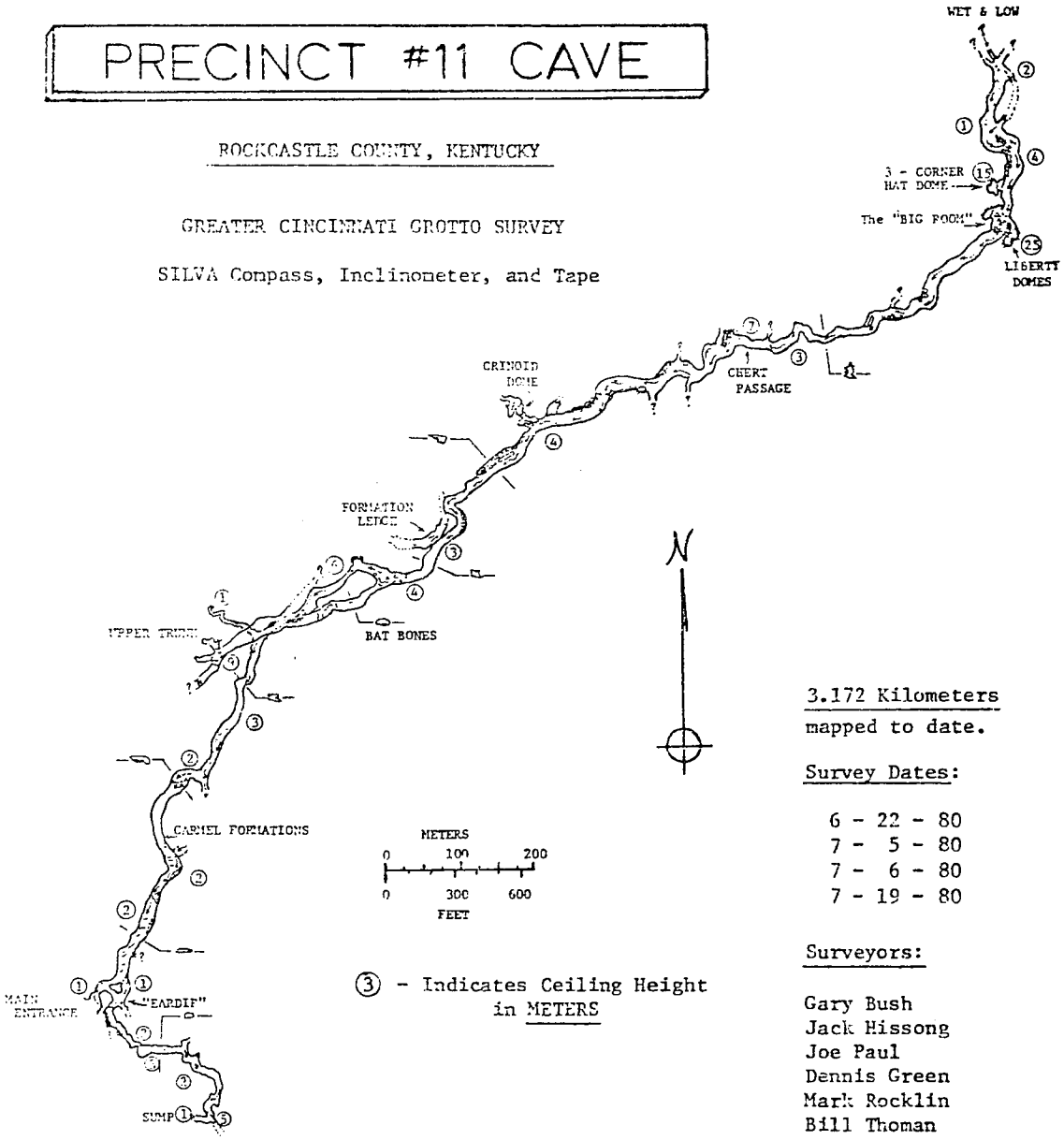
Preliminary Map Of

PRECINCT #11 CAVE

ROCKCASTLE COUNTY, KENTUCKY

GREATER CINCINNATI GROTTO SURVEY

SILVA Compass, Inclinometer, and Tape



3.172 Kilometers mapped to date.

Survey Dates:

6 - 22 - 80
7 - 5 - 80
7 - 6 - 80
7 - 19 - 80

Surveyors:

Gary Bush
Jack Hissong
Joe Paul
Dennis Green
Mark Rocklin
Bill Thoman
Ralph Mann
Shelley Page
Darren Green

(3) - Indicates Ceiling Height in METERS

Cartography by Gary Bush

7 - 28 - 80

of us ate a snack. When they returned, not having reached the end, we returned to the main stream passage and continued upstream.

After traveling at least as far again as we'd come already, we noticed the walls and ceiling of the trunk passage were filled with chert in amounts and sizes I'd never seen before. One piece protruding from the ceiling, having been eroded smooth by periodic high water, looked like a black log. It was at least 35 cm in diameter and ½ m long--just incredible. Further on, the passage almost looked like a coal mine mine, but it was chert--in fantastic amounts.

We finally came to a breakdown pile. As we climbed to the top, we saw we were entering a big room. Ceiling height was 25 m or more. Domes lined one side of the room. Climbing on the breakdown, Dennis noticed strong airflow upward into a tight upper passage.

We decided to push the trunk further upstream, hopefully to a drier entrance, so we wouldn't have to go back through the entrance pool. The ever-present breeze was still coming toward us. The passage still contained the small stream and was still 12-15 m wide. Occasionally, we encountered stoopwalks and sandbars. Several hundred meters further, we were crawling on sand. The trunk split into several routes, all very low. The center lead had a continual flow of water and a stiff breeze. Ceiling height was less than 1 m. Shelley and I pushed this. Dennis and Joe pushed the left lead, also blowing air, with water flow. Ralph poked around in the low, gravel-filled right lead. Our lead shrunk to a bellycrawl in 20 cm of water and the airspace was rapidly declining. Ahead there was less than 10 cm of air. Not wanting to get wet again for the long walk back, we decided to save this push for another day. The other leads had also deteriorated. We regrouped and decided to head back. Everyone was cold and tiring rapidly, having been in wet clothes for about five hours.

On the way out, we debated about the distance we'd traveled. We guessed possibly a mile, certainly a kilometer.

The bathtub at the entrance wasn't any warmer, nor any colder. It's easier the more you do it. The afternoon sun felt great. Outside, we found Jack Hissong walking the ridge nearby. He'd easily found the Scout and elected to scour the hillside for possible dry entrances. He'd only found a blowhole halfway up the hill.

We excitedly told him of our finds inside. Wearily, we returned to camp for dinner and sleep.

On Sunday morning, June 22, Jack, Joe and I returned to begin our survey. The others had returned home the previous night.

The survey of the initial wet passages went fast-faster than I had expected. By the time we reached the walking passage, however, I was getting chilled. Fortunately, I'd packed dry shirts and coveralls in plastic, so I could change once we got out of the water. Once changed, I was feeling fine. Joe was wearing his wetsuit, so he was OK. Jack wore his usual: a bathing suit and coveralls. He was overjoyed he wasn't hot! This was his kind of cave.

We surveyed up the main trunk. To my dismay, we didn't have time to reach the Big Room. We surveyed 57 stations in about six hours. We left the cave so we could return to Cincinnati at a reasonable hour, since we all had to work Monday.

I computer-reduced the data on Monday. Our efforts had yielded 1.42 km (that's 4,660 ft). Since we still hadn't reached the Big Room, this trunk was obviously going to net out quite large. The trunk headed NE from the entrance, following the centerline of the ridge.

The weekend of July 5, Jack, Joe, Dennis and I, along with Dennis' brother Darren, returned to continue the survey. Jack had come down on the 4th to walk the other side of the ridge to find the upper entrance, or at least a dry entrance. He'd spent all day walking all over the hill. He'd found a dry entrance about where the upper entrance should be. We drove there expecting to walk right into the cave. The 4WD trip down the creekbed started the day with some thrills. Unfortunately, all we found, after a sandy crawl, was a sump. We weren't getting in there. We returned to the wet entrance and headed in through the pool. Jack, Joe and I continued surveying up the main bore, while Dennis and Darren checked side leads and the upper sections of the Big Room.

By the time the tape team reached the Big Room, Dennis reported they'd found another two sets of dome complexes off the room, one on either side. We mapped to the larger set, then continued up the main trunk. By the time we'd reached the low water crawls, we'd been in about six hours, so we headed back out. Our adventures earlier that morning had added to our fatigue.

Dennis and Darren had to return to Cincinnati, so Jack, Joe and I returned to map side leads on Sunday. We decided to start with two water-filled tubes leading off the end of the entrance bathtub, now dubbed the Eardip--for obvious reasons. The center lead turned to neck-deep water with ½ m airspace, eventually ending after 50 m or so in mud chokes. The other lead rose out of the water to a gravel crawl into a breakdown room. The breakdown was full of mud. If I had to bet, I'd say this was a collapsed entrance, especially since it butted against the hillside--from inside. The gravel crawl continued into a nice, mud-floored room. Walking passage continued SW from the room. The passage was nice sized, 4-6 m wide, but periodically you had to wade through waist-deep pools. It degraded into a bellycrawl in water with minimal airspace. Joe reported a sump beyond. Apparently, this tube leads to the sumped spring entrance up the meadow nearer the house.

But just before the bellycrawl began, a canyon passage opened in the ceiling. Joe climbed up to find an intersecting passage containing numerous side crawls, nice formations, and large rimstone pools. We set a permanent station high on the wall and headed out. We did a surface survey between the entrance and the sumped spring.

The new data extended the survey to 2.63 km (1.63 mi) in 155 stations. The SW lead had been mapped to within 80 m of the spring and the line plot showed it was heading for the spring.

The GCG Annual Meeting took place on July 19-20, 1980. We scheduled one trip to the cave, now named Precinct #11 Cave. Richard Mullens, caretaker at Great Saltpetre Cave, reported the old voting shack for Precinct #11 was in the meadow just outside the wet entrance. In fact, it was his first voting place, over 45 years ago. Although the shack is now gone, it seemed an appropriate name, with local significance.

On Sat., July 19, Jack, Dennis, Bill Thoman, Mark Rocklin and I went to the cave to survey side leads upstream. Jack, Dennis and I began the survey at the first lead. Bill and Mark went to the next lead to push. When we finished with the low crawl, we headed up to them. They told of a nice loop back to the main

trunk. But, more importantly, they had found an upper trunk, some 20 m higher than the main stream passage, running essentially the same direction.

Bill, Mark and I surveyed the loop, while Jack and Dennis moved to the next leads upstream. The loop was high and dry, and contained areas with bat bone deposits. More important, Bill said they'd seen at least one flying bat. This was the first bat we'd seen in the cave. We'd been concerned with no bats or crickets in the main trunk, possibly indicating only the water entrance, which floods in wet weather. Now, with this bat, there'd be a chance of a dry entrance.

After completing the loop, we moved upstream to join Jack and Dennis. They'd found a side lead to a dome and a maze above it. We surveyed this, too. By the time we were done, several were getting cold, so Dennis led Bill and Mark out. Jack and I elected to stay in to survey in the large overlying trunk found by Bill and Mark. Dennis stopped to show them the nice formations on the high ledge, just off the stream passage. Jack and I headed up into the high lead.

It's hard to describe your feelings, walking in a virgin passage 20 m wide by 10 m high. But there it was, unmarked mud, except for two sets of prints, Bill's and Mark's. We surveyed to the left from the climbup point. The main trunk was eventually blocked by a mud pit. A ladder or etrier will be needed to negotiate the drop. Jack and I surveyed two side leads and found another. It was now 7 p.m. and we didn't want to miss the superb banquet back at the campground, so we packed up and headed out.

Back at the banquet, Bill told us of other important and interesting finds they'd made on the way out. Until they're confirmed by those more knowledgeable, we're going to hold up on announcing them.

The data from this last survey extended the cave's horizontal length, to date, to 3.172 km (1.97 mi). There's more known, but not yet mapped. The promising leads abound. As the cave is now officially a wold-class long cave, it represents a major find. The other aspects add more importance to the find.

In an area of supposedly minor caves, Precinct #11 Cave is certainly a jewel. I'm sure our future efforts will be rewarded as our current efforts have been. GCG members have a chance now to show just how far we've come from an apathetic past.

Note: The map printed with this article shows all the passages surveyed to date. However, much more passage is known to exist. This is, by no means, a complete and final map of Precinct #11 Cave. A complete map will be published once the survey is completed.

* *

The Electric Caver 16(9):107 Gary Bush

On Aug. 16 GCG returned to Precinct #11 Cave to continue the survey and exploration. Jack Hissong, Dennis Green, Paul Knasel, Bill Thoman and I represented the grotto. Bill had also asked Ron Wilson and Mike Mezmar to accompany us to examine the animal tracks found on our last trip.

The Eardip was successfully negotiated by all members of the party. In fact, the hot weather outside almost made the dip bearable.

The Formation Ledge was finally surveyed and photographed extensively. Meanwhile, Bill, Ron, and Mike went to the prints and examined them. The verdict: BEAR!!! We were hoping they would be cat!

After examining the entire area, Bill marked it off with survey tape to prevent its being tramped over accidentally. We moved to the Upper Trunk to do the virgin Right Side. First, however, we trekked down the Left Side to check out the 4-m drop that had stopped out last survey. We used an etrier to make the climb. Unfortunately, the trunk ended just beyond. There were nice formation there, however, so it wasn't a total loss...

Back in the Right Side of the trunk, we started to survey. Bill, Ron and Mike had separated from us when we first climbed up to the Upper Trunk, and we expected to see their prints in the virgin mud. But the mud was untouched. We continued our survey until Dennis found several pits and called back for the etrier. We joined him at the pits and proceeded to help check them. We found a nice, high dome, with several low leads from the bottom. I crawled in one for a very long while, never reaching the end. The airflow was going away from me and the marks of periodic waterflow toward me would seem to indicate this may lead to an entrance. At any rate, the tube is nicely decorated with unusual formations.

The other leads also look somewhat promising. More work for the future! With all the checking, photos, etc., we'd been in the cave for about 10 hours. We left tiredly, but reluctantly.

Later, we found out Bill, Ron and Mike had found another large virgin trunk out of a lead on the way up to the other trunk. This new trunk ended in a group of very high domes. More bear prints were found in this new area. They were all impressed.

Jack and I spend several hours on Sunday walking the ridge over the cave, looking for possible entrances. All we found were possible collapsed entrances. Nearby, we looked into Cookesburg Cave, a possible link to Precinct #11 Cave.

We also located a cave Richard Mullens told us about. It lies on the farmer's tractor road across from CCIC...

This latest trip yielded only 264.9 m (horizontal) but gave us a wealth of information.

The total survey of Precinct #11 Cave is now 3.437 km, or 2.14 mi for you "unmetrified" people.

* *

The Electric Caver 16(9):108 Dennis Green

...Ron and Mike inspected the prints while Dennis took pictures... The prints turned out to be bear paw marks somewhere in the range of 10,000-30,000 years old. They are unique as they are the only ones like this ever found in a cave in Kentucky. The prints had been found in dry mud in the Formation Ledge passage. This passage is about 1.3 m high and 4 m wide with a multitude of soda straws. Brightly colored tape was placed to one side to provide a safe crawl path. Several "craters" were identified as locations where a bear had settled in for hibernation.

* *

The Electric Caver 16(10):119 Gary Bush

The latest grotto trip to Precinct #11 Cave was on Labor Day weekend...

On Sat., Jack Hissong, Rick Webb and I surveyed the virgin upper trunk passage found by Bill Thoman, Ron Wilson and Mike Mezmar on Aug. 16. The dome complex near the beginning of the lead is impressive. It contains five domes about 25 m high. Two contain

superb horn coral fossils. The rest of the passage contains numerous skeletal remains [see p.]. NOTE TO FUTURE VISITORS: This is a sensitive area. Be very careful. Stay in the footprints already there.

On Sun., Aug. 31, Jack, Shelley Page, Ralph Mann and I returned to finish several side leads off that new upper lead. We then went to the upper Main Trunk, right side. This survey had been terminated on 8/16 when Dennis found a pit into a large dome. We surveyed to the edge of the pit. While looking for an easier climbdown, Ralph found another major virgin trunk passage off the Main Trunk--all walking passage.

We surveyed into the pit and through the dome. A small lead from the dome winds to the SE. This leads to the crawlway I found the last trip...it goes forever. We continued for 110 m into the crawl. This was only a small part of this passage, as I'd pushed at least four times that far. By this time we'd been in for about 7 hours; the surveying had taken its toll, so we left the cave.

The survey length for both days was 641.3 m. The cave's total survey now stands a 4.078 km. That's 2.53 mi for those of you resisting the change to metric.

* *

The Electric Caver 16(11):133 Gary Bush

On Sept. 27, the largest survey party to enter the cave met at Great Saltpetre Cave campground. The party consisted of Jack Hissong, Dennis Green, Linda Johnson, Richard Duncan, Mark and Bruce Rocklin, and Todd Smith. Oh! Yeah,...I was there, too. On the way to the cave, we met two men in the field below the old house. One of them was Wayne King, owner of the land. He was very friendly and interested in the cave. I gave him a map of the cave, at least of the preliminary survey. He was impressed that we'd already found over 2½ mi of cave. I promised to send him all the publications describing our survey of the cave, as well as an updated map. We bade him adieu and headed into the cave.

The large group traversed the Eardip with no problems, and rather quickly. In the Upper Trunk we separated into two teams.

Linda, Mark and I headed for the low crawlway Jack, Shelley, Ralph and I had started mapping on Labor Day weekend. Jack, R.D., Todd and Bruce headed for the virgin walking passage Ralph found that day.

Our crawlway deteriorated rapidly until our backs pushed the ceiling. Each meter came harder. To their credit, Mark and Linda kept pushing, without complaining (too much, anyway). Just as we reached the point where we could no longer fit, Mark began hearing a loud echo in front of him. (Isn't that always the way!) Be some feverish digging we were able to excavate a trench over to the small hole leading to the source of the echo. A higher passage --walking passage. We eagerly checked both directions. The right side continued as a sinuous 2-m-high tube. The left side, however, opened quickly into the side of a large trunk...with footprints in it--people prints. I was confused! There were prints, but I didn't recognize anything. There was only one answer. We had to be in the trunk being surveyed by the other team. A quick trip down the trunk soon showed familiar ground, verifying my suspicions.

We returned to the crawlway and mapped out to the big passage. Fortunately, they'd placed a marked station right near the side lead. We closed the loop there.

About then, Todd and Bruce came down the passage. They were on a warmup trip. Being in a tight crawlway, working our _____ off, that was one problem we didn't have!

We strolled up the nice trunk to find the other party. There were nice formations and a few bats in the trunk.

The trunk ended at a pit. Just before the pit, there was a right side lead. We could hear the others down the lead. They'd rigged a webbing ladder to drop a short climb. Beyond was another pit. While they were waiting for everyone to climb back up the drop, Dennis and Mark pushed a side lead nearby. This wound around and eventually brought them back into the original trunk.

By now, the party was feeling the effects of the long and slow surveys. We headed out. At the new Dressing Room in the lower trunk, Dennis, Linda and R.D. put their wetsuits back on. Then, it was back through the Eardip. The sun was long gone. I was surprised to find it was 10 p.m. We'd been in for about 11 hours--a fine trip!

...The computer listed the survey for the trip at 929.3 m. The total length now stands at 5.008 km or 3.11 mi.

* *

The Electric Caver 16(11):132 Gary Bush

We entered the cave about 10-ish Sat. morning, Oct. 25. The outside air temperature was about 38°F. We entered the pool at the Eardip with some second thoughts. But actually, I think the cooler air (the cave was sucking in for the first time) made the water less of a shock.

The change to dry clothes at the new Dressing Room (beyond the Yodeling Pool) was still its usual treat.

After a couple of brief side trips to sightsee, we moved to the end of the right side of the Upper Trunk, where the last survey (9/27) had stopped. A left lead into a junction room was our target. Each lead quickly died in either a mud choke or a low crawlway. One, however, led to a multilevel canyon. Dennis Green had checked all these leads on the last trip and hadn't found anything going anywhere. We didn't either.

There were nice formations in one place. And nice rimstone pools in another place. A high lead led to several rooms, the last of which ended in terminal breakdown and mud fill. But no going leads could be found. We spent a lot of time checking all the passages.

Since we wanted to return to the city that night, we quit surveying about 6 p.m. By 7:10, we were crawling from the Entrance Pool. It was 35°F, according to the thermometer in the Scout. The clean clean-up and change into dry clothes was a little nippy!

...The computer says we mapped 196.6 m. The total survey now stands at 5.205 km or 3.23 mi.

Precinct #11 Cave is currently listed as #135 on the NSS Long Cave List, as of Nov. 5, 1980. Further exploration of Precinct #11 will probably be postponed until spring due to the total water immersion near the entrance (which will be too cold for most cavers).

Montana

NANNIE BASIN SHAFT
UNA MOUNTAIN SHAFT

Powell County, Montana

The Bloomington Indiana Grotto Newsletter 16(4):2-3

Jeff Forbes

The Una Mountain alpine karst area is located in the Bob Marshall Wilderness in northwestern Montana. Numerous caves and karst features have formed in the Cambrian limestones at altitudes of 7,000-8,000 ft.

First notice of the area by cavers was in 1975 by Newell Campbell and Jens Munthe during an aerial reconnaissance flight. In order to reach Una Mtn. one must packpack or horseback 25 mi from the nearest road at Holland Lake. Since its discovery, the area has been visited only 3-4 times by cavers.

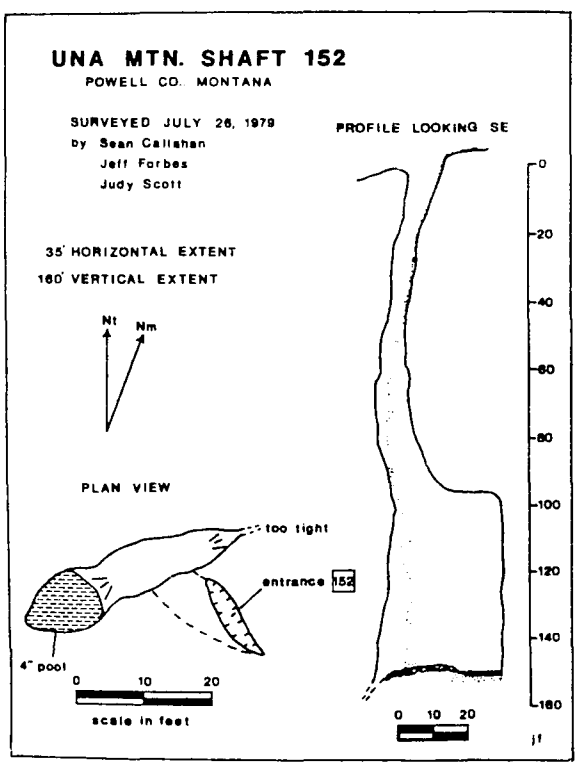
Of the approximately 20 caves which have been entered, virtually all are vertical shafts with little or no horizontal cave. These pits are concentrated on the north slope of Una Mtn. and in Nannie Basin to the south. Two of the deeper pits were descended and mapped by our party of three during a one-week backpacking trip.

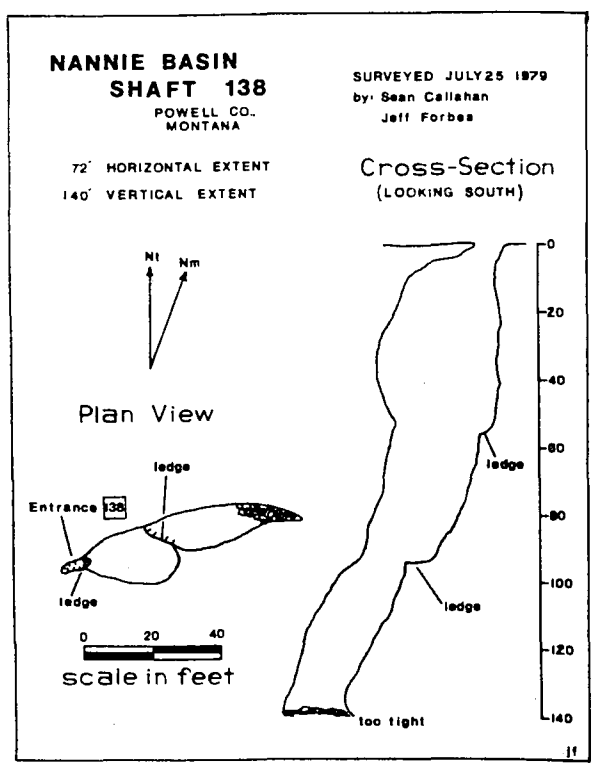
Nannie Basin Shaft (138 ft). This pit is located in Nannie Basin, a soilless karst surface of the type known as "limestone pavement." The rocks are relatively undeformed and dip at a gentle angle. Indeed, when viewed from above on Una Mtn., the flat basin floor strongly resembles a huge, cracked concrete slab. At least 10 pits are to be found in the basin.

Nannie Basin Shaft is a 138-ft sloping rope drop. The small (4 x 7-ft) entrance is level with the surrounding "pavement." A rope may be rigged to a tree 60 ft away or artificial anchors may be used. The drop contains two ledges, the second of which should be padded. The walls are jagged with no speleothems. The pit is crevice-like and narrows toward the bottom. The shaft has a flat gravel floor with no negotiable passages and was dry in late July.

Una Mountain Shaft (152 ft). This corkscrew-shaped pit is located at an elevation of about 8,000 ft on the north flank of Una Mtn. The 152-ft-deep shaft was rigged by placing a dead tree across the slot-shaped entrance as there are no standing trees nearby. Forst wedging has fractured the limestone around the entrance, creating a very real rockfall hazard. A small trickle of water from snowmelt was entering the cave in July. At the 100-ft level the shaft enlarges into an adjacent dome. At the bottom is a pool of water 4 inches deep.

Summary. These two pits are just examples of the many shafts in the area. Many of the shallower pits are snow plugged. Though none have yet been found, there is significant potential for deep cave systems. Water resurging from a large spring below Nannie Basin at an elevation of 5,300 ft may be derived from the shafts in the basin 2,000 ft higher. In addition, the area has hardly been looked at and many caves are unexplored. Persons willing to do some rugged hiking may well be rewarded.





New Hampshire

ICE GULCH NIGHTMARE MAZE

Coos County, New Hampshire

The Northeastern Caver 11(2):30-32

Robert W. Carroll, Jr.

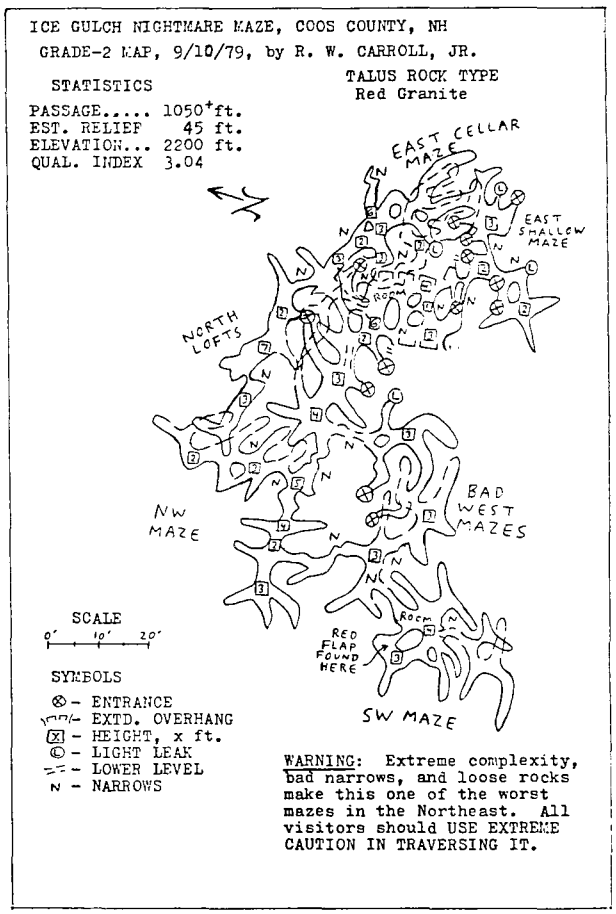
My 1979 "Talus Vacation" began like those in the past--a fast trip into Maine to check out an uncertain area, then a concentration on more promising objectives to the west. In contrast to the 1,100-ft talus cave at Saddleback Mtn. in 1978, Maine did poorly this year, bad gneiss yielding at best a 50-footer in the Bigelow Range. Because Miles Drake was planning to return in 1980, I "went easy" on New Hampshire this year and restricted efforts to two caves I had turned up in 1977-78. The first was at Ice Gulch.

On Sept. 12, 1978, this ravine had yielded mainly trivial caves because of excessive fragmentation, but one 300-ft formidable exception existed because of a "shielding-slab" configuration. I returned on Sept. 10, 1979, in hopes of raising the total to 500 to 600 ft; 1,000 seemed unlikely unless it got into a rare bridged-gorge configuration. Before doing the more intricate deeper mazework, I completed the uppermost leads east of the "barrier" entrance, where all leads quickly ended except for one that descended sharply into the lower system. I began to repeat this process in the west shallow mazes, but an unexpected pair of deeper intricate sections arose.

Ignoring the NW one for the moment, I crawled through a series of bad narrows, passed a pair of isolated exits, and then descended into the SW maze. This proved to be as bad as any talus cave I had yet seen in the Northeast: rough on the knees and elbows, loose rocks and narrows everywhere, and very intricate and pitch dark. With only one way out and turns everywhere, careful marking of the routes was essential. A red plastic flap 70 ft in indicated prior visitors, but virtually every floor surfacd showed no evidence of disturbance. Beyond a nice low room, a floor opening dropped into more mazework perhaps 100 ft in, but all leads then terminated, and I headed out to do the NW maze.

Though less risky to get lost in, this section still was rather complex and additionally had a south lead that connected directly with the worst part of the SW maze. The main west-trending series of crawls and small rooms soon ended, but a complex north branch added 90 ft to the system before terminating. I then proceeded to the lower east maze that had drawn my attention in 1978. At its NE corner, a narrows attracted my attention, and digging and squeezing led into a spacious room and nice hidden upper loft before this interesting lead ended. Exiting this and doing the leads in the middle-level maze, I then entered the "cellar" part.

A hairy corkscrew descent led out through narrows and small rooms to the lowest part of the cave. A bad place to get lost with only one way out, it briefly became mazework before all leads ended. No ice was noted here or elsewhere in the cave. Back at the middle level, the mazework led briefly southward, then sharply ascended to reconnect with the upper east mazework where I had begun documenting 7½ hours earlier. The final total came to some 1,050 ft. Over 80% pitch-dark maze and a "meatgrinder," it deserves the name "Nightmare Maze." Although red granite had strange black inclusions in the solid rock, the entire cave lacked "coral" or flowstone speleothems that three other White Mtn. red granite caves had in quantity.



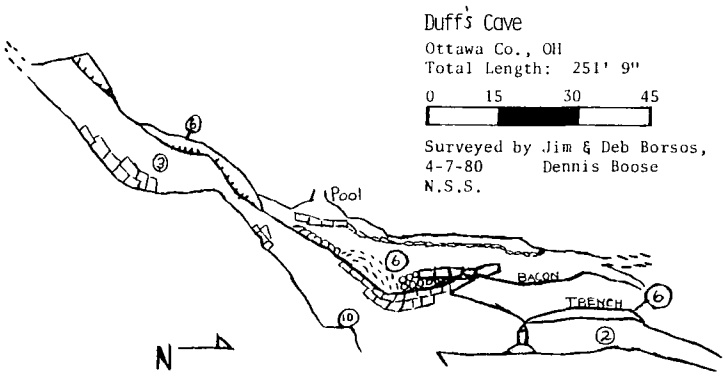
Ohio

DUFF'S CAVE (Black Cat's Cave)

Ottawa County, Ohio

Cleve-O-Grotto News 26(Aug-Sep):64

Jim and Deb Borsos and Dennis Boose surveyed and mapped Duff's Cave on South Bass Island, Put-In Bay, July 3. The cave, formerly called Black Cat's Cave, was found to have 259 ft, 11 inches of passage, beating former island record-holder Perry's Cave at 208 ft. Bacon rind was found in excellent condition.



Electric Caver June

WHADAYAH MEAN, WORN OUT ?
I JUST GOT EM BROKE IN.

Oregon

CAVE MOUNTAIN CAVE #1

Klamath County, Oregon

The Speleograph 16(10):80 Mark Perkins

In May, I struck up a conversation with a gas station attendant in Chiloquin about how Cave Mountain got its name. He assured me that caves did exist on the mountain, and one of them was right by the road. I blazed out of town in the VW batmobile. Sure enough, there was a cave beside the road, which he referred to as Cave Mountain Cave #1. The only place to pull off the road was into the cave itself!

I spent the next 10 min or so drawing a rough sketch map. No bats were present, but I did note a packrat nest in the rear. About a mile further

About a mile further east on the road, three openings were evident in a basalt-soil cliff. Due to wire fencing, time and steepness of slope I did no more than look and wonder. If anyone is in that area, these three might bear investigating, as they appear to be erosional caves. Directions reside in the file at Charlie and Jo Larson's.

SURVEYORS CAVE

Deschutes County, Oregon

The Speleograph 16(8):73-74 Donald W. Denbo

Not having had a great deal of luck on our last four attempts, Becky Taylor and I planned yet another trip to Surveyors Cave. Though less than 200 ft long and less than 100 yds from the road, this cave required five trips to explore because: Sept. 23, 1987 - not enough time, cold and wet entrance; April 28, 1979 - too much snow to get there; July 14, 1979 - too much icewater to get through the crawlway.

In April we enlisted the help of two friends from Oregon State Univ., Tom and Jane Ann Spoering.

We all entered the cave along a 15-ft ice slide. We quickly passed through the two outer rooms and behold! The crawlway was dry! I pushed my not-so-svelte body into the hole and found it a bit more than tight, but after moving loose rocks and unsnagging my coveralls twice I was through. Tom and Jane Ann declined our most generous offer to come through the crawl. I couldn't imagine why.

Becky and I quickly crawled over a few remaining boulders to find a small but breakdown-free lava tube passage. At the far end was a large and awesome lava fall, almost 25 ft high.

We mapped our way out and exited after more than two hours in this small cave. A very nice little cave that I would recommend to anyone. Just don't ask me to go again!

RUSS HARTER at DIAMOND CRATERS

Harter County, Oregon

The Speleograph 16(2):24-26

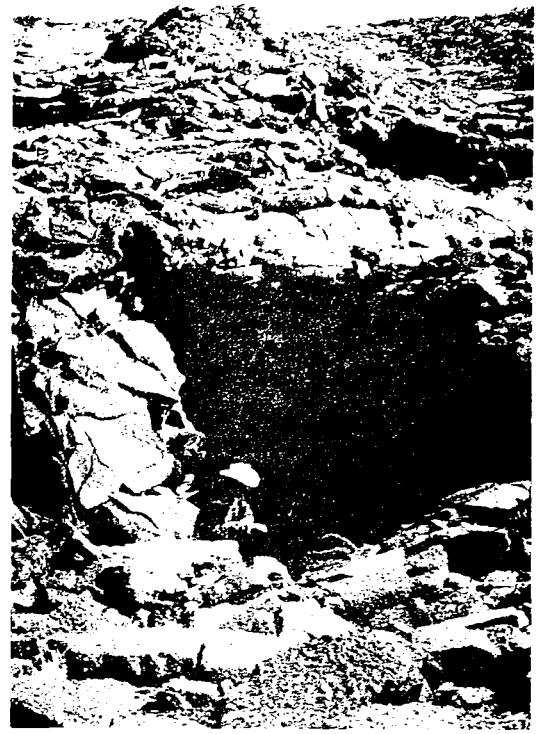
Esther Gruber and
Ellen Benedict

This was written from our field notes of Oct. 27, 1979, on Russ's first visit to the Craters. We stopped on Diamond Lanes to show him an overview and pointed out the various domes and craters and the contact between the Diamond Craters flow and the strata below it.

We turned into the Craters and drove past Keyhole Crater and up the ridge toward the Central Complex. [See *SD 79*, p. 88, for sketch of Diamond Craters area.] "The Central Complex has a moat around it--of lava; there was bulging up and collapse, no ash. The vent for the original flows is unknown. The flood basalt was not completely cooled when doming occurred. The volume of flow was not big at Diamond Craters. Jordan Craters, on the other hand, has a cinder cone buildup with large flow."

We headed back down the road, stopped at Keyhole Crater and hiked around. Russ explained, "Keyhole Crater is typical of lava lakes, small amounts of magma erupted a little bit at a time cooling in minutes or hours--see the thin layers in the walls. There were hot spots over the vent where lava welled up, Mushpot fashion. Red and yellow lava cools in presence of steam. Yellow indicates water on rocks at the time of cooling. Dense black (e.g. at Deadhorse Cave) indicates iron oxide with less iron content. Look closely at the layers, note the imprint on layers, the vesicles and chips in the surface. Note the roof features of surface tubes...ledges, le fault blocks, cave tension cracks. Types of basalt flows are: sheet flow, channelized flow, and pahoehoe flow."

After looking at the flows along the sides of this crater, we hunted for Littlefield Cave which C. D. had found in 1972 and told us about. Esther found it! Russ observed that Littlefield Cave is a "curious" cave. "It is not a simple lavatube--the downhill end drained toward the center of the crater --90° to the center of the crater...this suggests that when the crater collapsed, liquid lava drained out while the crater wall collapsed." We found a small passage (crawl type) which opens up into a large room of approximately 10 ft high and 25 ft wide. The total passageway is about 160 ft long. Russ showed us a couple of linings at a level portion near the lower end which suggested to Russ that some lava piped through the cave. He showed us "bathtub rings" on a large rock--here lava washed over a breakdown block. We saw a tube-in-a-tube located about 30 ft from the end. There were a lot of feldspar crystals about 1/16 to 1/8 inch across. Russ found evidence of at least four lava layers in this cave. Near the entrance we saw very well developed lava stalactites. After looking at them for some time, Russ called them "candle dip formations--these are stalactites which accumulate coating upon coating about the thickness of onion skins. The stalactite cools between layers. This suggests that the lava pond rose, coated the stalactites, subsided, rose again and coated the stalactites, subsided again, etc. Russ had read about candle dip stalactites but had never seen them before. Esther and Russ took pictures of Littlefield Cave and we explored further.



George Brown at the entrance to Stu's Cave surrounded by pahoehoe slabs. All photos from transparencies by Ellen Benedict.

Russ looked at the wide variety of surface tubes in every view. He said, "Here there are good exposures of surface tubes where we can see the tube from every projection--these are hard to find." He pointed out an area of almost "shelly pahoehoe."

Esther checked the mining claim on the flow near Keyhole Crater. The jar containing the claim had been smashed and the claim form was lying on the ground. Russ soon found Harter Cave, with a maximum height of 4 ft, width of 7 ft and length of 50 ft. Russ called it a "hybrid surface tube-semitrench." Harter Cave has a nice lining curve near the entrance. Although small, it isn't a simple surface tube; it has two different types of strata. Gas bubbles extended and collapsed down. Russ found a "not first quality cast, but it does have chips in it."

We found the wall of a semitrench to the west of Harter Cave which was a small scale version of what we had been seeing in Keyhole Crater. Near the edge of the Crater we saw a natural bridge, bowed up with a medial squeezeup. We looked at the exfoliation of lava in the south wall of the Crater--this looks like sandstone, boxwork weathering but is lava weathering instead. Russ again pointed out that Keyhole Crater erupted a small amount of lava over a few days... very small volume of lava...collapse didn't necessarily happen right away...cool...perhaps a year later. Fill, collapse, magma withdraws, end of eruption. We left Keyhole Crater at 1300.

We ate lunch at Lava Pit Crater and then hiked to Spatter Cone Cave. Russ looked at it for a while and then pointed out that it is a real spatter cone rather than a hornito. A spatter cone "is fed through an upper magma chamber rather than being a gas vent on a lava flow." The stalactites here are

smaller than those at Littlefield Cave and are true spatter which may have remelted a bit. Here the lava stood at one level for a long time; this is the reason that this type of stalactites formed... spatter, spatter, blob, blob. Russ showed us the black, glassy details of the surface, frothy and bubbly...not too weathered.

At Stu's Cave we showed Russ the stalactites which he compared to those at Littlefield Cave. Again he explained how the candle dip formations develop and showed us the evidence in Stu's Cave for thinking they were of this type. We saw the concentric rings like onion skins and the ceiling block with formations between it and the true ceiling.

At North Lava Pit Cave, Russ told us, "In my experience these delicate ledges are unique. I haven't seen anything like them. He was referring to the "bathtub rings" pictured on the cover of the Jan. 1979 *Speleograph*. Russ suggested that they may have developed something like the candle dip stalactites. We stopped at South Lava Pit and Surprise caves but had nearly reached the point of seeing just too much. It was also nearing dark so we decided to leave the Craters via the south jeep road and take Russ to Bacon Cave.

Were we ever glad that we went to Bacon Cave, a small and seemingly unimportant cave. Russ pointed out that it had formed at the intersection of two arcuate ridges--another way that lava caves can form! We looked at some delicate lava crusts on the ceiling of this cave. Russ suggested that the surface tube (named Tube Cave on the sketch map in [*SD 79*, p. 88]) drained Bacon Cave. Day was fading so we hiked back to the truck while we could still find it.

We asked Russ about the significance of Diamond Craters. He said, "Diamond Craters is speleologically significant because it has caves and caves are a geological anomaly!" In the pahoehoe flows, one can see the transition from roofed to unroofed sections. This can tell us much about why caves form in certain locations and not in others. In order to study lava cave formation, we need many examples of small tubes, semitrenches, trenches and slabs which didn't form any of these. These tell us how big caves developed. In the big caves we just can't see the details.

LAVA TUBE PUBLICATIONS BY RUSSELL G. HARTER

1970. Classification of lava tubes. *Speleo Digest*, pp. 189-192. (with J. W. Harter)

1971. Lava stalagmites in Government Cave. *Plateau*, 44:14-17.

1971. Bibliography on lava tube caves. *Western Spel. Surv. Bull.* 44:1-52.

1972. Basic morphology of lava tubes. *Northwest Caving*, 2:9-11.

1972. Passage modifications in lava tubes. *Oregon Speleograph*, 8:41-45.

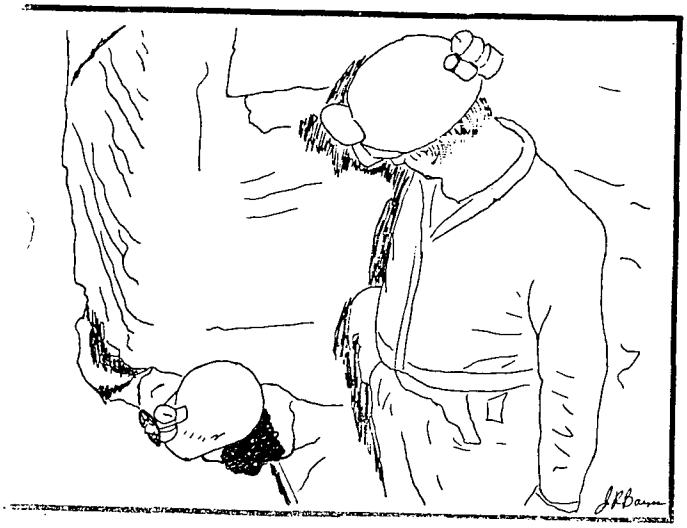
1972. Lava tubes at Pisgah Crater area, California. *NSS Bull.* 35:19 (abstract).

1973. Secondary chemical deposits in lava tubes. *Oregon Speleograph*, 9:114-116.

1976. Secondary chemical deposits in Pisgah caves. *Oregon Speleograph* 12:51.

1978. Strata of lava tube roofs. *NSS Bull.* 40:117-121.

1980. The geology of lava tube caves. *Proc. of the 1979 Far Western Reg. Cave Mgt. Symp.* (in press). (with J. W. Harter).



The Kentucky Caver

UPPER McKENZIE PITS

Linn County, Oregon

The Speleograph 16(10):86-87 Craig Skinner

Century Pit, formerly reported as Oregon's deepest natural pit at an even 100 ft, is no longer the longest drop around. A newly investigated group of volcanic vertical conduits in the McKenzie Pass region has proven to be significantly deeper. These seven morphologically related vents, only four of which have been completely explored to date, measure a maximum cumulative depth of 129 ft (so far). More quantification later (when I collect more rope) will take this down at least another dozen feet, though I'd be surprised if it went too much further than that.

I've tentatively and collectively named this assortment of vents and spatter cones the Upper McKenzie Pits.

The conduits, source vents for a Holocene lava flow, are located in the same general region as a number of other previously described vertical conduits: Century Pit, Moss Pit, Santiam Pit and the Little Belknap Cave System. Scott Murdock and I located them last October, checking out a lead on some shallow pits. They turned out, however, to be none too shallow.

The conduits are as dangerous as they are spectacular, and frankly, climbing around this place gets me nervous and sweaty. Much of the upper portion of the pits is loosely welded spatter than you can disassemble with your hands--all waiting to drop on me and my friends. I'll be mildly relieved to finish my survey, probably sometime next year. I'm currently studying the Upper McKenzie Pits as part of my thesis research on vulcanospeleology and areas of Recent volcanism in Oregon.

Texas

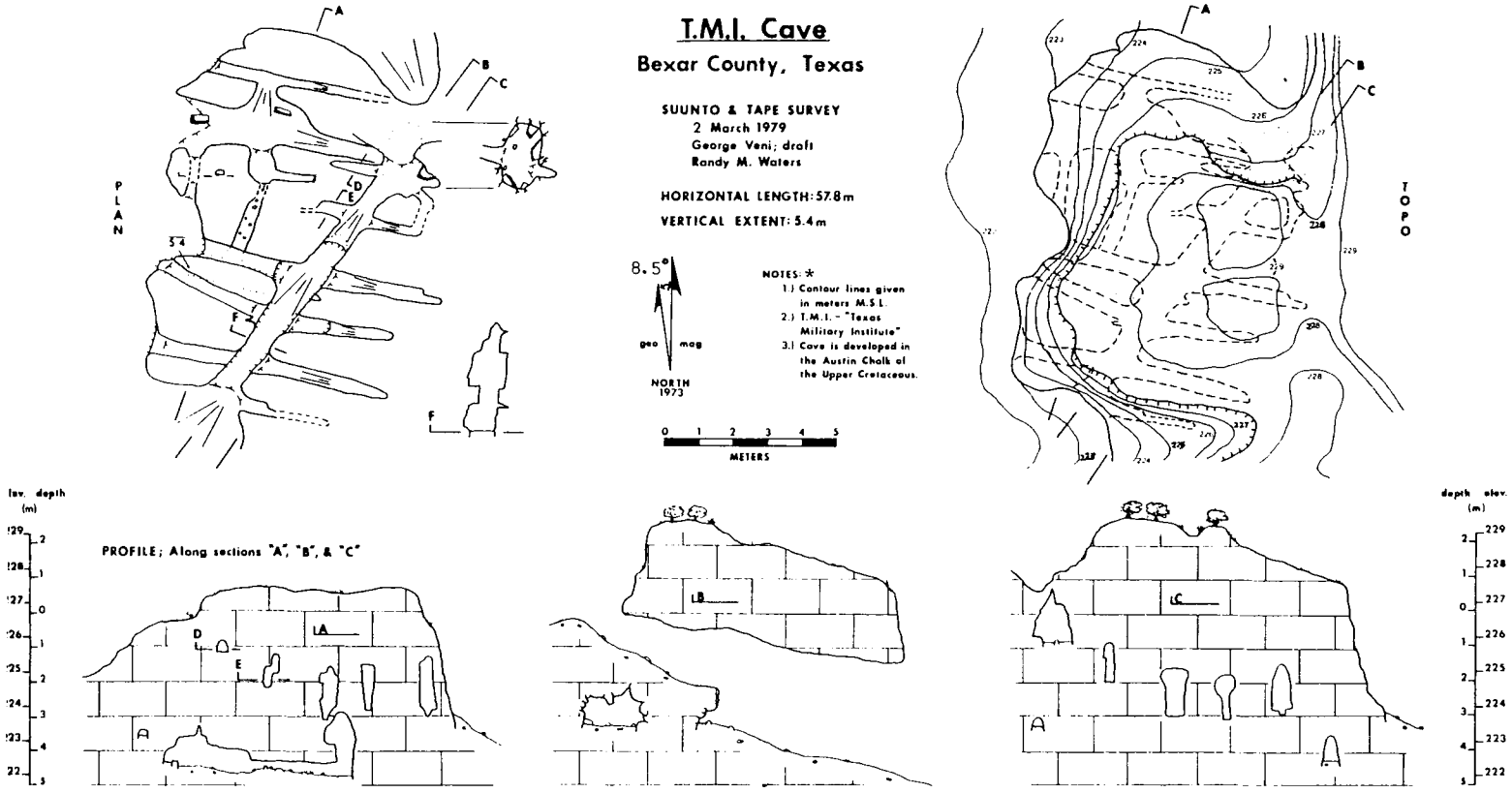
The Small Cave Map: T.M.I. CAVE

Bexar County, Texas

The Texas Caver 25(6):120-121 James Jasek

Here is a map of a very small cave that George Veni and Randy Waters mapped in 1979. All of us know that there are a lot more small caves than large ones, and for the most part very little work is done at all with the small cave. This is a beautiful map and you can easily see that several long hours went into the actual survey, and even more hours into the drafting. This was a very worthwhile project and can be repeated by any group of cavers. It is excellent practice for the draftsman, and could even bring a prize in the NSS Map Salon. Give it a try!

NOTES:
1. Contour lines given in meters M.S.L.
2. T. M. I. -- "Texas Military Institute"
3. Cave is developed in the Austin Chalk of the Upper Cretaceous.



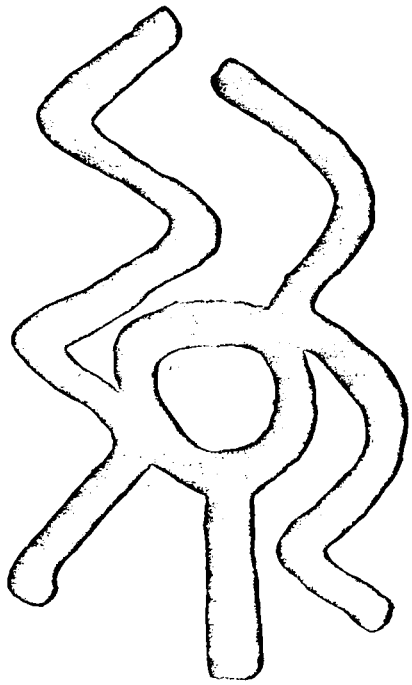
Sorcerer's Cave -- It's Story

Middens, metates and paintings are evidence of Indian habitation at the cave. Presently, there has been no form of dating in order to determine when the Indians lived there. The cave's entrance is in the side of a ravine, 6.4 meters above its floor. The 2-meter high passage extends back 10 meters to a 14-meter pit. There is no evidence of the Indians having gone beyond this drop.

After a flood in 1961, Leo Adams, who was then leasing the land, noticed that a number of his sheep were missing. In his search for them, he discovered the cave. Seeking refuge from the rising flood waters, many sheep entered the cave. As more would force their way in, those in the back would fall down the pit. Talking to the people from the nearby town of Dryden, they find it unlikely that Adams did not previously know about the cave because he had ranched the land since the late 1940's and the cave's entrance can be easily seen, even from a good distance. Also, there is some graffiti in the entrance. Scratched in the wall is the name "Russell Kelso, February 1941." Dating from apparently the same period, is a phallus engraved next to the name. People have not changed much in the last 40 years.

Anyway, it was in the Spring of 1962 when Adams called in some cavers to investigate the hole. In the Spring of 1962, hailing from Sul Ross University Speleological Society, Perry Clifton, Carl Kunath and Jim Rector were the first people to go beyond the entrance pitch. They followed the 16-meter high walkway to a breakdown choke, then took a side passage which gained them access to the other side of the plug. The entrance hall ended however, in a series of short drops going down 11 meters to a small dome room. But, the aforementioned side passage led to a 5-meter drop, then through a narrow crack into a 25-meter pit. The bottom of this pit was the limit of their exploration.

The Sul Ross cavers made a return trip a few weeks later. Going beyond the previous limit, Ron Griffeth, Grainger Hunt and Nick Lucas went through a short crawl at the bottom of the 25-meter pit, then down a 22.5-meter pit. Here they found a water passage leading to parts unknown, but they were unable to continue. Inhaling the dry dusty guano which is present throughout the cave down to this point, had caused a form of dust pneumonia. Nausea, vertigo, headaches and weakness forced their return to the surface.



Sketch of an Indian Painting in the Entrance

In 1971, Texas Speleological Survey, Volume 3, Number 2, "Caves of The Stockton Plateau" was published. In it was a report on Adam's Cave, as Sorcerer's was known then. This report was, for many people, the first time they had heard of the cave. Many tried to contact Mr. Adams, who for fear of liabilities, refused to give permission for further exploration. In early 1978, I tried my hand to get into the cave. Luck was with me. The lease had changed hands to a Mr. Hayre, who kindly received us.

On 16 September 1978, Steve Damon, Randy Waters and I went to the town of Dryden where we were unable to find our guide to the cave at the ranch. It was then that we became acquainted with Mr. Ten Eyck who is the proprietor of Dryden Mercantile. He proved to be extremely helpful and cordial for that first trip and all of the following trips to the cave. He directed us to Larry Choate of Sanderson, who directed us to the cave. In late 1977, Larry was part of a group of people who lacked technical, modern caving methods, but with lots of common sense and some practical mechanics were able to explore the cave. Using a counterbalance system, homemade cable ladders and 1-inch manila rope for safety, they pushed past the limits of the Sul Ross cavers. Beyond the water passage they discovered two large rooms, the first being 50-meters long, 7 to 12 meters wide and 7 meters high. The second larger room measured 35 meters long, 25 meters wide with a steeply sloping breakdown floor which ranged the ceiling height from 6 to 25 meters. At the lower end of the second room was a breakdown maze, leading down 13 meters to a pit. Even though they had made eight to ten trips into the big room, they never descended the last pit. There was one attempt, but it was aborted due to equipment failure.

When the San Antonio Grotto (SAG) cavers began their vertical survey of the cave, they soon learned that the Sul Ross description was exaggerated. Sul Ross's estimated depth at the water passage was 104 meters (340 feet). The survey placed it at 87.3 meters (287 feet). In addition to surveying, the SAG cavers also had a knack for naming things, which is important towards identifying the various areas in the cave. The cave itself was renamed. The three main pits were called Witch's Well (14 meters), Poltergeist Pit (25 meters) and Demon Drop (22.5 meters). The water passage was christened as the Bubble, Bubble, Guano and Trouble Passage. The water here is only .25 meters (8 inches) deep. Unfortunately, the guano below it was over waist deep. Walking through it is like trudging through pudding. As one progresses into it, bubbles of gas percolate up from the feces. Beyond here lay the first true room of the cave, the Inner Sanctum, and here the vertical survey for the first trip ended at a depth of 88 1/2 meters. Having a brief lunch, we pushed into the big room before leaving the cave. It took a while to soak in the majesty of the Sanctum Sanctorum. We sat in awe, dwarfed by the 10-meter high formations. Pushing deeper, I estimated the top of the yet unplumbed pit to be at 116 meters (380 feet). The long standing depth record of Langtry Lead had been broken!

We kept quiet about the find until we could take the vertical survey down the last pit. This would make the record official. The date was 21-22 October 1978 when Randy and I returned with Gary Poole to push the cave. Prior to commencing the survey, we checked a couple of leads in the Inner Sanctum. By climbing into a narrow dome, Gary was rewarded with the discovery of Surtur's Chamber, the most beautiful and most highly decorated room in the cave. Its location is fairly obscure and so the 17-meter aven is clear from the bat crap which is present throughout the cave. A drop into the chamber which requires a rope to descend acts as a built-in obstacle to preserve its delicate beauty. All of its splendor can be seen from the top of the 3-meter pitch so there is no reason for anyone to descend, for the traffic will only serve to disrupt its natural state. There

Pristine Beauty
3-Meters High--Surtur's Chamber

have only been two people down into it, one to check a lead that did not go and another at a later date to survey the room. In order to preserve the room, it is hoped that surveyor will be the last person to enter.

Returning to the survey, it was taken through the Sanctum Sanctorum to the virgin pit. All three of us were to get our chance at virgin passage. The pit was mine. Rappelling down 18 meters, I saw an offgoing streamway. The last survey point was set at the bottom of the pit. The stream would have to wait for Randy to descend and be the first to enter its waters. After all, he predicted it would be there. Entering the heavily silted stream, Randy led us 53 meters to a main stream intersection. Crystal clear water was raging by us. We had found the Sirion River.

With a choice to follow either up or downstream, we took the latter as more depth was still a main objective. We followed Randy for 500 meters and then it was Gary's turn as he blazed the way down passages 3 1/2 meters wide, 5 to 10 meters high, with water ranging from ankle to chest deep. Brief attention was given to the many leads, but we never really left the main river. Going past the rapids and the 2 1/2-meter high waterfall, the cave decided we had enough excitment for one day. The Texas depth record and 1,000 meters of virgin stream passage was to be our quota. So, in its wisdom, the cave lowered its ceiling into the 6-meter-deep waters and halted our exploration for our 17-hour trip and left us physically and emotionally exhausted.

Gary Poole and
10-Meter High Stalagmite

Our third trip to the cave was on 11 to 12 November 1978, when Scott Harden, Gary and I came back with plans to survey The Stream to the river and then go upriver and survey as we explored. The journey down went without incident, however at The Stream we found the water was up to .3 to .4 meters. A week earlier, 10 inches of rain fell in that area. Flood waters in the ravine rose high, but did not reach the cave. However, by infiltration much water had made its way to the river. This raised the water level enough the sump the upstream river passage at a low spot just a short distance from the stream intersection. The new water also served to chill the stream considerably. On the discovery trip, the water was at a very comfortable temperature, but unprepared for the cold, we were forced to an early exit.

A few days after this trip, the lease on the land expired and so permission to continue exploring the cave was deferred to the owner, Mr. Clay from Houston. He informed us that he was calling a halt to the exploration until he could talk with us and determine what our intent was in the cave and to express his desires towards anything we may do there. So, in December 1978, Gary and I visited his home and after an evening of discussion and the showing of slides, the following terms were reached in order for us to continue the exploration of the cave:

1. Permission must be obtained from both the owner and the current leasee.

2. Work at the cave must not impede or interfere with any ranch activities.

3. All efforts at the cave must be towards purposefull work (i.e., surveying, geology, biology, etc.).

4. To maintain continuity of work and prevent excessive calls which may prove disturbing to the owner or leasee, permission has been granted to the SAG to oversee and coordinate all cave activities.

5. Individuals interested in contributing to the work done at the cave must contact the SAG for the above mentioned reasons.

6. The location of the cave must NOT be published.

7. Release forms are to made for both the owner and leasee.

8. Trips will be of an infrequent nature, numbering three to four times a year at the most.

There are a couple of reasons for my going into detail on these points.

First: the owner's wishes should be well understood in order that they may be better respected. Without his consent there would be no caving.

Second: This places a restriction on who should go in the cave.

We all enjoy caving for the sport of it, but there is a time for work as well as a time for play. This is a time for work. People interested in going to the cave should have a knowledge of surveying or of any of the sciences which can apply to the study of the cave. These restrictions are not to keep people out of the cave and thus favoring a certain elite or special group, but because the number of trips to the cave are limited and there is still much work to be done, efforts must be made to produce the maximum amount of work from each trip.

On 23-25 February 1979, a large diverse group of people came to the cave. From San Antonio came Steve Damon, Dave Guerrero, Gary Poole, Ted Roberts, Randy Waters and myself; from Austin came Scott Harden and from Abilene came David Boettger, Gill Harder, Jonathan Justice, Tom Moore, Bruce Wharton and Barry Woods. The start of the first day was spent on a surface survey that identified some major faultings and joint sets and the contacts of the Segovia Limestone, Del Rio Clay and Buda Limestone. Later that evening, Dave Guerrero, Ted, Randy and I began the new, complete survey of the cave, starting at the Demon Drop and finishing for the day at Poltergeist Pit (the other survey was just a vertical view of the cave to establish its depth).

The next day we had two survey teams. Th first team consisted of Steve, Scott and Gary They went to the Sanctum Sanctorum and did a thorough spray of the room, including some triangulations to its inaccessible areas and t the large formations in order to determine their size. On the second team, Jonathan, Bruce, Barry and I picked up the survey from the previous day and sprayed from the Demon Drop into the Inner Sanctum. Meanwhile, on the surface David G., Ted and Randy were combing the land in an unsuccessful search to find any new holes.

Now everyone is accounted for except David B., Gill and Tom. They entered after the first survey team and after looking at the cave, they sat and watched the survey of the Sanctum Sanctorum. Soon after, they went down to the river. They took the upstream passage, which had been sumped on the November trip, and followed it for 525 to 540 meters (1,700 to 1,800 feet) to a terminal sump. On their way upstream, they encountered three pseudosumps and they felt that this sump might not be very long and could possibly be passed. During the trip to the sump they also went through a couple of spots of deep water, requiring a brief swim. Once at the upstream sump, they turned and went all the way to the downstream sump. Checking a nearby upper level lead, they climbed into a clay covered passage and followed it for 60 meters. At one point they had found that they were straddling a slot in the floor which dropped back into the river. Finally they reached a mud slide, sloping steeply downward. They felt that this bypassed the sump, but they could not get down the slide without a rope. Again the downstream sump was being defiant. It must obviously hold great secrets behind its watery doors, so once again it coerced a group of weary cavers to leave its depths.

The 20th of May 1979 found Randy and me driving home from Sorcerer's. We are weary, happy, yet disappointed. A 9-day trip to the cave was planned from 11-20 May 1979. Quite a few people had planned to attend. Other than the two of us, only three others showed up-Dave Guerrero, Teeni Kern and Gary Poole. Most of the misfortunes were simply that the fates were working against us. Illness, job troubles and similar problems prevented the arrival of many people. Of course, there were those who just did not come when they said they would. Here lay

the disappointment. Nonetheless, we were very pleased with the amount of work we did accomplish. The entire known upper levels were surveyed and so was almost 400 meters of river passage. Much time was also spent doing other studies in the cave (written about in the following reports). A few new, yet minor passages were discovered as well as some leads high in the walls and digging leads that blow air. These may yield more passage in the future.

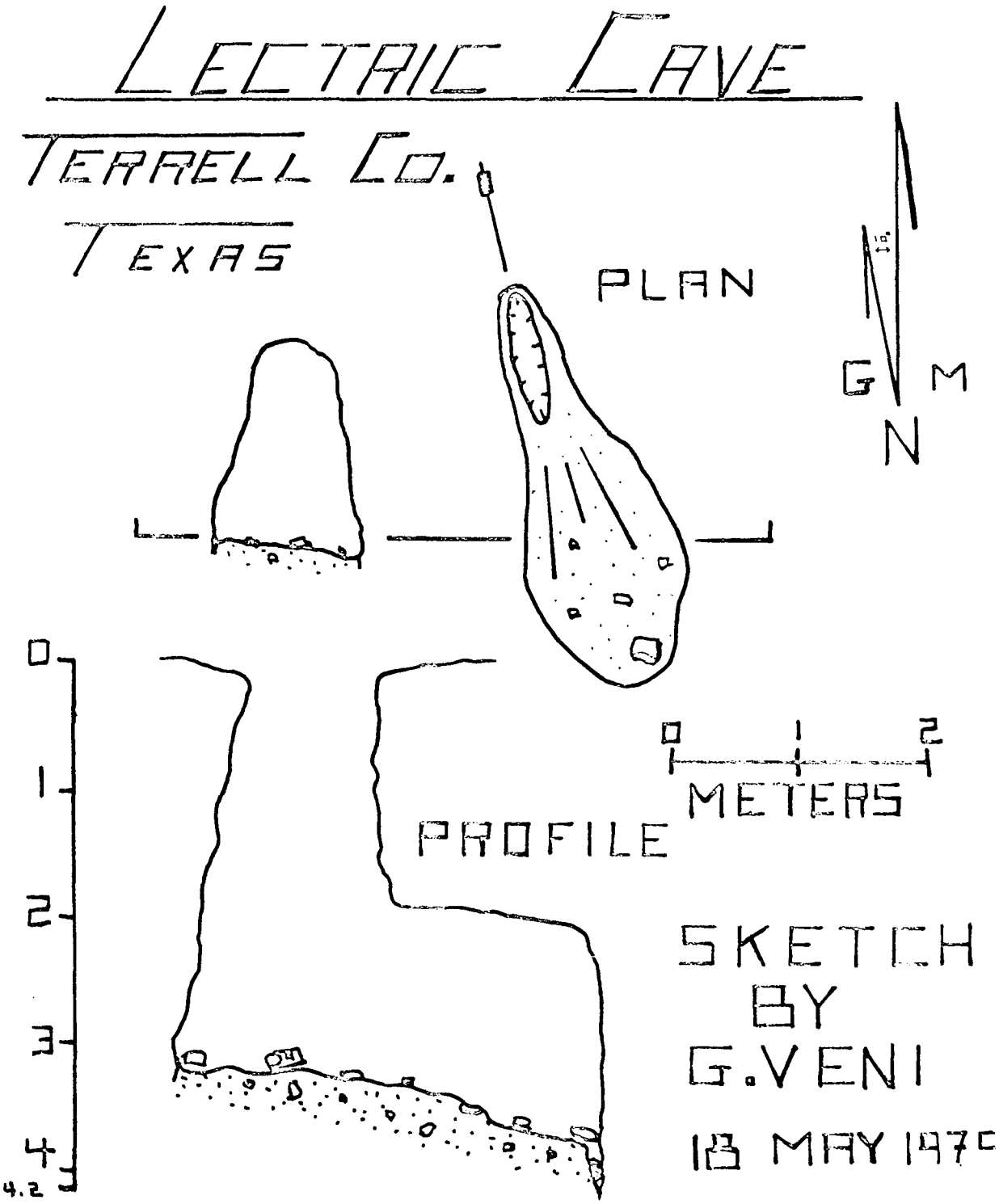
I continued the work, joined on the 25th of August by Bob Osburn and Mike Wharton. For the September weekend, David Drysdale joined Randy and myself.

Most of our efforts focused on the river survey. The 21st of August saw about 300 meters completed. This was the only productive survey for that week. Returning on the 23d of August, the Suuntos, having been left in the cave, were fogged beyond

Scott Harden In The Inner Sanctum

A final discovery on the May trip was on the 18th when Tony, the ranch hand, took Randy and me to see another cave. It was located near the telephone/electric lines. The hole was about 3 meters deep, 1 meter long and .5 meter wide. Tony was amazed that someone could climb down it, because he thought the entrance was too small. The hole enlarged a little, along the controlling joint trend, and then ended in a matrix fill of soil and scrap metal. Due to its location, we called it Lectric Cave.

The last trip to the cave was on 20-26 August 1979 and 1-2 September 1979. From 20-26 August, Scott Harden, Randy Waters and usability. Two days later, Bob, Mike and I surveyed 370 meters to the sump, but again the Suuntos fogged and upon reduction of the survey data, we found it caused an unacceptable amount of error. We were back to the river a week later, but this time the instruments were waterproofed with a silicon sealer. We repeated the last survey and added another 70 meters by doing the loop known as the Pirate's Passage. This passage takes half the flow of the river and resurges about 90 meters downstream. Actually, it is not a true surveyed loop due to a 3 to 4-meter-wide sump. The Pirate contains most of the crawling for the cave. including a 50-meter stretch of belly crawl through water and lots of sharp rocks.


LECTRIC CAVE
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4
4.2
SKETCH
BY
G.VENI
18 MAY 1970

The map of Sorcerer's Cave was made following the May 1979 trip. This August-September trip has added 727 meters of length and extended the depth to -167 meters (548 feet). According to the list for deep caves of the United States which was compiled in February 1978, Sorcerer's places as the 24th deepest, with a potential for 21st only 4 meters away.

Exploration on this last trip took place on a major and minor scale. The way we worked our caving scuedule was to have a day of work followed by a day of rest. The rest days were often as productive as the work days. They were spent in transferring, reducing and plotting survey data, repairing equipment and preparing for the next day. But a great deal of time was also spent walking the land, searching for new leads and making observations of the surface topography. Thus far, the only cave found within 1 kilometer of Sorcerer's is a hole known as Apprentice Cave. It sits 14 meters away from the main cavern. A 5-meter entrance drop leads into a narrow joint enlarged passage that parallels the trend of its neighboring cave. Apprentice has been explored to a 5-meter drop only 10 meters into the cave. This pitch is extremely narrow and will be difficult to get down, nearly impossible to get up. The lack of any airflow makes it doubtful that Apprentice goes far, so the drop will not be dropped until we get around to surveying it.

Six miles to the south, near the town of Dryden, we located a sink 3 meters in diameter. The rusting body of an old car filled the hole. We removed the auto and found that the sink dropped through 2 meters of loose alluvial walls to Buda bedrock. An offgoing crawl ends with dirt fill but holds promise for anyone who wants to do a lot of digging. In Sorcerer's, Randy did some digging in the area known as the Dragon Den, but was unable to find the source of its airflow.

On 23 August , when we went to the river and found that the instruments could not be used, we pushed some leads instead. The first downstream lead, indicated on the July 1979 map, was checked by Scott and Randy. Contrary to what the map shows for its trend, it makes a quick turn and heads in the opposite direction (northwest) for 30 meters to a fork. The passage is low, wet and muddy, but it still goes.

Climbing Out of Witch's Well

Further downstream is a 20-meter high dome pit we call Echinoid Aven because of the abundant fossils in its walls. Chimneying up some breakdown, we got half way up the aven. Its ceiling is composed of breakdown and a passage can be seen leading off. All of this, combined with a steady flow of water dripping downwards, makes this aven nearly identical to the River Pit. We expect that some well placed bolts will gain us access to upper levels similar to those of the known cave. Two other such dome pits have also been found, one near the insurgence of the Pirate's Passage and another about 150 to 200 meters upstream in the Sirion River.

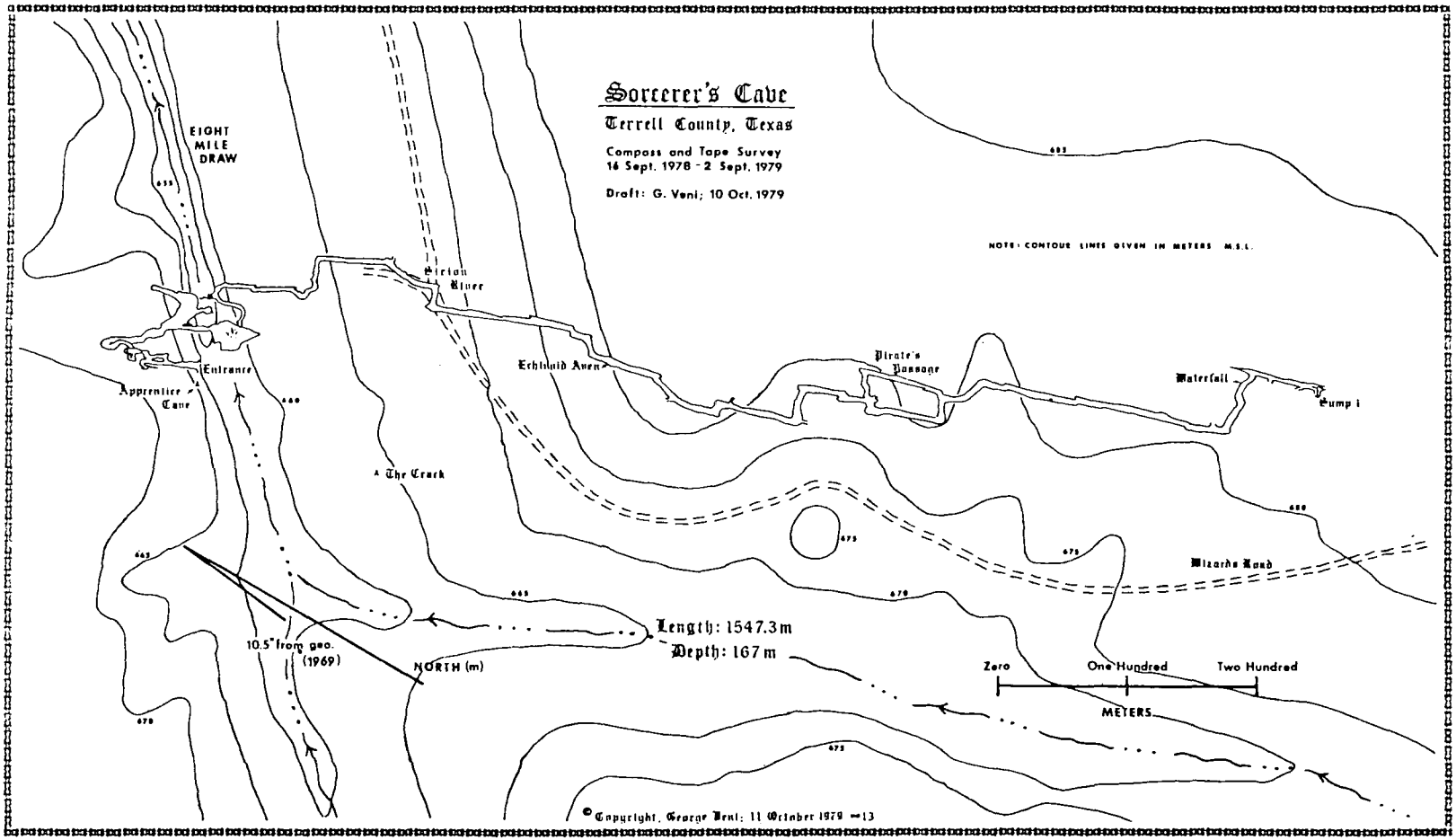
Other minor leads were looked into, but most of our effort was concentrated at the downstream sump. We kept in mind that the Abilene cavers on the February 1979 trip told us of an upper level bypass, but a steep mud slope prevented their descent to the waters beyond the sump. Randy and I arrived at the sump and chimneyed up the keyhole ceiling to another passage. The team of Boettger, Harder and Moore told us that they had to straddle across some passage with the river flowing below. There were no footprints in these mudcovered walls, so Randy and I questioned if they ever got as far as the sump. A very steep mud slope led upwards. Tenaciously gripping our precarious mud hand and footholds, we clawed our way up. At the top, an incoming side passage laughed at our mud covered bodies. This was the Abilene bypass. Pushing forward we reached the barrier mud slope. Now it was our turn to laugh. The slope we had climbed up made this one child's play in comparison. We bombed on down to the river!

Unfortunately, the river was not in a very generous mood. After only 60 meters we reached Sump 2, but there was another upper level to tempt us. Temptation can be most frustrating. A tricky climb up led to a bypass, but a near vertical mud covered pitch staved our progress as we watched the waters rushing by 7 meters below.

On the evening of 25 August, after surveying to Sump 1, Bob Osburn, Mike Wharton and I pushed up and over Sump 2. Bob braced himself on the walls and put the rope around his waist. Being the lightest caver, I slapped on a figure 8 and rappelled down. Upstream, the passage went 20 meters to the other side of Sump 2. Downstream, I followed the waters for 100 meters. The passage widened and the ceiling rose high. This is the largest section of river passage yet discovered. This is also the location of Sump 3.

I saw some upper level leads, but did not check them. It was getting late and we had a long trip outwards that awaited us. A piton was set for use as a future anchor. And, meanwhile the cave still laughs at our feeble and frustrating efforts to discover its many secrets.

Gary Poole Rappelling Down The River Pit


Sorcerer's Cave
Terrell County, Texas
Compass and Tape Survey
16 Sept. 1978 - 2 Sept. 1979
Draft: G. Veni; 10 Oct. 1979
NOTE: CONTOUR LINES GIVEN IN METERS M.S.L.
EIGHT MILE DRAW
Entrance
Apprentice Cave
Mirian River
Echinoid Avenue
Pirate's Passage
Waterfall
Sump 1
The Crack
Wizards Road
Length: 1547.3m
Depth: 167m
10.5" from geo. (1969)
NORTH (m)
Zero
One Hundred
Two Hundred
METERS
©Copyright, George Veni; 11 October 1979 -13

The Land

Terrell County has a temperate, semidesert climate. Summers are hot and long and winters are mild. The average annual rainfall is about 12 inches. Most of this precipitation occurs via late afternoon thunderstorms in late spring and summer. Snowfalls are infrequent. The average daily minimum temperature in January is 36° F. while the average daily maximum for the same month is 66° F. July has a minimum and maximum of 72° F. and 96° F. respectively. Of interest to retirees, the relative humidity is low, typically about 55 percent.

The Dryden area contains a flora typical of the Chihuahuan Desert and southern Edwards Plateau. However, some modification has undoubtedly occurred due to grazing and clearing. The uplands and plains are dominated by buffalo and tobosa grasses with a few cacti, thorny bushes and cedar. Typical of the bushes are the spiny hackberry and agarita. Due both to more water and better soil, the arroyos support a more varied and more lush plantlife including some small trees. Cedar, Texas black walnut and desert willow predominate among the trees with similarly hardy species occurring among the flowering plants. Most noticeable are the hairy jimson weed, the prickly poppy and the purple ground cherry. There are as well several species of unidentified grasses.

Sorcerer's Cave is located on the Stockton Plateau and this fact, along with the climate of the area, goes far in explaining the physiography of the region. The Stockton Plateau is on the western edge of the Edwards Plateau Physiographic Province and, like the Edwards, is composed primarily of almost flat lying Cretaceous limestones. The deep drainage basin of the Pecos River separates the two plateaus.

In the vicinity of the cave, the Stockton Plateau has the appearance of a roughly level upland which has been shallowly dissected by ephemeral stream systems. The hills are flat-topped, low, mesa-like structures separated by flat, shallow, broad valleys or terraces (this latter term not being meant to imply an alluvial substrata). The arroyos that cut these flat floored valleys are themselves usually quite shallow, rarely being more than 20 meters deep. The presence of flowing water in these arroyos is, as might be expected, highly seasonal. The lack of flowing water in the region is undoubtedly the explanation of the lack of topographic relief.

The morphology of the land surface is controlled to some degree by the rock strata. The mesa and valley flats tend to form on the hard limestones such as the Buda and Santa Elna, while slopes form on the thin, soft Del Rio Clay. There are exceptions.

Jointing In 8-Mile Draw

Sorcerer's Cave is found in lower Cretaceous carbonates. The nomenclature which will be used in this section is from the Geologic Atlas of Texas, Del Rio Sheet, University of Texas Bureau of Economic Geology. The entrance to Sorcerer's is just a few feet below the base of the thin Del Rio Clay and the bulk of the cave is located within the Santa Elena Limestone. This formation is fine grained to microgranular with occasionally massive beds. Chert nodules are found in the limestone as are miliolids and rudistids. The present base of Sorcerer's Cave is thought to be in the Sue Peaks Formation. The formation is a thin-bedded, microgranular, somewhat nearly carbonate. Its color is medium light gray to medium dark gray. The Sue Peaks is about 45 feet thick. Below the Sue Peaks is the Del Carmen Limestone. It is not known whether the presently explored portion of the cave extends into the Del Carmen. The extent requires further geologic work.

Creatures

WANTED: Trained bug person willing to help!

Biology is a field for which we who have worked in Sorcerer's Cave have much enthusiasm but little training. Thus far, most of the collections were made on the May 1979 trip. The bugs were collected according to the different areas of the cave and are presented below in that order:

Entrance: The most abundant critters here are the gnats, with the mosquitoes taking a close second. However, other bugs also abound. Harvestmen, black beetles of the Blaps genus, wood roaches and an occasional small mammal's home in the entrance. A wire fence prevents the intrusion of large animals.

Witch's Well to the Demon Drop: The roaches, beetles and a species of long-legged whitish-yellow spiders are in abundance from the Well to Poltergeist Pit. Below the Pit, biological activity decreases. No roaches are seen beyond it and the number of beetles and spiders drops singificantly. Cave crickets, present from Witch's Well, appear to maintain a constant population down to the bottom of the Demon Drop (also the furthermost extent of the beetles and the spiders). A pseudoscorpion has been collected from the top of the Demon Drop.

Bubble Passage to the Sirion River: Here, where the water begins, marks another decrease in biological activity. Perhaps the biology is just not as well noted because less time has been spent for biologic observations in these areas. Cave crickets have been seen in the Inner Sanctum along with the genus/species Nicolotia texensis. The latter creature has also been seen at the beginning of the Stream. At the river pit, a short-legged white spider has been seen in the Inner Sanctum and also in the Sanctum Sanctorum. A species of troglobitic isopod has been collected from the Stream. A couple of very white crickets were seen at and beyond the Pirate's Passage in the Sirion River.

Bats: The bat flight from the cave is not a long, continuous outflow of flying mammals. They fly out in very small groups or as individuals. The reason lies in that narrow parts of the cave tend to form traffic jams. Therefore, the exiting bats enter a holding pattern and slowly filter through the constrictions. The primary roost for the bats is in the Sanctum Sanctorum at a depth of 88 meters. They also roost in the Inner Sanctum on occasion. The population of the colony has been guesstimated at about 5,000. They have not yet been identified, but have been observed to have small ears and gray fur on their chests. Their primary feeding area is in the immediate vicinity of the cave.

A Friendly Snake Sits Over The Crack Leading Into Poltergeist Pit

Meteorology

A constant inflow of air can be felt in some narrow parts of the cave. On 16 May 1979, at approximately 1:30 p.m., we felt a strong inflow of air in the crack below Poltergeist Pit (two to three times stronger than normal flow). After 10 to 15 seconds, the flow reversed. The air moved in gusts, changing directions about three times per minute. An hour earlier, Randy was digging at a small hole in a wall. When water is present, it seeps toward this hole. He quit digging so we could continue to survey, but from distances of 2 and 4 meters away, we heard the sound of air movement. It was a heavy, grotesque type of breathing, moving at a rate similar to what we later found below Poltergeist Pit. It was this breathing that named the area--Dragon's Den. Outside was the edge of a large front of thunderclouds which could have been the cause of the abnormal air movements. During the August trip, steady outflow rather than inflow was noted. This occurred at times when the outside atmospheric pressure was low and when it was high.

During the time spent on the surface (12 thru 19 May 1979), I made an effort to study the airflow of The Crack. This is a small hole, a couple of hundred meters from the cave, that Scott Harden discovered during the February 1979 trip. Having no instrument to measure airflow, I developed a method to differentiate air movements. Rather than just say The Crack is blowing in or out, I tried to indicate strength of flow. The numbers I used were related in a very basic way--2 is twice as strong as 1, 3 is three times as strong as 1 and 4 is four times stronger than 1. However, 1 has no measurable value; only what I considered a very definite perceptible flow. Negative numbers indicate inflows of air. As much as possible, the measurements were made on an hourly basis and included outside air temperature and other weather conditions. The data has been placed on a graph. The only thing I can say about my observations is that the direction of airflow changes every 7 to 10 hours with little regard to weather conditions. Flaws that may lay in these conclusions are due to the lack of proper instruments and my lack of training in this field.

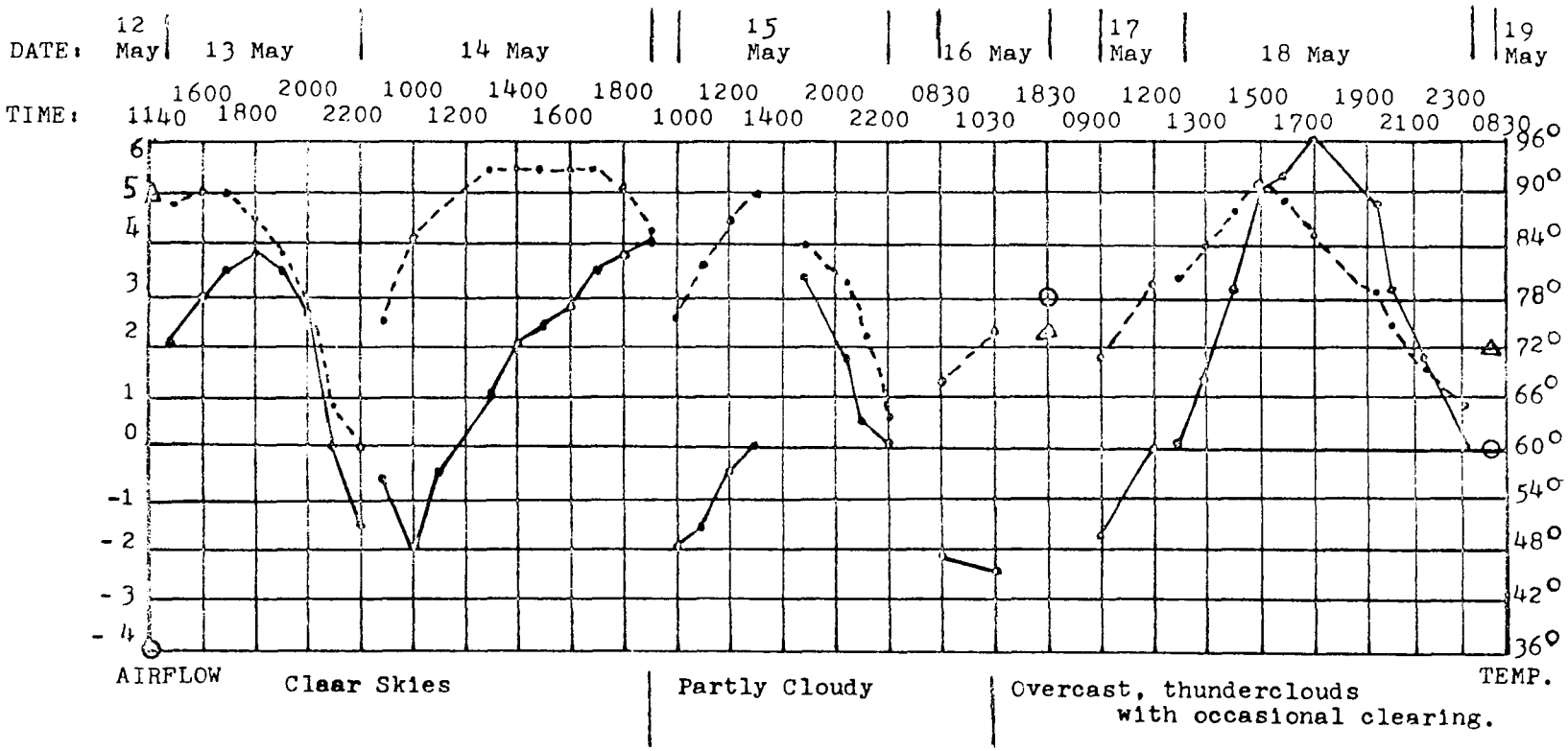
Paleontology

Back in February 1979 when the Abilene cavers discovered over 600 meters of virgin passage, they also noticed that in many of the gravel banks lining the Sirion River contained many highly mineralized bones. They collected a couple of small bones which have been sent for identification and dating. The bones lay in a poorly sorted matrix with the gravel, chert and clay. Some of the bones that are still in the river measure .3 meters long. Even though they have yet to be identified, they still provide valuable information.

The route that cavers follow in order to reach the river seems a very unlikely route for the bones to have followed, for there is no evidence of bones in the upper levels. Therefore, I believe that someplace upstream is (was?) another entrance to the cave with a more direct means of reaching the river. This would be confirmed by finding some bones in the yet as unsurveyed, upstream portion of the Sirion River. However, upstream differs from down in having no shallow water gravel banks on which the bones could collect. The average water depth is chest deep and deeper.

Checking Airflow At The Crack

Meteorlogical Observations at the Crack, 12-19 May 1979.
Terrell County, Texas



Airflow

Outside air temp. (°F)

Single measured airflow

Single measured temp.

Technique

With some caves you can stroll around as carefree and nonchalantly as if you were at home. At Sorcerer's Cave, as you don your surgical mask, you get the unmistakable impression that you are in for something different.

The masks are used in the dry upper levels of the cave for the prevention of the inhalation of excessive amounts of bat guano, thus preventing the illness which befell the Sul Ross cavers. It is even recommended that you wear the masks in the large damp rooms because of a little bit of histoplasmosis which has been spotted there. So far, no one has suffered any respiratory difficulties.

Technique for the pits is just standard vertical ropework. For the river, a wetsuit is needed. A wetsuit top can be worn, but as most of the water is below waist level, the bottom takes priority. When it comes to the perched water at the Bubble Passage, us oldtimers to the cave bring a pair of chest high waders in order to avoid the wet muck.

Good technique for visiting the cave down to the river is to bring a change of clothes as well as the waders and wetsuit. When you reach the river and put on the wetsuit, cover it with the clothes you wore down into the cave. This helps a lot in protecting the suit. When you exit the river, you change into the second, dry set of clothes and assuming you brought some waders, you stay dry all of the way out of the cave. If you did not bring waders, then do not bother with the extra change of clothes.

This brings us to a restrictive aspect of the cave. It is a very direct cave. Only one way in and only one way out, having few side passages to wander off into. Most people do not bring waders or extra clothes, so the restriction is on the number of people who should be in the cave at any one time. A mass exodus will result in many people sitting cold and wet at the bottom of a pit, waiting their turn to climb. This has the potential of causing many problems, so caution should be taken.

There are some places where one needs to chimney fairly well, mostly in the breakdown maze. The only crawlway in the upper levels of the cave is only 2 meters long. But, the most physically restricting parts of the cave are two very narrow cracks thru which you have to squeeze. They are located above and below Polergeist Pit. Also in the breakdown is one tight spot, but except for these areas, it is overall a roomy cave.

While surveying the cave, a Brunton mounted on a tripod was used from the entrance to the Inner Sanctum. From there to the river and for the original vertical survey, a pair of Suuntos were used. Closures with both instruments were excellent, yet there were a couple of oddball azimuths which went in definitely wrong directions. Fortunately, during the 9-day trip in May, a preliminary plot of the map was done to find such errors, so they were easily corrected after their discovery.

In trying to achieve accuracy with lots of detail, the survey went fairly slow. Much time was spent in sprays and in careful measurings of various features. The tapes used were steel and fiberglass, 30 meters long, with the latter doing 90 percent of the work. The fiberglass was preferred because of its accuracy to within 2 millimeters. Overall, the survey was very successful, for after plotting the data, the cave was virtually drawn, especially the rooms.

Ted Roberts Approaching Poltergeist Pit

Malfunctions

This is a listing of the most important events on a trip. Depending on how many you have and their nature, malfunctions can either make or break the day's venture. The following list is broken down according to the areas in which the incidents occurred.

Entrance, 12 May 1979: George's glasses fall apart.

Witch's Well, 25 August 1979: Scott blows two bulbs on his headlamp.

Poltergeist Pit, 16-17 September 1978: Randy's camera refuses to work.
21-22 October 1978: (1) Randy's jumar cord breaks while climbing. (2) Randy grabs a snake while sitting over the pit.
24 February 1979: Bruce gets stuck for an hour in the narrow crack leading into the pit.
20-26 August 1979: The presence of a snake in the crack above the pit keeps things lively that week.
2 September 1979: David D's footloop breaks.

Bubble Passage, 25 February 1979: George's waders spring a leak.
12-13 May 1979: (1) George's waders do a repeat performance. (2) Teeni's camera refuses to work.

Inner Sanctum, 16 May 1979: (1) Again, Randy's camera refuses to work. (2) Randy's strobe blows its internal circuitry. Three panels get fused together and two electronics experts who later examine it say that what happened is impossible.

Sanctum Sanctorum, 21-22 October 1978: George's optical tape measure refuses to work.
21 August 1979: Randy's strobe refuses to work.

Sirion River, 17 May 1979: George's main light refuses to work.
23 August 1979: Suuntos fog beyond readability. Survey has to be cancelled.
25 August 1979: (1) Randy's strobe refuses to work in synchronization with the camera. (2) Randy's camera develops a shutter problem. This was discovered during the processing of three rolls of film. Correction, three rolls of garbage! (3) Suuntos fog, not enough to be totally unreadable, but enough to produce an illusion of accuracy. The survey has to be repeated.

This is just a spotlighting of the more memorable events and there are many not listed. But the purpose of the list is to show that things seldom work the way you expect them to, thus affecting the entire venture.

A big noncave malfunction happened concerning the survey data. After figuring out the cave's depth according to the new survey and comparing it to the original vertical survey, I discovered that the new one was short by about 5 meters. Once my panic subsided, I soon discovered the reason for the difference. I learned that when I was transferring the survey data from the field book to a permanent record and then again into data reduction forms, the eye strain from hours of intense usage caused me to inadvertently copy the wrong numbers (i.e., 1.8 would become 1 or .8). Eventually everything was corrected and triple checked for errors, but another frustration was soon to follow.

All measurements and data are worked in meters. However, most people think in terms of feet. Thus, I would often convert meters to feet for the convenience of explaining the cave to others. I would say that Poltergeist Pit is 75 feet deep. Wrong! It is 82 feet. I was using the wrong numbers for conversion. Fortunately, it does not affect the survey.

Human Achievements

This is another one of my out-of-the-ordinary topics. Here I wish to show the amount and utilization of manpower and to give credit to the various efforts put forth by the people who have worked at Sorcerer's. May their achievements soon be surpassed in the constant striving for excellence!

Number of People Having Worked in the Cave: Since September 1978: 17

Number of Females Having Worked In The Cave: One (Teeni Kern)

Total Manhours of Work Since September 1978: 603.3 hours

Most Hours For One Person: 165.35 hours (George Veni)

Most People in The Cave At One Time: 10 (24 February 1979)

Longest Trip In The Cave: 19 hours (1-2 September 1979--David Drysdale, George Veni, Randy Waters)

Most New Passage Discovered on A Single Trip: 1.06 kilometers (21-22 October 1978—Gary Poole, George Veni, Randy Waters)

Most Passage Surveyed on a Single Trip: 451.5 meters (1-2 September 1979--David Drysdale, George Veni, Randy Waters)

Most Traveling to Reach The Cave: 514 miles (Bob Osburn, Socorro, New Mexico)

Most Effort to Get To The Cave: 15 May 1979 (Randy Waters' hike of 9.25 miles in 6 hours, while carring a 90-pound backpack)

As with "Malfunctions," all personal achievements cannot be known. These are merely the more documented events. I hope that this dramatizes the need for more people to take an active interest in the cave. Getting your name on a list like this is trivial, yet it is the achievements that this cave is in need of. This list is just nice to look at and reminisce about once the work is done.

Acolyte Dave Prays To Brunton God While Rabbi George Records The Event

PSI Caving

By now, you the poor reader must be wondering where and why I dream up these crazy topics and what kind of a kook I must be! For those skeptical of psychic phenomena, things here will definely become kookier. Please keep in mind that regardless of how strange the following events may sound, they and related opinion are very serious and sincere.

Since I first started caving, I have always experienced a certain harmony and communication with caves. This is something I know that many other cavers feel to varying degrees. This is also the way that many caves and their passages are named--by the feeling they give to the explorers. These feelings have been a dominating factor at Sorcerer's Cave.

Upon first entering the cave, we felt a very powerful, eerie sorcerous atmosphere. Though we previously contemplated renaming the cave, the choice was made for us as the cavern spoke its name. In the course of that first trip, I was the first to approach the 25-meter pitch. Without any conscious thought, I surprised myself when I muttered the name Poltergeist Pit. This name has held true for most major problems and minor annoyances that occur in the cave usually occur at this pit. Again, the cave has made itself known.

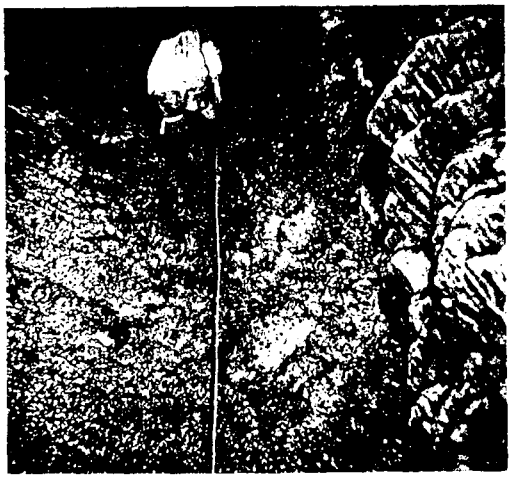
On 21-22 October 1978 we all knew that we would each be able to travel lots of virgin passage. The pit was for me. Randy predicted that the river would be there, so he led us the first 500 meters. At that point it was Gary's turn for new passage, and when Randy gave him the lead, he told him to take the other half. Another 500 meters was exactly how far Gary had led us when we reached the sump.

On 24 May 1979, I tried working the Ouiji Board with a couple of caving friends, Patricia Herrera and Tom Shook. To keep the story brief, we soon discovered that there was a spirit that kept the board from working for me. The spirit called itself Puet.

He said he was a demon living at a pit in Sorcerer's Cave. The pit was identified as having a depth of 206 feet. The closest number on the survey was for the Demon Drop (he claimed the pit was accurately named) whose drop began at about 198 feet. Puet had interfered with the board to get our attention. He complained that he did not get any recognition and threatened to hurt someone unless he got it. The recognition was to take the form of carving his name in the cave. Patricia pointed out that this would be doing something that was against our beliefs. Swiftly and with anger the board wrote out, "My damn cave." When Patricia objected again, Puet called her a bitch. However, he did agree that we would not have to carve his name in the cave if I would put his name on the map and letter it in gold!

An interesting event happened a week later. After the final reductions of the survey data and the correction of my meters to feet conversion (see Malfunctions), I rechecked the depth for the lip of the Demon Drop--206 feet, just as Puet said!

I offer no explanation for these events. I am merely relating the facts. But this sort of thing does make one wonder about the validity of certain feelings people have towards things not yet proven. Two such feelings are (1) Randy's prediction that we will find a large room 8,000 feet downstream in the Sirion River and (2) my prediction that before we get to highly technical aspects of exploration (scuba diving, bolting up domes, etc.), the cave will have a surveyed length of 20,000 feet!



The Demon Drop--Home To Puet

The Future

No one can predict the future, even though some of us try. But I am optimistic about the future of Sorcerer's Cave. There is no lack of cavers who can explore and survey the cave. Yet, to fulfill the cave's total scientific potential, I find that there is a great need for trained personnel in the various specialty fields (geology, biology, archaeology, paleontology, etc.). Preferably people would be able to make a study of the field work soon after the data is acquired. Hopefully, results could be available in a relatively short time, rather than in a few years as has been the case with some other projects. Of course, some studies are inherently time consuming. Anyone interested in contributing towards any of the efforts at Sorcerer's Cave, please write or call:

George Veni
4254 Goshen Pass
San Antonio, Texas 78230
(512-699-1153)

The potential wealth of knowledge from this cave is immense. Little is known of the geology of the area, and Sorcerer's Cave gives an excellent cross section view of the land. With conditions ranging from dusty and muddy with lots of guano mixed in to crystal clear running water, the biology is quite diverse. Meteorology, paleontology, hydrology--all these fields have much to offer. Last and certainly not least is the exploration. No, it is not like the caves in Mexico, but there is nothing like it in the state. Sorcerer's Cave offers depth, length variety, excitement and lots of unchecked leads which greatly increase its potential. Thus, many of the people who have visited Sorcerer's Cave consider it one of the best caves in Texas.

"Thus Ends Another Adventure"

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Ted Struggles At The Guano Drop

Mike Wharton In Narrow Section Of The Sirion River

Sorcerer's Cave

The Camp

George Veni

Announced as a "TSA Project", I was curious about the type of response I'd get for this trip. The response was good but the dates were bad, so it was just Logan McNatt, Randy Waters and I at the cave on Saturday, 8 March 1980. An eight hour trip saw us rig the cave to -87 m, hauling down 60% of the gear. Since 3 of the 4 major drops were behind us and having to get wet to go any further, we felt this was a good place to stop. An hour was spent on bug collecting before exiting.

On Sunday, Logan and I entered the cave with the remainder of the gear. Randy, who wasn't feeling well, was to join us on Monday. With the cave rigged, we quickly reached our other gear, in spite of the 80-90 lbs packs we carried. Soon enough we reached the bottom of the River Pit and all the vertical work was behind us. Now the real work started, having to backpack the 4 duffell bags, plus other miscellaneous packs and gear, over 1 km to the camp. With uneven terrain, ankle to chest deep water and occasional stretches of stoop and duckwalking, for back pains to remember the cave by, our hike was "quite sporting". It took two trips to get all the gear to camp from the pit.

Now I'd like to publicly thank Logan for not deserting me as any normal, intelligent person would. The camp wasn't quite the way he had imagined it from my vivid descriptions. I told him it was a dry, upper level from the River, (dry, meaning not in the River). Imagine a narrow, sticky, mud-covered passage, with large breakdown slabs angling their jagged edges upwards and isolated pools and puddles occupying the smooth sections of the floor. This was home!

Our dry camp clothes were wet and much of our gear was soaked. There was only one place to hang a hammock and the best place Logan found for his sleeping bag was a 2 m long natural bridge. Its drawback was that it sloped down at both ends, leaving him in suspense as to which way he'll slide down while trying to sleep: one way he breaks his leg, the other way, his head. Fortunately his bed stayed stationary. Unfortunately, another natural bridge to which my hammock was tied, came crashing down on Monday morning. A painful awakening!

Needless to say, morale was low that morning. After a 12 hour rest, we climbed out of our sleeping bags, at 2:30 am, intermittantly growling, sighing, and moaning about our surroundings. Breakfast helped, but it wasn't until we began surveying that we started feeling better about things.

We surveyed through the area known as the Abilene Bypass, (it bypasses Sump 1), which the camp was located in and then taken to Sump 2. The survey ended because the book became too muddy and it was 9 pm, our agreed time to see if Randy had made it to camp yet. Not finding him there, we figured he didn't feel well enough to come down. Due to safety reasons in case he had, we were obligated to exit.

It was a cold desert night that greeted our wet, tired bodies at 1:30 am. It was impossible to wake-up Randy. Changing into dry clothes, Logan retired to his tent and I to the cab of my pick-up. With our sleeping bags

550 feet below us we tried various methods to stay warm: I shivered a lot and Logan lit a cigarette to try and warm his hands over. Eventually it dawned on me to start the engine and warm the cab. Soon we were both restlessly asleep and uncomfortable, but at least warm.

There was no way we were up to going caving on Tuesday, so we did other odds and ends like cave hunting, searching for burned rock middens and associated Indian points for study. That night we slept fairly well for we learned Randy had slept with 3 blankets under his sleeping bag for padding, the previous night Logan and I froze.

Wednesday was a great day. We were all feeling good and blitzed on down to the Sirion River. Our objective was to survey upstream and we did just that, 434 m to the Sump. Here we stayed for a bit until we determined it could not be easily free-dived. No upper leads for bypasses either so we called it a day. Randy surfaced and Logan and I went to camp.

Thursday started off well, as we extended the downstream survey to Sump 3, then problems arose. Permit me to digress a little. I mentioned earlier that our camp clothes had gotten wet in transit, but as it turned out, we didn't need them. Surprisingly the air and water temperature were measured at 75 degrees F. The water had always felt a bit warm, but not so with the air when wearing wet clothes. We "streaked" the cave during our time in camp, because our dried out clothes were too hot and humid to wear. Now Logan had brought some eggs and sausage to eat, expecting a cooler, more preserving environment. It seems that they were slightly spoiled when he ate them for breakfast Thursday morning and at Sump 3 he began to feel the effects. Considering the situation, I deemed it unwise to try and free-dive the sump, so it remains a good lead for the future. The survey ended and we checked the upper leads finding them to be a high extension along the same joint of the river passage below. In essence, a long natural bridge.

Returning to camp, Logan nursed himself as best he could, but rest and time were to be the cure. Friday morning all was well. Randy joined us from the surface and we broke camp, leaving behind depots of food, carbide and gear for the future. All 4 packs were much lighter and we took two out of the cave and the other two as far as the River Pit.

That Saturday we were joined at the cave by Scott Harden and Gary Poole from Austin, Michael Hughes, Charles Hudson, Dave McAdoo and Jim Patton from Galveston, and Barbara and Ned Strenth from San Angelo. The day started with a bang as Scott and Gary tried to blast their way into The Crack, a small hole on the surface that blows air. Afterwards, they went to some neighboring ranches in search of a hopeful upstream entrance to Sorcerer's Cave. Nothing major was discovered, but land owner relations were established for future trips. The Galveston cavers went down to the Sirion River, pushed as far as the Pirate's Passage, then on exiting, derigged the cave to within 50 m of the surface. An 18 hour trip! Ned and Barbara collected bugs from the entrance pit and Logan, Randy and I search for more middens, points, and arranged the gear we had already brought out of the cave. Sunday, the derigging was completed and Scott pushed nearby Apprentice Cave back about 30 m to an 8 m pit. This produced some excitement and some good leads, but those are for the next trip to work on. It was time for everyone to go home.

In retrospect, the trip and the camp were a success. 744.2 meters (2,441 feet) were added to the Survey, plus 5 inches of depth. The most valuable work done was learning what it takes to set up a camp. The surveying we did this trip could have been done from a camp on the surface, but if we hadn't had to retreat to the surface on Monday and had been able to push a good distance beyond Sump 3, then camp would have been an absolute necessity.

Closing, I'd like to thank everyone who joined this trip, Dr. R. Crawford of the University of Washington in Seattle, who has taken an active interest in the cave's biology and to Debbie Bowman, Don Bowman, John Cross, Don Keith, Dottie Kern, Linda Palit, Tom Reinbold, Tom Shook, Marjorie Waters, and in memorium, Chuck Stuehm. There donations of their gear and of themselves helped to make this trip possible.

Sorcerer's Cave

Archeology

Logan McNatt

Modern-day explorers of Sorcerer's Cave cannot help but notice that they are not the first people to enter the cave, since the entrance area was obviously occupied by Indians. The floor is covered with burned rocks, which spill out of the entrance and form a talus slope down the side of Eight-Mile Draw. Scattered among the burned rocks are flint flakes and chips - the "debitage" or waste products created during the manufature of stone tools. A thin triangular "biface" (chipped on both sides) was collected from this entrance area. This finished tool may have served either as a spear point or knife, or perhaps both. A wide ledge along the right wall contains about ten shallow "mortar holes", created by the grinding of seeds, berries and nuts for feed. Portions of ledges within the entrance were used as seats and walkways so much that they have been worn to a smooth polish. The ceiling is smoke-blackened, probably from Indian occupation although some of it may be from modern fires. Finally, two pictographs (pictogarphs are painted, petroglyphs are carved) are located on the left front corner of the entrance, just under the overhang (see TC Feb. 1980, p 3).

It is extremely unlikely that the Indians ever ventured past the entrance area because immediately beyond is a 14 meter unclimbable drop, the "Witch's Well". A metate (grinding stone) fragment was found at the bottom of this pitch, and testing would probably yield other artifacts which have fallen or been washed down the drop. It is conceivable that human skeletal remains could be recovered, since "shaft burials" in caves were a fairly common method of disposing of the dead (for example, Hitzfelder's Bone Cave, Bexar County).

Who were these people, how many of them used the cave, and when did they live there? Some of these questions are difficult to answer. Archeologists have been working in the lower Pecos and trans-Pecos areas since the early 1930's, and have found evidence of human habitation dating back at least 11,000 years. The general scenario appears to be one of small bands of people who led a semi-nomade life and depended on hunting and gathering for their survival. A typical band may have been 10-25 individuals, probably an extended family. We do not know what they called themselves, what language(s) they spoke, why they painted pictographs, nor very little else about their abstract religious/political ideas. Such things are not preserved in the archeological record.

We do know that they were excellent survivors well-adapted to an environment which seems harsh and uninviting at first glance. Archeological excavations have yielded a great deal of information about their material culture. Wood items included spears, atlatls (spear-throwers), digging sticks, "rabbit sticks" (curved sticks probably both thrown and used as clubs), needles, drills, scoops, and stakes. Bone and antler artifacts consist of awls, needles, scrapers, beads, pendants, and flakers for chipping stone. Vegetable fibers were used to make sandles, baskets, nets, mats, cords, and bags. A great number and variety of chipped stone tools were used, including projectile points, knives, scrapers, and choppers. The lifestyle and technology of these people underwent essentially no major changes for thousands of years. About the only discernible changes were in the styles of projectile points, and the introduction of the bow and arrow sometime around A.D. 800-1000.

These prehistoric people depended heavily on three desert succulents: sotol, agave, and prickly pear. They exploited virtually every other possible food resource, such as walnuts, acorns, mesquite beans, persimmons, wild onions, shellfish, snails, fish, reptiles and amphibians, birds, and a wide variety of mammals, particularly rodents, rabbits, and deer. They probably shifted residence from season to season to take advantage of the various resources and local environments.

We can only speculate about the number of bands who may have used the cave, as well as the length of frequency of their visits. Such questions can only be answered by very detailed investigations of the stratigraphy within a deposit; unfortunately, the midden in Sorcerer's Cave has been significantly disturbed by livestock and people.

Six burned rock middens are located on the surface within several hundred meters of the cave. These piles of fire-fractured angular limestone rocks are very common in central and west Texas, and are the remains

of cooking pits or earth ovens. The often have a central depression surrounded by a ring or horseshoe-shaped pile of rocks, and subsurface pits are common. Foods such as sotol, agave, and lecheguilla were roasted for hours in these ovans. Projectile point styles and radiocarbon dates from excavated middens indicate that they range in age from 4-5,000 B.C. through historic times.

Of the six burned rock middens near Sorcerer's Cave, only one (B) is a ring-midden with a central depression. The midden measures 9 X 7.5 meters, with the depression about 3.5 X 2.5 meters. Maximum height of the pile is 0.5 meter. Midden "D" is a large mound in front of some low shelters. Beside the usual burned rocks, chipping debris, and broken tools were fragments of mussel shells and a mane fragment. (A mane is the grinding stone held in the hand and moved across the surface of a metate or bed-rock mortar.) Midden "D" has been partially disturbed by the road. The other burned rock middens (C,E,F, and G) are all badly scattered and disturbed by sheetwash erosion and livestock. Numerous thick, unfinished bifaces were noted at each midden, and a total of 12 projectile points/fragments were collected.

A reconnaissance for over one kilometer upstream and downstream from the cave yielded no other burned rock middens. It therefore appears likely that the cluster of middens near Sorcerer's is associated with the occupation of the cave.

Sorcerer's Cave and the burned rock middens are now on record at the Texas Archeological Survey, Balcones Research Center, in Austin, which is the central repository for archeological data in Texas. The site has been assigned a number:41TE282. Under this standardized trinomial system, the "41" stands for Texas, "TE" for Terrell County, and "282" indicates the site was the 282nd site recorded in the county. All collected materials are currently being stored at George Veni's house, along with photographs and a copy of the site survey form.

All Texas cavers are encouraged to keep an eye out for archeological sites near caves, particularly in central and west Texas. Please do not dig or otherwise disturb the sites, as a tremendous amount of information can be destroyed if the original deposit is disturbed. Take pictures, make a quick sketch map noting location and topographic features, draw or describe any artifacts, and report the information to the Texas Archeological Survey Balcones Research Center, 10000 Burnet Road, Austin, Texas 78757, phone, 512-836-0440. Or contact one of the caver/archeologists: Logan McNatt, Department of Anthropology, Texas A&M University, College Station, Texas 77843; Ron Ralph, Master Planning Branch, Texas Parks and Wildlife Department, 4200 Smith School Road, Austin, Texas 78744.

Archeological sites, like caves, are a delicate resource which need to be properly recorded and protected.

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There's a spirit above
And a spirit below:
A spirit of love,
and a spirit Divine,
But the spirit below is the
spirit of wine.

Pierpont 1838.

Tennessee

CAVE OF THE DOMES

Cannon County, Tennessee

Speleonews 24(4):60-62 Joe Douglas

One fine day in August, Joel Buckner, Larry Johnson, Tim Whitty and I visited Cannon Co. A variety of things happened, not all pleasant, but we did discover a small hole blowing air. We noticed an indentation right off the highway and, after securing permission, we walked up to the site and started moving rocks. A body-sized slit was soon open enough to permit entry. Just inside was a low, wide room. A small crawl led off to the left, but this passage was blocked... Due to the lack of a rock hammer and digging tools, we exited the cave. However, we were greatly encouraged by the strong air flow present. On the way back to the car we looked at the small spring right below the cave, then drove to another cavern.

Shortly thereafter, Joel Buckner moved to Missouri to attend school. Before he left he agreed to hammer and dig during Christmas break. I told John Hoffert and David Parr about the lead and they showed an interest as well. Thus, when Jim Hodson caught a cold and cancelled a trip to Blowhole on Dec. 29, Joel, John, David and I headed toward Cannon Co.

After talking to the landowner and armed with trowels and John's rock hammer, we walked up to the cave. Once inside...everyone moved rocks and enlarged the crawl by digging. Moving slowly, we all crawled behind John as he dug and slithered through, foot by foot. Twenty minutes and a hundred feet later we all stopped short in a slightly higher passage. There we encountered a hands-and-knees crawl through two feet of cold water.

Joel said he wasn't sure he wanted to get wet at the beginning of the day and I agreed. A cold breeze was blowing through the crawl. John said nothing. David said that one of us needed to look into it and we all agreed. Joel said to David, "You're closer." John and I smiled. David saw the conspiracy, took off his shirt and plunged ahead. We heard some shout shouts and then David's voice faded into the distance.

When we heard David's shouts, we started slinging on our gear. Not bothering to take my shirt off, I pushed into the water with Joel and John close behind. After eight numbing feet, the pool ended and the floor sloped down. A large flowstone and the sound of a creek greeted me as I stepped down into walking passage 7 ft high and 10 ft wide. The creek lay a few feet into the passage. Joel and John joined me and we immediately started walking down the passage. The walls were lined with stalactites and there were stretches of stoop-sized passages intermittent with the walking. Joel estimated the footage as we walked. We stopped for a sip of water after 1,500 ft and called for David. Receiving no answer, we continued down the passage. Approximately 2,500 ft into the cave we found a large, multi-dome complex reaching upward, beyond the range of my carbide lamp. Several small waterfalls fell from the domes and we were all very impressed. At the far end of the domes we spotted David--sitting and smiling.

A passage continued past the domes but it became a high, narrow stream canyon, not unlike Pleasant Ridge Cave. I stopped at a convenient spot to change carbide while David led the way up a climb to a continuation of the passage. In a few minutes he was back saying that it looked very tight ahead. The narrow, boxwork passage had taken its toll on his shirtless body. David and I went back to the dome complex to look around some more. Finding little in the area, we waited a few minutes then headed out. We checked a couple of leads on the way out but found nothing extensive.

Meanwhile, John and Joel pushed the narrow canyon until they reached an impassable spot. However, they could see that it did open up ahead. This lead remains. They then backtracked past the domes to a large breakdown block in the main passage. There they discovered another stream which was feeding the main creek. They soon found more walking passage that led to another beautiful dome complex. One dome on the side of the complex was estimated to be 100 ft high. A wrinkled, orange formation was also noted. John and Joel left at least one good lead in this part of the cave. They checked a couple of other side leads, then headed out. David and I met them at the entrance room and we all left the cave.

Cave of the Domes is estimated to contain at least 3,500 ft of nice cave and 10 domes are present. It is our sincere hope that the pool of water will dry up in the summer. Mapping of the cave will commence as soon as other projects are finished.

EXTENSION TO HIDDEN HOLLOW CAVE

Sumner County, Tennessee

Speleonews 24(2):25 Larry E. Matthews

On Nov. 18, 1979, I led a Nashville Grotto trip to Hidden Hollow Cave. Due to a combination of factors...18 people turned up for the trip...

On the way into the cave a number of unchecked leads were pointed out and some of the cavers took advantage of the chance to explore some virgin cave. Eventually most of us had had enough and headed out to the cars. When I left to go back to Hendersonville, the only persons left in the cave were Gerald Moni, Jeff Sims, and David Parr. I hadn't been home very long when David stopped by my house to tell me what they had found. They had pushed the Lower Level passage upstream past Discovery Dome. After about 200 ft of crawling through water, they had broken out into ½ mi of virgin walking passages that were decorated with beautiful formations.

Naturally, I couldn't resist seeing the new discovery, so I returned on Dec. 2 with David Parr, Ken McLean, and Phillip Hart. I clanked my Army surplus ammo box full of camera gear through the various crawlways and entered the new section. The water crawl opens into a high canyon, probably 50 ft high and up to 15 ft wide in places, but very winding and of irregular width from top to bottom, so that its overall

size is not immediately apparent. After a ways, perhaps 500 ft (very difficult to estimate, because we zig-zagged up and down the canyon) we arrived at a fork. The passage to the left proved to be an abandoned trunk passage, quite probably on the same level as Hodag Avenue and quite likely a continuation of that passage that has subsequently been separated by breakdown and fill. This section of trunk passage was perhaps 500 ft long and very well decorated. At this point, I decided that it had been worth dragging the camera gear this far. Since this passage obviously needed a name, I christened it Parr Avenue.

After leaving Parr Avenue, we ventured down the other branch. This branch is a canyon passage, averaging 30 ft high and from 2-15 ft wide. It is most easily traversed by straddling the canyon about 15 ft above the floor for the first several hundred feet. Formations are not as thick as in the other branch, but some very nice ones are there, including a stalagmite mound and column that is a sparkling off-white that has a blue cast. This passage continues about 1,000 ft, becoming generally wider and lower. The walking passage abruptly drops to a crawl through the stream which David says they pushed for nearly 300 ft and would probably require wetsuits to be pushed further. The several crawlways and loops that David pointed out would indicate that this new section probably does add ½ mi to the length of the cave. Due to the photographic activities, no pacing was done to get a better estimate.

Hidden Hollow Cave is now estimated to have 1½ mi of explored passages, all of which is unvandalized except for a few names smoked on the ceiling about 400 ft from the entrance. All of the main formation areas were virgin when found. There are still a number of good leads waiting to be pushed!

SOLUTION RIFT CONNECTION

Marion County, Tennessee

Speleonews 24(2):27-30 Brad Neff

...Stella and Dan Twilley, Baggy [Marion Smith], Jim [Smith], Jill [Dorman], Sue and I ate at the TAG while they told me of their previous day in Solution Rift. Six drops, leading to an unexplored seventh, had been done, including a virgin 160. Today they were returning to explore the remainder, and hopefully emerge at a spring resurgence on the valley floor...

We tagged along to Mr. Smith's farm, talked briefly with him and headed over to the base of the mountain. Jim and Baggy were going to go in by themselves to push the cave and derig... I had been very ill and wasn't sure I was completely over it...

Desire to explore won out, and I expressed my intent to go along and began gathering gear...

Just inside the entrance I managed to drop my rack down a pit, and barely managed to eventually retrieve it. Not an encouraging start.

Down two dry drops (total about 40 ft), we joined the stream, and on to the third drop of 12 ft.

Next came the Pig Wallows, a long, low and very muddy bellycrawl. Finally we rejoined the stream again and began crawling over sandstone cobbles downstream. The passage enlarged to walking after a few hundred feet to pit #4, a raging 20-ft toilet-bowl.

At the bottom were the Brr-Brrs, a series of moderately low airspace crawls. This led us to a part of the cave of special concern--a low crawl where the water tunnelled in--a potential siphon if the stream went up appreciably. On the other side was the 160. Hard-charging, we rapidly descended this and the following 20-ft drop, and were soon looking down the unexplored pit, a 30-footer. Still relatively oblivious to the pounding water, we rappelled into a spacious walking passage and headed downstream, carrying two ropes and all our gear. The walking passage quickly degenerated to a crawl over jagged chert, with occasional pools. On and on we crawled, expecting to exit the spring just beyond the next bend.

Oh, no! Our passage suddenly ended, the stream flowing under a low chert ledge. Jim pushed on, helmet off, in the 4-inch airspace broken by formation curtains. Faces pressed to the ceiling, we occasionally submerged to clear the formations as our combined breath echoed in the tiny airspace. I could hear sharp metallic sounds through my submerged ears as my rack banged over unseen obstacles. Finally, we emerged into a small room, reeling with vertigo. After waiting for things to settle down and wondering about the weather outside, we pushed on until, again, the passage ended and the stream flowed beneath a ledge. This time there was more air, but it was lower--a bellycrawl. I propped my head on my pack and rope so I could breathe without straining while Jim dug a very low, rocky passage. I groaned when he hollered back "Come on!" Baggy and I reluctantly followed to a hands-and-knees passage.

The end was near, however, and it was bitter. I waited in a small room while first Baggy, and then Jim pushed a horrible bedding-plane crawl with a minimum of air. It pinched down to about an inch of airspace, impossible given the tight dimensions. Our hopes of exiting a lower entrance were in vain. We headed out.

I arrived at the base of the last pit already exhausted from the endless crawl and our fast pace, racing to get through the low airspaces before any rise in the water level. Baggy and Jim were both dripping blood from cuts on their hands and Baggy was upset over losing his rack, several carabiners, and his seat in one of the water crawls.

Baggy, Jim and then I ascended. I had climbed in waterfalls before, but not like this. As I approached the lip, the water slammed me from wall to wall like a rag, despite my attempts to avoid it. Shaking with exhaustion, I finally cleared the lip and we were off. The next pit was relatively easy. Baggy was halfway up the 160 when Jim and I caught up. I asked Jim to climb next as I laid down to rest, the thundering of the waterfall echoing around us. When he would swing underneath the waterfall, it sounded like BBs hitting his helmet instead of water. My turn. The climb was surprisingly easy, considering my negligible reserves of strength. Swinging underneath the waterfall was a sobering experience. Its force was unbelievable--I was pinned in my climbing gear, unable to move, while nearly deafened by the sound of the impact on my helmet. Luckily, periods of exposure to the full force of the water were short if violent and were really more interesting and awe-inspiring than life-threatening. At the lip, though, my arms felt like lead as I

fought over the last few feet. Baggy and Jim coiled the rope while I packed my gear. I chose to carry the 200, opting for a single, if bulky, rope.

I floated through the Brr-Brrs to conserve energy, and waited for Baggy to climb the drop. It looked tough, especially at the lip, where one was exposed to the full force of the water in a narrow passage. I tied the 200 onto the rope and rigged in. It was relatively dry as the water was shooting in an arc off the lip and over me. Further up, it was even worse than I had feared, but there was no way to avoid the water. At the top, Jim and Baggy had the rope coiled almost the instant I got off. Jim headed off with three ropes, Baggy had two, and I reclaimed the 200. Misery loving company, Baggy and I stayed more or less together through the steadily lowering passage. Soon we were belly-crawling in the stream, pushing the ropes and gear before us. Gradually the length of our breaks increased and the distance traversed between them decreased. An eternity later, we arrived at the beginning of the Pig Wallows, and left the stream behind. This turned out to be something of a disadvantage, as pushing the rope through the goopy mud splashed it in my eyes. Being covered with mud and unable to turn my head in the low passage, this was most irritating. Ahead, the 200 was rapidly disintegrating into an unmanageable mess, increasingly larger as the coil failed and far heavier with caked mud. Progress slowed to inches as I strained at shoving the tangled mass through the sticky crawl, reassured only by the grunts ahead, punctuated by long silent periods of rest.

Finally, Baggy was through the digs. After numerous threats to abandon his rope, he reentered the crawl and dragged the rope forward through the tightest part, then staggered off. I slowly followed, tucking the rope under my arm like an oversized basketball.

The next three pits were almost anticlimactic, if still tiring. The worst was over--we had made it. Jim had changed his clothes at the entrance. I stuffed my top into Jill's borrowed pack, tossed in a couple of ropes, and stumbled down the mountain to the trucks. The others arrived soon thereafter, and I relaxed in the Blazer as Sue drove home.

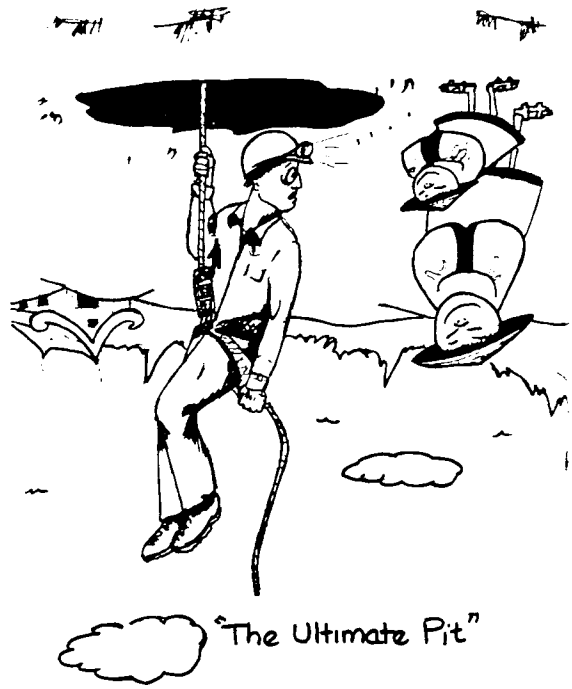
* *

Speleonews 24(4):63 Marion O. Smith

Solution Rift, Marion Co., TN, was "bottomed" in Dec. 1979, but due to high water it was not possible to come out the spring at the base of the mountain. In 1980 the work has continued in the cave resulting in a survey and a connection to the spring.

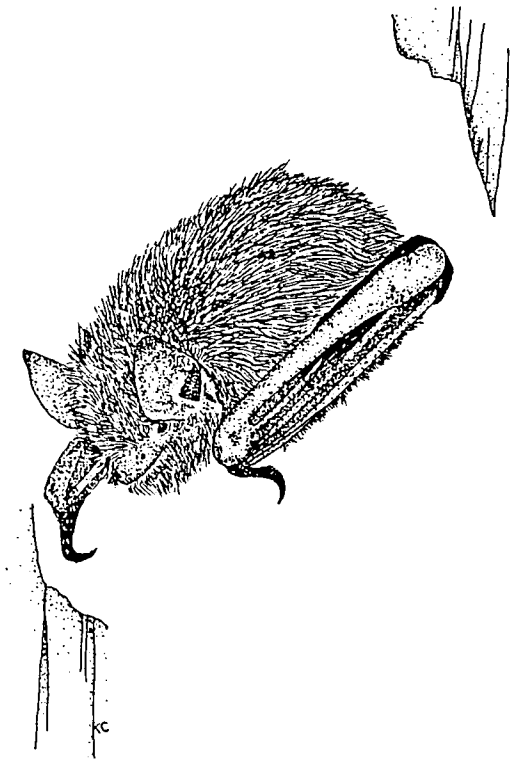
The map was undertaken by Dan and Stella Twilley. On May 24 they, Noel and Jennifer Benedict, and Marion Smith set 69 stations and got within a few hundred feet of the fourth drop (23 ft). On Aug. 23, they, Gerald Moni, and Jim Smith set 68 stations, descended all the other drops (Confederate Well is 167 ft deep) and tied in with Will Chamberlin, Jill Dorman, and Marion Smith who had set 74 stations from the spring entrance. (Depth and length figures are not available at this writing.)

Technically, the connection of the spring entrance to the rest of the cave was accomplished by Buddy Lane and Sandy Montgomery on July 20, when they, without knowing it for sure, overlapped by some 50 ft the furthest 1979 Solution Rift penetration. On Aug. 2, Gerald Moni, Will Chamberlin and Marion Smith made the first through trip out the spring entrance.



(11)

Carbide Dump # 21



Karen Chappel 8-1

Virginia

DIVING IN AQUA CAVE

BCC's Newsletter Volume 6-80

The water disappears into Bad News Siphon in Butler. It also disappears into the Third Siphon in Breathing and again in a siphon in Better Forgotten. None of these streams are known to connect until all the water reappears in Aqua. In a straight line it is 12,000 ft between Butler and Aqua Siphons, 12,500 ft between Breathing and Aqua, and 5,000 ft between Better Forgotten and Aqua. There's a lot of cave there somewhere. The term *siphon* is usually applied to water-filled passage which goes God-knows-where. When a diver gets pushed into a siphon and comes up to air on the other side, the siphon becomes a *sump*. It is the hope of turning the siphons of the Butler-Sinking Creek System into sumps that inspires the interest in diving. (Fueled by several beers and the belief that roaring trunk passage is just a few feet away.)

Some progress was made in Butler when Sheck Exley turned Last Hope Siphon into a sump, but Bad News has yet to yield. Breathing's siphon is really not a true siphon but just a tiny stream crawl. And the difficulty of getting equipment into Better Forgotten has placed it on the back burner.

The diving in Aqua can be divided into two stages. The early dives occurred around 1960 with dives in both sump and siphon beyond French Lake, and the active siphon in the B Passage. A second series of dives followed in 1980 and things were very different 20 years later. The current map of Aqua shows two sumps beyond French Lake separated by a small room. The passage runs NW for approximately 200 ft before it terminates in a siphon which was penetrated to a distance of 300 ft and a depth of 80 ft.

In May 1982, Karen Wark and David Whall made a dive beyond French Lake. They swam through the first sump and into the small room. There they found the air so foul that they continued to breathe from their tanks. Entering the second sump, they found it was no longer a sump. The clear sandy bottom and unlimited visibility of the 60's was replaced by stagnant water and heavy silt. Groping along in zero visibility, they penetrated to a distance of 75 ft and a depth of 25 ft. At that point they were working with tank on the ceiling and belly in the silt. This certainly did not seem the way to go.

Unaware of their interest in the System, I made a dive in the active siphon of the B Passage in July (supported by Toni Williams and Dave Morrow). I penetrated 70 ft following a sharp left turn as shown on the present map. There I met a restriction. After silting out the passage and attempting to squeeze past this point, I returned to the siphon room to wait for the silt to clear before having another look. Two of my lights failed as I swam back, so I cancelled the second attempt.

Later that month I linked up with Karen and Dave. That meeting resulted in the Bad News Siphon dive. The day after the tank recovery trip in September, we returned to Aqua. There was only 4 ft visibility in July, so I wanted someone else to have a look at the restriction to determine if it could be passed. Dave made the first dive and returned to report that by removing his tank he was able to get beyond the restriction. Sixty ft further he encountered a second and tighter restriction. Tying off the permanent line, he returned. Karen made a dive, surveyed the passage, and reported that she felt the second restriction could be bypassed to the right.

We returned after the annual meeting in October for another attempt to pass the second restriction. Dave and I went to the point Karen had indicated. To our surprise, visibility was back to the 60's standards: 30+ ft. Which in a passage the size of this one means unlimited. Beyond the second restriction we could see 30 ft down divable passage. We moved some rocks to open things up a bit and then exited when I reached the turnaround point of my air supply. Karen then made a dive and took additional notes for the map. That was the last dive of 1980.

So where does that leave us?

We plan to make another attempt at passing the second restriction, but only when we have excellent visibility. The working area is small and we want to be able to maintain visual contact between the divers - so as to insure a reasonable safety margin. We have switched to smaller tanks, 50 and 15 cubic ft, because they're easier to tote. And we can stay down at the passage depth, 6-10 ft, as long as we can tolerate the cold water.

When the results of Karen's survey were added to the existing map, something peculiar turned up. It appears that the second restriction is in the middle of French Lake. To correct this error and to add vertical control, we hope to undertake the re-mapping of Aqua sometime during 1981.

TAKE NOTHING

BUT PICTURES

LEAVE NOTHING

BUT FOOTPRINTS

Vermont

CHILLER CAVE

Windsor County, Vermont

Diablo Grotto News Letter 13(9):4-5 Jeff Abare

On August 23, 1980, Vermont's first 1,000+-ft talus cave became the state's second longest cave.

Robert Carroll, Jr., controversial leading talus caver, led a small expedition composed of Peter Quick (Boston Grotto) and Jeff Abare (Diablo Grotto) in an effort to connect several adjoining talus caves in Windsor Co., VT.

We met early Saturday morning and hiked to the summit, gaining about 1,000 ft elevation within the first mile. Leaving the trail, we pushed through dense Green Mtn. forest to the top of the parent cliff and made our way down a precarious 120-ft pitch to a sloped base littered with house-size boulders and magnificent pinnacles.

We entered the N.E. Entrance (then a separate cave) via two small vertical holes, climbing down 20 ft to a 30-ft hallway. While Bob checked leads to the north, Peter and I dug through to a 10-ft drop. I returned to the surface, brought in and rigged a rope; Bob squeezed through, did a body rappel and was followed by Peter. Checking leads heading SW, they reached the Ice Crawl, which Bob recognized as part of Chiller Cave. While Bob returned to the Rope Drop and dug a bypass, Peter left through the Eyrie Exit and I returned to the N.E. Entrance. Peter and I completed the circle on the surface and returned via the Eyrie Exit.

After exchanging congratulations, we checked leads near the Ice Crawl, including some upward to the N.W. 3-D Mazes. While Bob and Peter went in separate directions, I returned once again to the surface to coordinate our efforts by maintaining voice contact. Our tally surpassed 1,000 ft, with Peter and Bob mopping up leads to the east and SE of the N.E. Entrance. Under a series of large boulders, various rooms, alcoves, pits and large entrances (some 20 ft high) were found. The easy stuff was completed; however, digging and technical vertical work will undoubtedly add more.

Surface characteristics indicate promise of producing perhaps a mile by connecting several contiguous talus caves. Currently, Chiller Cave is contained in an area approximately 100 x 250 ft with 80 ft of relief in a remarkable talus area many times this size.

DEER LEAP CAVE

Rutland County, Vermont

The Northeastern Caver 11(1):14-15 Robert W. Carroll, Jr.

My first visit to the Deer Leap talus area--and last one until this spring--had been over 12 years ago. The fragments were large, the rooms were impressive, but I had less interest in talus then, and the "porkie" in one of the lesser leads further dampened my enthusiasm. Years passed, hiker traffic increased, the porcupines moved out, litter increased and advances in nonsolution caving and verification of a 620-ft talus cave at Smuggler's Notch eventually drew my interest back to Deer Leap. Despite the abundance of broken glass in places, the abusers of this fine area had miraculously spared a rare and beautiful "coral" formation. My second surprise came when I took a notebook inventory of passages and examined lesser leads more carefully.

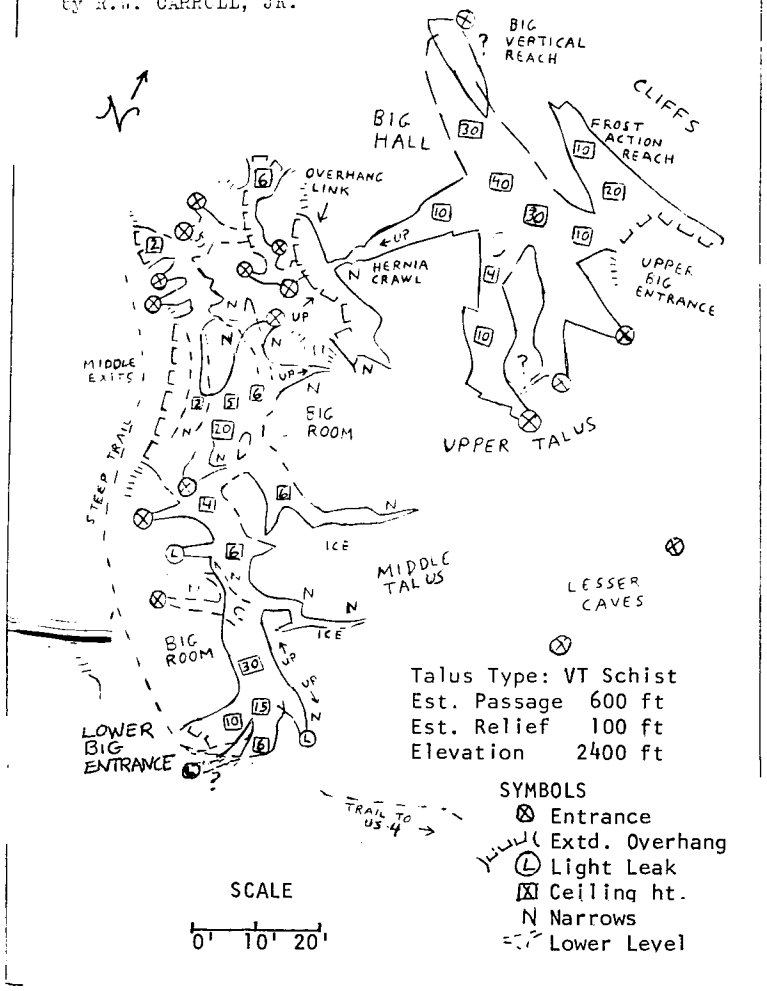
Ascending the lower talus slopes, I first poked into a couple of minor caves before relocating the lower main cave. Inside the big entrance was a tricky drop into a 30-ft-high room from which various leads went in several directions. The lower ones pinched out quickly or had fill or ice blockages, but the upper back one continued on through small rooms to a second large entrance and room. After photographing the "coral", I poked into more leads--the upper ones too tricky to climb, a lower one pinching out, but the uphill set finally yielding a link with a shallow but intricate talus maze. Near the upper cliffs, the system initially seemed to end with some 400 ft of passage and probably 80 ft of relief.

Then I noticed that some of the fragments were beneath a wide overhanging ledge with a narrow opening that had strong air currents. Rechecking this talus cluster, I found an overhang-overlap link with the ledge opening. A slothes-ripping aqueeze into the opening (the Hernia Crawl) quickly led to a high passage and overlook to a very impressive room that actually had an echo--a rarity for talus caves. Finding a way down, I examined its various leads and gaping entrance and soon recognized it as the second largest cave there that I had seen in 1966. Vertical reaches beyond my climbing ability raised its relief to over 100 ft, and my itemized estimate exceeded 600 ft of passage. This upper segment of the cave was more like a tectonic system as it was in contact with the main cliff. Especially curious was a 25-ft lead off the big entrance that resembled a frost-action cleft. I shortly thereafter left the cave and headed back to the car with a much greater respect for the potential of schist than I had had up to then. This is more than can be said for those whom I heard smashing bottles on the rocks above as I headed down the trail.

Those visiting this impressive cave should use extreme caution on climbs and traverses because of the slippery schist surfaces. Narrows, ice, loose rocks, and broken glass in bad places require further caution. Some climbs probably require expert vertical techniques. Those with cameras should get photos of the "coral" mentioned above and any other anomalies they see; at today's rate of abuse, these rarities are existing on borrowed time.

DEER LEAP CAVE - RUTLAND COUNTY, VERMONT

GRADE 1-2 MAP, 5/20/79
by R.W. CARROLL, JR.

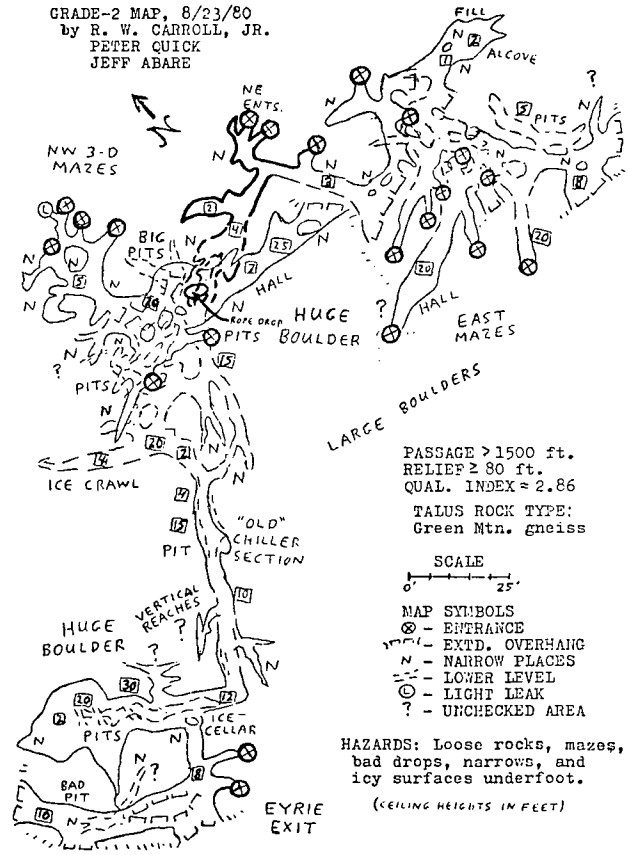


Talus Type: VT Schist
Est. Passage 600 ft
Est. Relief 100 ft
Elevation 2400 ft

SYMBOLS
- Entrance
- Extd. Overhang
- Light Leak
- Ceiling ht.
- N Narrows
- Lower Level

CHILLER CAVE
Windsor Co., Vermont

GRADE-2 MAP, 8/23/80
by R. W. CARROLL, JR.
PETER QUICK
JEFF ABARE



PASSAGE > 1500 ft.
RELIEF ≥ 80 ft.
QUAL. INDEX ≈ 2.86

TALUS ROCK TYPE:
Green Mtn. gneiss

SCALE
0' 25'

MAP SYMBOLS
- ⊗ - ENTRANCE
- EXTD. OVERHANG
- N - NARROW PLACES
- LOWER LEVEL
- Ⓛ - LIGHT LEAK
- ? - UNCHECKED AREA

HAZARDS: Loose rocks, mazes, bad drops, narrows, and icy surfaces underfoot.

(CEILING HEIGHTS IN FEET)

Washington

NEW CAVES ON DOCK BUTTE

Whatcom County, Washington

Kevin Allred

A number of us were excited by Bob Brown's description of a karst area he had visited the week before, so on Sept. 22 Rod Crawford, Paul Nystrom, Bob, Wally Bosshart, Carlene Allred, baby Lehi and I went to check the three entrances he found.

A walk-in entrance yielded some 50 ft of passage (barely a cave) which Rod and Paul explored. Carlene chimneyed down a pit in the other direction which Bob later named "Pika Droppings in the Snow Twin Pits Cave." *(The CC editor shortened the name.)* The pit really did contain pika droppings and snow and does have a twin pit. Bob made it sound like the droppings were actually in the snow to mislead people.

The best prospect was saved for last and is an impressive fluted pit some 30 ft deep. The sound of a running stream rose from below. Wally descended and discovered a walk-through, narrow stream passage. It soon ended upstream but he followed it perhaps 70 ft downstream to deep water and a lower ceiling where he turned back.

Wally, Rod and Carlene went down to a large resurgence nearby and started to dig it out. Suddenly a rush of water burst out. Wally and Rod reported a pronounced sucking noise when an air space had developed where there once was a sump just inside. After we had lowered the water level some 6 inches more, Wally and I entered the pit containing the stream, while Rod and Paul waited at the resurgence in case we could make voice contact.

Where Wally had stopped in deep water, I left the others to map out while I tried to continue without getting wet. Wishful thinking; after 60 or 70 ft I was almost completely drenched at the base of a 7-ft waterfall. I was further tortured by the near-freezing water while crawling through pools with little head space. After getting within 10 ft of Rod and making contact, I abandoned the idea of plugging the resurgence by trying to squeeze through a 12-inch-high space half filled with flowing water; what more horrible way to die?

I quickly retreated the way I had come. Some extremities were numb with cold by the time I clawed out of that miserable cave. Bob has since named it Resurgence Cave.

Rod and Carlene surveyed the surface from the entrance to the resurgence.

HUNTERS CAVE

Cowlitz County, Washington

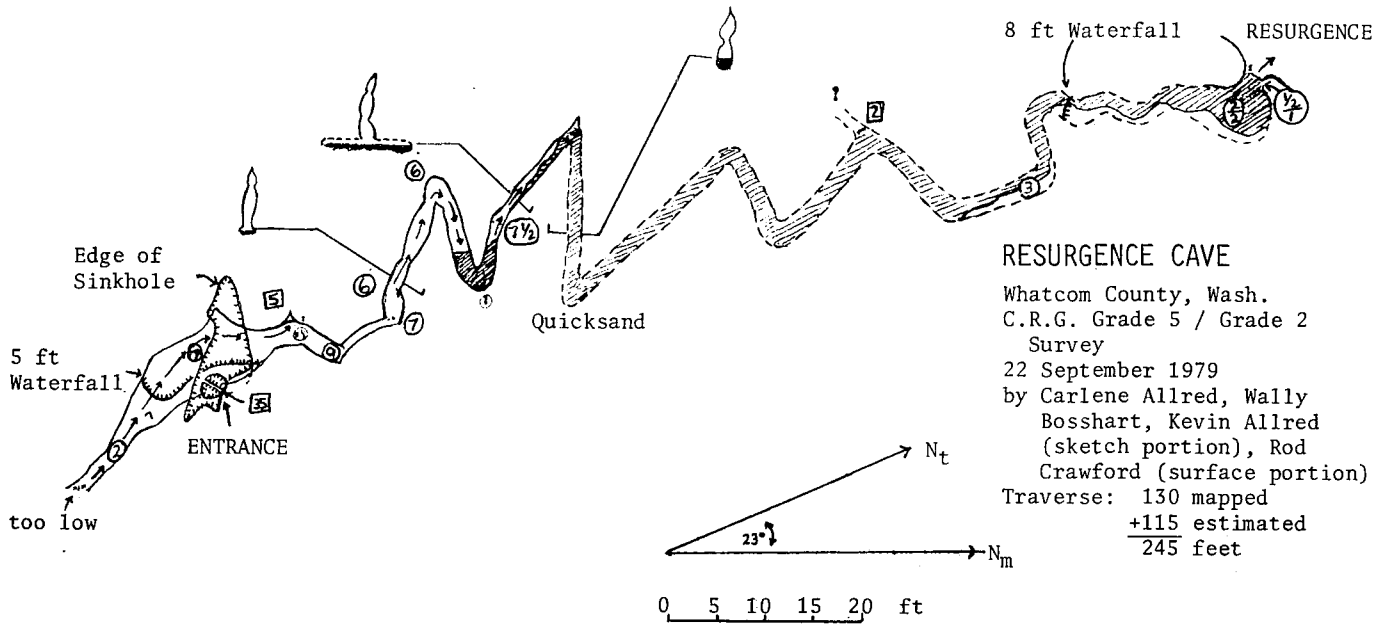
The Speleograph 16(6):58-60 Mark Perkins

Nothing beats a sunny morning to begin a caving trip, and that is just what we got on the May Sunday Rick Pope and I journeyed to the area above Christmas Canyon to look at some caves...

We stopped once or twice at Christmas Canyon Cave, an erosional cave, to get more compass bear-ngs ings... From Christmas Canyon Cave's second entrance we compassed up to a small cave that I covered in about 60 seconds. The Larsons named this one Dogwood Cave for the dogwood tree in the collapse entrance. Two things are wrong with this cave. You step into a 6-ft-high passage that looks like it should just boom along, but it ends after less than 50 ft. The second is, I saw no dogwoods at the entrance or anywhere nearby--only maples...

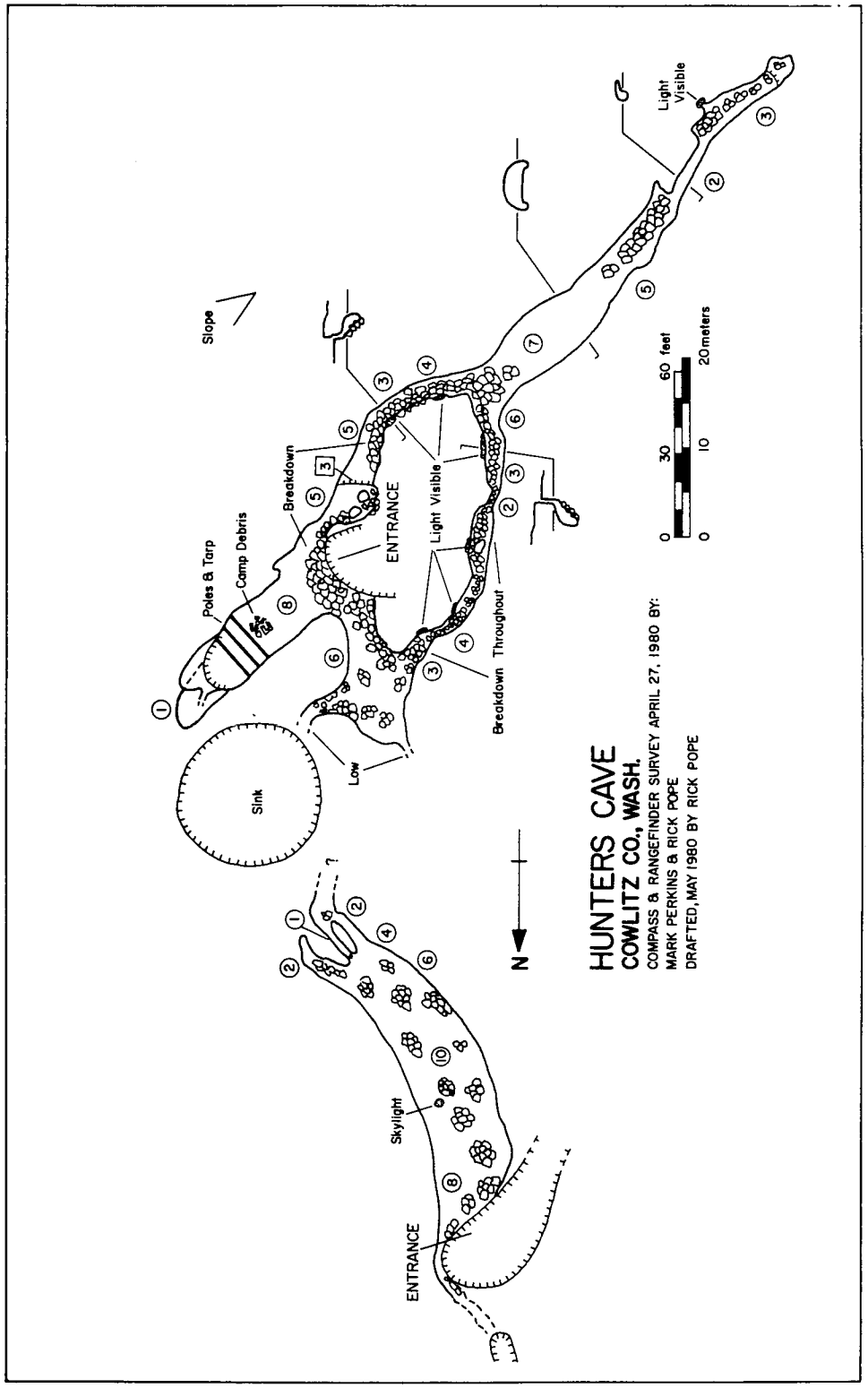
From there we walked around the corner of the cliff face (I use that term loosely, but that is just about what you do), looking for another cave described as having a camp in it, but not being much cave-wise. We found it in about 10 minutes, and boy, was there a camp in it! Someone had strung poles across the main room of the cave and hung plastic to protect the area underneath from drips, made an honest-to-goodness fire ring, and placed three large flat pieces of breakdown to form a table with two other rocks serving as chairs. Out came the compass and map gear. I got to be the dumb end (better known as the sit-and-freeze job) and we began mapping. The passage behind the camping area went nowhere, but we mapped completely through the breakdown around the sink, plus another large passage and crawlway on the opposite side, for almost 550 ft! Turned out to be a nice sized cave and not your usual run-of-the-mill lava tunnel.

We then began walking north and found another opening that began as big as Lake Cave. Talk about promise! It soon pinched down to two crawls. We mapped the "harder" one to where the two joined, and then came back out due to the beginning of fatigue. Doing some overground checking, we noted that the crawlway probably continued only another 30 ft or so and most likely terminated at a collapse near the earlier cave with the camp. I am sorry about lack of names but we have not het learned if the caves have been named. (Ed. Note from Charlie Larson: These two caves were visited by your editors in the mid-1960s, named and then the names as well as the notes of the visit were filed in some sort of irretrievable fashion, so whatever name is given the caves caves is gladly conceded.)



RESURGENCE CAVE

Whatcom County, Wash.
C.R.G. Grade 5 / Grade 2 Survey
22 September 1979
by Carlene Allred, Wally Bosshart, Kevin Allred (sketch portion), Rod Crawford (surface portion)
Traverse: 130 mapped
+115 estimated
245 feet


HUNTERS CAVE
COWLITZ CO., WASH.
COMPASS & RANGEFINDER SURVEY APRIL 27, 1980 BY:
MARK PERKINS & RICK POPE
DRAFTED, MAY 1980 BY RICK POPE
N
0 30 60 feet
0 10 20 meters
Slope
Poles & Tarp
Camp Debris
Breakdown
ENTRANCE
Light Visible
Breakdown Throughout
Low
Sink
Light Visible
Skylight
ENTRANCE

PICKING'S CAVE

Skamania County, Washington

The Speleograph 16(3):35-38 Bob Davis

As a new member of Oregon Grotto, I take pleasure in introducing Picking's Cave to northwest cavers. The cave is lengthy and complex, an important addition to the ever-growing list of lava tubes that are located in the Trout Lake area.

Picking's Cave was discovered on June 30, 1975, by the late Stuart Picking. Stuart, a 1975 graduate of Hood River Valley High School and a former student at the Massachusetts Institute of Technology, was killed in a tragic mountaineering accident on Mt. Hood in August, 1978. Stuart and two of his friends were looking for Dry Creek Cave when they found the upper entrance of Picking's Cave. After squeezing through the entrance, they still thought they were in Dry Creek Cave. After a few hours, though, they realized they were exploring a cave that in no way resembled the map of Dry Creek. Not until a couple of years later did they know for sure that Picking's Cave was indeed an unlisted cave.

Excited by their discovery, they (and other Hood River cavers) made numerous trips to the cave over the next few years. Until last summer, exploration had been confined primarily to the area around The Maze. When Dick Cheney, a member of the original exploring party, and I decided to survey the cave, we had no idea we would encounter so many new passages, as well as a second entrance. Indeed, the cave is still not fully explored. We have surveyed and mapped 4,400 ft; another 300 ft have been explored but not surveyed. At present, three unexplored leads look promising for future caving excursions.

The upper entrance of Picking's Cave is very inconspicuous, appearing at first to be nothing more than a jumble of mossy rocks. If not for a small lava bridge located just west of the entrance, the cave would probably never have been found. The actual entrance is a shoulder-width hole in dirt at the lower end of the small entrance chamber. (This chamber is in the twilight zone.) Upon observing this uninviting portal, I have many times allowed others in my party to "take the plunge" first. The breakdown-choked lower entrance is not much easier to penetrate; however, the insects are not as irritating as at the upper entrance.

Crawling is the major mode of locomotion in Picking's Cave. And, as always, the lava carpet is not kind to the bony appendages of any caver. Most of the cave's crawlways have 12-14 -inch ceilings. The Meat Grinder crawlway, Razor Squeeze, and Owen's Crawl (named after the late Dan Owen, another member of the original discovery party and victim of the same Mt. Hood accident that claimed Stuart) are especially strenuous spots. Walking passages are found in the cave; these passages are predominantly free of breakdown. Most of the crawlways contain much loose rock; many have dangerously loose ceilings. Picking's Cave is definitely a feast for hard-core crawlers.

Picking's Cave contains features common to many lava tubes. Lava speleothems are abundant in certain spots. In most cases, these formations are groups of stalagmites. Lava tube slime is present in abundance in a number of places, sometimes reaching a thickness of 1 cm. Mice, harvestmen (in dry regions) and a plethora of flying insects constitute the major biota of the cave. Rodent skeletons have been found deep within the cave. Two areas are filled to the ceiling with loose silt, giving rise to the very plausible idea that more entrances may exist.

Wisconsin

BOSCOBEL BEAR CAVE

Crawford County, Wisconsin

The Wisconsin Speleologist 17(1):11-12 Lou Goodman

On Jan. 5, 1980, a visit was made to Boscobel Bear Cave. The following are some of the observations and ideas resulting from the observations made on that visit.

Scope of Examination. The cave was examined from the entrance to the main room to about a (plan distance) of 80 m. The rear crawlway matrix was not entered and only limited examination of other side passages was undertaken. Length of visit was approximately four hours.

The Cave. The entrance is located near the top of a ridge in a modest doline in which the northern face is weathered, vertical outcropping, the other sides sloping downwards in a typical ponor structure. There is, however, no indication now of any runoff or feeder trench for such a ponor, all previous traces if any having long since been weathered away. The slope of the southern side of the doline appears to be continued in the cave all the way to the main room where breakdown is present. In the entrance, as could well be expected, were several Eiskeulen (ice "stalagmites"). Only one icicle was noted and it was in a protected location, out of range of the warmer cave air.

In the entrance room was an old (abandoned) bird's nest. It was the only biological presence other than bats that was noted in the cave in spite of the fact that the twilight zone penetrates the main room, most likely to its end with favorable sun position. It is possible that the lack of biological evidence was due to people since trash (rusted cans) was noted in some of the cracks between boulders in the main passage examined. In one corner niche of the main room some bones were noted but their source is openly questionable.

Entry to the main room from the entry hall can be gained by either continuing the slope in from the entrance or by taking several possible side routes that will lead to more vertical drops. The vertical drops lie in between some settled breakdown blocks, though all development was not tectonic since beneath some of these blocks on faces that face away from the entrance, some vertical rills forming a shallow karren were noted, most likely the result of solution after settling in relatively recent times.

The development of the main room is at a series of cross joints that run approximately 245° and 350° azimuth. The floor consists of large breakdown blocks and a very viscous mud. Both the northern and southern ends of the room slope down towards the center of the room which forms the lowest point. The side pas-

rocks. If not for a small lava bridge that is located just west of the entrance, the cave would probably never have been found. The actual "entrance" is a shoulder-width hole in dirt at the lower end of the small entrance chamber (this chamber is in the twilight zone). Upon observing this uninviting portal, I have many times allowed others in my party to "take the plunge" first. The breakdown-choked lower entrance is not much easier to penetrate; however, the insects are not as irritating as at the upper entrance.

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TEST YOUR KNOWLEDGE OF: "INTERESTING CAVES and CAVERNS OF THE WORLD"

CAN YOU MATCH THESE CAVES WITH THEIR DESCRIP - TIONS? Information from Information Please, Almanac, 1979.

__A. AGGTELEK

__B. ALTAMIRA CAVE

__C. ANTIPAROS

__D. BLUE GROTTO

__E. CARLSBAD CAVERNS

__F. FINGAL'S CAVE

__G. ICE CAVE

__H. JENOLAN CAVES

__I. KENT'S CAVERN

__J. LURAY CAVERN

__K. MAMMOTH CAVE

__L. PEAK CAVERN OR DEVIL'S HOLE

__M. POSTOJNA (POSTUMIA) GROTTO

__N. SINGING CAVE

__O. WIND CAVE

__P. WYANDOTTE CAVE

****

Scoring Yourself

16 right Congratulations! You should join Dr. Halliday on his next expedition to the world's best caves.

12 - 15 You are well-read about famous caves of the world

8 - 11 Pretty good. You might review some of the books in the Grotto Library.

4 - 7 Fair. You could use a little research.

3 and under - See you next meeting!

****

1. In Virginia. Has large stalactitic and Stalagmitic columns of many colors.
2. In Black Hills of South Dakota. Limestone caverns with stalactites and stalagmites almost entirely missing. Variety of crystal formations called "boxwork."
3. On island of same name in the Grecian archipelago. Some stalactites are 20 feet long. Brilliant colc and fantastic shapes.
4. Near Dobsina, Czechoslovakia. Noted for its beaut ful crystal effects.
5. Derbyshire, England. About 2,250 feet into a mount Lowest part is about 600 feet below the surface
6. In Crawford County, southern Indiana. A limestone cavern with 5 levels of passage; one of the larg est in North America. "Monumental Mountain, approximately 135 feet high, is believed to be of the world's largest underground "Mountains.
7. S.E. New Mexico. Largest underground labyrinth y discovered. 3 levels: 754,900 and 1,320 feet below the surface.
8. In village of same name, northern Hungary. Large stalactitic cavern about 5 miles long.
9. A lava cave in Iceland; name derived from echoes of people singing in it.
10. Near Santander, Spain. Contains animal paintings (old Stone Age art) on roof and walls.
11. Near Torquay, England. Source of much informatic on Paleolithic man.

sages noted lie at the top of the northern slope and at the SE corner of the southern slope, both of them above the low point in the room. The ceiling shows the fine development of the cross joints with joint expansion but there is one curious feature to be seen in the wall of the room. At a level that is below the level of the entrance to the room there are what appear to be karren of some depth. The problem, however, lies with the fact that they are noted only on the western wall and on the southern side of the large settled block and are of a vertical length of from 25-35 cm. They do not appear to be deep enough to have been anastomoses but may well form a zone of weakness or higher solubility (?). Two of the five bats that were observed (four by myself) were seen deep in the rillen.

At the northern end of the room are some structures that strongly resemble planes of repose. Measures of the angles of slope averaged out to around 40° or 41°, fitting the general range of slopes seen elsewhere (*ca.* 35° to 50°). Also noted was a possible solution horizon indicating standing water. The horizon was roughly reflected in the walls in the immediate area but no examinations were made to see if they could possibly be related to the karren in the southern half of the room. There were no accurate plans of sufficient size of the cave nor any extant cross sections to aid in such a correlation available at the time of the visit. On the eastern wall was a bedding plane that may be related to the horizon; however, a rough measurement of the angle indicated that from the location of the horizon, the bedding plane was at an angle of 4° (higher) and that there was a possible correlating speleogen at the same level as the horizon in the form of a reverse slope (no horizon).

At the base of the main room was a very short passage that perhaps held the last of the speleogens noted. There were some structures in the ceiling that are scallop-like in their nature, but of a rather large size. In the northern wall and in other parts of the cave are numerous evidences of stromatolite fossils, fossil algal colonies that very often take on an arched dome-like structure. In this short side passage there is a pendant-like structure that appears to be like an anastomosis separating two of these scallop-like structures that may just well be the underside of two stromatolite domes. If they are scallops, then there was considerable flow, a flow that is not borne out in evidence at a higher level in the cave where all traces point to slow water percolation. Also, the pendant structure could only exist if there was a subsequent breakdown that removed the floors of the original tubes.

Possible Speleogenesis. The original expansion of the cave was on a cross joint pattern, probably under phreatic conditions. With the downcutting of the external valley, the cave drained. It is possible that the drainage halted at a level of the wall karren (mentioned as being positioned on the two walls) and that these karren were caused by later vadose action. Drainage and loss of stability were then probably the cause of the breakdown visible in the large room.

At a later date (possibly glacial) the cave was subjected to periodic inundations with a possible longer period standing at the level of the horizons noted. At this time level control may have been due to some spring (water table) level of drainage for the valley structure then in existence. The water at that time carried sediment (glacial) causing the development of planes of repose and some weak horizons (other traces possibly erased by later weathering).

At this time or later the main entrance opened up and was probably a functioning ponor. Active rillen can be seen at part of a wall that could have been an entrance drain if other paths (currently more accessible) were mud filled/blocked. Later valley downcutting removed the traces of any surface drainage forms, leaving only the current doline entrance.

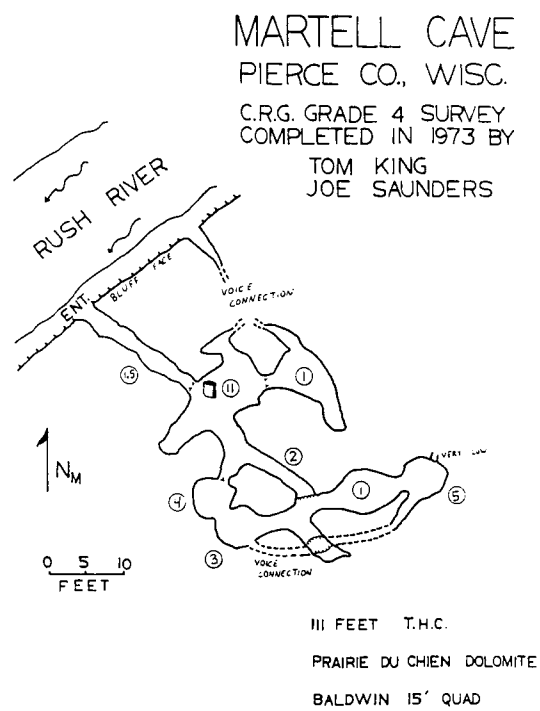
Due to sediment fill, the cave could have been plugged up and then undergone some further minimal solution (weathering) until later drained to current status. The drain (and possible further passage) might be found in the short side passage at the base of the large room on the east side. The current status of the walls shows weathering possibly due to current atmosphere/moisture available over a long time. There were no traces seen of any speleothemic activity.

MARTELL CAVE

Pierce County, Wisconsin

The Wisconsin Speleologist 17(1):14 Joe Saunders

Martell Cave is located on the southern end of the town of Martell on the eastern bank of the Rush River. A 20-ft crawlway opens into a standup room with several crawlways leadong off of it. The cave is rather phreatic in internal appearance and most likely once served as a spring outlet when the river was somewhat higher. Local topographic setting has broad uplands covered by glacial till, with scattered sinds; major surface drainage has cut sharp valleys into the uplands, with numerous springs along the rivers where those have incised into the dolomite.



PARADISE PIT CAVE

Door County, Wisconsin

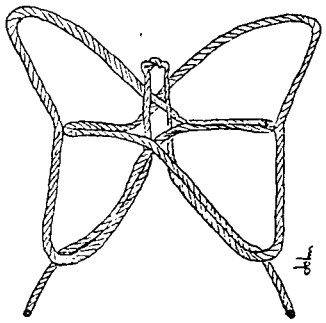
The Windy City Speleonews 20(1):5 Gary K. Soule

The results of the final mapping trip by Jim Whitehurst, Kevin Hennings and me are now official. With over 600 ft mapped in this latest discovery, Paradise Pit Cave is now 1,781 ft long, passing up the 1,740 ft mapped in nearby Horseshoe Bay Cave for the longest mapped cave in the state. But, since Horseshoe Bay Cave has an estimated 300 ft more of unmapped cave recently discovered, Paradise is only the second longest cave in Wisconsin. A recent digging trip into the south end of Paradise involved moving lots of rock, and while the passage still goes, it will not be easy to continue.

Don Spude, a former Door Co. caver, sent me some personal comments on the caving activites here. Here is part of his letter:

"A decade ago I would have considered it unlikely that a southern Door Co. cave located anywhere except perhaps on the Brussels Hill would ever surpass Horseshoe Bay to become the longest mapped cave in the state of Wisconsin. That reality exists today due in large part to the efforts of a few determined individuals who saw a challenge and rose to meet it. You can be justifiably proud of the accomplishments that ultimately served to unveil one of Door Co.'s greatest speleological resources. Paradise Pit Cave now approaches the theoretical limits set for long Wisconsin caves. Still, who's to say that this barrier cannot be broken? After all, it wasn't too long ago that it was thought impossible for extensive caves like Paradise to develop outside the Driftless Area, and particularly within the Niagara Formation.

"Speleology, the fledgling science that it is, still constitutes a highly theoretical area of study. Established rules governing cavern genesis are perhaps inadequate, and there is evidence to indicate that cave systems are actually the result of a more complex series of events than originally believed. Whatever the case, the future is sure to hold a great deal of excitement in store for speleologists and cavers alike."



DIABLO GROTTO NEWSLETTER 13(8):13

John DeBoer

West Virginia

IZAAK WALTON CAVE

Randolph County, West Virginia

Baltimore Grotto News 17(110):114-117 Bob Gulden

Last year Doug Medville and Bob Thrun flew with Gordon Mothes along Cheat Mt. in Randolph Co. They were taking aerial photos, looking for new cave leads. A few likely spots were found and photo-raphe graphed. In April 1978 Doug, Hazel and Susan Med-ill ville, Bob Thrun, Chuck Hempel, Carol Vesely, and I drove up to Randolph Co. from Gordon's place. We were here to look at some of the leads found by Doug, Bob, and Gordon. After a hike through the woods on Cheat Mt., we found a cave with a stream flowing out of it, forming a 15-ft waterfall into a sink. The upper cave was explored for about 100 tight ft by Thrun and Vesely. All of us then drove over to the Izaak Walton land, where another lead had been seen from the air. A talk with the caretaker of the property verified that there was a cave up the valley with a stream coming out of it. It was getting near dark so we decided to save this for another day.

That another day came in May 1978 when Tim Walker, Norm Alt, and I returned for a look. We talked with the caretaker and got permission and directions on how to get up to the cave. The caretaker's son went and got a map of the property (808 acres). ON that map was an X with an arrow pointing to it with the word "CAVE". With these directions we had no trouble in driving and walking to the entrance. Basically all one has to do is follow the stream to the resurgence.

The entrance was found, 60 ft away from and 25 ft higher than the resurgence. The entrance, sitting in a headwall, is 30 ft wide and up to 60 ft high. This was named the Bud's Entrance, after the old collapsed Bud house near the cave. The entrance opens into a room 50 ft long, 35 ft wide and 1-7 ft high, being higher on the west side. The west third of the room has a floor of breakdown while the other 2/3 is of mud. A crawlway going NE foes only 20 ft to a mud fill. Two holes along the west wall open up into the Rat's Nest Passage, named for a number of rats' nests in the passage. Both entrances to this passage are crawls over small breakdown to the SW. The Rat's Nest Passage is up to 3 ft high and at the end it slopes up into a mud fill. Also near the end of the passage, a lead goes to the NW that was not entered but appears to be too small.

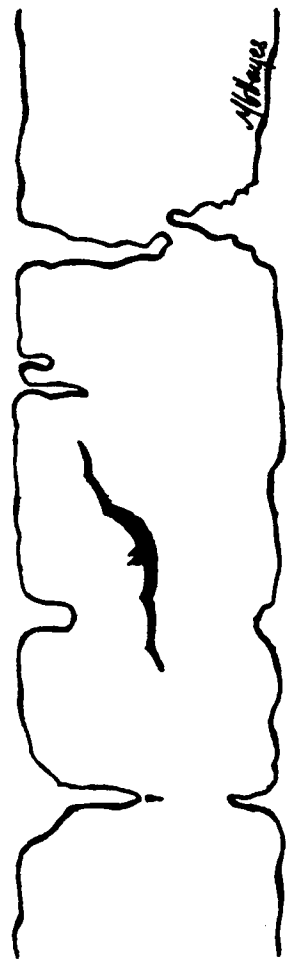
To the NE the Rat's Nest Passage opens up to walking height, 30 ft wide and up to 15 ft high, with a floor of large breakdown block. A lead on the NW was too small to enter. The Rat's Nest Passage leads into the Baltimore Room (passage) 90 ft long, 20 ft wide and 3-15 ft high. A continuation of the Rat's Nest Passage proceeds to the NW, and was not followed on this trip.

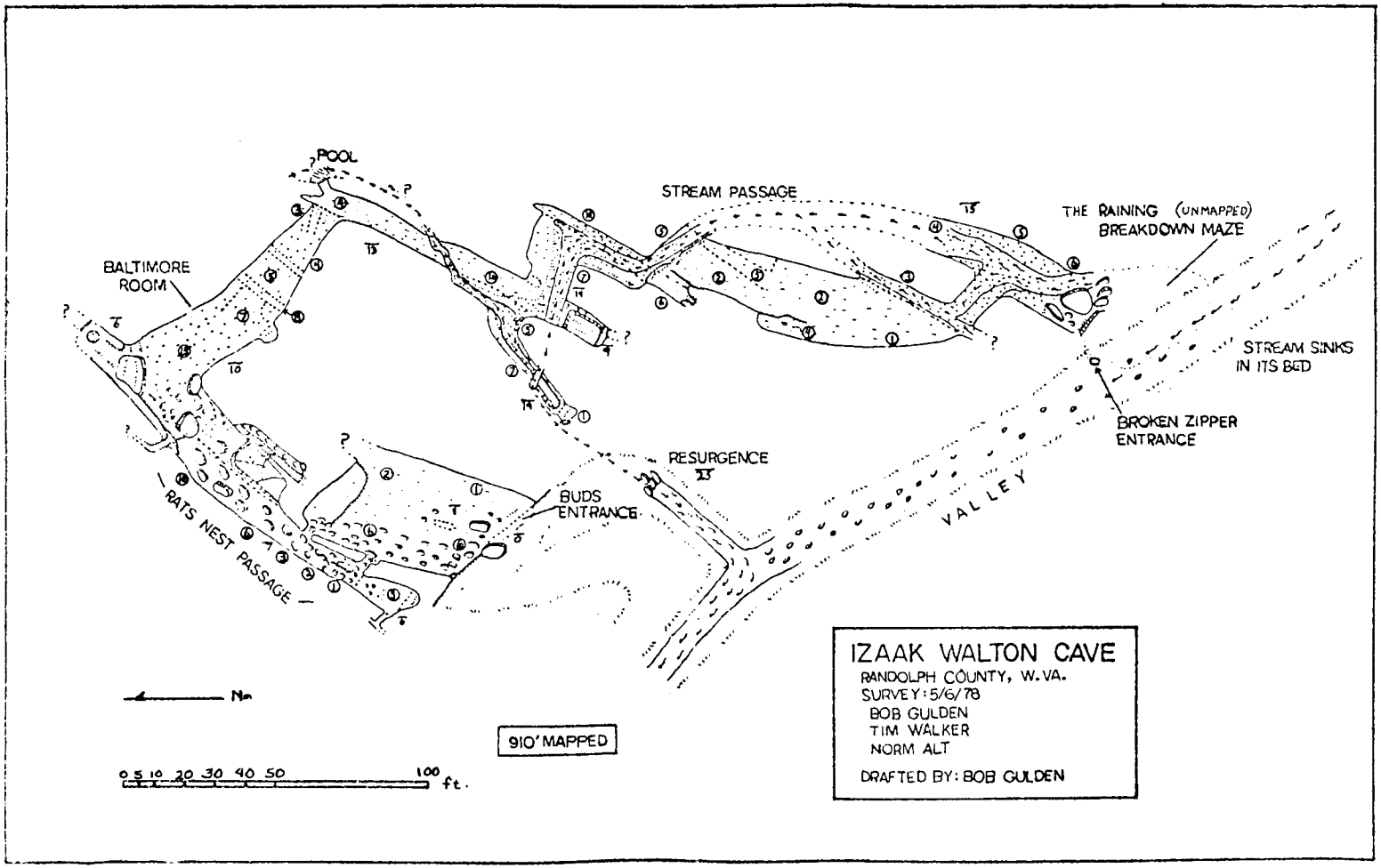
The Baltimore Room (passage) is a gravel-floored passage heading SE. The ceiling slowly slopes down to 3 ft high, where it intersects another passage. A belly crawl through a pool of water kept us out of this lead. The Baltimore Passage turns to the SW and is 4 ft high and 7 ft wide. Some 40 ft farther, a stream flows across the passage. The stream enters by way of a small crack too small to enter. The Baltimore Passage continues to the SW and connects with the main stream passage in the cave; the ceiling height here is 10 ft. The stream passage is 230 ft long, 15 ft wide and 1-4 ft high. The Baltimore Passage continues to the SW over a breakdown slab to an unentered crawl. The stream disappears into the wall at the end of the stream passage. To the west is a passage that continues until it meets the small stream that crossed the Baltimore Passage. The passage then swings to the SW to where the main stream reappears in a churning hole, a neat sight. Downstream was not followed, but from where the stream was last seen it's only 40 ft to the resurgence. Maybe during drier times an entrance can be made from the resurgence.

Upstream 70 ft in the main stream passage, a passage 15 ft wide, 2 ft high heads south for 60 ft to where it again intersects the main stream passage. An overflow passage is also along the east wall of this passage. We ended our survey in a breakdown room with the stream coming in on the SE side.

I climbed up through the breakdown into the upper breakdown room. This is a very wet area as water drips everywhere. I left the near-raining breakdown maze. As I poked my head up into this area I saw some leaves - ah-ha! another entrance somewhere. Tim and Norm soon joined me in the search for the other entrance. After much climbing around we found nothing, so I climbed back over to where the leaves were to have another look in that area. A 1st high crawl over the top of a breakdown block had leaves in it. Tim came over and climbed into the crawl. He found himself in a small room with a crack going up and more leaves, spiders, spider webs and at the top of the crack a hole to the outside. Tim was able to climb up and look out and see trees. We spent the next hour digging an entrance from the inside out. Tim was the first one to squeeze out. But in doing so he broke his zipper, hence the entrance name "Broken Zipper". Once out, Time found a good digging stick and proceeded to enlarge the entrance to accommodate my body... It's about 200 ft between entrances. We mapped 910 ft this trip, with a total depth below the Bud's entrance of 20 ft, this being where the stream disappears.

Four weeks later I was back with Doug Dotson and Scott Lippy to do some more surveying. We went to the NE end of the Rat's Nest Passage and completed the passage. A climb up a breakdown slab puts you near the ceiling; a crawl continues for 50 ft interrupted in three places with very small dome pits on the SE side. The passage becomes too small. We then went to where the crawl met with the pool. Doug Dotson was the first to enter this lead, now named "Follow Dotson Then Decide." This passage was mapped and followed for over 600 ft, a hands-and-knees crawl the whole way in a stream. The stream sumps upstream but a crawl continues as a mud bank and leads into an upper level. Going right leads to 30 ft of crawl to where the passage was blocked by rimstone dams. To the left was followed for 50 ft to a tight 90° turn. Only about half of the stream passage was mapped and the upper level. So a hanging survey we have got. This stream passage has a good deal of cave life. As this passage is all crawl through a stream, *people should stay out due to the cave life.* In all there is about 1/2 mi of passage in Izaak Walton. It's still not completely mapped, but there's no rush. It's an enjoyable little cave as long as one keeps out of the stream crawl.




POOL
BALTIMORE ROOM
STREAM PASSAGE
THE RAINING (UNMAPPED) BREAKDOWN MAZE
STREAM SINKS IN ITS BED
BROKEN ZIPPER ENTRANCE
RESURGENCE
BUDS ENTRANCE
RATS NEST PASSAGE
VALLEY
N
0 5 10 20 30 40 50 100 ft.
910' MAPPED
IZAAK WALTON CAVE
RANDOLPH COUNTY, W.VA.
SURVEY: 5/6/78
BOB GULDEN
TIM WALKER
NORM ALT
DRAFTED BY: BOB GULDEN

Australia

TOP OF AUSTRALIA
The Ningbing Limestone Block

The Wisconsin Speleologist 17(1):4-10 Jim Countney

Location: North of the Tropic of Capricorn, east of the Kimberly Ranges, the NE corner of the state of Western Australia. Named for the Ningbing Station, an abandoned ranch. Station headquarters were midway along the eastern flank. Nearest town is Kununurra, 50 mi south on dirt track.

Date: August, 1974. Late winter, near the end of the 11-month dry season.

Available water: Siggins Spring usually reliable. Ningbing wind pump out of service; rainwater in tank wants distilling. Billabongs and lesser springs unreliable.

Geologic Setting: Surrounded by red sandstone hogbacks and cuestas, black alluvial soil.

Ningbing Ls.: Triangular fault block, eight mi wide at the south, tapers to a narrow outlier cut off by a gorge about 15 mi north. Uniform, dark grey, hard, thick-bedded limestone, heavily faulted N-S, rises a few ft to several hundred ft above surrounding plain. Higher areas sculpted into razor-sharp rillenkarren, barren fractured pavements at intermediate levels, thin soil and parched grass covering low flat areas.

Known Features: Caves containing Aboriginal pictographs were reported to be near a gate at the SE corner.

Party: Pete Roberts, West Australian Speleological Group; Jim Countney, New Zealand Speleological Society.

Special Gear: 4WD vehicle with water tank, 'roo bar, winch.

In eight hours on the limestone, only three small areas were searched; the area containing the pictograph caves, a portion of the south face, and the bed of Four Mile Creek.

Pictographs were found in two of four caves facing a narrow ledge about 60 ft up the east face. Solid, roughly life size paintings in red or yellow earth colors depicted turtles, a human figure, and lizards or crocodiles. Hand prints, formed by blowing pigment around a hand placed against the wall, were scattered or in small groups. Strings of stick men 6-8 inches high appeared to be drawn in charcoal. These drawings depicted hunting or ceremonial activities. In places they overlap the painted figures.

The largest of these caves is about 30 ft wide and 8 ft high at the entrance, with a nearly level ceiling. Twenty ft in, the ceiling drops sharply to 3 ft, forming a rear wall where both paintings and drawings are found. The 3-ft-high section, which pinches about 15 ft further in, has paintings on the ceiling.

There are a few upward leads in the rear of these caves. A climbable bell in the largest cave connects to the surface via tight crevices and shafts. A few pill-shaped chambers, maximum 2 ft high by 6 ft wide, occur at bedding levels.

No other caves were found. The surface above the caves has numerous cracks and fluted shafts with rock and dust chokes 10-20 ft down.

No caves were found in the area searched along the south face. There are abrupt vertical offsets at the marked faults; otherwise the area is similar to that above the pictograph caves. Enterable fissures and shafts are blocked. Surfaces are pitted and fluted, with knife-blade ridges between. Clusters of rainpits are found on steep surfaces. Solution pans in level areas are 3-8 inches deep, 2-3 ft wide. Pan floors are lined with a thin, hard brown deposit that gives a false impression of loose dust. Low pedestals, almost the inverse of solution pans, occur where the rock is protected by a slab remaining from the overlying bed.

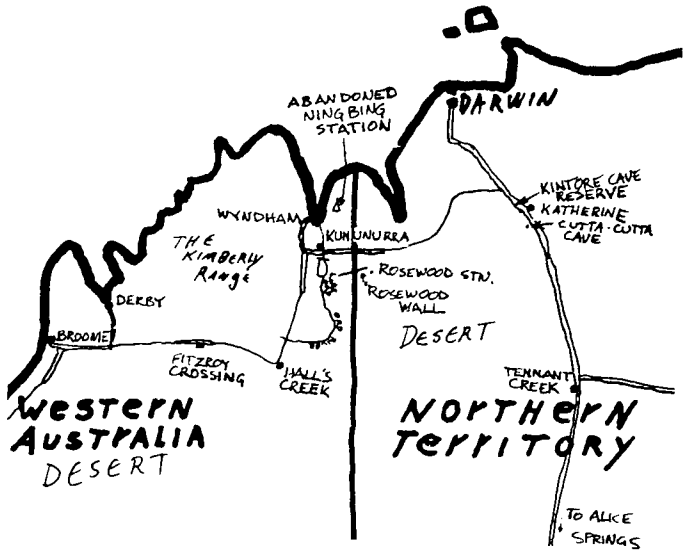
The sharpness of the rillenkarren presents a special hazard. Leaning on an ungloved hand to enter a shaft, I pressed too hard and received a gashed palm for my effort. A bandage kit should be carried; a stumble could cause severe bleeding. Vibram soles get chewed away rapidly as the rock blades slice pieces off the lugs.

The bed of Four Mile Creek was searched headward. Isolated pools gave way to a trickling stream 100 yds from the limestone. A series of rim pools marks the contact of plain and limestone. Pools are about 3 x 5 ft and 2 ft deep. Dam walls are 8-10 inches thick, hard inside but soft, mossy and overhanging on the downstream side. Above the pools, soil and vegetation tapered off to barren limestone and stream flow was noticeably stronger.

A tributary from the west issued from a slot too small to enter. Searching above the spring, Pete found a 4-ft-high by 6-ft-wide entry to a single dome-shaped chamber some 20 ft high by 30 wide. The cave has a couple of breakdown blocks, some dried 'mites and 'tites, scatterings of kangaroo bones, and no leads. It is contained in a dome-shaped hill not a great deal larger than the cave itself.

Stream flow in the main channel petered out at scattered seeps. Further up the dry channel, Pete noticed birds on a bench level a few rods to the east. A hole about 6 x 10 ft held water. On a ledge above lay a Johnson River (?) crocodile about 2 ft long. The water fairly swarmed with fish--flat sided, whitish, 6-inch-long fish. The croc dove in, the fish disappeared, and so did the croc. I climbed down the few feet to water level and probed with a stick at what appeared to be bottom. It wasn't. Pete and I invited each other to have a dive, but after a discussion of crocodile teeth we both declined.

Further up, the streamcourse becomes a series of broad, bare pavement terraces. Each step up is higher, the distance to the next step shorter, the fissures longer and wider. A fig tree grew in the corner of one fissure. Small, but figs are cave



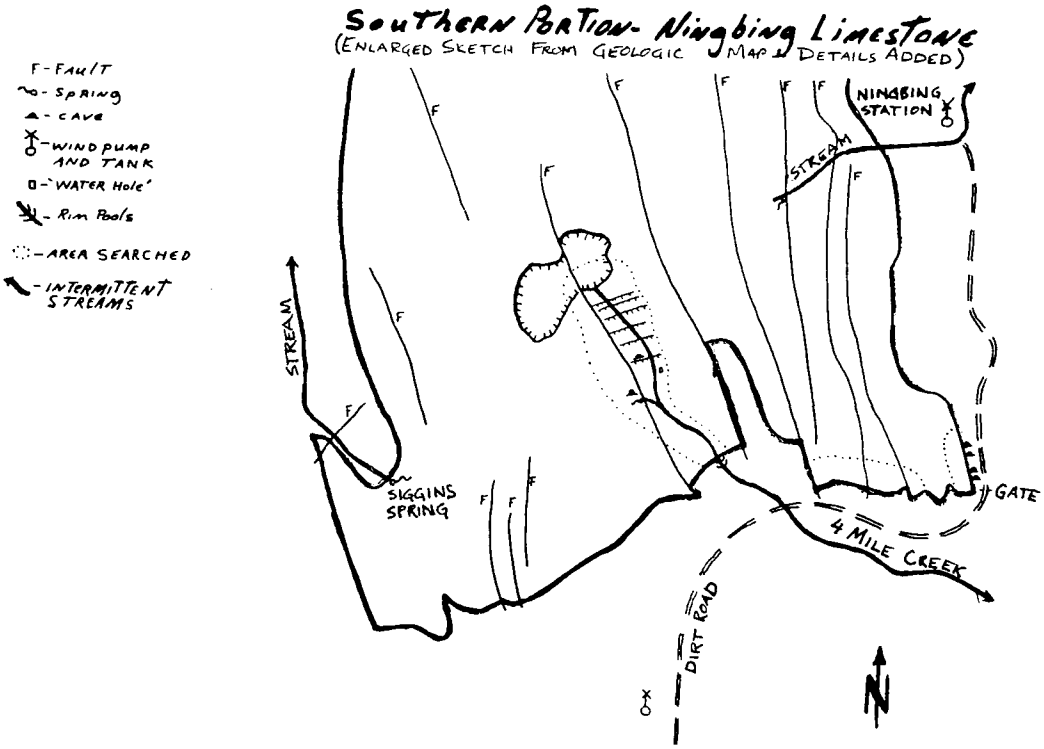
indicators. The fissure bottomed at 15 ft. A tight crawl led a few yards to several connected pill-shaped chambers and an awkward down-angling tight slot inhabited by spiders and gnats.

Further up, the terraces were like roadways crossing our path at right angles. We leapt over fissures 3 ft wide and 100 yds long. All those we checked were choked 10-20 ft down. The last terrace was a 20-ft step up. Bare pavement gave way to thin soil and dry, stemmy grasses. We followed the path of flattened grass that marked the streamcourse. Reaching the center of the broad depression, we searched for sinks but found none.

It was dusty dry and still. Nothing but dead brown grass as far as the eye could see. The tropic sun beat down. No breeze stirred. I was hearing a rushing wind. But nothing stirred. I thought of heatstroke and circling vultures. And sipped at my dwindling water supply.

Then Pete pointed to what I had not seen. A willy-willy, like a mini-tornado, wandered across the plain whirling a cloud of stems and dust. We hurried to it and danced along in the breeze, cooling as the perspiration left our clothes. Thus refreshed we headed home. And Willy-Willy followed us for a way.

It was interesting. I wish we could have checked Siggins Spring and the gorge up the north end. So, if you're ever in that neighborhood...



Bermuda

Mid-Ocean Cave Diving
GREEN BAY CAVE SYSTEM

Underwater Speleology 7(4):46-48 Tom Iliffe

The mid-ocean islands of Bermuda are among the most remote in the world, located over 600 miles from the nearest land. The Bermuda seamount was formed by submarine volcanic eruptions on the Mid Atlantic Ridge and later completely capped with a dune-derived carbonate sandstone. Caves developed in this limestone during the Ice Ages when sea levels were as low as 300 ft below their present-day levels and the large amounts of fresh water necessary for cave formation were present on the island. As sea levels rose, many of the caves were flooded with seawater so that today most of Bermuda's inland caves contain tidal sea-level pools.

The first comprehensive cave diving explorations began in September, 1979 with the visit of NACD/NSS cave divers Paul Meng, Barry Warner and Mark Ciaravella. In addition to exploratory dives in 20 different caves, local divers Tom Iliffe and Paul Hobbs were certified as cave divers. Most sections of the caves explored during that period were very similar to the air-filled portions of the caves, characterized by fissure passages and large collapse rooms. Little actual solutional passage was observed and consequently penetrations were on the order of tens to hundreds of feet. The submerged portions of the caves were extremely well decorated with large speleothems formed when the caves were dry. In many of the underwater caves, fragile helictites and soda straws were found perfectly preserved despite their long submergence.

Abundant marine life was found in many of the caves, especially in those with more direct connections with the sea. In a faunal survey conducted by Dr. Tom Iliffe of the Bermuda Biological Station, 17 new species of marine organisms have so far been identified from the caves. These include three new species of troglobitic shrimp, an isopod representing a new family whose closest relatives are known only from fresh water, and a new marine alga from the sunlit entrance pools. Coastal caves acting as alternating tidal spring-siphons contained a profusion of sponges and other encrusting organisms covering nearly 100% of the available wall space. In some caves it was possible to qualitatively determine the magnitude of tidal flow and hence connections with the open sea by the amount of marine growth on the cave walls.

The most interesting find has been the discovery in November, 1979 of an extensive cave containing true passage which probably acted to carry tidal flow between the nearly enclosed inshore basin of Harrington Sound and Bermuda's North Shore. Reference to the cave pool, known as Cliff Pool, had been made by Collins and Harvey in 1921 in their paper on "Marine Algae of Bermuda." Shortly after reading this description of the cave and subsequently locating it on a topographic map, Tom Iliffe and Paul Hobbs made their first dive in the cave on November 13, 1979. From the entrance pool at the base of a 20-ft-high limestone bluff, the cave steeply descends into a large room, the Foyer, from which a major passage, the Trunk Passage, extends. The Trunk Passage, averaging 50 ft wide by 20 ft high, continues for 500 ft before apparently ending in breakdown. On the left side of the Trunk Passage is the longest single passage in the cave, the North Shore Passage. This passage begins with dimensions similar to the Trunk Passage but towards the back it tapers down to an average of 15 ft wide and 5 ft high high. The North Shore Passage is characterized by crystal-clear water and many large, prominent formations.

Another interesting find was nearby Green Bay Cave with direct access to Harrington Sound. This large cave contains vast varieties of marine life throughout its extent. Since Green Bay acts as a true tidal cave, alternating between a spring and a siphon, visibility is generally limited. Tom Iliffe and Paul Hobbs made the initial dive in Green Bay Cave on November 24, 1979, going from the entrance to a large breakdown room in the back, approximately 500 ft. Four additional dives in Green Bay by Tom and Paul yielded no major breakthroughs, so the emphasis was shifted back to Cliff Pool, where subsequent dives led to the discovery of several side passages and loops extending the cave to 2,283 ft of surveyed passage as of April 26, 1980.

In August of this year, Paul Meng and Barry Warner returned to Bermuda to help continue the explorations.

On August 12, Paul and Barry dove with Tom for their first time in Cliff Pool and went to the termination of the line in the North Shore Passage while installing 300+ ft in a right loop tunnel. All three were unanimous in agreeing that the physical characteristics of Cliff Pool were different from and more promising than any cave previously explored in Bermuda.

On August 15, Tom and Barry returned to the end of the line in the North Shore Passage and extended the line 115 ft through some delicate formations to its end in a small breakdown room 27 ft deep.

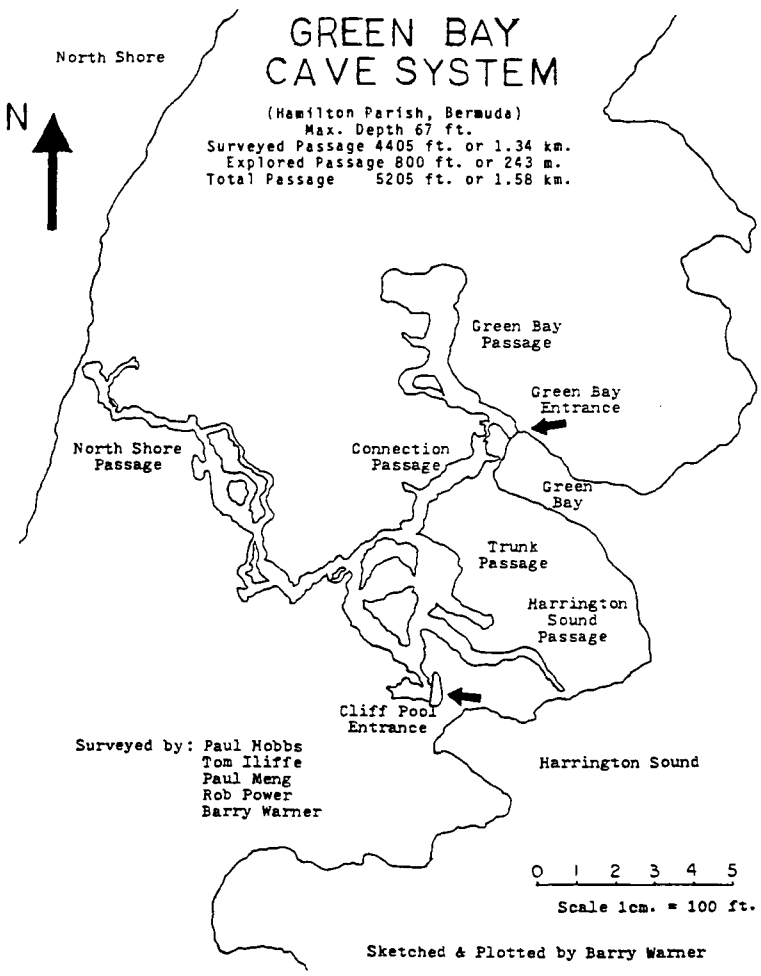
Paul Meng, Paul Hobbs and Tom Iliffe returned to Cliff Pool on August 17 and dove through the Trunk Passage and added 200 ft of line down a passage near the breakdown at the Terminus of the Trunk Passage.

On August 16, Paul and Barry dove Green Bay Cave with Rob Power and Paul Hobbs to the terminus of the large passage into the breakdown room. No leads were found out of this breakdown room. Green Bay and Cliff Pool were less than 300 m apart but a connection between the two that Tom Iliffe and Paul Hobbs had earlier looked for, before their discovery of the North Shore Passage, wasn't found.

On August 18, Tom, Paul and Barry checked out side passages on the North Shore line and through several small tunnels with hanging breakdown and a major restriction, they managed to add an additional 580 ft of line.

Paul Hobbs, Paul Meng and Barry Warner completed the North Shore line survey on August 19 while adding more line down a delicate side passage in the back. Total surveyed passage now reached 3,565 ft but it appeared the North Shore section was nearly walled out and the last major lead would have to come from the breakdown at the end of the Trunk Passage.

On August 23, Tom and Barry planned a dive in Cliff Pool down the Trunk Passage to try to add on to the Harrington Sound line and resurvey the Trunk Passage coming out. As a secondary objective, Tom suggested they look through the breakdown for any leads. Swimming in to the terminus of the Trunk Passage to the breakdown area, Barry tied off to the Trunk Passage line and proceeded up over the breakdown. After picking their way through the breakdown for some 50 ft, they both noticed a large opening to their left in the floor. Dropping down the opening, they came into a large passage. There was an immediately noticeable difference in this passage from the rest of those passages previously seen in Cliff Pool as there were sea cucumbers and starfish on the sandy floor of this passage; also, visibility was markedly reduced, the water was warmer, and there was a noticeable current. Swimming upstream, they encountered a passage in which they could only see the floor and occasionally one wall. After reeling out approximately 300 ft of line down the passage, they encountered a wide room with a low ceiling and reduced current. Taking a guess and swimming to their right through the larger section for about 75 ft, they encountered crystal-clear water devoid of any marine life and a noticeable thermocline. Turning around, they came back to the middle of the room and went ahead to the left where after a few short feet a moderate current was again noticeable. Now beginning to near the end of the line on the reel, they swam through a small passage full of stalactites and heavily encrusted in sponges, until they reached a point where the passage widened slightly and the ceiling came down even lower. Barry began to tie off the line and end it since there were only a few feet of line left and tieoffs were getting scarce, but they decided to swim a few feet further into the room and look around to see where they would go when they returned. Reaching the end of the line on the reel after 10 ft, Barry signalled Tom he was tying off to a rock in the sand. Just as Barry was cutting the line, he noticed approximately 15 ft ahead, at the limit of visibility, a nylon line running along the wall. Tom swam up and also saw the line. Taking an extra gap reel and connect-



noticed the line. Taking an extra gap reel and connecting the lines together, they swam against the current along the line until 150 ft later they emerged from Green Bay via Cliff Pool.

The connection was significant in that it linke inked two of Bermuda's largest and most interesting caves, geologically and biologically. Surveyed passage length climbed above 4,400 ft and when combined with 800-1,000 ft of measured but unsurveyed passage the total passage length reached the one-mile figure making this system Bermuda's largest, underwater or in air.

In less than a year's time, cave diving in Bermuda has gone from nil to the discovery of an extensive cave system still growing. And yet, Bermuda cave diving is still in its infant stage as there are several dozen caves still awaiting their first cave divers. With four certified cave divers in Bermuda now as a result of another cave course taught by Paul Meng, even greater and more rapid progress should be made on the caves, plus a return trip by the "Southerners" which is already planned for this winter.

British Columbia

SAWTOOTH CAVE AREA

British Columbia

Northwest Caving 10(1):9-10 Phil Whitfield

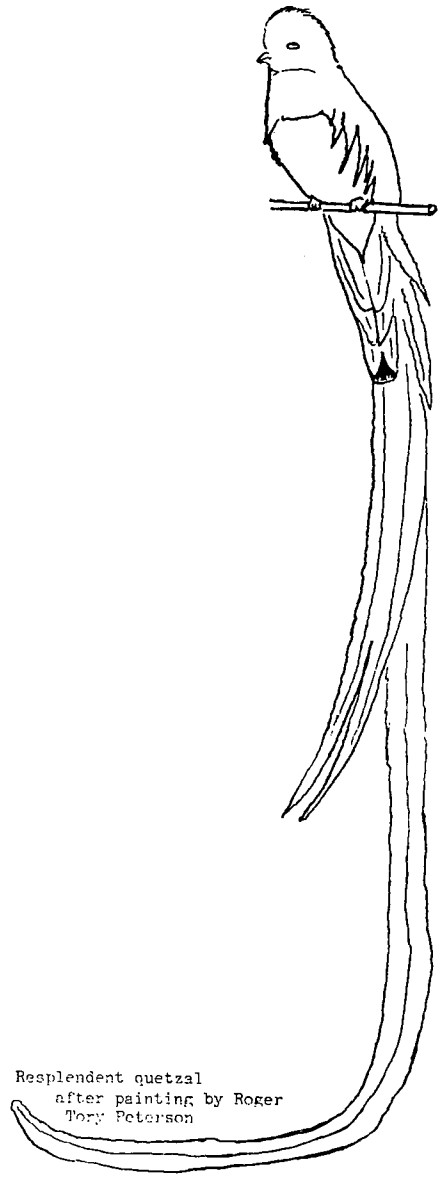
In 1976, residents of Argenta and Johnson's Landing at the north end of Kootenay Lake introduced me to a cave at the 7,400-ft level in the Purcell Mtns. overlooking the lake. Lack of equipment limited my reconnaissance, but the locals reported having earlier descended the steeply sloping entrance shaft with ropes to a considerable depth, beyond which a constricted passage impeded further exploration.

In 1977, a Vancouver Island Cave Exploration Group (VICEG) party returned to the cave on Sawtooth Ridge, descended the 150-ft entrance shaft and shifted breakdown in the constriction beyond to gain access to virgin, horribly unstable and steeply sloping passage below. Thwarted by lack of rope to rig an obviously very deep shaft, and somewhat unnerved by the profusion of loose rocks at the angle of repose, this party contented itself with surveying out.

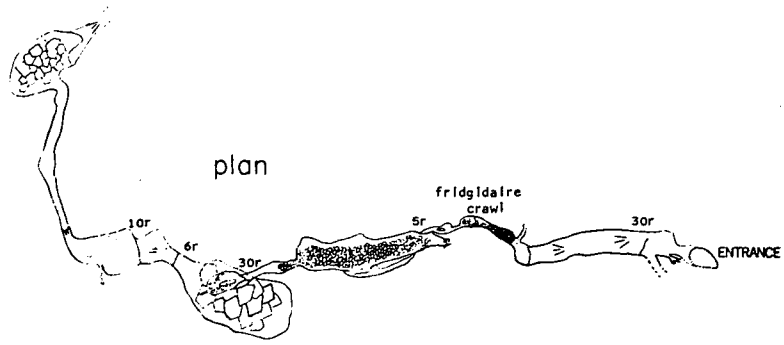
On August 5-7, 1978, another VICEG party, reinforced by Torontonians Kirk MacGregor and Roger Bartholomew and by independent cavers, returned to the area by the standard access route, a 5,300-ft climb by 4X4 up a fire access road from lake level, followed by a 3-hour slog across alpine ridges to the Sawtooth Ridge. This time, a five-man team bottomed and mapped Sawtooth Cave in seven hours, finding, besides the known 150-ft entrance slope and 15-ft drop beyond, a 130-ft shaft and a 40-ft drop, to say nothing of more intervening rockslides waiting to be awakened. The total depth approximated 475 ft.

The same trip revealed one 140-ft-deep blind shaft nearby, and, in a nearby alpine valley, a horizontal stream cave system (the Cave of the White Band) at least 900 ft long. Small streams sinking into the steeply dipping limestone bands on the surrounding landscape almost demanded further exploration, but time did not permit, and the area remained untouched for two years.

In July 1980 , Dennis Herman, one of the 1978 party, camped for two weeks with a climbing group in another alpine basin just to the east. Here also were found numerous caves and karst features, and they also remain incompletely checked.



Resplendent quetzal
after painting by Roger
Tory Peterson



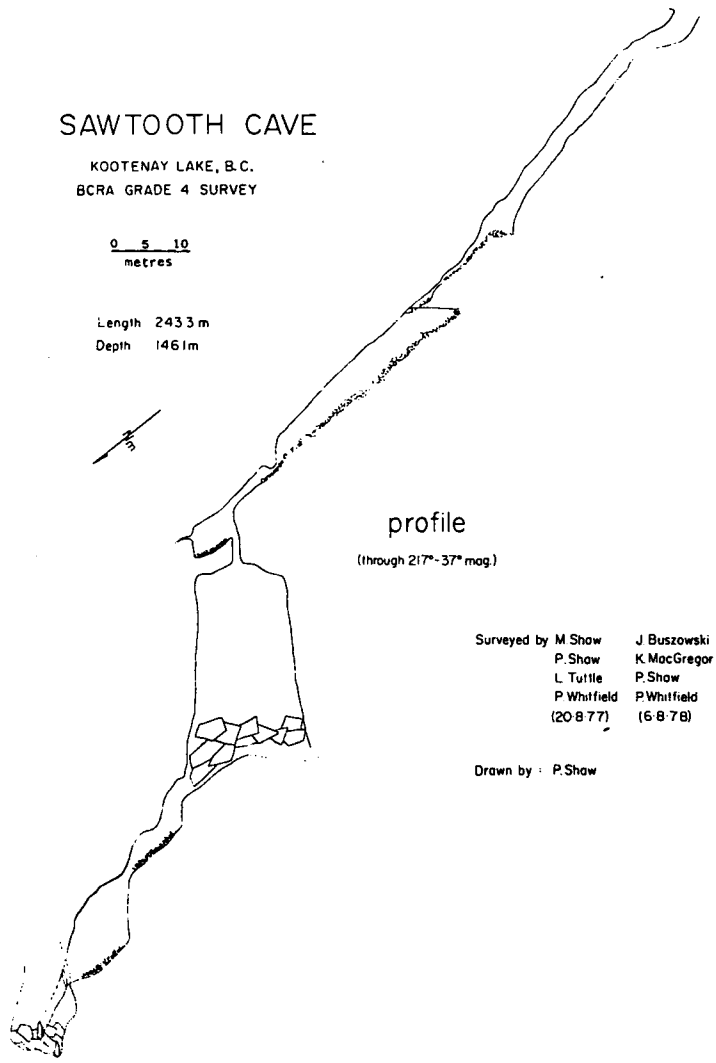
SAWTOOTH CAVE

KOOTENAY LAKE, B.C.

BCRA GRADE 4 SURVEY

0 5 10
metres

Length 243.3 m
Depth 146 m



profile

(through 217°-37° mag.)

Surveyed by M Shaw, P. Shaw, L. Tuttle, P Whitfield (20.8.77) — J Buszowski, K MacGregor, P. Shaw, P Whitfield (6.8.78)

Drawn by : P. Shaw

Mexico

CAVING IN CUETZALAN: COHUATICHAN

The Explorer (March 1980):43-46 Ray Hardcastle

Dec. 29 was our first full day in Cuetzalan and Bob Richards, Rich Breisch, Debbie Gogatz and I had the urge to go caving...

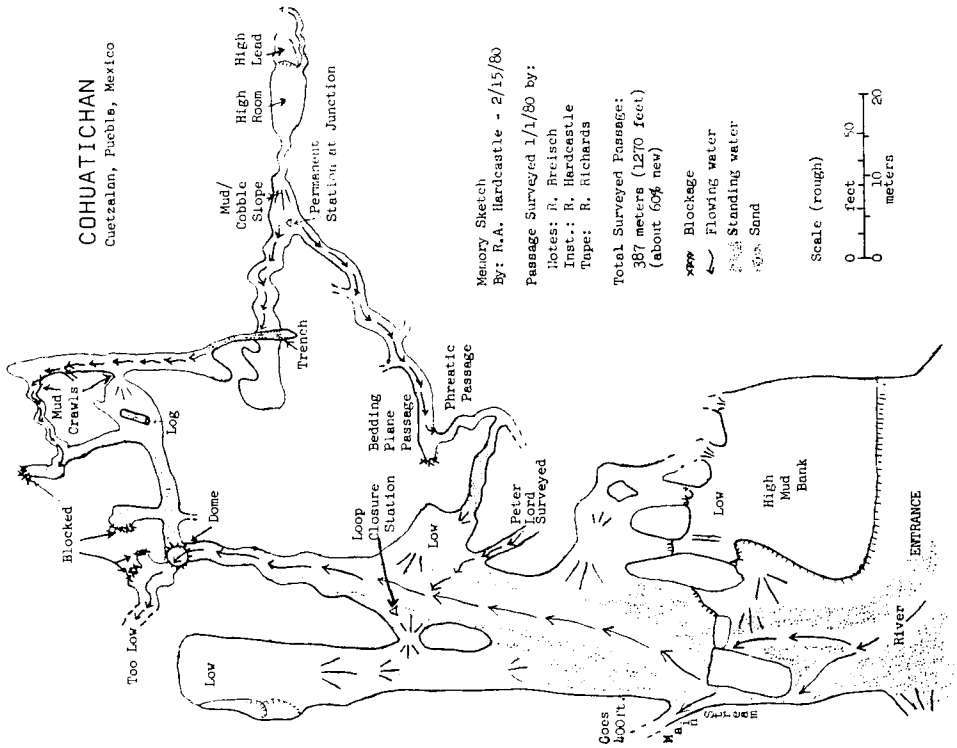
I've never seen such a huge entrance before. The cave took all the water from a small river that drained the local valley. When we got to the entrance we found that it decreased in size rapidly. After only a few hundred feet the height of the main passage was only about 4 ft. Apparently all the water entering the cave used to sink to the left of the main passage just inside the entrance. This passage had been explored for about 400 ft, but not surveyed, several years ago.

On this trip we found that some of the water continued down the main passage. We went as far as we could, until the ceiling got low and we would have to crawl in the water. Since we didn't have wetsuits we decided to leave that and go up a mud bank on the left side of the passage to check out a large room. It was quite big and had a firm mud floor with some large breakdown blocks. The ceiling got low toward the back so we took a side lead and climbed down into a muddy pit. It was blind so we turned around and headed out.

On Jan. 1 Bob, Rich and I hiked to Cohuatichan in wetsuits to extend the survey. We decided to push the main passage in the hope of connected to nearby caves. We crawled through the water beyond where we had been before, and came to a junction where the ceiling rose in a dome. The water went off to the left. It was plugged with mud and sticks straight ahead, and dry walking passage went up to the right.

I checked out the stream passage. The stream went over gravel under bedrock with about 4 inches of airspace. To the right the passage was again plugged with logs, mud and rocks. It didn't seem prudent to push the stream crawl since it was raining and it would be very tight with no room to turn around if it didn't go.

Instead we decided to find a way around the plug. Bob checked out the dry walking passage, which went at at least two ways. We continued up the dry passage, which didn't stay dry long, looking for a way around the blockage. We ignored a crawl near a log which went into a parallel passage, in favor of the now-stoopwalk passage we were in. This went to another junction where a small stream formed a 2-ft-deep pool behind another mud/rock/wood blockage. The right passage became walking passage after about 20 ft of muddy crawl. We followed this to a mud plug, but it



had a tight, low vertical crawl in about a foot of water to the left. We followed this for about 20 ft to a junction with a fair sized mud-floored room with a stream coming from the left. We climbed out of our trench and followed the left stoopwalk passage for about 40 ft to another junction. A mud and cobble slope went up straight ahead and another stoopcrawl with stream went down to the right. We went up the slope to a 12-ft-wide by 40-ft-high by 30-ft-wide room. A high lead appeared to go straight ahead but it would take bolting to get to it. At the apparent end of the room I saw a tight fissure lead that went. We saw a couple of shelless snails and a white millipede about 2 inches long. After about 40 ft the lead got too tight to continue. Rich and I started surveying here since it was now apparent that we were in new passage not shown on the map.

[Surveyed downstream to right from permanent junction station, ate lunch, and returned to survey downstream left from junction station.]

We were going slightly uphill and the passage was getting larger. There were occasional small muddy leads off to either side... Eventually we were able to stand up in ankle-deep water. Here the passage entered a bedding plane configuration and got plugged with mud just beyond a deeply scalloped meander passage on the left.

We followed the meander passage for a few feet to another junction, muddy and low to the left and dry and hands-and-knees to the right. We followed the dry lead for about 20 ft where the water again appeared as a stagnant pool completely covering the floor.

The only thing to break the routine of surveying was when Rich had to recarbide. He'd say, "Let's hold it for a minute. I've got to change my carbide." One of us (electric cavers) would say, "Oh, no, not again. Well, no sense wasting electricity." Click! "That's right." Click! There would be a pause,...a sigh,...then from out of the dark: "Come on, one of ya turn on your lamp." "Why?" "We don't need light when we're not doing anything." Another pause,... heavy sigh...then: "Dammit, turn on your lamp!" "What's the matter, can't you see?" "TURN ON YOUR BLOODY GODDAM LAMP!" "Now, now, try and remain calm." "TURN ON YOUR !(@$&¢***%#! LAMP!"

We heard the river again and hoped we could complete the loop into the main cave stream passage. Sure enough, with another few survey stations, Rich crawled over a mud slope under a low ceiling into the main passage near a small stream that Peter Lord had surveyed years before. We tied our survey into our other station, completing a 380-m loop, and headed back to the house having added to the survey some (possibly) former virgin passage.

SUMIDERO JONOTLA / GRUTAS DE CUEXALOCSTOC
The Darkness Beyond

Virgin Passage 4(4):6-7 Doug Wilson

About 13 mi from the town of Cuetzalan is the cave called Sumidero Jonotla, or Teponoguas, as it is known by the locals. It is a big cave. On Jan. 11, Steve Knutson (OR), Bill Liebman (CA), Maureen Cavanaugh (TX), Andy Grubbs (TX) and I left the cavers' house and drove to a parking spot about half a mile from the cave.

Jonotla had been explored several km downstream the previous year. Norm Pace, Bill Liebman, and Warren Anderson had stopped at the top of a sump bypass when they encountered an estimated 60-70-ft drop into an impressive void. Having no more rope, they left a 4-ft-long piece of flagging tape to mark their progress. This was being blown almost horizontal by the wind blowing into the darkness beyond--our objective.

A short way inside the 180-ft-wide by 60-ft-high entrance was a short but tricky downclimb to the stream. We walked single-file into the darkness ahead. Nobody said much. Everyone was lost in their thoughts as we walked quietly down a most impressive stream gallery which was getting bigger by the moment. This is the kind of caving which lends itself to personal reflection. You wonder why one goes caving and what it is that keeps bringing you back to the now-familiar environment of a cave.

The pace is pleasant as we cross and recross the stream several times. We eventually reach a large flowstone which drapes down almost to the water. A gap between the flowstone and water allows one to drop into a canal. The cold sensation that hits you on your first immersion in a wetsuit reminds you that you are but a visitor here. Short of breath, you paddle quickly to the gravel bar 40 ft ahead. From here you begin to work your way up the left wall as the stream disappears down a series of waterfalls. Along the way an exposed traverse is encountered. Bill leads the climb and sets up a belay. Minutes later everyone is up and we push on. The first rappel is only minutes from here. Just above the first drop is another exposed climbdown into a mud-covered chute. The drop is 60 ft or so down to the stream. Once at the bottom, you step out onto a rock in the middle of a deep pool, zip up your wetsuit and take the plunge...

At the end we pass the first of two feeder streams cascading down from the left wall and enter a room full of breakdown. The passage gets big here, real big. This is the first time I have ever been in a cave where I cannot see the ceiling. Climbing up and over the breakdown, we come upon the second waterfall inlet. After some route-finding through the breakdown, we come to the swim which leads to the sump, the sump bypass, and the darkness beyond.

This swim is really fine... I slide into the deep water. The flowstone ceiling drapes down almost to water level 15-20 ft in front of me. At first, it appears there is no way through short of freediving, but by watching the others who had gone in front of me, I know there is one small opening large enough to allow you to go through. I see it and swim towards it. Taking a breath, I lower my head and swim through. On the other side, I pop into a spectacular flowstone-draped gallery. I swim slowly. I hear voices up ahead as the others tackle the etrier climb up into the bypass...

Floating in the water at the bottom of the etrier, I look up and try to figure out the safest way up. I lift my right foot almost out of the water and place it in one of the loops. Reaching up, I grab a loop and start to pull myself up. I groan. My pack must have 20 lbs of water in the bottom of it... At the top there is an exposed and tricky climb off the etrier up into the bypass. I dump the water

out of my daypack and vow that the next pack I get will have drainholes in the bottom. I scramble up the steeply ascending mud-covered passage and join Bill and Steve, who are getting ready to do a 15-ft climb... Bill leads the climb on belay. Steve goes up, and the two of them pull our packs up.

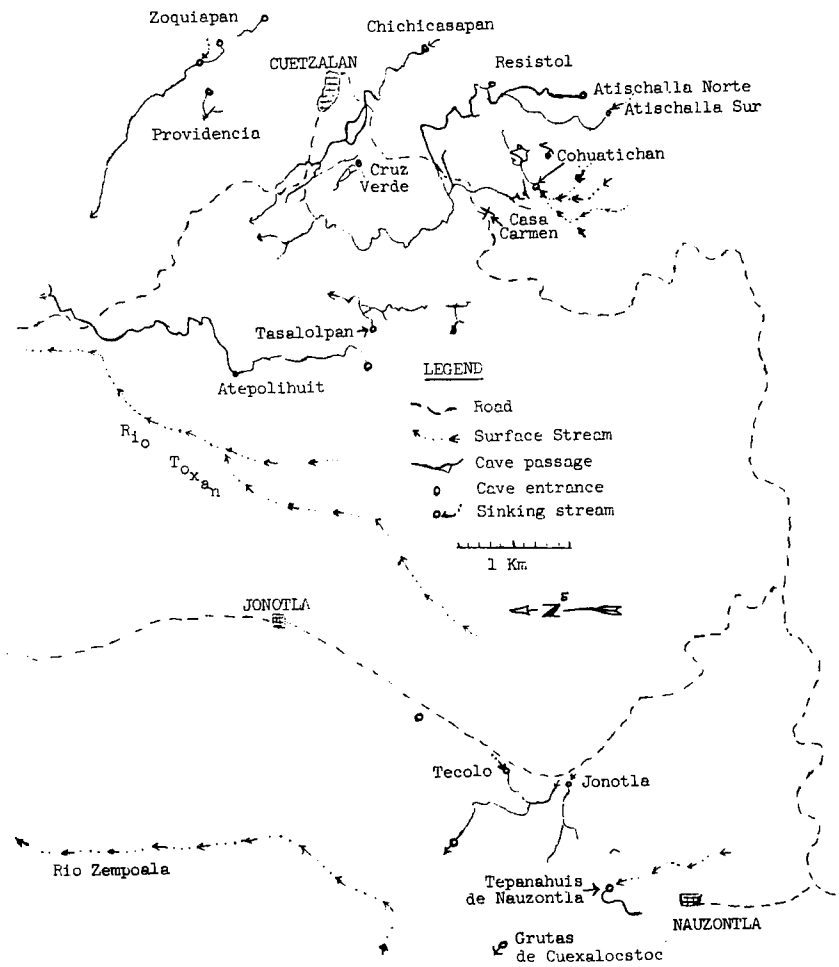
The excitement is beginning to build as all of us reach the top of an awkward and slightly harrowing climb and head off down large walking passage. A couple hundred feet later we reach the drop that had stopped Norm, Bill and Warren the year before. We pause to recarbide and eat. While we are eating, Steve demonstrates the now-famous "satchel charge" when he opens his rubberized cave pack and looks inside. The explosion doesn't kill anybody but it does scare the heck out of us.

After eating, I walk over to look at the drop and the darkness beyond. I am impressed. The top of the drop is about 6 ft wide, belling out into blackness. There are no walls, no floor, and no ceiling visible. Down below, I can hear the roar of a stream. The wind is blowing at a gale into the void. I walk back to the others to escape from the wind.

Steve rigs the drop and is the first one down. We have a good idea of what we will find. Jonotla is headed straight towards a large cave on the other side of the ridge with a stream flowing out of it. Partway down the drop Steve yells that he can see daylight. The drop is against the wall for 15-20 ft and then goes free for the last 50 ft. You land on a flat rock next to the stream.

After surveying down the drop and taking some pictures, we begin surveying towards the daylight reflecting off the walls. We survey up a breakdown mound and down to a large pool on the other side. We cross the pool and continue until we can see the entrance. It is the most impressive entrance I have ever seen. Thick jungle grows just outside.

This is the cave known as Grutas de Cuexalocstoc.



CAVING IN CUETZALAN: ATEPOLIHUIT DE SAN ANDRES

The Explorer (April 1980):62-66 Ray Hardcastle

On Dec. 31, eight cavers left Casa Carmen, drove to Pueblado de San Andres, and hiked down to Atepolihuit de San Andres to continue the survey of this significant Cuetzalan river cave.

We split into three survey groups: Group 1 (Joe Lieberz, Debbie Gogatz, and Ray Hardcastle), Group 2 (Bob Richards and Bill Liebman, both wearing wetsuits) and Group 3 (Mike Boon, Steve Robinson and Rich Breisch, also wearing wetsuits).

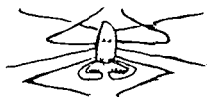
Group 1 entered the cave last, down the steeply sloping sinkhole entrance using a rope for a handline. The cave has at least four entrances but this is the easiest; no vertical gear or wetsuits are needed to enter and it leads directly into the big room. All the newcomers to this cave were impressed by the sheer size of the room and the sound of the rushing river far below in the breakdown. Across this huge room you can see light filtering down from another (vertical) entrance. The room is a little less than 100 m across, more than 100 m long, and roughly 20 m high. The ceiling dips downslope while the breakdown slopes downdip and roughly toward the centerline of the room where the river's sound gives witness to its presence. Group 1 surveyed this room, out the entrance, and up the sinkhole to a post which serves as a permanent survey station for the area.

Meanwhile, deeper in the cave Group 2 found their their surveying going very slowly with just two of them. They were in a part of the cave with a fast-flowing river running along the bottom of a high, narrow canyon passage. Mapping this section of the cave was indeed sporting. They had to swim across pools and climb down waterfalls. After a few hours they were joined by the lower mapping crew.

The lower crew had picked up some extra gear that had been left in the cave from previous push trips and had carried these ropes, ladders, etc., with them upstream as they surveyed. When the two groups met it was decided that two people should carry this gear out while the other three continued the downstream survey.

Steve and Mike, lugging out the gear, got to the big room just as Group 1 was taking their dinner break. Mike (as usual) didn't want to survey but would rather carry the excess gear out of the cave. Debbie and Ray joined him; thus Joe and Steve were left to continue the survey.

While Mike changed out of his wetsuit at the entrance, Debbie and Ray tried to get a decent picture of an amblypygid--a whipless whip-scorpion. It was about 6 inches across with its legs folded up, body about 2 inches long by a little less than 1 inch across, and two big pincers next to its mouth--uuggly! They had seen two others in the big room near the vertical entrance.



Meanwhile, back in the cave Joe and Steve continued the survey toward the 10-m waterfall. Bob, Rich, and Bill were surveying in the lower section of the river passage. The passage was only a few meters wide in places but several meters high. Many small side streams were seen joining the main river gallery and were duly noted in the survey book.

On Jan. 2, eight cavers again headed for San Andres in Bill's truck in hopes of completing the survey. Again they split into three groups: Group 1 (Bob Richards, Ray Hardcastle, and Joe Lieberz), Group 2 (Andy Grubbs and Elenor Ledesma, president of the Mexico City Speleological Society, who were going to collect biological specimens mostly in the large entrance room), and Group 3 (Steve Robinson, Maureen Cavanaugh, and Bill Liebman, all in wetsuits).

Group 1 started their surface survey at the permanent station in the village while the others headed for the cave. They surveyed down the gently rolling hillside connecting various sinkholes and other karst features. Every now and then they had to stop while Joe explained to inquisitive residents what they were doing and why they were tramping through their fields. Once they understood, they were extremely helpful, pointing out sinkholes and cave entrances. Thus they surveyed down the ridge... They tied in their survey to the center fence post at the top of the entrance sink of Atepolihuit de San Andres.

Joe decided to continue the surface survey. In the Cuetzalan area it's only clear for one day after a rain. You can see far enough to tell where you're going because the water has not yet evaporated to form the nearly everpresent mist.

So they surveyed through a fence to some houses above the cave. Here Joe talked to the residents, who pointed out the other (vertical) entrance to the big room; it was less than 30 m from their houses. Another local in a nearby cornfield told Joe about another large deep pit nearby which Joe thought might be the skylight over the main river passage deep in the cave. They hiked about ½ km to a clump of trees in a fair-sized sinkhole. Sure enough, the trees screened a vertical drop with the sound of a river roaring below. Joe hacked his way down to where he could see the river and declared that it was indeed the skylight to San Andres. They didn't have any rope (or vertical gear) so they couldn't go any further down the pit. Ray found a place where he could hang over the pit in the thick bushes and drop the tape straight down. Unfortunately, it wasn't long enough (at 31 m) to reach the bottom. They established a station near one end of the pit and continued the survey overland to another sinkhole (very, very large) that has a significant cave in it.

They surveyed through another sink that was taking water. Joe thinks that this is were the stream that comes out of the breakdown in the big entrance room comes from. They completed the survey up the hill to the entrance (center fence post, again) of San Andres.

Bob and Joe went into the cave and came out with the biologists, and all five trooped back to the truck. Andy said he had spotted three human skulls in the cave downslope from the vertical entrance, and some other human remains. They had lots of specimens to show for their seven hours in the cave. They had even managed, somehow, to get an amblypygid in a jar about as big as a 35 mm film cannister.

On Jan. 4, seven cavers again left Casa Carmen in Bill's truck, determined to finish the survey of San Andres... Andy Grubbs, Bill Liebman, and Steve Robinson dropped the skylight so they could measure its depth and get another tie-in between the surface and the cave surveys. The pit was about 40 m deep.

They had to tie 10 m of webbing to the end of the tape to reach the bottom.

Joe Lieberz, Ray Hardcastle, John Birkig, and Bob Richards surveyed from the skylight pit to the vertical entrance to the big room. This completed yet another loop on the surface survey. Then they went into the cave to see how the others were doing. They found them working their way upslope in the big entrance room, having completed the cave survey. All seven cavers spent some time amongst the mud and breakdown below the vertical entrance looking for artifacts and bones. Andy found a couple more human teeth and Bill took photos of these and of the human skull pieces Andy had found before. Evidently, the people in the area had used this vertical entrance as a convenient burial vault--kind of an express route to the underworld. Soon all headed back for the truck and Casa Carmen.

Even though the survey was complete, the cavers were somewhat disappointed. The cave went the wrong way before ending in a boulder choke. The main Cuetzalan caves (or cave system) were heading in a generally eastern direction while San Andres headed west. They had hoped it would connect with the main cave system. It may still eventually connect, but the boulder choke will have to be gotten through somehow and then the cave will need to reverse direction. It's hard to see how this could be.

CUEVA DEL PORVENIR

Coahuila

The Texas Caver 25(4):74 Peter Sprouse

Cueva del Porvenir is a large guano cave SW of Monclova, Coahuila, that was formerly mined for phosphates. It is reached by traveling 70 km of dirt roads across the desert. After passing through the small village of Reforma, an obscure road leads west towards the Sierra San Marcos y Rinos. This road enters the Canon el Rosillo (Canyon of the Dew), and in the middle of the canyon a side canyon, Canon el Guano, enters from the south. Up this the road continues, although in disrepair, to an old mining camp below the cave. The steep canyon walls contain many unchecked entrances, and a large entrance to a 100-m-long cave lies situated directly across the canyon from Cueva del Porvenir. The old mining road continues right up to the entrance.

A miner's trail leads most of the way through the cave, almost giving the impression of a commercial cave. The passage is spacious, with an average cross section of 10 x 15 m. Many high domes open in the ceiling. Mining pits with crude wooden bridges and ladders open in the floor, and abandoned digging tools and wheelbarrows lie by the trail. There are even some examples of "Mexican mining art": several stalagmites are carved to represent people or serpents. About halfway through the cave a large bat colony resides in the ceiling, replenishing the guano taken by the miners. The single passageway gradually climbs to its end in a series of high domes, 1,000 m from the entrance.

The cave's existence was first learned of in the 1960s by Bill Russell and James Reddell, but they failed to reach it due to only a sketchy location and an inadequate vehicle for the desert roads. With the help of the new topo maps (sheet G14A61), a group of Austin cavers located the cave and mapped it in August 1975.

A GLIMPSE BENEATH MAYALAND

Yucatan, Mexico

York Grotto Newsletter 17(3):41-45 Bernard Smeltzer

From several thousand feet above, the appearance of the Yucatan topography was indeed unusual, to say the least. A Martian landscape would have shown more familiar features. For below me there were no erosional scars, no streams, rivers, or valleys threaded the surface, no lakes dotted the flat monotony; only a green tableland stretched to infinity, bordered by the azure waters of the Caribbean. Some geologists believe a convulsion of nature heaved the peninsula from the Caribbean as recently as 10,000 years ago.

I arrived in Merida, Mexico on March 10 with plans to visit Mayan ruins for two days with a tour group. After that I had nearly four days left to locate and explore caves and more ruins. Having very little data on the immediate area, I had no idea how to accomplish this. On the morning of my third day it was my good fortune to meet Manuel Cortez Quinones who for a reasonable fee offered to provide transportation and guide service on full-day trips into the Yucatan countryside. Manuel was well versed in the archaeology of the area, and to make the situation slightly more interesting, said he knew of several caves that he would take me to.

Since the northern half of the Yucatan Peninsula is underlain by Cenozoic and Quaternary limestones and all drainage flows underground, there are, of course, numerous caves. What made human culture possible in this streamless region are the caves and the natural wells or sinkholes, which the Indians call *cenotes*. The Mayas must have explored every cave they came upon in hope that it would lead to a permanent source of water. Thus, the life of the Maya was oriented to a great extent around caves and cave-related features. Cities and religious centers were planned and developed near cenotes which provided an inexhaustible water supply. Eventually some caves and cenotes took on supernatural aspects and human sacrifices were made as gifts to the water gods. The first scientific study of Yucatan caves was made by Edward H. Thompson in 1888, under the auspices of the Peabody Museum of Harvard University. In 1895 Henry C. Mercer, who had investigated so many Appalachian caves, conducted an expedition to Yucatan for the University Museum, University of Pennsylvania. Mercer had hoped to find evidence of Paleolithic man in Yucatan's caves. His search revealed only Mayan culture artifacts. More recently (1947) Robert Hatt conducted faunal and archaeological researches in Yucatan caves.

I was accidentally introduced to my first Yucatan cave while examining the ruins of Kabah. It was here, in 1876, that the French explorer Le Plongeon claimed to have found a mural depicting the destruction of Atlantis. A mural such as this would make an interesting photograph and I was searching through several corbeled vaults opening from the an interesting photograph and I was searching through several corbeled vaults opening from the rubble near the top of a pyramid, when I noticed a sink-like depression in the courtyard below. A scramble down the broken stairway of the pyramid brought me to an agave-lined cave mouth about 4 ft high. Progressing about 30 ft from the entrance over potsherds, I noticed a chattering noise and around the next bend a broad crawlway led on with a

CUEVA DEL PORVENIR

CUATROCIENEGAS, COAHUILA, MEXICO

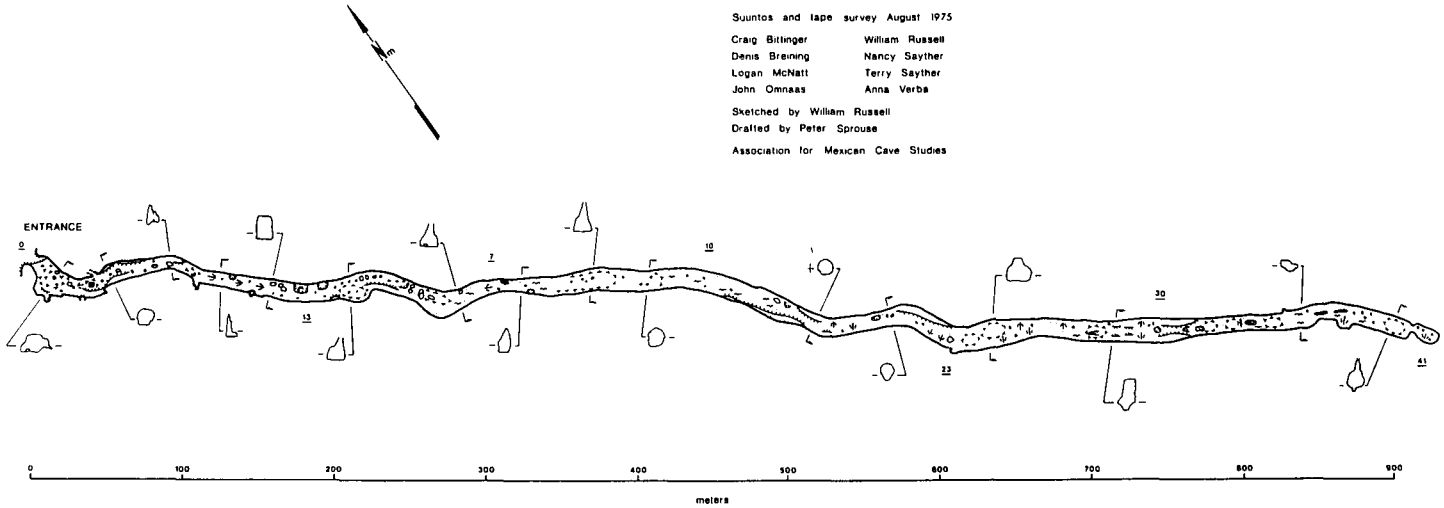
Suuntos and tape survey August 1975

Craig Bittinger	William Russell
Denis Breining	Nancy Sayther
Logan McNatt	Terry Sayther
John Omnaas	Anna Verba

Sketched by William Russell

Drafted by Peter Sprouse

Association for Mexican Cave Studies



ceiling matted with shuffling leaf-nosed bats. Needless to say, I didn't continue on, for my close contact would have disturbed scores of our furry friends.

At the ruins of Uxmal I was told a strange story related to another cave nearby. According to Maya legend, the 125-ft-high Pyramid of the Magician, soaring above me, was built overnight by a dwarf who was hatched from an egg by a witch. After she died she continued an existence in Caba Chen, a cave at the village of Mani. Here she sits by a stream with a serpent by her side, selling water to those who will exchange a baby or child, so she can give it to the serpent to eat. At Mani, Manuel and I located Caba Chen near the center of the village and descended a stone staircase under a dark arch. At the base of the stairs a strangler fig tree grew toward a skylight 20 ft above. Sounds of muffled laughter issued from a distant passage. We reluctantly ventured onward, but to our suprise did not find a chuckling witch and her monster snake. Here were three smiling, brown Mayan boys swimming nude in a deep pool. Obviously they were paying no heed to the warnings of the legend, or perhaps the ghost witch and her pet had moved to another cave.

The next cave on our agenda was at the Mayapan ruins, the last Mayan stronghold. This city was the seat of the "Triple Alliance" formed by three major Mayan cities to rebuff the Toltec invasion from the north. We found the cave near the base of a huge crumpled pyramid, not far from a more interesting astronomical observatory temple. Using a log with many broken limbs as a ladder, we descended into a vertical-walled sink. A grove of banana trees occupied the floor of the sink. An iguana scurried up a ledge. A moss-covered fluted column, just under the lip of the sink, first drew our attention, then we proceeded into a wide passage down a slope. About 500 ft from the entrance the passage reduced in size to a crawl. At this point Manuel very solemnly announced that the Maya believe every sizeable cave shelters a jaguar. As we were not wearing proper caving garb for crawling or for battling big cats, our attention was diverted to an area on the floor resembling a hearth. Here we found numerous potsherds, charred animal bones, and a lone jade bead.

The following day, at the sacred city of Chichen Itza, I enjoyed a cavelike experience within the heart of the Mayan-Toltec pyramid, El Castillo. During the restoration of the north staircase, a corbeled tunnel was found penetrating the base of a narrow, steep staircase. At the top of the stairs, in a small chamber, one is confronted with a snarling stone jaguar, painted red, with jade eyes and wearing 73 pieces of jade over its body. A shallow incense basin indents its back. As I photographed this awesome statue I thought of the many bizarre ceremonies that must have occurred here.

Leaving Chichen Itza, we headed a few miles west to Actun Balankanche, "Hidden Throne Cave." In 1959, Jose Gomez, a guide at Chichen Itza, was exploring this cave when he broke through a manmade wall sealing a passage leading to secret ceremonial chambers containing offerings. According to Mayan authority Sir J. Eric S. Thompson, "The finds are the most spectacular in speleological archaeology yet to come to light in the Maya area." Cameras are generally not allowed but with the help of Frank Herceg I was able to obtain permission from the Mexican park officials to photograph the cave. Balankanche is now a public monument. About 750 ft from the entrance is a locked gate and a stoopway through the old Mayan wall. After 950 ft this passage ascends to a roughly circular room with a massive column occupying the center and a ceiling bristling with stalactites. On the column are hand prints in red ochre similar to those seen on the Mayan ruin walls. On the mound at the base of the column are a dozen or more pottery incense vessels as they were left 1,000 years ago, some spiked and others bearing the features of the Toltec rain god, Tlaloc. Other offerings left here include pieces of jade, stone censers, and miniature corn grinders with mullers. In a passage nearby, at the base of a string of thin columns, is an array of offerings of the same general type and a few hundred feet further, near the edge of a lake, is the most extensive group of offerings in the cave. This consists of more than 200 stone corn grinders. The lake extends to more ceremonial areas, some now partially submerged. The lake harbors the completely blind Brotulid fish *Typhliasina pearsei*, a new species described by Hubbs (1938) and closely related to a saltwater species. Another more common blind fish, *Pluto infernalis*, also inhabits the lake along with the rare cave shrimp *Creaseria morleyi*. A less desirable denizen of the cave is the big myriapod *Scolopendra*, with a nasty bite that can be fatal. As we gazed into the lake passage, a single pottery censer with the wide-eyed face of Tlaloc, perched on a small cobble island, stared back at us. Though unique, this cave was a virtual steam bath and we were glad to escape its drenching 80°F atmosphere.

Loltun ("Rock of Flowers"), the first Yucatan cave to be scientifically studied in 1888, was our next destination. Since 1978 parts of the Cave of Loltun, largest in Yucatan, have been commercialized. It is an extremely impressive cave, and as Edward Thompson said in 1897, "In a region more accessible to tourists it would be world famous." We entered Entrada Nahkab ("Beehive Entrance") through a broad arch in a 40-ft cliff draped with vines. On the cliff face to the left of the cave mouth is the most remarkable bas-relief petroglyph I have seen. Marching across the pink and blue limestone wall is a Mayan priest, 9 ft tall, with a grotesque headdress, carrying a spear. Several hieroglyphs have been carved above the speartip. Stone steps led down into a large corridor floored with black humus, dotted with seedlings. The weird contours of a fallen block caught my eye. On closer inspection I found it had been carved into a large human head, with thick lips, wearing a rectangular hat and ear spools. A passage width of 50 ft was quite uniform, but the ceiling often rose into great smooth domes and incredible spongework. Immense stalactites were common, often reaching the floor with little stalagmitic deposit below. The pink to orange-tinted walls were as striking as the speleothems. When I saw the first *haltun* I was immediately reminded of the flowstone-encrusted wooden trough in Haynes Cave, WV (long gone! *YGN* ed.). Haltuns are massive water-catching stone vessels that were carved in the cave and placed under dripping ceilings by the Maya. Scores are scattered through the cave, many cemented to the floor by a thick flowstone deposit. To the Maya, water collected in this manner is "virgin water" and is still used in some ceremonies. At one spot in a side passage, our guide pointed out a shallow pit from which an Indian skeleton had been dug. Nearby we saw the hand prints, great numbers

of them covering the walls, some far above our heads. These appeared to have been produced in a manner similar to those made by Cro-Magnon Man in European caves. A hand was placed against the wall and soot was blown through a hollow reed around the edge of the hand.

After about 1,700 ft, quite suddenly the trunk passage opened upon a big sunlit chamber filled with a blue-green reflection. Shafts of light filtered through the jungle foliage and entered two stalactite fringed skylights 175 ft above the mountainous floor. Thick twisted roots of Alamo trees penetrated the floor from above. Brilliantly colored birds flew from wall to wall, their cries echoing. This place, I was told, was the Rotunda or Inscription Chamber of the Peabody Museum expedition. Petroglyphs covered many walls and fallen blocks. From here a passage led about 100 yds to an almost unbelievable scene: an underground tropical forest also bathed in sunbeams from a skylight. At the north end of this chamber a ladder of saplings led up to a stairway cut into a rock ledge. Above was Entrada Loltun and our exit from the cave. On a ledge where we crossed over to the surface, an archaeological crew had uncovered fossil bones during the previous year. Afterward I inspected these in the museum at Merida and found they consisted of a section of tusk, a fibula, and a molar cusp of a mastodon along with the hoof core of a horse. This Loltun find is one of the few Pleistocene bone discoveries made in Yucatan.

Though I had limited time for exploration in Mayaland caves, I found the few I visited to be quite enchanting, especially because through sheer necessity the early Maya were among America's first spelunkers.

T.A.G. Tenacious Arduous Grim Extension• SISTEMA PURIFICACION

Tamaulipas, Mexico

Texas Caver 25(4):67-68 Hal Lloyd

It had been 22 months since Chris Albers, Warren Anderson, Peter Sprouse and I had discovered the Gonzo Pit in the Fool's Paradise of downstream World Beyond, Brinco. We had originally surveyed as we explored nearly 200 m of virgin passage, which consisted of wet flowstone climbs into emerald pools and canals. Near the deepest point of our exploration, Chris Albers pioneered a 20-m swim below a short climb, which led to the brink of a dark wet chasm, the Gonzo Pit. We estimated the pit at 30 m plus through rockfall. Since we had no ropes, our group exited, climbing out of Brinco after 14 hours underground.

Dec. 28, 1979, Jim Smith and I arrived at Brinco then did a short two-hour trip, including a visit to the Vampire Roost.

Two days later we carried duffel bags containing wetsuits, ropes, bolts, vertigear, extra carbide and food to the Dressing Room, for deep penetration into the cave the following day.

Dec. 31 Jim and I entered Brinco at 5 p.m. and bombed on down to the Dressing Room where we gathered our gear, suited up and then proceeded to the chute. We made our way past many sporting freeclimbs, wades and swims into the World Beyond. We then proceeded downstream to the junction where we separated our ropes (two 100 and two 50). At 300 m plus deep, we arrived at the yawning mouth of the Gonzo Pit.

Jim rigged his 100-ft PMI and I descended first and landed on a spray-lashed ledge 30 m down, 10 m above the bottom. The splashing water (0.7 cusec) lent an air of excitement to the deep virgin experience. Two sporting downclimbs (wet) dropped us into a fine stream passage, which led to a 4-m downclimb. This led to a series of deep pools that required swimming. The passage was 1.5 m wide here, and a flowstone boss spanned the width, yielding a 2-m drop into a deep pool. Ahead, more pools and short flowstone-covered drops of 1 m, 2 m, and 1 m to a 5-m-deep pit (rigged). This drop is dry because the stream is diverted through a hole in the floor, to resurge on top of a flowstone boss. Next a 2-m downclimb leads to Rain Pot, a challenging wet pit. Jim pioneered a traverse over the pit and down the wet chimney crack (12 m) to the rain-blasted bottom. The water splashes into a waist pool, then flows to a 5-m free climb. Below here (we were taking turns pioneering ahead) a 4-m climb down to a 1-m drop into a lake chamber. Beyond, we found a 7-m climb followed by a flowstone face climb, dropping 7 m to a sloping ledge. A 16-m pit was rigged next and dropped us into a wet chamber, with a waterfall gushing out of the dome in the ceiling. This is known as the Pisser.

Ahead we freeclimbed drops of 5 m, 7 m, 3 m, 2 m, 3 m, and 5 m deep separated by wades and short swims. Everywhere, flowstone added intense beauty. Drops of 3 m, 1.5 m, 3 m, 2 m, and 2 m were explored to the next obstacle, the Flusher. Water flows into a 0.5-m-high by 1-m-wide crawl, which slopes down 2 m into a large dome, with a waterfall coming in from above. Down the steep water-pounded flowstone walls 7 m leads to free climbs of 5 m, 3 m, 4 m, 1 m, 1 m, 4 m, 4 m, 5 m, 4 m, 4 m, and 2 m. Ahead, Walrus Pot, a wet 10-m pit into a chamber, was pioneered. We found a dry overflow route which dropped us past Walrus Pot in a series of short popcorn climbs. At this point a 3-m climb dropped us to a junction. One was led to a grand passage with a 5-m-high ceiling, yielding a 15+-m-deep pit, the stream plunging over the edge. We had run out of ropes by this time so we took the crawl route instead. This we named Thorn of Plenty, because of the abundance of sticker-like formations. It consists of climbs of 2 m, 2 m, 8 m, and 3 m. This dropped us into a lake-covered borehole 3 m wide by 5 m high, going both ways. Downstream we swam, side by side, in this wet dream passage, the Canal of Ulysses. After nearly 100 m of swimming we arrived at a point where a 5-m-wide tributary feeds in. This was dubbed Rio Halla. We crossed several gour pools as we progressed downstream in this sculptured stream canyon. A 5-m downclimb leads to a junction. The wet way (unclimbable) looked like a sump, the other a vertical shaft into virgin darkness. We named this pit Enchanted Well as it was the limit of exploration at -581 m (estimate). We returned to Rio Halla and explored upstream to the Ayatullah Sump. Above the sump is a dry borehole which we did not climb. We swam back up the Canal of Ulysses, past where Thorn of Plenty comes in, to a cascade. We climbed on the wall to a natural bridge which spanned the width of the passage (3 m) and crossed over it to the passage

on the other side. The Arch of Triumph bypassed Thorn of Plenty and put us back at just below Walrus Pot. From here we proceeded, exiting after 19 hours underground, and covering an underground distance of 10 km round trip.

We named our discovery the TAG Extension, due to the tenacious, arduous, grim nature of the route.

Jan. 5, 1980, Jim and I left the mountains to return to the U.S. to pick up the third member of our team, Jill Dorman. Jan. 13, we finally arrive at Brinco via lumber truck. Jan. 14, our team entered Brinco with 500 ft of rope to continue exploration down Enchanted Well, After picking up the rest of our gear at the junction at the end of World Beyond, we proceeded to the Gonzo Pit. Equipped with 800 ft of rope, we rigged our way down to Enchanted Well.

Some jughandles provided a good rigging point and backup rig. Jim Rappelled in first, followed by Jill, then me. This 20-m pit took us to the wet flowstone floor, where the stream gushed from the side. Immediately beyond this, a 1-m drop, followed by a 1.5-m climb, led to a deep wet chasm. I descended first on PMI, 21 m down the center of the waterfall. This we unanimously named Huautla Well.

Next, a 4-m downclimb to the top of Aquarius Well, a wet 12-m pit (rigged). The shafts are large, very beautiful and filled with the symphone of crashing water.

Jill led us into a gallery with climbs of 4 m, 4 m, and 3 m to a grand passage containing a 10-m-wide flowstone boss with rimstone gours and sparkling water flowing across it. A 4-m handline drop onto the top of the gours led across to climbs of 5 m, 4 m, and 3 m.

Here the passage split two ways: one dry into a jagged chamber followed by a 15-m drop into a great borehole, the other way a low crawl with all the water flowing into it. The crawl led to where the water funneled into a 1-m hole. This provided us with a nice sporting 15-m drop known as the Drownder. This led to a climb of 3 m over breakdown into the Gallery of the Huns, where we encountered a 2.5-m by 3-m tunnel. This led quickly to flowstone-lined canals. Another stream entered at this point. The passage continued as a 0.5-m-wide crawl with a high ceiling (8 m) which provided us a deep swim, 50 m long. Here a short crawl led to another swim. The ceiling dropped to 8 cm above the water, and for 3 m it was lowair.

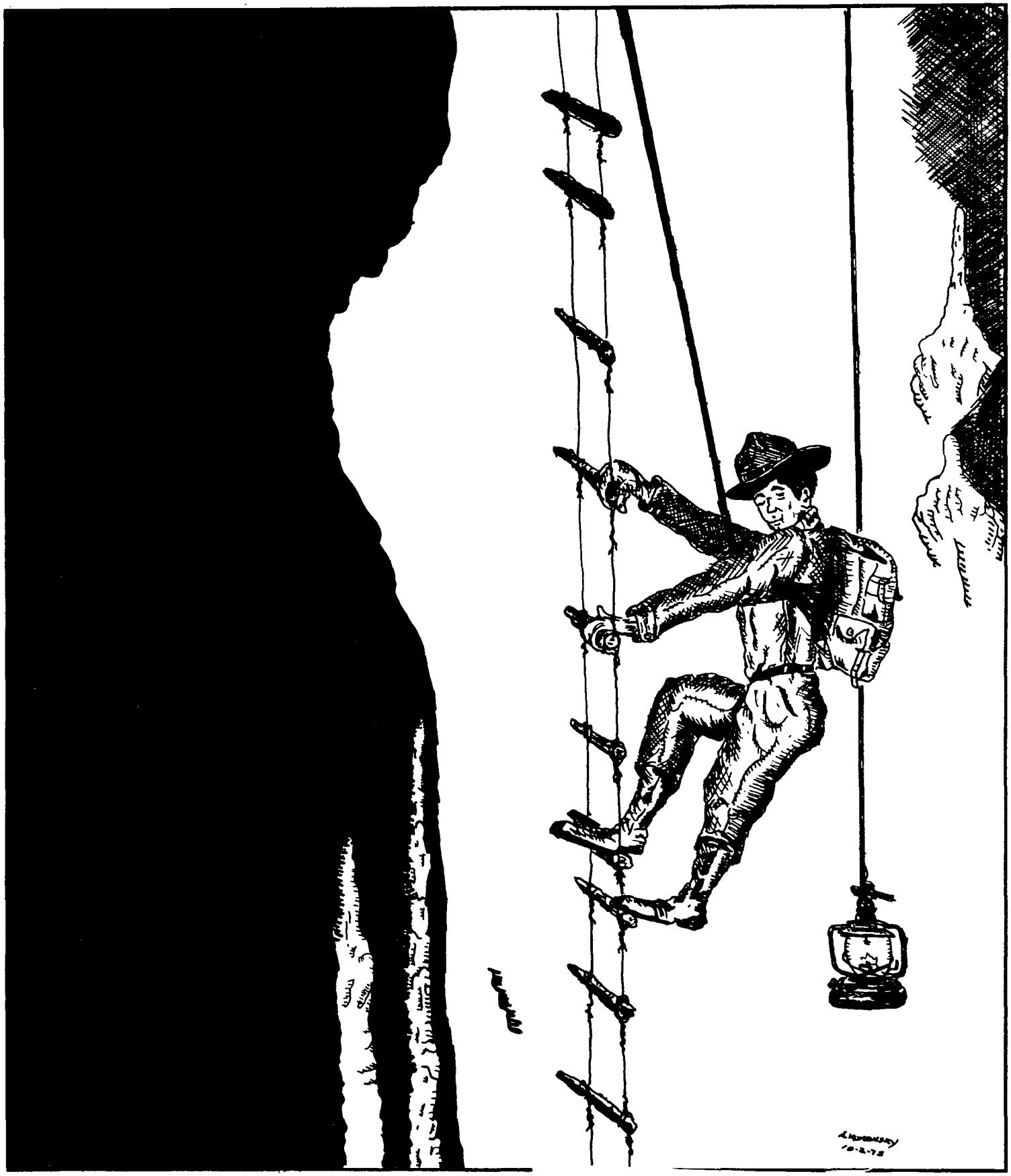
Beyond the lowair, the ceiling rose to 0.5 m, then to 15 m high. The passage here is 6 m wide and leads to breakdown. This we named Bjornson Hall. We continued downstream to a large sump chamber, the Dark Lagoon.

We swam across the pool before Jim prepared to freedive the sump. I belayed from the shore as Jim took a deep breath and went for it. He came back reporting that he had found an airbell. With that we returned to Bjornson Hall and explored an upper overflow borehole. We found it connected to Gallery of the Huns.

We could gaze up with our electrics 20 m and see a route up the wall on resolutional flowstone. Jim led this route which brought us to the junction above the Drownder. We derigged and made our way back to the Gonzo Pit, then World Beyond. We exited the cave after 28.5 hours underground.

We pioneered 2 km of beautiful passage to a depth of 682 m deep, down 55 freeclimbs and 11 rope pitches, in the remote reaches of one of the world's finest deep cave systems.

Equipment & Supplies



Lighting

THE B.A.T. LIGHT

Northwest Caving 10(1):19-20 Phil Whitfield

At the 1978 Carlsbad Cave Management Symposium, Steve Fairchild of Murphys, CA, introduced me to his unique lighting system--three series-connected 2-volt 2.5 amp-hour sealed rechargeable cells taped to the top of a light construction helmet and powering a helmet-mounted Justrite headlamp. Steve's rig was based on a dismantled American Sears 6-volt rechargeable cell which could be purchased separately for $16.95 or with both 120 V. car rechargeable units for $22.95. Depending on bulbs used, the system provided from 0.6 to 2.3 candlepower for up to eight hours, offering brighter, more adjustable, fiddle-free, doourless and sootless light than carbide on shorter trips. Its disadvantages were that the three lead-acid cells, at 6.4 oz (182 g) each, put quite a load on one's mind and could not be conveniently replaced underground when discharged, being almost integral to the headgear.

Bob Brown and I experimented over the past two years, evolving the B.A.T. Mk II Lighting System illustrated herewith. It employs two lead-acid cells taped together, wired in series and housed in a metal Justrite 4-cell battery case cut down to 3½ inches (9 cm), a length sufficient for the 2.4-inch (61-mm)-long cells and spare lamp bulbs. A homemade spade clip on the back of the case slips into a cut-down L-1 lamp bracket mounted on the rear of the helmet, as flush and low as possible to reduce ceiling contact. A 1.5-inch (4-cm) two-strand wire runs from the cells through a slot in the case's upper lip to a standard automotive trailer plug, the other half of which connects by a 12-inch (35-cm) two-strand wire to a Justrite headlamp unit, modified by the addition of another spade clip to fit into another L-1 bracket.

I am still tinkering with bulbs and chargers, but presently use either G.E. #13 or #425 bulbs, the latter of which last better but are slightly less bright than the 13s. The 4-volt battery packs last about eight hours from a full charge and can easily be unplugged and replaced with spare packs *ad nauseum*, depending on how much weight one wants in one's sidepack. About one lb of batteries for 24 hours' reliable, bright light seems reasonable enough to me. The Sears chargers, though designed for 6 volts, will work with 4 volts, though overheating must be watched and some step-down device should ideally be used. I also am charging three packs in series (six cells) on a 12-volt, 2-amp-hour car battery charger quite successfully, though the cells do not quite receive the manufacturer's specified level of 2.3-2.65 volts each with this unit.

To summarize, the features of the B.A.T. light which I appreciate include:

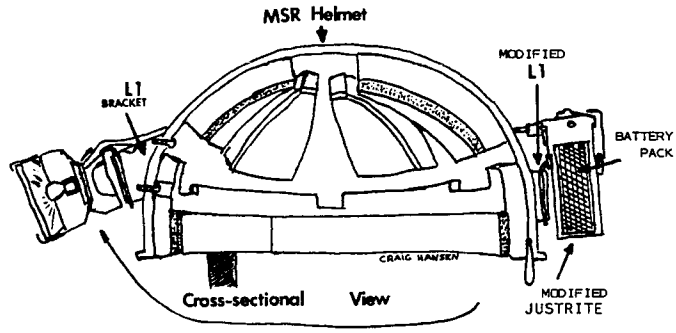
- eight hours of bright, reliable, focussable, odourless, fiddle-free, sootless illumination per battery pack;
- Complete helmet mounting eliminates cord hangups
- Complete helmet mounting eliminates cord hangups and bulky belt packs;
- Rear-mounted 15-oz battery pack tends to keep helmet from slipping forward (unlike a front-mounted 9-oz carbide lamp) without pulling back;
- Electric headlamp can be stowed and battery pack retained as a counterweight if a carbide lamp is used as a backup upon expiry of batteries;
- All lighting can be easily removed if helmet is to be used for above-ground purposes;
- Car charger permits system's use on vehicle-based trips away from AC power sources;
- With cells obtainable at about $4 each, and other components relatively cheap, the cost of the system, excluding chargers, can be quite low.

Detailed specifications on the cells used can be obtained from:

Gates Energy Products 1050 S. Broadway Denver, CO 80217 (303) 744-4806	OR	Robert E. Priebe Co. 2211 Fifth Ave. Seattle, WA 98121 (206) 682-8242

Additional information on electric lighting systems is contained in William W. Varnedoe Jr.'s article, "Some Engineering Characteristics of Small Portable Electric Lights for Caving," *NSS Bulletin*, 1970, 32(4):71-87.

The B A T Light



CONSUMER REPORT - DISPOSABLE FLASHLIGHTS

Disposable flashlights are becoming more and more popular in caving. Good cavers frequently carry them as their 2nd, 3rd, or 4th light source. We have been recommending them for youth groups. I've told novices not to count on them for more than 2 hours light, without really having any proof or practice to back up that feeling. I have used several different brands myself without knowing the differences between them. There is very little written in caving literature about disposable flashlights. Don Davison's S&T column once had an article about the corrosive properties of a Ray-O-Vac. But other than that we have been de-

pending on the disposables without much objective information or testing background.

The lack of usable information and comparison data motivated me to analyze and study them myself, and write this article for our membership and readers, who should have a vital interest or curiosity in the reliability and performance of their light sources.

I will define disposable flashlights as being small, hand-held, inexpensive, pocket-size flashlights that give off enough light to be reasonably useful in caving, and are sealed in plastic cases in such a way that it is impractical to try to replace interior bulbs or batteries, thus are thrown away when their life is gone.

Shopping all over Cincinnati in the last month, I was able to identify and purchase 8 brands of lights. All popular and readily available in the area except #3. I do not claim to have a scientific background, nor do I have equipment to make any sophisticated tests, so the experts among you may consider my statistics and methods non-professional. I tried to be objective and approach evaluation of each brand without any prejudice. I approached this as a consumer trying to analyze and compare the advantages and disadvantages of each brand, to ultimately identify the best ones. I tried to give them fair ratings and selected a side-by-side comparison technique in a number of important measurable areas. The chart has 19 columns, lettered A thru S for reference. These represent:

A. Marked retail cost that I paid for each light not including tax. Cost does vary from store to store, but the price range for all of them is between one and two dollars. Price is not a consideration in the selection as they are all about the same price.

B. Weight measured in oz. in a dry fresh state, as measured on a small postage scale.

C,D,E. Measurements in inches to the closest 1/8 inch, made at the largest points.

F. Not all of these lights point straight ahead. This column is an angle measured in degrees as the light sits upright on its base, with 0° being the base, 180° straight upwards.

G. Country of manufacture or assembly as printed on the unit or its wrapping card, although it was found on internal examination that some of their bulbs or batteries were made in a different country.

H. Name and address of manufacturer.

I. A subjective grade of switch vulnerability. "A" is the best (how well the switch is protected, and how easy it can be accidentally turned on by rubbing against the inside of a pocket or an item in your pack).

J. Subjective grade for the plastic lens that protects the bulb. Some were thin and brittle enough to be easily smashed with a thumb or cut with a sharp object. #5 didn't have any lens, but it was sealed from the bottom to keep it waterproof. The lack of a lens would expose the bulb to mud and trauma.

K. A description of the power pack or batteries, determined after internal examination.

L. A description of the bulb, determined after internal inspection.

M. Candlepower measurement of the light at its brightest initial intensity. Life Lite advertises 100 CP. Figures for the others were guessed at in relationship to that one. [Chris Cubbison furnished additional information.]

N. Time to failure at 55°F in a high-humidity basement. With all 8 lights in fresh new condition, they were turned on and timed, in a continuous fashion, until there was only a faint orange glow remaining, judged to be too faint to provide any beneficial light.

O. "Second life;" 2 days after initial failure (see N.), all lights had a second life, which was also timed and recorded. In the case of the three longest second lives, the light was almost as bright in intensity as its original light when fresh. Thus, the lights still have limited utility even after they are once exhausted. (Tests to determine if they had further lives and the lengths of same were not made.)

P. Ability to function after submersion in a jug of cold water for 18 hrs. When I got them out and partially drained the ones that dripped, all could still be turned on and glowed with a 3rd life, even after this abuse.

Q. Ability to float in water. Three still floated even after being held under water for 18 hrs. Four other samples sank when first put into the water. One more filled and sank within 5 min.

R. Subjective grade for waterproofness. Although the units are semi-sealed, there are some vulnerable areas around the switch and lens, and cracks that allow water in. The grades are based on how much water got inside, was drained out, or was found after internal examination.

S. The last thing I did was break open each unit to look for signs of leaking and corrosion, 2 hrs after they came out of the water. All but three showed some adverse effects which I have noted in this last column. In the three units that had wrapped power packs, the cardboard wrapping soaked up most of the moisture inside the unit and presented a soggy appearance which would be conducive to battery deterioration.

Readers of this article can draw their own conclusions, and pick the light that best suits their needs. As for myself, those who go caving with me will probably see more Life Lites by Garrity in my pack. Even though it is the largest and heaviest, its superior staying power and other features make it the most desirable brand for me for use as a backup light source for caving.

	(A) Cost	(B) Weight	(C) Length	(D) Width	(E) Thick	(F) Angle	(G) Made in	(H) Manufacturer	(I) Switch	(J) Lens	(K) Power unit	(L) Bulb	(M) CP	(N) Time left on	(O) 2nd life	(P) Wet	(Q) Float	(R) WP	(S) Corros
(1) Life Lite by Garrity	1.77	5.8 oz	4-1/2"	3"	1-5/8"	120	USA	Garrity Industries 20 Garland Dr Stamford, Conn 06907	D	B	3 C battr wrapped 4.5 Volt made in France	flange Norelco PR-29 German 9C	60	11 hrs, 45 min	1hr-15min	Yes	Float	C	power pack leaked white liquid
(2) Escort by Ashflash	1.79	5.6 oz	4-1/8"	3"	1-3/4"	90	USA	Ashflash Corp So Norwalk, Conn 06856	F	A	3 C battr wrapped 4.5 Volt England Berec 1689	screw 3.5V 0.2A	95	3 hrs, 25 min	5min	Yes	Sink	D	copper contact dark brown liquid
(3) Wonder by Rally	1.79	4.7 oz	4"	2-5/8"	1-3/8"	150	France	?	A	A	3 C battr wrapped 4.5 Volt	screw 3.5V 0.2A France frosted	60	10 hrs, 5 min	35min	Yes	Float	B	slight gray leak at power pack
(4) Dalon by Wonder Corp	1.09	3.5 oz	3-1/2"	2-1/8"	1-1/8"	180	USA	Wonder Corp Stamford, Conn 06904	C	D	2 C battr standard separate 3 Volt	flange Norelco PR-4 9G1 Hong Kong	40	2 hrs, 50 min	1hr-25min	Yes	Float	A	no leaks or corros
(5) Brite Lite by Ray-O-Vac	1.27	3.1 oz	3-7/8"	1-7/8"	1"	180	USA	Ray-O-Vac ESB, Inc. Madison, Wisconsin 53703	B	F	2 C battr plain long separate 3 Volt	flange N-PR-4 Hong Kong sealed in	40	2 hrs, 15 min	1hr-20min	Yes	Sink	B	no leaks or corros
(6) Eveready by Union Carbide	1.69	2.7 oz	4-3/4"	2-1/8"	1-3/8"	170	Hong Kong	Union Carbide New York NY 10017	D	C	2 AA battr separate 3 Volt	flange PR-4 2.3V 0.27A1	40	1 hr, 35 min	10min	Yes	Slow Sink	D	switch contact corros reflect speckle
(7) Duracell by Mallory	1.29	2.5 oz	4-1/8"	1-3/4"	7/8"	165	USA	Mallory Battery Co Tarrytown, NY 10591	D	C	2 AA battr std Mallory alkaline copper tops 3 Volts	flange N-PR-6 Holland recommend PR-4	45	2 hrs, 20 min	40min	Yes	Sink	D	bulb base corros
(8) Endura by Wonder Corp	1.29	4.8 oz	4"	2-5/8"	1"	120	USA	Wonder Corp. Stamford, Conn 06904	C	A	3 C battr wrapped, 4.5 Volt, France	screw 3.5V 0.2A France	60	10 hr, 45 min	30 min	Yes	Sink	C	no leaks or corr.

The users of disposable flashlights will still want to take only fresh units into caves. Please keep in mind that my results and times were under ideal conditions. Intermittent use will probably extend life; in fact Lift Lite is the only brand that gives a 1-yr guarantee for intermittent use. The lights will get weaker as they are used, and in some of my timing data, the light was getting pretty dim for half of the time period before I finally stopped it as being too dim. Field conditions in actual caving like bumps, mud and dampness may shorten their lives. Also it is not known what storage in a cold or hot automobile may do to their lives. None of the disposables have features that would allow you to attach them to your clothing, hat, or person, although I have seen youth tape two or three of them to their hard hats with rather satisfactory results. One model of Dalon light (#4) does come with a magnetic strip which lets it cling to iron or steel equipment.

The personal investment of purchasing and then wasting and destroying eight perfectly good disposable flashlights just for the purpose of doing this research and article was well worth it to me if it adds to our knowledge of light sources, and makes us all a little more safetly conscious of the pieces of equipment we depend upon underground. I have learned a lot in developing this project and report, and I'm glad to pass the information along to my fellow cavers, so that they too can make practical use of the data.

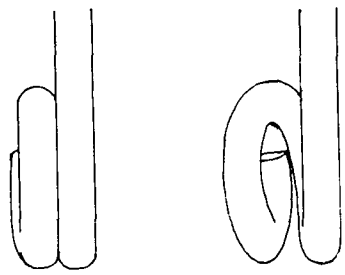
Vertical

MORE WORRY ON THE ROPE

The Huntsville Grotto Newsletter 21(6):40 Eric Batchelder

When designing my rappelling system I made two assumptions: one, the carabiner holding the seat sling to the rack would never fail, and two, the rack itself was as sound as the Rock of Gibraltar.

While at the grotto's annual venture to Fall Creek Falls, I did some changing over from climbing to rappelling and vice versa. When finished, I noticed noticed that the coil on the bottom end of my rack was spread open (see below).



before after

The best explanation that I have come up with is that somehow in my various gyrations on the rope, my seat sling carabiner got flipped onto the topside of the coil. When the carabiner was loaded with my weight during changeover, the carabiner acted as a wedge, spreading the coil open.

I believe I've learned two things from the experience: The first is to avoid damaging the rack by making sure the carabiner is always situated properly, especially during changeover. The second is to make no assumptions when designing a rappelling system and build in redundancy everywhere--even for the rack and carabiner. It makes for less worry on the rope.

MITCHELL RIG MODIFICATIONS

Nylon Highway #12:2 Gary Moss

The addition discussed in this article, though not new, is worth repeating because of its simplicity and resulting improvement of the safety of this popular rig.

The modification involves the addition of a sling from the top Jumar to the seat harness. This sling should be of such a length that it will pull tight when the climber makes the largest step he is likely to make with his top Jumar. This addition allows the climber to be continuously attached by his seat harness to the standing line. This continuous attachment has several advantages:

- Easy to rest in seat. All the climber has to do is take a large step with top Jumar and sit down.
- If the climber is hit by a falling rock, he will slump onto his seat harness rather than slumping into a heap on his heels.
- If the climber's box system fails, he will fall into his seat harness and will not invert and place large loads on his ankles. It should be noted that without the box system, this rig converts into the old Plummer climbing rig. As a result, the climbing box is no longer a critical component.
- The sling going through the climbing box gets a lot of wear when climbing. If this sling breaks, as has happened before, the climber is left with only one point of contact. But if the climber is thumbing his bottom Jumar cam open, as many do for the first 30 ft, the climber will now fall. This very type of fall occurred at the Texas vertical contest. If a sling from the seat to the top Jumar, not the bottom Jumar, were attached, this type of fall could be prevented.

This small addition greatly improves the safety of this very popular rig. Let me also add that in the Mitchell or any two-point rig, an extra point of attachment (a Prusik, Jumar, Gibbs, etc.) is critical to the safety of these systems.

RIGGING AT GOLONDRINAS

SFBC Newsletter 23(9):7-8 Gary Mele and John Tinsley

The traditional trail approaches Sotano de las Golondrinas [San Luis Potosi, Mexico] from the downslope aspect of the perimeter. The literature states the drop ranges from 1,094 ft at the traditional rigging point to 1,235 ft at the high side. Our two 1,200-ft ropes constrained us to select rigging points on the low side. The points we selected are shown in Fig. 1 and include the traditional rig point at "A" and what is a much easier lip to negotiate at "B". The best field evidence marking the traditional rig point is a concentration of several well polished grooves, each about 11 mm in diameter, worn into the edge of the lip. We soon deduced these grooves were formed as 1,100+ ft of unpadded rope was hauled from the pit and dragged over the lip during countless expeditions.

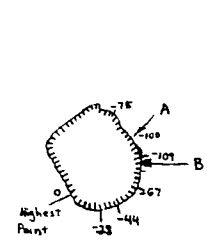


Figure 1
Air view of entrance. Numbers are in feet relative to the highest point.

Fig. 2 shows the traditional rigging point in profile. Inspection of the outcrop along the trend indicated by the rope-eroded grooves reveals a VW-sized rock pinnacle which serves as an ideal primary anchor. After unbraiding the rope, one end was looped three times around the pinnacle, then backed up and secured by a bowline to a hefty herb, an 8-inch diameter tree. The canvas rope duffel padded the lip; eight small pads (gloves, spare parts of pants, etc.) padded the rope at several points around the pinnacle. From the anchor, the rope was routed to the lip through an eroded joint. The free end of the rope was lowered through a Jumar until the primary anchor was under load. The rope, pads and anchors were inspected prior to each descent and each morning to be certain that the culinary preferences of local rodentia had not devoured our margin of safety.

The lip at the traditional rig point overhangs awkwardly. Negotiating the lip *en rappel* was facilitated by a loyal assistant who would haul on a Jumar attached below the lip. The resulting slack enabled one to thread the rappel rack and climb over the lip relatively unencumbered by the 60-70-lb rope dangling below. Once over the lip, you are given control of your descent by your assistant who lowers the Jumar and the weight of the rope onto your gear, as the 60-lb rope becomes a bottom belay. Ascent of the lip was facilitated by using a Jumar and etrier to clamber over the lip after disengaging chest box from the main line, or by transferring to a short rope or "tail" prior to going over the lip. Bill Frantz provided a Teflon-padded leather "bearing" which we used to "grease" the lip during hauling the rope out.

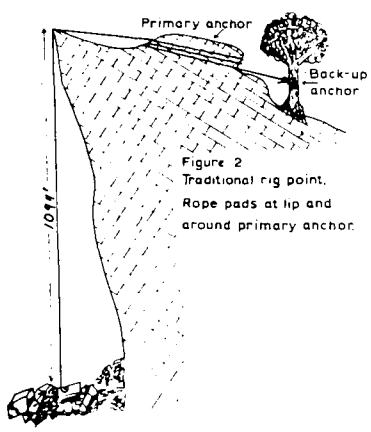
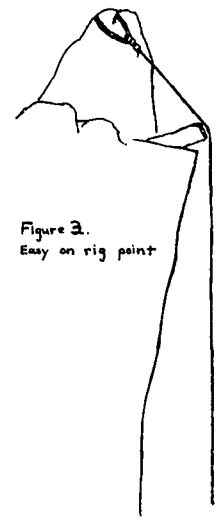


Fig. 3 shows the easy-on rig point. From the lip at the traditional rig point, proceed south around a microbus-sized boulder to a flat inward-sloping solution-hole-filled portion of the lip. At the left extremity of this flat and extending slightly beyond the lip stands the boulder over which the rope passes and beneath which the rope may be approached. A large rooster head located in back of, to the left of, and about 50 ft up from the boulder served as the main anchor point. Two lengths of 1-inch tubular webbing looped twice around the rooster head became main anchor and backup anchor. Various shirts, pants and packs were used as rope pads. We then attached the rope to both slings using a figure-eight knot and carabiners and lowered it into the pit using a figure-eight descender for additional friction.

The flat lip of the pit passing beneath the overhanging boulder allowed access to the rope beneath the final rope-rock contact. Rappellers positioned on this shelf used a Jumar-wielding assistant to carry most of the weight until a rack could be attached. After the assistant lowered the rope, rappellers slid from the shelf, removed the Jumar lifter, and descended into the pit. To exit the pit using this rope, climbers clipped into a separate safety from above and detached ascending gear while transfering body weight to the shelf.



CAVEPROOFING PHOTOGRAPHIC STROBES

SFBC Newsletter 23(10):7-8 Bill Frantz

Have you ever had the experience of taking your photo gear out of the ammo can, turning the strobe on, seeing the ready light come on, and not being able to get it to fire? The camera won't trigger it and neither will the open flash button.

This phenomenon is usually due to moisture affecting a part of the strobe called the "trigger transformer." This part takes the small pulse of electricity from the camera contacts, and converts it to a pulse of several thousand volts which causes the flash tube to fire. When moisture gets into the circuitry, this high-voltage pulse is shorted out before it gets to the flash tube.

There is a fairly simply "fix" for this problem: pot the trigger transformer in epoxy resin. I did this to a Vivitar 151 about four years ago and it has not shown the failure mode described above since. I have just performed the same operation on a Sunpak 411 which showed the failure mode and it appears to have cured it also.

Here is how you do it:

1. Take the cover off the strobe, being careful not to lose any parts or break any wires. If the strobe has a swivel head for bounce flash, the trigger transformer may be located on a small auxiliary printed circuit board next to the flash tube. The Sunpak 411 is built this way; all that is necessary for access is to pop the back of the swivel head off by gently prying at the small crack on the back of the head near the swivel.

2. Locate the trigger transformer on the printed circuit board. See Fig. 1 for an example. The trigger transformer is normally a small core wound with fine wire. It may be identified by noting the direct connection to the trigger lead of the flash tube (Fig. 2) and the four wires coming from it.

3. Build a form around the trigger transformer to keep the epoxy from running over the whole inside of the strobe. This can be done by taking a small piece of polyethylene (a piece of an ordinary plastic bag will do) and carefully wrapping it around the trigger transformer, leaving an opening at the top to pour the epoxy resin through. Secure it with tape. Allow the epoxy resin to flow down the trigger transformer wires onto the printed circuit board in order to insulate them, too.

4. Mix up epoxy resin according to the directions on the package. It should not take too much to cover the trigger transformer.

5. Pour the epoxy resin into the form around the trigger transformer.

6. Let the epoxy resin set up (see directions on package for setup time).

7. Remove excess portion of the polyethylene form. Be careful not to break any of the fine wires. If some of the polyethylene is left in the strobe it will cause no harm, so consider just cutting off the excess.

8. Reassemble the strobe and you're done.

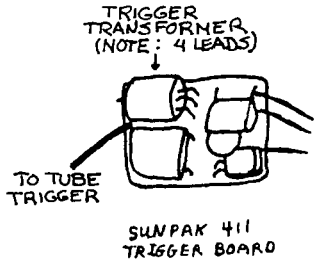


FIGURE 1

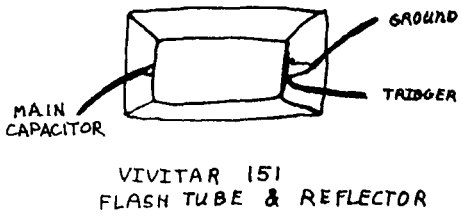
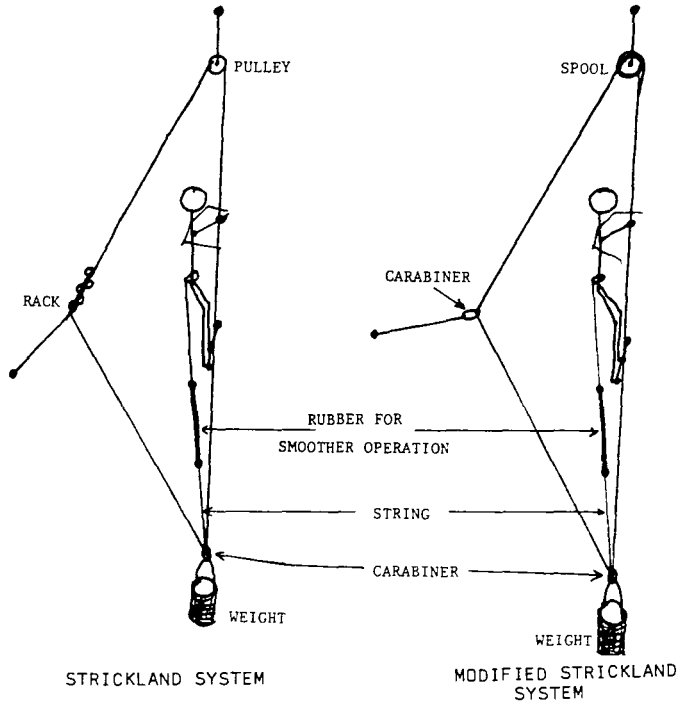


FIGURE 2



A CLIMBING PRACTICE SYSTEM

Nylon Highway 13:6-8 Dick Graham

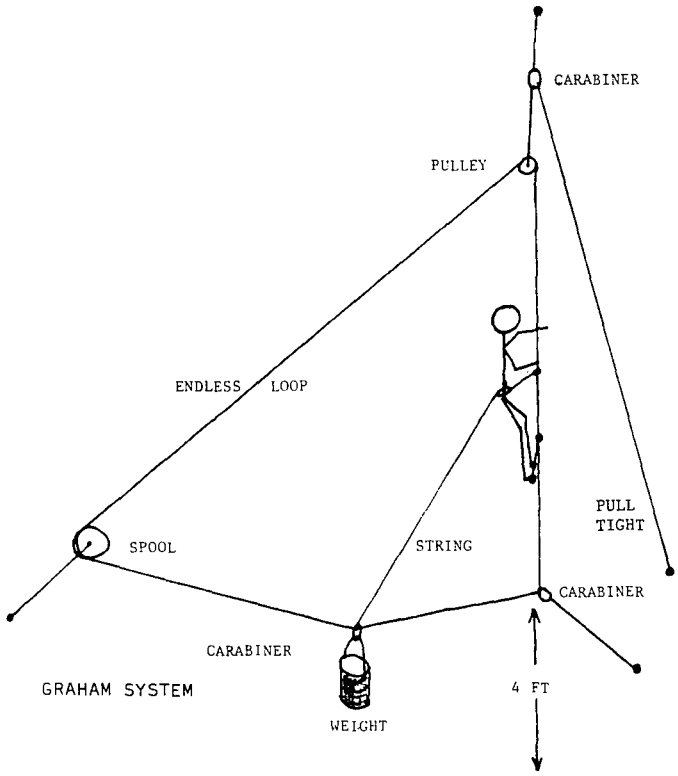
Since the nearest pit I can rig is five hours away, I have for the last two years been keeping in shape with an endless loop climbing system inspired by Darrel Tomer (see *Nylon Highway #10*). The essential differences between his system and mine are:

1. a friction device to absorb energy rather than a piston machine; and

2. an unsafe but very thin and flexible splice in the loop of rope.

A weight is adjusted to hold the climber stationary; when the climber stops, the rope stops. As the climber climbs faster, he moves upward, pulling the weight up; as the weight moves up, it allows the rope to move faster. Thus the climber can climb at any speed. This system maintains the climber at a constant height rather than maintaining a constant rope speed as the original Tomer system does. (I understand that Darrel has modified his system to incorporate an automatic variable speed control.)

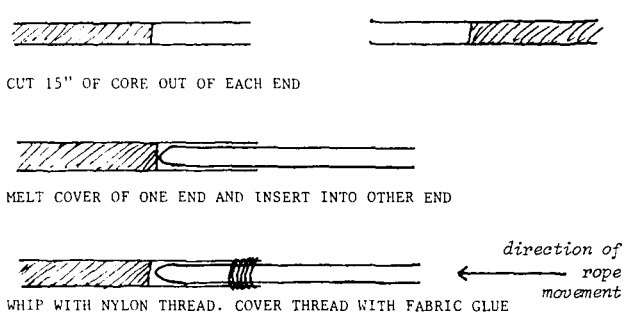
I demonstrated my system during the vertical contest at the 1980 NSS Convention and described it at the Vertical Session there. Afterwards, Pete Strickland described to me a system he had used, which was like one described by Tomer. It is similar to mine but uses fewer attachment points. Pete said he had used the system and it worked well except that the splice tended to hang up in the rack. I tried a rack with similar results, even with a smooth splice. I replaced the rack with a spool having a diameter of about 2½ inches; this I placed where the pulley was in the system Pete described, which I call the Strickland system for easy reference. This modified Strickland system works more smoothly than my original system and is much easier to assemble.



OPERATION:

1. Set up loop in a triangle, as shown (10 m is a good length).
2. Apply proper friction in friction device (this requires experimentation).
3. Pull on rope supporting pulley (about 100 lbs force) to tighten loop. This step applies only to the Graham system and is essential to it.
4. Put weight on rope. A bucket of stones is convenient and easy to adjust.
5. Attach string from weight to climber.
6. Climber begins to climb.
7. Adjust amount of weight (10-25 lbs) so that climber just barely reminas stationary.
8. Adjust length of string to maintain climber at desired height from ground.

I am not providing any information on the design of my spool, because I am far from satisfied with it.



ENDLESS LOOP SPLICE

DIAPER SEAT SLING SAFETY

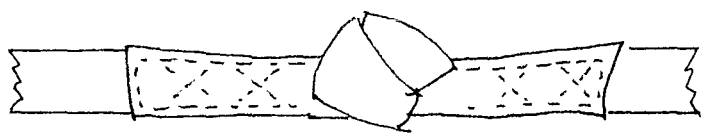
Northwest Caving 10(2):18-19 Joe Fackler

An incident occurred this year which could have been much more serious had not presence of mind and/or traning saved the day and/or caver.

A caver was climbing (using Jumars) at the 110-ft pit below Jabberwock Jump in Canada's Nakimu Cave. Approximately 35 ft from the top, his seat sling came completely untied. He was able (with some difficulty) to retie it and continue the climb.

Several things contributed to his competent handling of what could easily have been a disaster. First First, he was not hanging in a waterfall. Elaboration on that point should be unnecessary. Second, he did not panic, due (according to the caver involved) to training he had received in emergency procedures and single rope techniques. Third, his ascent system, like most in use today, had him securely attached to the rope in three places.

If you are using a tied "diaper" type of seat sling or any other tied sling, CHECK THE KNOTS each time you use it. If you do not trust knots alone, you might consider stitching the loose ends of the knot to the sling (as shown below), giving extra security.



If you are using a stitched seat sling, make sure you check the stitching on a regular basis--even if you are using a commercially produced sling. If you sew your own (Simplicity Pattern #926), use a [nylon] thread of a different color from the sling material, to make inspection easier.

When purchasing seat sling material, buy it from a mountaineering shop, [a caving supplier] or a good outdoor shop. Avoid "seat belt" webbing [for tied slings]. There is a type of material on the market that makes the old reliable water knot useless! When tightened by having two cavers pull on it at once, it was easily loosened by gently pushing on the material.

Not good! No, sir! Uh-uh!

Now that we have covered some specifics, a general safety message directed at the more "experienced" cavers:

DON'T GET SLOPPY!

Check the rigging of pits carefully. Have someone rig and someone else check. Check each other's gear, before climbing or descending.

"SNAKE FIGHT" ROPE COIL

Bill Bourdillon
VICEG NEWS 10(1):2

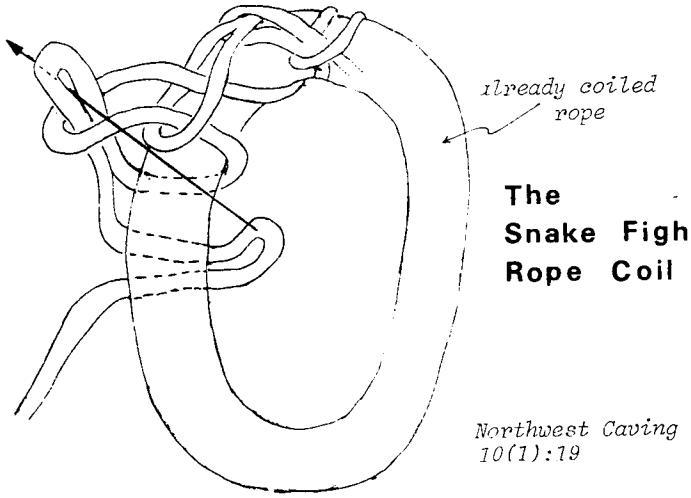
The picture says it all! The coil probably has a proper, more flattering name, but Woods and Whitfield agreed that "snake fight" was most suitable. Far from being the hopeless tangle it looks, the snake fight is essentially a method of daisy-chaining a rope around a basic one-loop coil by alternating the chain loops side to side on the basic coil. The result is a surprisingly tidy, tight coil which unravels effortlessly and totally without snarls with only light pulling on the outside end. This characteristic enables it to be paid out smoothly and rapidly or lobbed completely down a pit. Whatever is left on the coil when the rope stops paying out remains firmly coiled--an ideal quality on a pit with several ledges or hitching points.

Coiling a long snake fight does take a bit longer than other coiling methods and it is most easily handled by two persons, one chaining while the other holds and slowly rotates the basic loop of the coil. (I had intended to diagram this system, but being a rather poor artist, I gave up after two hours.) The technique has been demonstrated fairly widely, so until a diagram is available, interested persons should try asking around with VICEG members; someone should remember!

In my opinion, the disadvantage of longer coiling time is more than outweighed by the advantages of tangle-free uncoiling, which include the possibility of using only a portion of a long rope without ruining a huge coil. The snake fight works best on soft ropes (Blue Water III) but seems to suit stiffer brands like PMI [regular] if larger chain loops are used.

Perhaps the strangest thing about the snake fight is how it came to us via Ranger Brian Goring at Hawaii Volcanoes National Park, who saw it used on the TV adventure show "240 Robert"! Who says one can't learn good things from television?

In the photograph, Phil Whitfield is wearing the snake fight rope coil.



The Snake Fight Rope Coil

Northwest Caving 10(1):19

DOUBLE BUNGY GIBBS ASCENT SYSTEM

SFBC Newsletter 23(12):6-7 Kathy Williams

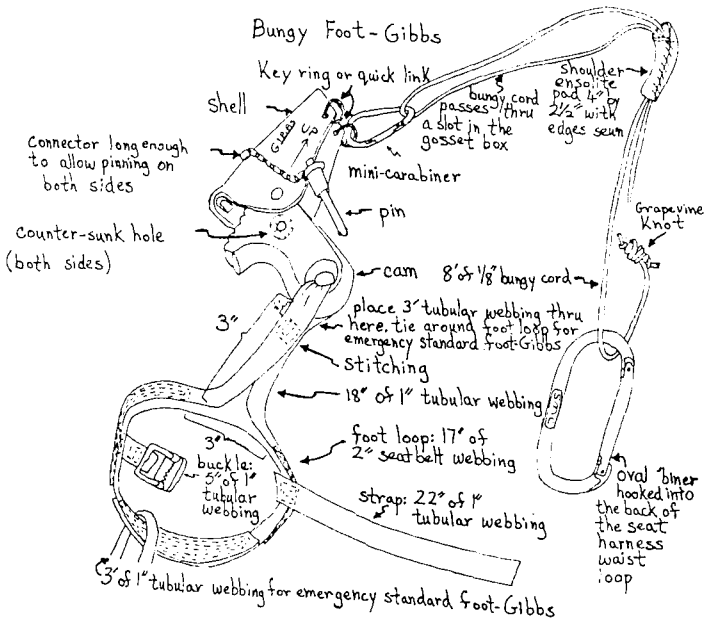
The double bungy Gibbs ascent system is of great use to people who want to ascend solely with leg power power and who have experienced their ankle turning and spraining from the standard foot-Gibbs during ascents greater than 500 ft. The ascent system consists of a bungy foot-Gibbs, bungy knee-Gibbs, chest Gossett box, and a Gibbs (use the spelean shunt from your descent system) riding on the Gossett box and connected to a seat harness. I've modified the bungy foot- and knee-Gibbs to be used on either foot so that uncomfortable stress can be alternated.

Since all the ascent system is standard except for the bungy foot-Gibbs, I'll describe only the bungy foot-Gibbs in detail. I'll begin with modifications of the ascender. Both sides of the cam pin hole should be countersunk to allow easy engagement of the pin from either direction. The pin will knock against your leg if it is pinned through the wrong side. Be sure the connector (parachute cord is good) from shell to pin is long enough to allow pin emplacement from either side. Place a small key ring or quick-link through each small hole at the top of the shell so the bungy cord can be hooked to the side that gives the best angle during climbing. Hook a minibiner through the bungy cord so the ascender can be clamped to the rope before clipping the spaghetti-like bungy cord to the key ring of choice at the top of the shell.

The bungy cord should be about 8 ft long, and 1/8 or 1/4 inch in diameter, tied with a grapevine knot to make a loop. It goes from the minibiner hooked to the key ring atop the Gibbs shell, through one of the Gossett box slots, over the shoulder to a carabiner hooked to the back waist loop of your seat harness. (The knee-Gibbs bungy cord needs no Gossett guidance.) Make a pad for your shoulder where the bungy cord presses in by cutting a 4x2½-inch piece of Ensolite and whip-stitching two edges together with a hand stitcher. The doubled bungy cord can be pushed through the tubular pad and positioned at will.

The Gibbs ascender is connected to the sewn foot loop (about 17 inches of 2-inch seatbelt webbing, overlapped 3 inches) fitting your largest caving boots by 1-inch tubular webbing threaded through the Gibbs cam and sewn on either side of the foot loop spanning 3 inches from the top of the foot loop to the bottom of the Gibbs cam (use 18 inches of tubular webbing). Start stitching the tubular webbing that goes through the Gibbs cam to the foot loop 1½ inches down the side of the foot loop from the top center of the foot loop, which allows the cam to move to the side of your foot closest to the rope while your weight is supported equally by all parts of the foot loop, thus eliminating the problem of the foot being turned to one side. Sew the doubled webbing together ½ inch below the Gibbs cam so that if the bungy cord breaks, a 3-ft piece of 1-inch tubular webbing can be threaded through the space between the cam and the stitching and tied around the foot loop, creating the standard foot-Gibbs. For a chicken loop, sew on a strap (22 inches of 1-inch tubular webbing) and a buckle (with 5 inches of 1-inch tubular webbing) on each side of the foot loop and fasten around the ankle.

That's all. The double bungy Gibbs system makes rope-climbing easy in free-fall pits.



ROPE PADS

Cleve-O-Grotto News 26(4):32,34-35 Tom Johnson and Bill Foot

When planning a vertical caving trip, get any available information you can about the pit or pits you will encounter. This will provide valuable input to determine the amount of padding, if any, which may be required.

Some of the more commonly used rope pads are duffel bags, garden hose, and carpet.

If your rope is being carried to the cave in a duffel, many times that will serve as the pad for your first pit. When placing the pad, make sure it is securely tied off to avoid its slipping from the area requiring the rope protection. To secure rope pads, ½-inch nylon webbing or ¼- or 5/16-inch nylon rope are excellent. Try to avoid using the rope itself as a tie-off point. This will be discussed more fully below.

A second type of rope protection is garden hose. A length of 3/8- or 7/16-inch I.D. hose can be split lengthwise and the rope then laid inside the hose. When using this form of protection, keep the following points in mind:

- Since the hose is normally not anchored, it may slip from its desired position--especially if larger-I.D. hose is used.
- When rappelling, you must place the hose after you have passed the point needing protection since obviously the hose will not pass through the rappel rack.
- When ascending, especially with Gibbs or Pru-Prusik knots, you must remove the hose or push it ahead as you climb. At best, this presents an inconvenience and at worst, a hazard, by removing the protection before the climber has passed this precarious point.

• Finally, consider the difficulties of moving the hose by the first climber if climbing in tandem.

Probably the most widely used rope pad is carpet. A major feature, as with duffel bag padding, is that once the pad is placed it does not have to be moved while rappelling or ascending. Additionally, carpet can be cut to any desired size. Although it is tempting to make rope pads narrow to reduce weight and facilitate handling, the width must be sufficient to insure the rope will not slip off to the side during rappel or ascent. We find that pads 1-1½ ft wide are satisfactory.

Requirements of rope pad lengths will vary greatly; consequently, an optimum length cannot be recommended. We find that pads about 3 ft long will do for most situations. If more than one location in a pit requires padding, then simply use additional pads. This saves carrying extremely heavy and bulky pads which will seldom be required.

After the pad has been cut to size, place one or two holes at the narrow end of the pad. These holes should be at least 2 inches away from any edge to reduce hole-tearing on the pad. Next, attach a 15-20 ft length of ½-inch webbing or small nylon rope to the pad. The longer the line, the more flexibility you will have in placing and anchoring the pad.

Whenever possible, we prefer not to anchor the pad to the rope because it can add difficulty in beginning a rappel or completing an ascent. If anchoring the pad to the rope is the only alternative, tying off as close to the rig point as possible will minimize these difficulties.

One final note on carpet pads. The friction of nylon surfaces in contact with each other can cause abrasion [glazing] to your caving rope. Therefore, if you are using nylon carpet as a rope pad, we recommend the carpet back be in contact with the rope rather than the nylon surface.

NOTE: The ½-inch webbing and small nylon rope mentioned in this article are not safe as the primary rope for rappelling, ascending or free climbing. Never rely on these lines for any form of direct personal protection around pits.

A WEAK SPRING ON SOME 1979 JUMARS

The Spelean Spotlight 9(11):9 Tony Mulbrecht

It was correctly reported at the last meeting that some 1979 Jumars had a weak safety catch spring. The defective spring under load deforms and rotates, allowing the safety catch to self-release, which can cause the Jumar to slip or come off the rope. Only a few Jumars were found to be in this condition. The problem can be corrected by replacing the spring.

A weak spring apparently is not detectable by looking at it. Allen Padgett, chairman of the NSS Safety and Techniques Committee, gave me this procedure as a way of checking the spring:

Take the safety trigger, rotate it down, and tie or tape is in this position. If it is defective, in 24 hours the spring will snap out of correct position. An alternative to testing the Jumar yourself would be to return it to the place of purchase and let them have the proper people check it.

INEXPENSIVE CAVE REGISTERS

Speleonews 24(4):66-67 Trick Howard

For years cavers have gone to a lot of trouble installing and keeping up with cave registers. They serve several useful purposes, most notably keeping a log of traffic in the cave. The expense of installing a register has been the main drawback. The usual register found in a TAG cave is composed of a piece of steel or plastic (PVC) pipe with capped ends, one of which is fastened to a length of steel chain bolted to a wall, while the other unscrews to permit access to the paper and writing utensils inside.

Having recently moved into an old farmhouse in Marion Co., I planned to put 15 or so registers in the more popular county caves. After a visit to the local hardware store, I realized that to install 10 registers of the usual style would cost approximately $60. Forget it!! There must be a more inexpensive way. Maybe something around the house... Try this:

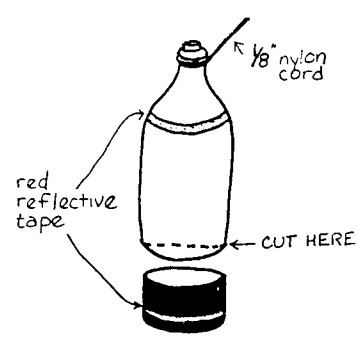
Necessary items: one 2-liter plastic drink bottle, three sheets Mylar, two pencils, 3 ft of 1/8-inch nylon cord, two strips of red reflective tape.

Instructions:
1. Rinse out bottle, screw cap on tightly, pull the black bottom off the jug (by twisting).
2. Cut bottle open (see diagram) so a person can reach fully into the bottle--but leave enough so the black bottom fits back snugly.
3. Finish with red reflective tape around top and bottom, write cave name on bottle with a large Magic Marker (you can easily write on the residue left when you remove the label from the bottle), and tie the nylon cord around the neck to hang it by.

Putting Mylar inside the bottle is by far the most expensive part of the operation I use it only for the wet caves.

This type of register has two benefits: it eliminates useless trash (the bottle), and it is CHEAP! The whole thing can be "decked out" for less than $2 (less than 50¢ if you use paper instead of Mylar). It solves the problem of people stealing the register containers because (1) who would want to steal the thing? and (2) if they do get stolen, who cares? You can make another one in 10 minutes!

To date we (David Bradford, Linda and Brenda O'Dear and several others) have installed six registers in the deep darkness of Marion Co. Please look for them, sign them, add comments, whatever...



A SIMPLE QUICK-RELEASE CHEST BOX

Carbide Dump 21:2-3 Karl Koon

Are you tied of turning wingnuts to attach or detach your chest box from the rope? Do you long for the virtues of a quick-release box?

If so, here is a simple method of converting a Blue Water box to a quick-release variety. The idea is simple. Just introduce a removable spacer in front of the box, between the aluminum channel and the wingnuts. The necessary clearance on the sides for the rope is thus gained by removing the spacer.

Once the rope has been inserted, just replace the spacer and secure it to make sure the rope remains in the box. The assembly method I use is almost as simple as the idea.

Hardware Needed: • Two ¼x3-inch plated bolts with approximately 1 inch of thread

• One piece ½x2x4-inch dogwood (Dogwood does not have a dominant grain which could easily be split.)

• Six inches nylon cord

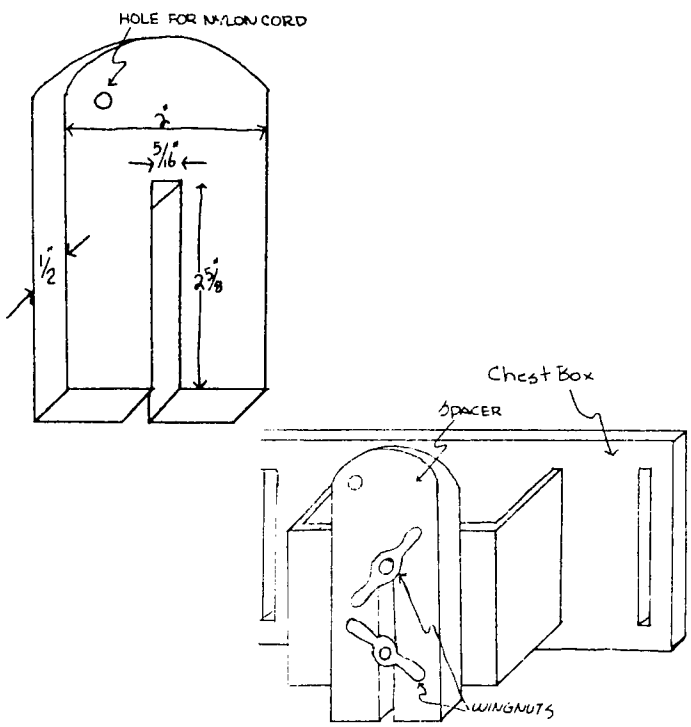
Instructions. Cut the dogwood to the above dimensions. Cut a notch 5/16 inch wide and 2-5/8 inches long up from the bottom of the wood. This notch will allow the wood spacer to pass over the bolts holding the box together.

Drill a small hole in the top of the spacer to secure the spacer to the chest harness.

Boiling the dogwood in linseed oil is recommended to prevent it from cracking and to harden it. The spacer will thus become hard as steel.

Now remove the bolts supplied with the box, keeping the wingnuts. Replace these with ¼x3-inch plated bolts and screw the wingnuts on the end.

The spacer is thus secured by tightening the wingnuts against the spacer. It takes merely a turn or so of the wingnuts to allow the spacer to be removed and the rope to be inserted into the box.



THE 1979 JUMAR

SOME CHANGES HAVE BEEN MADE

The Northeastern Caver 11(2):37 Robert Jefferys

As members of the 1980 Rio Iglesia Expedition, we each received a new pair of Jumars to review. While the classic ascender has retained the basic original design, there have been some significant changes.

First, both the body and the cam have had heavy structural reinforcement. The new strength is reflected in the company's claim of a 1,100-pound test strength. Anyone who has heard the horror stories about Jumar frames fracturing partway up a rope climb will be glad to hear this news.

Looking closer at the cam, there are now fewer teeth and they are taller. This may not be fore the better, since several team members noticed the lower ascender would occasionally stuck when using either a Mitchell or Texas system. This might be just a break-in problem, though. Another notable refinement is the carabiner hole at the base. This is a sorely needed feature overlooked on the old model.

Next we come to the infamous plastic safety lever, which has also been revamped. It now has three catch positions to hold the cam open. The literature that the Jumar Co. provides never does spell out why they have multiple positions, but I suspect at least one is for use as a safety rappel device and another for speedy rope attachment.

Most Expedition personnel quickly found this to be a dangerous situation and filed off the first two catches. After making this minor alteration, the new Jumar 79 becomes an indispensable tool for every vertical caver, regardless of what climbing system he uses.

The Jumar still remains unbeatable for its ease of use. The ability to manipulate it with one hand makes it extremely versatile. They are good for crossing knots fast. With its new higher tested strength, it has become a more attractive safety cam for working around pit lips and on freeclimbable rope drops, etc.

Cavers should take a lesson from their rock climbing brothers who perished while seconding a traverse on a fixed line. A Jumar used on a horizontal line should have a carabiner rigged at the base and attached to the line. This keeps the ascender running parallel to the rope and prevents it from twisting off when loaded. Field tests by the AMCS* have ciation for Mexican Cave Studies] have shown that a Jumar rigged this way will catch if either end of the main line breaks. This is certainly reassuring news.

So, despite the inflated price, the Jumar 79 looks like a good deal.

EASY WASHING OF A 600-FOOT ROPE

SFBC Newsletter 23(7):7 Kathy Williams

Tools: Two ice chests (standard size), rope washer, hose, ladder.

Feed all of your 600-ft rope into one ice chest.

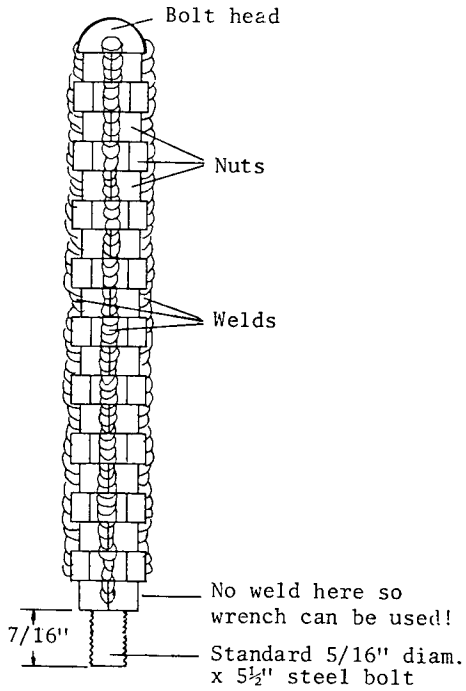
Fill the ice chest with water. Insert the free rope-end through the rope washer so that water sprays toward the rope-filled ice chest. Pull an arm's length of rope back and forth through the rope washer about three times, depending on the filth factor of the rope, and then feed the rope into the second ice chest. The rope never touches the ground...

Once you have pulled the entire rope through, set up a ladder in a shady corner of your garage and bring over the ice chest filled with rope. Place a wad of rope on the lowest step and on each successive step upwards. The rope will be dry in about three days and will not be tangled.

SOME NEW FACTS HAVE COME TO LIGHT

The Northeastern Caver 11(4):83 Robert Jefferys

Some new facts have come to light since I wrote "Some Changes Have Been Made" and mailed it off to Toms Smith from the Huautla Post Office. Shortly afterward, we returned to Li Nita to look for a connection. It was during a marathon run to Mil Metro Room (Thousand Meter Room) that Dino Lowrey was horrified to find that the safety latch on the single Jumar she was using lay limp and useless. Back at Camp I, close inpsection revealed a broken spring to be the culprit. Then in Austin, Hal Lloyd, who had just left the expedition, eerily related a similarly harrowing story. It was clear now that there was a serious problem, if two out of a batch of 12 had the same defect. Apparently we were not alone, as Eastern Mountain Sports has now issued a recall on all Jumar 79's they sold and will replace the springs free of charge. For all others, you should consider purchasing the parts from your favorite cave supplier and replacing them.



LIGHT DUTY BOLT DRIVER

The Texas Caver 25(6):115 Roger Bartholomew

A convenient bolt for attaching ropes to a rock wall is the self-drilling anchor made by Philips Drill Co., Michigan, IN. Briefly, it is a 15/32-inch-diameter cylinder, about 1¼ inches long, with a hole through the center. One end of the center hole is threaded to accept a standard thread 5/16-inch-diameter by ½-inch-long bolt. The other end has hard steel teeth which do the drilling.

The self-drilling anchor does not drill its own hole. It has to be attached to a device called a "driver" which is a solid metal cylinder about 6 inches long having a 5/16-inch threaded section on one end. The toothed end of the anchor is placed against the rock and the driver is alternately struck with a rock hammer and rotated until the 1¼-inch-deep hole is made in the rock. During the process, the hole in the rock and the center hole in the anchor have to be periodically cleaned of rock dust. When the hole is deep enough, a tapered pin is pushed into the toothed end of the anchor, the whole assembly is placed in the hole and the driver is struck several times. This causes the tapered pin to split the edge of the anchor and expand it against the walls of the hole in the rock. After the anchor is so set, the driver is removed and a carabiner hanger is attached to the anchor with a standard 5/16-inch diameter by ½-inch long bolt.

The bolt driver which is sold commercially for the anchors is a bulky and heavy object for the cave pack. A thinner and lighter one can be easily made if one has access to a machine shop. However, most people do not have such access and in some cases have used a standard 5/16-inch diameter by 5½-inch-long bolt for a driver. This substitute is very thin and is very easily bent by the driving operation. A more robust substitute can easily be made with a minimum of tools.

Purchase a standard thread 5/16-inch-diameter by 5½-inch-long bolt which is completely threaded over its whole length. Then purchase a sufficient number of steel nuts to thread on the bolt leaving just less than ½ inch of thread showing on the end. Then stop off at a welding shop and have four welds made down the length of the driver to hold the nuts in place and to stiffen the driver. Leave two flat surfaces on the bottom nut free of the weld to allow the use of a wrench to remove the driver.

This driver will hold up only for light duty bolting and will be low in weight and small in volume. Upon occasion it may bend slightly but this can be remedied by laying it on a rock and straightening it with several blows from the rock hammer. The details of construction are graphically presented in the diagram.

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Biology

CAVES AS ISLANDS

North American Biospeleology Newsletter 20:1-2 — Rod Crawford

[Abstract of a paper presented at the North West Regional Association Symposium on Cave Science and Technology, Feb. 16-18, 1980]

Caves as Islands: A False Analogy?

Culver (1970, 1971) has suggested an analogy between caves and islands, based on a study of the distribution of four species of aquatic crustaceans in the caves of the Greenbrier Valley, West Virginia. Culver's analogy has been cited many times and is widely accepted by American cave biologists. I suggest that, at least for groundwater animals such as those Culver studies, there is little similarity between caves and islands.

An island is a patch of favorable habitat surrounded by a barrier to dispersal (e.g., land sur-oun rounded by water). There is much evidence that for groundwater organisms, interstitial groundwater is the primary habitat whereas the open and accessible waters of caves are only marginally habitable. This is true even of large animals such as the European cave salamander *Proteus anguineus*. For this groundwater fauna, a cave is just the reverse of an island. Dispersal barriers do, of course, exist for groundwater fauna, but seldom correspond to the boundaries of caves.

This is not to say that some caves, with unique features such as hot springs, may not be island-like for that reason; or that caves may not serve as islands for obligate trogloxenes such as some bats and camel crickets which need the access to the surface which a cave entrance provides.

* *

North American Biospeleology Newsletter 21/22:3 — David Culver

Two things prompted me to write. First, I am in the process of writing a book on the evolutionary ecology of cave faunas [Culver, David C. *Cave Life: Evolution and Ecology*. Harvard University Press, Cambridge, MA. 189 pp. 1982]. I would appreciate receiving preprints and reprints from Biology Section members on ecology, genetics, evolution, and adaptation of cave organisms.

Second, I would like to respond briefly to Rod Crawford's critique of the caves as islands analogy. I agree that for many species cave waters are marginal habitats. I think the eastern species of *Stygobromus* are instructive in this regard. In the Greenbrier River drainage there are four species: *emarginatus*, *spinatus*, *mackini*, and *pollostus*. I think it is clear that cave waters are a marginal habitat for *pollostus*. It is found only in small drip pools and then only sporadically. On the other hand, *emarginatus* and *spinatus* have large, persistent populations in cave streams, and thus cave waters are not marginal. In West Virginia, *mackini* is like *pollostus*, although in the Clinch drainage in Virginia, it too forms large permanent populations in caves. The real question is whether *emarginatus* and *spinatus* are also common in non-cave phreatic waters. The evidence here is ambiguous. They have only been found outside caves once: in an excavated spring. On the other hand, aquatic species show no area effect (Culver, Holsinger and Baroody, 1973, *Evolution*), suggesting high migration rates. For terrestrial species, the analogy is more appropriately with small mammals on mountain tops in the Great Basin and oceanic islands rather than continental islands.

SCORPIONS

Only a well conditioned person can turn over a rock, see a scorpion scuttling for cover, and not jump back with a small start.

Of the creepy-crawlers in this world, the scorpion rates among the creepiest. Surrounded by wives' tales and misleading information, a common human reaction to a sighting is fright.

In truth, the scorpion is a useful member of the scientific family *Arachnida* which also includes spiders. Other relatives include the crab and crayfish.

Over 600 different species inhabit the warm regions of earth, and they go back a long time in earth history. Fossils of early scorpions have been dated at more than 400 million years old.

Three species are found in Oregon. The mordant scorpion has a dark shell, or carapace, and measures about two and one-half inches long. This species is found on the coast and other moist areas. The northern scorpion is found throughout the state. It is smaller than the mordant and is colored yellow-green. Another yellowish variety, the spotted scorpion, may occasionally be found in the state.

The scorpion has a shell covered, segmented body, eight legs and strong pincers. The major identifying trait of the scorpion, and also the source of fear and legend, is its tail.

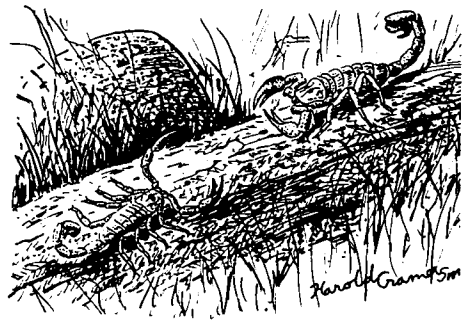
Scorpions are poisonous. They sting their victims by arching the tail over their body and delivering poison. While an African variety has a venom as strong as a cobra's, most scorpions are relatively harmless to man. The sting of the Oregon species is comparable to that of a wasp.

The usual scorpion victims are beetles and other ground dwelling insects. Often the scorpion will not sting at all, but simply rip apart its prey with its powerful pincers. Incidentally, no scorpion has ever been known to commit suicide by stinging itself.

Scorpions are nocturnal. They come from their cracks and crannies only at night.

Young scorpions hatch from eggs immediately after delivery from the mother. The mother will then lay sideways so the young can crawl onto her back. They will ride there, holding on with tiny claws, until their first molt. The process usually takes one week.□

Jim Gladson



RECENT BIOLOGICAL DISCOVERIES IN MEXICAN CAVES

AMCS Activities Newsletter 11:37-39 James Reddell

In the 10th Anniversary issue of the *Association for Mexican Cave Studies Newsletter* 4(1), 1973, I prepared a summary of the biological work of the AMCS during its 10 years of existence. At that time 145 species, including 64 troglobites, had been described on the basis of collections made by members of the AMCS. In the eight years since that report was written, work on the biological collections of the AMCS has continued unabated. An additional 168 species, including 86 troglobites, have now been added to the Mexican cave fauna as a result of the collecting efforts of AMCS cavers. A large part of the material obtained during the last 18 years remains unstudied, particularly that material collected in the Purificación, Huautla de Jiménez, and Cuetzalan regions. The purpose of this brief report is to summarize work in these and a few other areas. Most of the species collected during the la last few years remain undescribed, but many will be published in a forthcoming biological bulletin of the AMCS.

Purificación Area, Tamaulipas: The first collections to be made in this area were by Roy Jameson and David McKenzie in 1973. This early reconnaissance trip resulted in the discovery of several of the more notable species known from this region, but by far the most exciting finds were not to be made until the Proyecto Espeleológico Purificación got well underway. The only troglobite described from the area is a blind leiodid beetle, *Ptomaphagus (Adelops) mckenziei* Peck, from Cueva de California and Cueva del Brinco. This is only the second known troglobite in this family in Mexico, the other being known from the Sierra de Guatemala.

Other exciting species of terrestrial troglobites known from this area include a new genus and species of chactid scorpion (now known from three caves), three new species of eyeless pseudoscorpion, a blind tarantula, blind harvestmen of the genus *Hoplobunus*, the most highly cave-adapted centiped in Mexico (a new species of the scolopendrid genus *Newportia*), blind millipeds belonging to several families but still largely unstudied, and three species of eyeless trechine beetle of the genus *Mexaphaenops*. This last find is particularly notable in that nowhere else in Mexico do more than two species of trechine beetle occur in a single area (and then they belong to very different genera). Furthermore, there are only four other species of the genus known; thus, almost half of the known species of the genus occur in the limited confines of the Purificación area.

Another remarkable aspect of the cave fauna of the region is the presence in it of four species of troglobitic aquatic isopod. Undescribed species of the delicate, elongate isopods of the genera *Mexistenasellus* and *Caecidotea* occur in the sump lakes in Cueva del Infiernillo. A new species of *Speocirolana* is known only from Sótano de las Calenturas, where it is fairly abundant in the deeper lakes in that cave. Species of *Mexistenasellus* are known from caves and springs in Cuahuila, Nuevo León, San Luis Potosí, and Veracruz. The nearest records of *Caecidotea* are in Texas to the north and Veracruz to the south. *Speocirolana* is a widespread genus ranging from Coahuila south to Puebla in the Sierra Madre Oriental. The most spectacular discovery in the area, however, was a species of marine-derived isopod of the suborder Valvifera. There are no records of this suborder from caves in the New World and only one or two doubtful records of its occurrence in freshwater. Its presence in the stream in the World Beyond in Sistema Purificación is amazing.

Cuetzalan Area, Puebla: Although some collections were made in this area in 1973 and 1976, little of this material has been studied. The only troglobite described from the area is the spirobollelid milliped *Reddellobus troglobius* Causey. This is the only New World troglobite in the order Spirobolida and is a good indication of the unique fauna of this region. Among the more unusual animals known from the region are several species of blind spider (including a blind tarantula), glomerid millipeds (commonly referred to as pill millipeds because they roll into a tight ball much like pillbugs, with which they can be easily mistaken), a possibly troglobitic scorpion of the genus *Vaejovis*, and a troglobitic beetle of the genus *Mexisphodrus*. Recent finds have included a new species of troglophilic crayfish of the genus *Procambarus*, subgenus *Villalobosus*. This brings to three the number of crayfish known from the caves of the area, more than in any other part of Mexico.

San Pablo Zoquitlón Area, Puebla: Few collections have been made in this interesting karst region, but these give promise of many exciting things to follow. Included in the fauna is a new genus and species of snail belonging to the family Charopidae and a completely eyeless spider of the genus *Nesticus* (only the second species in Mexico to totally lack eyes).

Huautla de Jiménez Area, Oaxaca: A few collections were made in this area as early as 1966, and troglobitic millipeds, collembola, and carabid beetles have been described. The most notable finds, however, have been made during the recent expeditions to La Grieta, Sótano de San Agustín, and other caves. One discovery stands out more than any other: the largest and most highly cave adapted scorpion known from caves in the world. This amazing new genus and species was found first by Roy Jameson and Patty Mothes in Cueva del Escorpión. It has more recently been collected at depths up to 820 m in Sótano de San Agustín, La Grieta, and Li Nita. Study has shown that its closest relatives are the small troglobitic and endogean species of the genus *Typhlochactus*. Other notable finds in the Huautla region include the first completely eyeless tarantula in the world, one specimen of which was found in La Grieta.

Xilitla Plateau Area, San Luis Potosí: A few small collections were first made in this area in the late 1960s. Recent collections have included specimens of blind planarian, a completely eyeless diplurid spider, a new record for the troglobitic tarantula *Schizopelma stygia* (Gertsch) (previously known only from caves near Ahuacatlan), and new species of blind millipeds and harvestmen. Most of these collections remain unstudied.

Aquismón Area, San Luis Potosí: A few recent collections have been made by Peter Sprouse, Terri Treacy, and others in the area, but all remain unstudied. The most important find since the initial collections in the 1960s was of an eyeless crayfish

of the genus *Procambarus* from the sump pool in Hoya de las Guaguas. This species, collected by Andy Grubbs, is the only troglobitic crayfish in Mexico north of Oaxaca and Veracruz and possibly belongs to a subgenus (*Scapulicambarus*) not previously known to have cave representatives. The significance of this discovery is that the deep base-level waters of more northern Mexico may harbor a very distinctive fauna.

Potrero Redondo Area, Nuevo León: Recent collections were made in this poorly known area by William Elliott in May 1980. The only material identified from his collections are the carabid beetles. Surprisingly, a series of small eyeless beetles proved not to be trechines but instead were representative of a new blind species of *Rhadine*. The only other record of blind *Rhadine* from Mexico is from Cuesta de Chipinque, Nuevo León, collected in 1969 by Stewart Peck and lost until a few weeks before Elliott's specimens were identified. These two specimens are most closely related to *Rhadine persephone* Barr from Tooth Cave, Travis Co., TX. This indicates that the northern end of the Sierra Madre Oriental, sorely neglected by cavers, is potentially of great interest.

The most interesting thing about all of the recent biological work in Mexico, most of it quite incidental to other goals (such as mapping, record setting, and basic reconnaissance) is that we still know appallingly about the biology of Mexico underground. The recent collections in Mexican caves, in areas reasonably well known now, still produce startling finds. Only in the most intensively studied regions (Sierra de Guatemala, Yucatán Peninsula, Sierra de El Abra) do we have any hope that we have found the majority of the species present. And even here we cannot be all that sure. As an example, two recent collections made in Sótano del Arroyo and Sótano de la Tinaja, two of the best studied caves in Mexico, produced interesting specimens: in one, a new record for the rare troglobitic mysid, *Spelaeomysis quinterensis* (Villalobos), and in the other a new species of troglobitc pseudoscorpion. These two casual collections point up vividly the need for collecting by any caver willing to stick a small bottle of alcohol in his pocket and take a few minutes to turn over rocks or look in a pool.

(*AMCSAN* ed. note: All biological collections must be labeled with the following information: 1) name of cave and its location, including the state; 2) name of person(s) who collected; 3) date collected. Print this information with a pencil (ink will smear in alcohol) on a small piece of paper and put the paper in the bottle. Send the collection to the AMCS, P.O. Box 7672, Austin, TX 78712.)

Geology

THE GEOLOGY OF DEFENSE CAVE

Inyo County, California

Limestone Ledger 12(5):28 George W. Moore

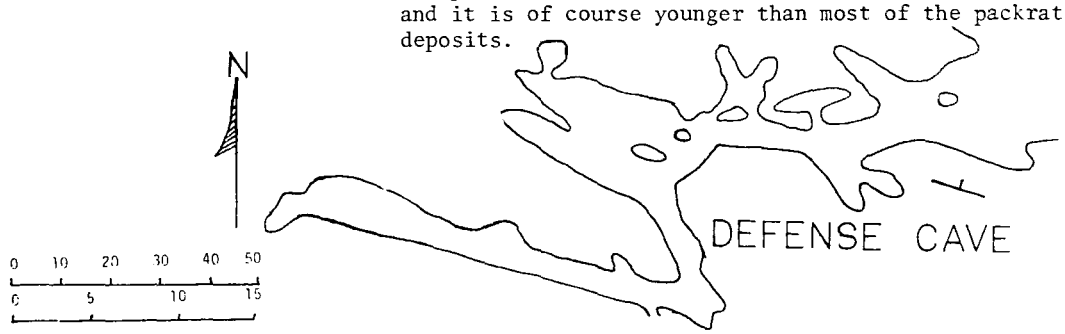
Defense Cave lies at 4,300 ft altitude in the Argus Mountains, near Death Valley National Monument. This cave has also been known in the past as Argus Cave and Modoc Cave. The entrance is 20 ft wide and 12 ft high and open about 40 ft above the base of a steep slope. The cave has about 200 ft of passages, most of which can be traversed without crawling. The temperature of the largest room in January 1964 was 64°F.

Defense Cave is formed in the Tin Mtn. Limestone of Mississippian Ave, and the rocks dip 75°N at the entrance. The passages, which are approximately horizontal, are developed parallel with the limestone beds and along two sets of joints. A 25-ft sill of andesite porphyry lies just outside the cave entrance, and the steep slope there resulted from its having eroded more deeply than the adjacent limestone.

The cave contains a deposit of packrat droppings and dehydrated packrat urine that is as much as 5 ft thick. The reason for the dehydrated urine (a material that resembles amber) is that packrats leave a series of droplets of urine in the dark part of the caves so they can find their way out again by scent. Over a period of thousands of years, the deposits may become very thick, such as those in this cave.

At the north side of the largest room in the cave, about 80 ft from the entrance, an unusual event occurred at some unknown time in the past. One of the thicker packrat deposits caught fire and burned. The products are gray ash and black clinkers on the floor, and a dark tarry material on the ceiling. Because of the restricted oxygen supply, the burning was probably slow. A temperature of between 870 and 1,470°C is indicated for the process, because the ceiling deposit directly over the ash contains tridymite, a silica mineral that forms within this temperature range.

It is not certain whether this burning took place in the historic or prehistoric eras. A factor that argues for some antiquity for the event is that the ash, which was probably originally CaC and related oxides, has now been converted to $CaCO_3$, presumably by the absorption of CO_2 from the cave atmosphere. Except for this fact, the ash looks fairly recent, and it is of course younger than most of the packrat deposits.

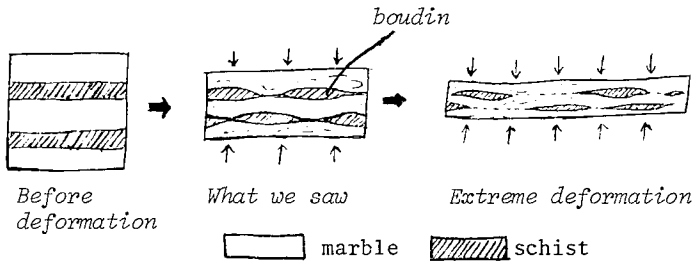


BOUDINAGE IN THE MARBLE MOUNTAINS (CA)

Diablo Grotto News Letter 13(9):6-7 Janet Sowers

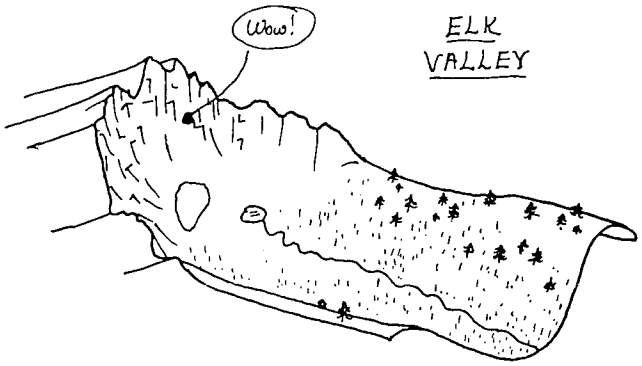
On my first trip to the Marbles, Bob Bastasz, Kathy Tonnessen and I decided to tag along with two biologists, Roy and Mark, on a collecting trip to Upstairs-Downstairs Cave. Roy is making an inventory of the cave fauna of the Marble Mountains area for his master's thesis. We hiked way up on the marble karst beside Black Mtn., looked in lots of holes and finally found the right one...

Once inside, we helped Roy and Mark look for critters. While they were picking up bushy-tailed woodrat bones, I kept one eye on the rocks and found a very interesting geologic feature: *boudinage*. As you know, marble and schist are metamorphic rocks. Both have been subjected to intense heat and pressure. If deformation occurs in interlayered schist and marble, boudinage can develop like so:



The schist pulls apart into little pillows called *boudins*. This happens because the schist is mechanically stronger than the marble. The mechanically stronger material will always form the boudins. Think about it. Anyway, I found beautiful schist boudins in the wall above the rat bones.

Bob went through a low crawlway looking for the rest of the cave. He found more boudins and a bit of cave that wasn't on the map. Roy found the main passage after a while and shortly thereafter we found ourselves at the back entrance of the cave. What an impressive sight! Imagine coming down a passageway and seeing snowcapped peaks through the hole ahead of you. The passageway opens out on a high cliff face at the head of a beautiful valley. The cave entrance is about halfway up a cirque wall, down from which the valley is perfectly U-shaped, as carved by a glacier.



CONTEMPLATION ON CRINOIDS

The Electric Caver 15(9):84 Shelley Page

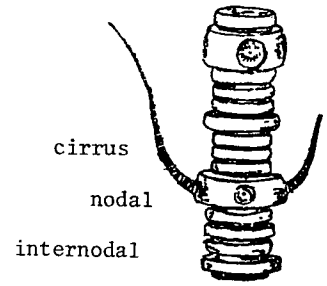
It's hard to avoid crinoid fossils while caving in Pulaski and Rockcastle counties [KY]. Fossilized crinoid stems, in particular, decorate the ceilings of low crawlways and jut prominently from passage walls. One sometimes wonders, "How many crinoids died to make this cave?" (a la Steve Martin's "How many polyesters died to make this leisure suit?").

Actually, crinoids were feisty echinoderms, or spiny-skinned animals. These "sea lilies" own the distinction of being the first spiny-skinned animals. Living relatives today include starfish, sand dollars and sea cucumbers. Crinoids share the basic echinoderm characteristics: adult bodies whose parts are arranged in five starlike sections and skeletal supports in the form of plates or spines of calcite.

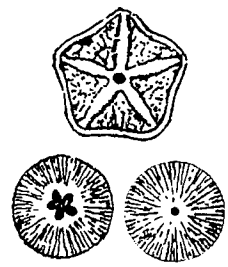
A crinoid body featured a tall stalk anchored to the ground by root-like structures or natural "cement," arms, and a calyx, or flower-like structure. The stalk or column consisted of flat columnals fastened face to face with little freedom of movement. Therefore these "lilies" did not sway gracefully like their botanical counterparts. Stalks grew by converting food and dissolved lime salts into calcite through a fleshy cord that ran through the axial canal seen in columnals or fragments of stalks.

Crinoids nourished themselves by ingesting water through perforated plates which then passed through the inner canals of the animals. Cilia along grooves in the arms gathered food and took it to the mouth, located in the calyx.

Crinoids inhabited a wide range from shallow waters to oceans at 13,000 ft or more. Vast colonies lived in the shallow seas that covered Ohio and Kentucky during the Devonian, Mississippian and Pennsylvanian ages, which explains why they are so abundant in our caving area. Most crinoidal limestone beds consist of broken columns and separate columnals with only a few calyxes. It has been theorized that mature crinoids broke loose from their stalks and drifted away.



Parts of a crinoid column



Crinoid columnals, showing the axial canals

CALCITE, ANYONE?

Northwest Caving 10(2):21-22 Penny Humphreys

Limestone has, in great part, been formed by the deposition on a sea bottom of great thicknesses of calcareous materials in the form of shells and skeletons of sea animals. A smaller proportion of these rocks has been formed directly by the precipitation of calcium carbonate from sea water.

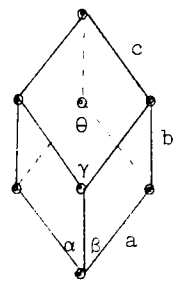
The predominant mineral occurring in limestone is calcite. Calcite is composed of one "unit" of calcium (Ca^+) and one "unit" of carbonate (CO_3^-). They commonly join together in microcrystals like this:

$\bullet = Ca^+$

$\theta = CO_3^-$

$a = b = c = 6.36\mathring{A}$

$\alpha = \beta = \gamma = 46°6''$



Crystals can occur in over 300 different forms. They are usually in coarse- or fine-grained aggregates.

The negative charge on the CO_3^- unit bonds with the positive charge on the Ca^+ unit. Although the bonds are strong, they are not as strong as the attraction between CO_3^- and the H^+ ion found in water containing carbon dioxide. This stronger attraction is what causes calcite to be soluble in water.

Pure calcite is white, but it may be variously tinted red, green, blue, yellow, or even black by impurities. The chemically pure, optically clear, colourless variety is known as Iceland Spar, valuable for various optical instruments. Banded calcite is called Onyx Marble, or Mexican Onyx.

Calcite's compressive strength is 28,000 psi. This means it's strong enough to handle the weight of an average-type rock above it to depths of about 6 km.

The name Calcite has a Latin history. It's derived from the word *calx*, which means "burnt lime." All limestones are very luminescent at temperatures of 900°C and higher. This is the origin of the word *limelight*.

PRELIMINARY METHODS FOR THE ANALYSIS OF CAVE SEDIMENTS

Western Kentucky Speleological Survey Annual Report 1980:39-43 Tamaris Chisholm & Patricia Hart*

The purpose of the project was to determine the amount of organic materials and calcium carbonate present in a sample of cave sediment. These amounts can be an indication of the hydrologic conditions of the cave (White and White, 1968; Sweeting, 1973; Waltham, 1974; Beck, 1977; Collcut, 1977; Mylroie, 1978). Parameters such as surface conditions at the time of sediment deposition, water volume, water aggressiveness, and water flow velocity can be in part determined if the amounts of calcium carbonate and organics in the sediments are known (Jennings, 1971; Bull, 1977).

The experiments undertaken were designed to see if a relatively simple procedure could give the calcium carbonate and organic content of cave sediment samples. This procedure involves determining the successive weight losses of a cave sediment sample as the organic and calcium carbonate portions are selectively removed.

The procedure was first run on a group of standards made up of known amounts of calcium carbonate, organic material (starch), and inert sedimentary material (quartz sand). These known standards were made up at varying relative concentrations and were tested in triplicate.

The standards were initially dried at less than 100°C overnight in a laboratory drying oven to remove any moisture. They were then weighed and placed in a muffle furnace to be ashed at 600°C for two hours. This effectively removed most of the organic material without destroying any calcium carbonate present. The samples were weighed again and the calcium carbonate was removed by addition of a known quantity of hydrochloric acid. The samples were then dried on hot plates at low temperature under a ventilation hood and weighed again.

The results of this procedure for the percent of organic material in the standards are shown in Figure 1. This plot shows the procedure to be relatively precise because of repeated groupings of the sample types. As expected, the samples with increased amounts of organic materials had the greates percent weight change. This straight line on the graph (a visual fit) demonstrates that this procedure is relatively accurate under controlled conditions.

After establishing standard curves for the percent organics and percent calcium carbonate, samples of cave sediments were collected from Cool Spring Cave in Trigg Co., KY. The same analytical procedure was followed on a sequence of layered sediments for Cool Spring Cave. The weight changes accompanying each step of the experiment were measured, then using the standard curve and the slope equation ($y = mx + b$) the percentages of organic material and calcium carbonate in the cave samples were determined. The values obtained (shown in Table I) demonstrate ranges comparable to cave sediments from similar environments analyzed by other investigators (Collcut, 1977; Bull, 1977; Hladnik and Kranjc, 1977). This procedure gives a good approximation of the organic and calcium carbonate content in a sediment with a minimum of laboratory effort.

This technique, although simple, has strong application in certain areas. For example, in areas where caves were covered by ice during Pleistocene glaciations, the successive advance and withdrawal of the ice sheets can be expected to leave a distinct sedimentary record within the cave conduits. Sediments deposited under stagnant, ice-covered conditions could be expected to be low in organics and high in calcium carbonate whereas sediments deposited during ice advance or ice withdrawal would reflect increased amounts of aggressive water and the establishment of surface ecosystems by containing high organic content and low calcium carbonate content (Mylroie, 1978;

TABLE I

RESULTS OF SEDIMENT ANALYSIS FROM COOL SPRINGS CAVE, TRIGG COUNTY, KY

SAMPLE NUMBER	% WEIGHT CHANGE DUE TO ORGANICS	CALCULATED % ORGANIC	% WEIGHT CHANGE DUE TO $CaCO_3$	CALCULATED % $CaCO_3$
1	0.58%	1.89%	1.48%	5.16%
2	0.69%	2.37%	1.74%	6.33%
3	0.67%	2.28%	1.86%	6.87%
4	0.53%	1.68%	1.94%	7.23%
5	0.59%	1.94%	1.88%	6.96%
6	1.87%	7.44%	1.56%	5.52%
7	0.51%	1.59%	1.63%	5.84%

Hladnik and Kranjc, 1977). A major advantage of this procedure is that it can be used where sophisticated facilities are not available.

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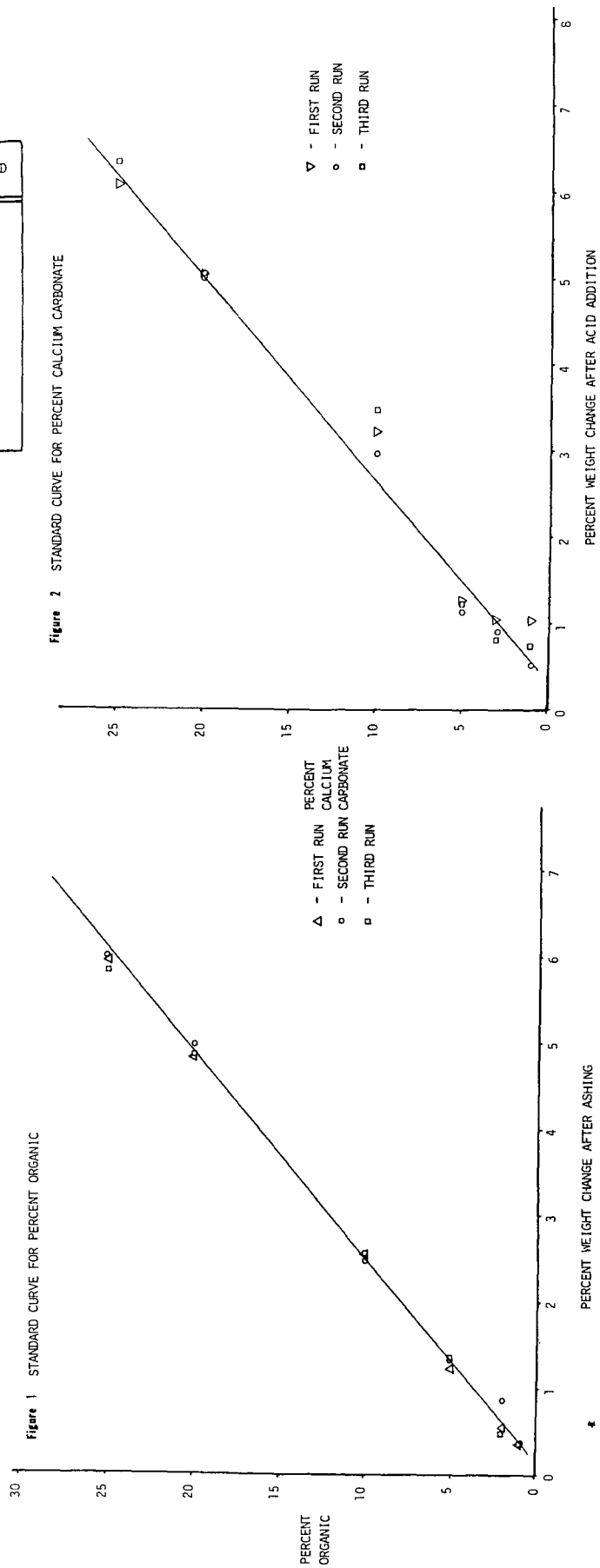

KARST RESEARCH AT CANBERRA, AUSTRALIA

GEO² 7(3):37 J. N. Jennings

Near Canberra there are only tiny fluviokarsts, though a good scatter of them. Of these, Cooleman Plain, a subalpine temperature inversion grassland at 1,250 m, has engaged the author's attention for many years. Limestone solution monitoring data for the Blue Waterholes catchment over the period 196 -197', on a better basis than 1965-1969 observations already published, are still in process of analysis. The flow and solute load duration curves already calculated indicate a lesser importance of high stage events than in other karsts for which similar data are available. An imperfect attempt to compare surface solution on bare karst and covered karst pointed to the great significance of evapotranspirational water loss from the latter, suggesting the need to test the common assumption that it is the more favorable microenvironment in the surface mosaic for solution; covered karst areas may in fact depend on bare karst areas for import of still aggressive waters (Jennings, 1978). A hypothesis that here the hardness of cave drips depends more on P-ET control of water availability than on the thermal control of soil CO_2 levels was to a degree disproven at Murray Cave but it was evident that observations needed to be at much closer time intervals than was the case for clarification of such matters (Jennings, 1979). Limestone tablet experiments have been carried on for a further three years, confirming earlier findings (Jennings, 1977) that solution loss is greater from better drained soils than worse drained, and that solutional and mechanical abrasion losses in a cave stream are about equal. These experiments employ the local limestone.

Tablets of limestone from Yugoslavia have also been exposed at a variety of sites at Cooleman Plain and also at the nearby Yarrangobilly Caves by the author and A. P. Spate (of CSIRO Land Use Research) as part of an international experiment being organized by I. Gams. Likewise at these two areas microerosion meter sites have been set up in a range of situations by the two of us, together with D. I. Smith of the Australian National University (formerly of Bristol University, England).

The Yarrangobilly Caves karst, basically similar in rocks and climate to Cooleman Plain, nevertheless has the valuable difference that it is in eucalyptus forest. The author and S. P. Spate have been monitoring a spring here since 1975, which is livelier hydrologically than the Blue Waterholes; continuous conductivity as well as discharge recordings are yielding interesting flood event data. This spring, with more allogenic stream input than authigenic seepage water supply, has presented difficulty for catchment delimitation to Jennings, Spate and Smith. A two-colour spore drift tracing provided some useful information but had some disquieting aspects to it. A quantitative triple dye experiment chiefly proved that with substantial transit times, storm events raise natural fluorescence levels so much as to render fluorescein useless and leucophor of doubtful utility; fortunately, rhodamine WT remains a valid dye to use in these circumstances (Spate, Jennings, Smith and James, 1977). But even with it, substantial dye has remained unaccounted on some occasions. Whether this is due to unknown resurgences or to adsorption is undetermined at the moment, though there is the intriguing possibility that, in low flow experiments there is much loss of dye by adsorption in a sluggish phreas whereas in high stage experiments, the dye is "jetted" through with little loss. Whatever the answer on this, it is now evident that the catchment cannot be defined with great precision. Monitoring effort may now be shifted therefore to a small spring dominantly seepage fed.

In Jersey Cave, Yarrangobilly, Spate (1980) and J. Ward are continuing study of "black" speleothems well expressed there; organic carbon has been proven the discolorant and it seems most likely that airborne transport after forest fires is the mechanism involved.

Also at Yarrangobilly, the author, Spate, and Bao Haosheng (a visiting fellow at the Australian National University from Nanjing University, China) are applying simply morphometry to the blind valleys there to test an assumption of controlling relationship between their volume on the one hand and catchment area and hydraulic gradient to output on the other, with the likely possibility in mind that historical differences may obscure any such correlation.

J. N. Jennings
Australian National University, Canberra
23 March 1980

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Guide to the Scenic Geology of BOCA CAVE

Marion County, Oregon

The Speleograph 16(2):21-22 David Shafer*

My experience with volcanic caves in Oregon is that one finds them by looking toward one's feet. Part of the enjoyment of locating and exploring Boca Cave, though, is sighting the cave high on the slope of a prominent peak from the trail below.

Boca Cave is a small recess on the east slope of Triangulation Peak, NW of Mt. Jefferson in the Willamette Forest near Detroit, OR. Little reference to the cave is made in geological literature. It is an excellent exogenetic volcanic cavity, probably formed by collapse and evacuation of a pocket of loosely consolidated cinders and ash between lava flows. Triangulation Peak was a Pliocene volcanic vent which erupted extensive amounts of pyroclastics and lava as part of the Outerson Volcanic series (Thayer, 1939).

Boca Cave was formed by the weakening and partial removal of the cinder pocket which was enveloped between basalt on the slopes of the eroded volcanic vent. Two E-W trending faults intersect within the cave to create a zone of weakness. In addition, water has eroded and weathered the permeable pyroclastics, a process that is active today. The combina tion of intersecting faults and easily eroded cinders probably caused a collapse which formed the initial cave room. The roof and wall material is mostly basalt which shows columnar joint structure outside the cave. The floor material is covered by cinders which have been broken and weathered to a clay-like material. No volcanic tuffs or breccias were found exposed within the cave though flows are exposed along the trail below it.

The mouth of the cave was estimated to be 20 ft high and 25 ft wide. The cave consists of one large room, 50-60 ft wide to the back wall and 80 ft long, with a short, narrow extension west along the fault. The ceiling is 30-40 ft high.

Boca Cave is enlarging along the back wall by continued removal of the cinders. Groundwater percolates through the cinders, weathering them to friable clays and transporting the material across the sloping cave floor. Water was copious in the cave in early September during the author's visit. Other agents of erosion are algae and moss which prosper in the damp environment. The symmetrical cave mouth, which frames Mt. Jefferson from the inside, has probably been shaped by frost wedging or even glacial action...

Other geological features of the region can be seen from the summit of Triangulation Peak, reached by a 0.75-mi-long spur trail which leaves the Triangulation Peak Trail 1.5 mi east of Road 1071. From the 5,434-ft summit all the major Cascade stratovolcanoes from Mt. Rainier to Diamond Peak are visible, as well as Ollalie Butte, one of the highest cinder cones in the Oregon Cascades. Other landmarks visible include Coffin Butte, Park Ridge, Cathedral Rocks and the glacier-carved valleys of Whitewater and French creeks. Cirques and headwalls formed by Pleistocene glaciers are noticeable on the slopes of Triangulation Peak and Outerson Mtn.

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GLACIAL ORIGINS OF THE BAHAMIAN KARST

Underwater Speleology 7(4):49 Dennis Williams

The geological history of the string of shallow-water carbonate banks that stretches SE from Florida 1,400 km to the island of Hispaniola is tied to the repeated changes in sea level that resulted from the alternate storage and release of great quantities of water held on land as glacial ice.•

The northwestern Bahamas consist of two large flat-topped banks (Great Bahama Bank and Little Bahama Bank) that were flooded near the end of the melting cycle of the most recent glacial period. The islands of the present-day Bahamas are the exposed margins of these banks and this dry area represents less than 10% of the banks' total area. During interglacial periods when the level of the ocean covers most of the Bahamian banks, additional carbonate material is added through several sources. The most important of these sources in terms of volume is a result of the banks' unique topography and the close proximity of the Gulf Stream. As relatively cool seawater from the Gulf Stream spills onto the shallow banks, its calcium carbonate solubility is decreased, causing $CaCO_3$ to precipitate in the form of ooids.

In the past, sufficient quantities of these ooids have been precipitated to form the bulk of the carbonate materials found in the Bahama Banks. Mounds of these unconsolidated ooids pile up on the sea floor during interglacial periods. Then as the level of the ocean is again lowered by the accumulation of glacial ice, the newly dry dunes are redistributed by the wind before being cemented together to form oolitic limestone. This process has been successively repeated through the many glacial epochs and has been able to maintain the tops of these banks coincident with the average maximum height of interglacial sea level despite an extensive subsidence of the Bahamian Platform.

In islands of an adequate size and in the entire bank when a lowered sea level permits it, a fresh water lens forms by displacing sea water that has entered the aquifer laterally. Rain is the source for this fresh water and a distinct halocline is maintained by density and temperature gradients. Present-day annual rainfall rates of less than 1.5 m are capable of maintaining a maximum lens thickness exceeding 20 m.

ANASTOMOSES AND CEILING PENDANTS
Fear and Loathing in the Joint Planes

SFBC Newsletter 23(11):7-8 Bruce Rogers

"Anastomoses are systems of minor, curvilinear, tube-like solution cavities lying in a plane and making an intricate pattern with their crooked courses and repeated intersections." So said J. Harlan Bretz in his classic *Caves of Missouri*. Anastomoses are seldom seen except in cross-section or where collapse has exposed them. They form intricate mazes in soluble rocks along planes of weakness in the rock. These planes of weakness may either be bedding planes or joint planes. In the highly contorted marbles of the western states, joint planes are the more common weakness planes. The joint planes range from nearly horizontal to steeply dipping. The curious fact about the anastomosis and joint plane is that the anastomosis is developed above the joint or bedding plane. In cross-section the anastomosis has a nearly circular shape when small--1-3 mm--ovoid shape with a narrower base than upper portion when medium-sized--4 mm to 30 cm--and a trapezoidal shape when large--30 cm to 1.5 m in width. Above this size they merge with half tubes and ceiling channels, animals of a different nature.

It is apparent that these forms are phreatic or sub-water table in origin. They appear most commonly in massive, relatively joint-free carbonate rock. Evidently the water dissolving the cave depends on the few joints present to facilitate lateral percolation. If the rock had many joints or was fairly porous, other types of passage would develop in response to the easier flow conditions. Experiments with salt and plaster blocks have shown that anastomoses develop where flow rates are very small and hydraulic head is large. The initiation of this form of solution may be controlled by earth tides. The pumping action of the separate rock masses on either side of the joint slowly moves water through the joint. Random orientation of sub-millimeter-sized solution pockets is soon integrated into a linear anastomosing pattern. The density and orientation of the pattern is evidently dependent on several factors. The density of the anastomoses may be controlled by the stress applied to the rock mass, with more solution taking place in high stress areas, and is initiated on a sub-crystal size. Once the stress-controlled pattern is set, further growth will follow the pattern. Experiments with salt and plaster blocks and silicon crystals have shown close correlation of density of anastomoses and applied stress. The orientation of the anastomosis systems may be dependent on the local groundwater gradient, which in turn may be controlled by pre-existing cave passages or surface streams. In any case, the anastomosis will develop aligned with the groundwater flow, however slow. The channels will develop away from any feature that collects the water flow, thus major joints and other features with little flow restriction will exert control over the anastomoses.

Once the diameter of the anastomosis channels exceeds about 4 mm the flow of water through the channel will become turbulent instead of laminar. This allows more solutional activity and somewhat greater flow rates. The shape of the solution channel will change as more water passes through it. As the water slowly traverses the tube it will become saturated with dissolved calcite and a saturation gradient will form with the denser solution at the bottom of the anastomosis. If the water is carrying clays in suspension, they will tend to settle out, coating the bottom and lower sides of the tube. Both of these mechanisms will prevent further solution on the lower portions of the tube, leading to an ovoid-shaped tube with a narrow-necked base. Carried to an extreme, the intervening ceiling pendants will slowly be dissolved and large, flat "pancake" rooms will result. Usually, however, some portion of the anastomoses system will intersect a larger solution passage and be drained of its water. Occasionally two or more sets of anastomoses will develop in closely spaced joints or bedding planes. As they enlarge they may fall and form a large breakdown room.

The fact that anastomoses are found in otherwise passage-free portions of carbonate rock; that they are commonly interrupted by other solution forms; and that they are nearly always small in size leads us to conclude that they represent the earliest form of cave development.

Anastomoses are uncommon in most Western caves. Only by diligent searching will they be observed. Since most caves in the West have had a phreatic origin, anastomoses are to be found lurking about in various states of preservation in nearly all caves. Church Cave has several areas of them, especially near the Pancake Rooms. In the canyon end of Boyden can be found examples. Bear Cave across the River has very large anastomoses and intervening ceiling pendants. Throughout Lilburn Cave, but especially in the northern portions, are areas of these forms. Indeed, the Anastomoses Room has its ceiling covered with them. A peculiar set off the end of Glacier Hall has horizontal flats between the pendants despite the approximate 30° slope of the passage they roof. Crystal Sequoia Cave has large areas of small, Mr.-Bill-sized anastomoses that are formed along inclined joints up to about 40° from horizontal. Most of these anastomoses are choked with silts derived from other metamorphic rock weathering products. Others in the ceiling of Marble Hall are among the largest in the state, being up to nearly a meter in diameter.

White Chief Cave has very large anastomoses in the the ceiling of the Big Room that one may easily ins inspect while careless stepping into the stream on the floor. Clough Cave also has these forms present, but they have been badly corroded by further solution of the passage. Areas of anastomoses can be found lurking in the shadows in Soldiers Cave nearby. Further north, both Cave City Cave and Cotqui Cave have areas of anastomoses. Much of the areas in Cotqui are missing and those left are heavily encrusted with silt. Violin Cave near Volcano has very large anastomoses that are engulfed with later-aged silts. And lastly, in one of the more popular urban caving site sites astride the San Francisco-Marin city line, similar structures have been reported in the mixed carbonate-ferrous roof structure.

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GLACIER CAVES

The following is excerpted from "Glacier Caves," Western Speleological Survey Miscellaneous Series Bulletin #13, Dec. 1970, by Garry D. McKenzie. The original bulletin includes many references to articles on glacier caves and descriptions of those caves.

* * *

A glacier cave is defined by speleologists as a cave formed within or at the base of a glacier. In reference to glacier caves some glaciologists and speleologists have used the ambiguous term *ice cave*. Although the term *ice cave* is analogous in construction to *sandstone cave* or *limestone cave*, through popular usage, this term is now used to designate permanent caves in rock formations, in which ice forms and remains far into the summer or throughout the year [also known as *glacières*].

An ablation cave in a glacier is formed by circulating warm air in cavities that may have been formed in part by meltwater streams. These caves are usually formed near the terminus of a glacier where meltwater streams flow from beneath the glacier, or at the margin where lateral streams flow beneath the glacier. In the terminal areas of the glacier, deformation is at a slower rate. Only where the rate of closure of a cave by plastic deformation is less than the ablation by warm air and water will the cave form and remain open. Interconnecting moulin systems and subglacial tunnels are also of the ablation type of glacier cave. The size of such caves is variable and depends in part on the season. Probably the largest cave system explored to date is the Paradise Ice Cave System in Washington. There W. R. Halliday and C. H. Anderson found several km of passages with one chamber 75 m long, 27 m wide and 8 m high. The fact that ablation caves melt rapidly during summer makes some of them extremely dangerous during this period. Since portions of the roof could collapse at any time, one should not linger in these caves, and at certain times it is unwise to enter them.

An obstruction cave is formed as the result of interrupted glacier flow due to a bedrock or other subglacial protuberance. Obstruction caves are found near the margins of glaciers, usually in the upper part of the ablation zone and in the accumulation zone. Throughout most of the year entrance to such caves may be impossible without tunneling. Some contain many speleothems during most or all of the year. The size of such caves, which are usually smaller than ablation caves, depends on the rate of closure relative to the velocity of the glacier. These conditions depend on the thickness of the overlying ice, the temperature of the ice, the velocity of the glacier at the cave, and the size and shape of the obstruction. Apparently some parts of an obstruction cave, although originally formed by a subglacial obstruction, may be modified during the summer if the cave is below the accumulation zone. In the terminal zone of a glacier small obstruction cavities may often be the place where erosion by meltwater streams begins to form ablation caves.

THE GROWTH OF HELICTITES THROUGH SURFACE TRANSPORT

The Potomac Caver 23(5):74-75

Hartmut Bender
Translated by Roberta Swicegood

(Note: Translated from *Die Höhle*, March 1969, the official publication of the Union of Austrian Cave Researchers and the Union of German Cave and Karst Researchers)

Early Theories: Capillaries and Drifting Droplets. Helictites crystallize from a parent liquid solution. According to the capillary theory, the solution reaches the point of helictite growth through internal capillaries. This would explain a helictite's growth in length. However, it does not explain the increase in helictite thickness--sometimes to the point of knob formation--which can occur over the entire surface of the helictite, rather than just at the tip. Additionally, helictites with pure crystalline 90° cross-sections and needle-shaped points cannot be explained by the capillary theory, and the capillary theory fails to explain the close connection between helictite formation and extremely high relative humidity.

Because of these difficulties with the capillary theory, it was replaced in time by the drifting droplet theory. The parent solution was postulated to occur in the form of drifting water droplets containing calcium. These droplets were supposedly attracted by an electrical charge onto the helictite crystal.

Drifting water droplets containing calcium can only occur through the atomization of falling water; they cannot occur as the result of evaporation. In the Kluterhöhle (Kluter Cave) and Bismarckhöhle (Bismarck Cave) in Sauerland, Germany, helictites have been found far from dripping water. In two places a helictite was found on bare rock more than 100 m away from other calcium deposits. Another plate-sized occurrence lies completely isolated by damp clay banks in a place which is protected from air circulation but nevertheless is highly humid. Many helictite examples in the two caves occur either on or in the immediate vicinity of the ceiling joint. The foundation rock of all other sites with helic-

tites present possesses a porous structure. It may therefore be assumed that in these cases the parent solution comes from the foundation rock.

The calcium carbonate ($CaCO_3$) concentration of t the drifting droplets present in the caves was measured at 2°DH, and the CO_2 content of the air was determined to be high. The low degree of $CaCO_3$ present in the water, taken together with the high CO_2 concentration, preclude the formation of helictites and contradict the drifting droplet theory.

Additionally, the finite maximum size of helictites is not explicable by the drifting droplet theory, and the sites of helictite occurrence are not located, as the theory would lead one to expect, near the cave floor. Rather, the helictites are located primarily on the walls and ceilings.

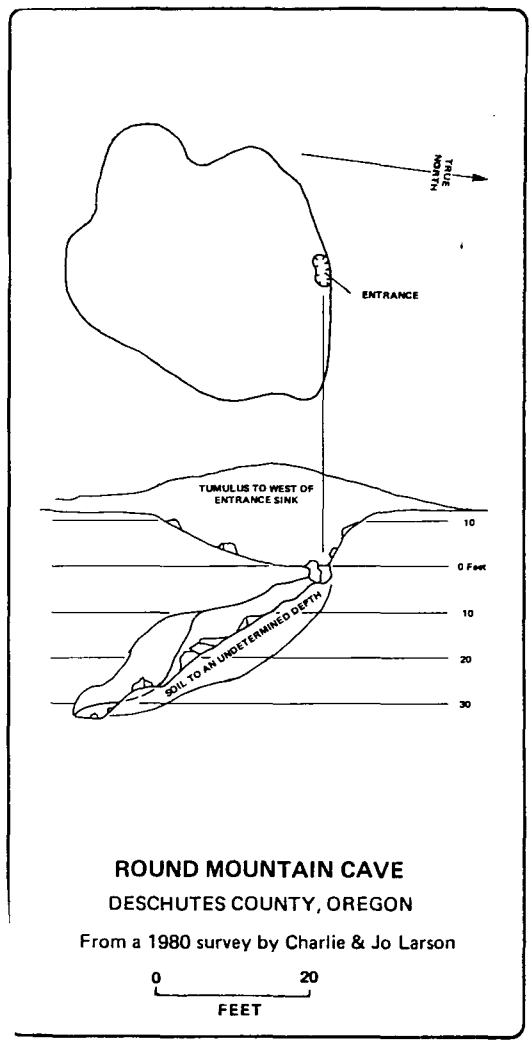
Surface Transport Theory. The parent solution can theoretically reach the point of helictite growth in three ways:

1. through the crystal (capillary theory)
2. through the air around the crystal (drifting droplet theory)
3. along the crystal's surface (surface transport theory)

The vanishing contact angle between water and calcium is exactly 0°; thus, water is encouraged to spread itself along the calcium crystal. The thickness of the water film is determined by the amount of water present and the humidity of the cave. Large amounts of water create stalactites and stalagmites. Relatively dry air tears the surface film. The relative humidity in the Kluterhöhle, as measured by both centrifuge and hygrometer, approaches 99-100% at helictite sites. At these sites, the film of water becomes so thick that it may readily be observed with the naked eye.

Experiment. The surface of a 5-cm-long helictite was dried, and the helictite was placed upright in a closed glass container. Its foot was placed in a fluorescein dye solution. The helictite, which appeared to have a matte surface, was immediately covered by a 1.5-cm-high, thick layer of dye solution. After 20 minutes the color had climbed to 2.5 cm; after a week, it had reached the tip. A second helictite was placed in the glass container, which was left open in dry air. At low humidity, the dye did not climb the helictite. When the container was closed, the dye reached the tip in a month. At high humidity levels, the second helictite became glisteningly wet, and behaved in the same way as the first one. Both helictites were dried and broken at the end of the experiment. The interiors showed no trace of fluorescein.

Conclusions. According to the surface transport theory, the growing helictite crystal carries a water film along with it like a cap. Therefore, it does not matter whether the parent solution comes from the immediate vicinity, as in the Kluterhöhle, or has traveled some distance. It is important only that a saturated solution of water, relatively high humidity, and the opportunity to surrender CO_2 to the air be present to allow the growth of the crystal. The maximum growth against the force of gravity is on the order of 5 cm.



CORALLOIDS IN ROUND MOUNTAIN CAVE

Deschutes County, Oregon

The Speleograph 16(11):98 Charlie Larson

Rick Pope's comments (*The Speleograph* 15:125) about Round Mountain Cave prompted Jo and me to visit there during a recent trip to the Cascades.

Round Mountain Cave is a surrogate cave in basalt. Its ceiling and wall surfaces, free of secondary mineralization, show mostly clean, though very old, fractures. We observed no signs of plastic deformation or of the telltale signs of lava movement. The cave was apparently created when the lava in a vertically oriented vent system withdrew, or fell back, followed by the collapse of some, but not all, of the overburden. The entrance is at the north end of a sink about 40 ft in diameter, about 12 ft deep. An occasional boulder projects from the soil lining the bottom of the sink and the soil has been funneling into the entrance for so long that nearly the entire floor slope is covered by soil which has all but buried several large boulders. Most of Round Mountain is heavily forested with medium sized trees of several different species, which accounts for the unusually thick soil layer.

The cave is much older than other caves in the area. Howell Williams' geological survey of the area does not recognize Round Mountain but identifies the lava flows of the area as possibly as early as Pleistocene. That part of the mountain (to the west of the peak) in which the cave occurs appears to be made of sterner stuff than the red ash and scoria exposed in some of the road cuts passed through on the way to the top.

The "half-inch projections of unidentified mineral deposits" in Round Mountain Cave, mentioned by Halliday in 1952 (*Cascade Cave Report* 2:4), cover most of the ceiling and walls. They are siliceous precipitates, ranging in shape from spiny to botryoidal, and best described as coralloid speleothems. Though individual elements seldom reach one inch in length, there are coral-like clusters which have attained lengths (from the cave wall) of 2-3 inches. The color of the coralloids ranges from dirty gray to dirty brown. They are comparatively soft, being especially soft, scaly, and lighter in color where forming in the presence of water. They are, of course, easily damaged, even when brushed by clothing.

A most enterprising packrat(s) occupies the cave and has several nests there. Also, there are two remarkable "haystacks" of moss and dried mushrooms laid up for winter.

PSYCHOLOGY OF PSEUDOSPELEO

The Speleograph 16(12):112 Luurt Nieuwenhuis

Once upon a time, in a *Speleograph* long ago, there was an article concerning pseudospeleothems for the non-caver. That article was never resolved. Thi This appears to be a good time to do just that.

If you cannot, or will not, visit caves to look at formations, you can still see some of the same forces at work in the civilized world around you. My last article dealt with stalactite-like formations that can be found underneath mnay parking garages and other public structures. After talking about these features at the past North West Regional Association educational seminar in Seattle in February past, I took one of the participants out to the Sea-Tac Airport. Just for curiosity, we checked out the parking garage there, and sure enough, there were a bunch of small stalactites.

I work in a place where many chemicals are stored. A leaching bin or leaking tank valve can give rise to many of the same order of features that can be seen in places in the wilderness or the civilized wilds of the city. Observing these features can be an educational experience since instead of millennia or years, changes may take place in days or weeks.

I first stumbled on these goings-on when I observed a slow drip from a valve under a tank of $ZnSO_4$ solution. The liquid was near saturation, and as the material slowly dripped out, evaporation supersaturated the liquid, and crystals formed. The result looked like a normal lumpy stalactite from a distance. (By contrast, the same liquid crystalizing in a tank produced crystals that grew on the tank with large, well formed geometric shapes.) After this, I kept my eyes open for other pseudo-speleothems, and found that they occurred quite commonly.

There are, where I work, a number of bins that contain some fertilizer chemicals, including $FeSO_4$ and $ZnSO_4$. They are exposed to the rain all year long, but no stalactite-like growth occurs during the winter or spring. Only during the drier portions of the summer is there anything to be seen. And then things happen so fast that you can easily miss something if you don't look for a few days. I've seen stalactites ("ice"cicles? chemcicles?) grow in a few days so that, had they been in my trophy case back home, if I had a trophy case, they would have fooled anybody from a distance of a few inches or more. They would be built up in roughly concentric layers or crusts around an initial chemcicle, with the whole effect tapering slightly downward. Some would be pure white, indicating a high degree of purity of zinc sulfate with small crystal size, while others would be the most vile shade of rust from the iron contaminating the chemcicle with oxides. Growth rates of up to an inch a day were observed under these conditions.

In another case, ammonium sulfate stored in a rail car became wet and seeped through a crack in the bottom of the car. Again, most growth occurred during the summer months, with shapes reminiscent of limestone speleothems. In this case, the chemcicles tended to remain closer to a minimum diameter determined by the drop size of the liquid at the end of the projection, and in addition, stranger shapes resulted from the action of the wind upon the bottom drops.

We'll get on to some conclusions derived from all this a little later, but first some more observations.

We also have drums of acid sludge, probably $CaSO_4$ in a very strong sulfuric acid. If the drums are left unattended too long, the barrel dissolves at the top of the sludge and the contents slowly seep down the outside of the barrel. What results from this is a lump that looks for all the world like a small deposit of ridged flowstone (or to lavatubers, like silica flowstone deposits). The material remains microcrystalline with no recrystallization into a structurally rigid form.

One of the most colorful chemcicles was derived from some leaking bags of nickel chloride. A bright green, multi-colored stalactite formed with a central channel that remained open on one side. The growth of this chemcicle was much slower than that observed on the megacrystalline forms. After a period of about two months, a matching stalagmitic mound formed

under the chemcicle, and eventually a 6-inch column resulted. This feature was also microcrystalline, with structural strength resulting only from the tight packing of the mud-like material.

Now for some conclusions. First, the observation was made that most of the chemcicles formed during the drier summer months. This was obviously not due to the lack of leachate water during the other months. Instead, a good rainfall would wipe out a complete crop of chemcicles in one day. (Yes, I have quite a collection of them.) Rather, a steady drip coupled with dry and evaporative weather seemed to cause optimum results. Since the leaching of the salt from the "parent" solids took time, especially in those instances where the percolation of the liquid through the parent was rapid, the resultant liquid would not be fully saturated. The drop would then have to undergo evaporative concentration in the atmosphere in order to reach saturation and supersaturation.

When a drop of liquid first comes out of the end of the chemcicle (and almost all of the observed chemcicles had an initial central open conduit through which liquid traveled), it probably is not quite saturated. As it dangles on the tip, it redissolves a portion of the previously crystallized end material. Then when evaporation increases the concentration of the salts dissolved in the drop, crystallization begins at the site where just previously solution was occurring along the outer surface of the drop.

Very slow drop rates, down to a flow rate that just maintains the drop's existence, will tend to crystallize material across the bottom, sealing off the central channel and either forcing the liquid down the sides of the chemcicle, or more likely, reducing the size of the opening until liquid is squeezed out through the small remaining opening and starts to form another normal minimum diameter chemcicle below the necked-down point.

On optimum liquid flow rates, there is probably some initial re-solution of the chemcicle (giving it a very clean crystal edge to grow onto) followed by some deposition of dissolved solids onto the crystal edges at the base of the chemcicle. When the drop grows too big, it falls off, and another drop takes its place, to also leave some crystalline deposit behind. The growth occurs at the same width and curvature portion of the drop, and the crystal sides of the chemcicle grow straight down in the best "soda straw" tradition. Faster liquid feed rates, or slower evaporation rates (the results are similar) will tend to leave the liquid at the tip of the chemcicle in a corrosive condition, and the chemcicle soon redissolves.

It appears likely that during this time there is often some flow of liquid down the outside of the chemcicle or through minute ducts from the inside of the chemcicle to the outside, whereby the overall thickness of the chemcicle is built up. Where there is a regular series of thickness bands down the outside of the surface, this feature is probably the result of liquid trickling down the outer surface. When the heavy rains come with their undersaturated liquids, then everything redissolves and disappears. *Sic transit gloria pseudos.*

The microcrystalline deposits that are not formed by further crystal growth and recrystallization form things very reminiscent of silica formations in lava tubes. When broken apart by hand they show uneven or conchoidal fracture, since any structural integrity that they possess is due mostly to the packing of the constituent particles. Most of the drippy mud type of formation that I found tended toward massive, rounded smooth, or squat flowstone-like features.

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The one thing that amazed me most about my field observations of chemcicles was the rarity of pseudo-stalagmites. In none of the parking garages and under only one of the bridges that I checked was there a carbonate stalagmite. In all of the observations at work, with all of the leaking drums and leaching containers, I found very few cases of well developed pseudo-stalagmites. Curiouser and curiouser. But then, silica stalagmites are rarer by a few orders of magnitude than silica stalactites or dog-tooth-like hanging features in our wet northwest lava tubes. In any case, you can see that a lot of cavelike features remain that you can occupy your time with when you can't go caving.

(As a postscript, I must add that those leaking drums and leaching containers where I work are being collected, contained and treated in order to render them environmentally safe.)

REMARKS ON THE HELICTITE PROBLEM

The Potomac Caver 23(6):89-93 Fritz Reinboth and Friedrich Göbel; translated by Roberta Swicegood

(Note: European speleologists have been involved in a lively controversy about helictite formation for many years. This article from *Die Höhle*, Dec. 1975, the most recent I could find, claims that a new version of the once-denigrated capillary theory fully explains helictite growth. I suspect, though, that the controversy continues. The translation is a slightly abridged version of the original text, omitting some digressions from the main theme. --R.S.)

Introduction. The origin of helictites has long been one of the most productive conversation themes among speleologists. Now, studies by Kramm and Linder of the helictites of Söhnstettener Cave, and the authors' studies of helictites in Winterberg (Harz), have proven the validity of all essential points of Andrieux's "expanded capillary theory." According to Andrieux, calcite solution is conveyed to the helictite's growth areas primarily through the capillary that is present in every helictite, and secondarily through transport of the calcite solution along the surface of the formation.[1] The solution conveyed through the capillary is responsible for a helictite's length, and surface transport of solution is responsible for its thickness. It follows that a capillary is absolutely necessary for the growth of a helictite, while the influence of surface transport on helictite growth can vary greatly. It is surface transport that determines the helictite type: filiform (straight) or vermiform (convoluted).

The drifting droplet, or tip discharge, theory of Cser and Maucha is put forward again and again in competition with the capillary theory. According to this theory, electrically charged droplets of calcite solution attach themselves to the tips of helictites through electrical attraction, discharging calcite and adding to the helictites' length. It seems appropriate at the time to report on the investigations of the authors and to discuss the drifting droplet theory in the light of new information produced by these studies.

The Capillaries. The presence of the capillary is overlooked constantly or limited to specific helic helictite types by the defenders of the drifting droplet theory. It is self-evident that there are helictites, for example opaque ones, in which the presence of a capillary is not immediately apparent. Therefore, the question of whether the capillary is an integral part of helictite structure can be resolved only by statistical methods. The authors have performed a survey, testing a large number of helictites of different sizes, characteristics, and origins for the presence of a capillary. 100% of the transparent examples, and 97.2% of the translucent examples, had capillaries. The following table shows the results of our examination of helictites obtained from caves opened during quarrying operations in the Winterberg Quarry near Bad Grunz (Harz).

PRESENCE OF CAPILLARIES IN HELICTITES

	Transparent	Translucent	Opaque
Recognized	762	138	0
Not recognized	0	4	134

After both sides of one of the opaque helictites from Winterberg were sanded down, a capillary was discovered in it as well. The investigation of 10 broken pieces of transparent helictite, picked up under draperies in Divača Cave (Yugoslavia) yielded corresponding results: capillaries were present without exception.

In view of these findings, Aubrecht's attempt to save the drifting droplet theory, at least with respect to the formations he calls "pseudofiliforms," appears problematic. According to Aubrecht, "pseudofiliforms" are formed by the condensation of water, and "possess no capillaries and cannot possess capillaries." Unhappily, Aubrecht's proof for the existence of such capillary-free, condensation-formed (!) (*sic*) helictites is nonexistent, although he contends that a great number of helictites in Erlacher Cave were formed in this fashion. At any rate, it appears misguided to assume completely different causes of growth, such as capillary transport and tip discharge, for immediately neighboring subtypes of the same formation.

The formation of capillary-free helictites is, in the opinion of the authors, not supported by physical theory. Explaining the electrical charge supposedly possessed by the drifting droplets of calcite solution causes substantial difficulties when one considers the realities of the cave environment in which helictites are formed. (The Lenard Effect is not a factor in any cases known to us, because no waterfalls occur in the vicinity of the helictite formations.)

Jenatschke holds that radioactivity is the most probable causative factor, without presenting any proof of this. Such concepts as "magnetism" or "microelectrical processes," brought into the discussion by some authors, bear witness only to complete confusion. When the creators of the drifting droplet theory themselves state positively that a helictite cave is an electric-field-free space (in which electrostatic charges cannot exist), the verdict on this theory is clear.

The Appearance of Helictites on Draperies. Helictites seldom occur directly on a substratum of limestone: rather, as a general rule, they grow on already-deposited calcite. Because limestone is "dense" in comparison to calcite, and because the calcite solution can only reach a capillary through the substratum, this observation makes the importance of capillaries in helictite formation clear.

In the caves of Plania and Divača (Yugoslavia) helictites are especially plentiful on large draperies. Abundant clusters of large helictites grow in the inward folds of the draperies, while drapery surfaces which are turned outward show, at most, the beginning stages of helictite formation. This observation clearly contradicts the drifting droplet theory because the inward folds form, in an electrical sense, an almost completely enclosed Faraday Cage. Therefore, no electrical field is present, and discharge at the tip is impossible in such a situation.

Appearance of "Reflective" Helictites. An observation made in the helictite dome of Stalagmiten Cave in Winterberg is also impossible to bring into harmony with the drifting droplet theory. The helictite dome was the highest-lying room of the cave which was, sadly, a victim of limestone disintegration. Along a ridge in this room, which contained a luxuriant growth of helictites, were countless filiforms with lengths of up to 200 mm. These completely

straight helictites were mostly transparent and colorless; they grew by preference in calcite-covered side fissures and short chimneys. Older stalagmites and stalactites formed the substratum.

A phenomenon often observed in connection with these filiforms was the appearance of "reflection" when they encountered obstacles preventing further straight-line growth. Bending away from obstacles, which Aubrecht describes as typical of "pseudofiliforms," was never observed in these helictite clusters. Rather, the filiforms grew fast to the obstacle and then built a continuation in the opposite direction. The continuation possessed a new crystal orientation, and appeared to be a new helictite. However, the "new" helictite was supplied with calcite solution by the capillary of the helictite which impinged on the obstacle. This phenomenon may be observed in Divača Cave as well. Aubrecht has described it in Erlacher Cave, and considers that a right-angled further growth is typical, and that crystal formation processes are its cause. This does not hold true for the examples observed by the authors in Winterberg and Divača. Rather, the continuations seem to follow a law of growth which dictates that acutely angled corners produce acutely angled continuations, and obtusely angled corners, accordingly, obtusely angled ones. The authors have named this phenomenon "reflection" and the formations "reflected helictites." The phenomenon appears only in connection with filiforms, and we have determined no more about it than the law of growth stated above.

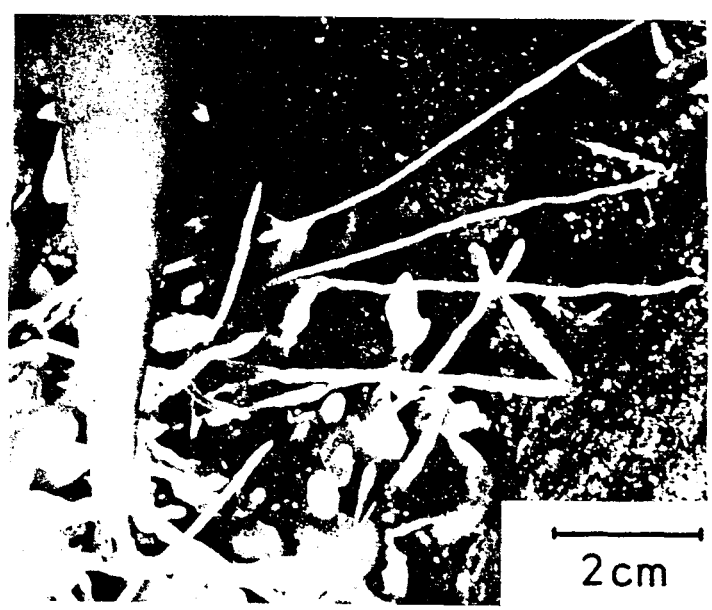
Surface Spreading of Calcite Solution. Surface transport of the calcite solution has a greater significance for the formation of helictites than was previously assumed (although Bender considers it solely responsible for helictite formation). Without surface transport, the calcite solution could not move out of the capillary opening. A grwoth in thickness, clearly apparent in vermiform examples, and evident in filiforms in the hood at the tip, would not be possible without a spreading of the calcite solution over the helictite surface.

Andrieux has exhaustively observed this spreading *in situ*, and has described it in detail. Calcite solution spreads over the helictite from both the substratum and the capillary opening. Bender claims --without qualification and, unfortunately, without citing a source--that the contact angle of water and calcite is zero, and that water moistens a calcite surface so that a monomolecular, spreading film is formed. Gmelin cites various values developed for the water/calcite contact angle of 87°, or, on a polished surface, 71°, while Somochwalow and Held (1936) claim a contact angle of 24°. Bender's claim is thus problematic. However, Gmelin neglects the implications of the fact that the contact angle is a function of the border and surface tensions of three substances: calcite, calcite solution, and air. Hence, he does not discuss the influences of such factors as degree of saturation or humidity on solution spreading.

The authors have conducted experiments with surface spreading. These produced a negative result; under normal climatic conditions (including relatively high humidity) moistening of smooth calcite surfaces does not occur. In our experiment, some (admittedly not fresh from the cave) monocrystalline stalactites were used. These were placed, according to Bender's procedure, in uncovered containers and in a large climate-controlled cabinet with a maximum of 90% relative humidity. Water at 20°C was then added. The rise of water up the surface of the calcite could only be observed on a normal, concentrically layered stalactite. This was an expected result because contact angles less than 90% are always smaller on rough surfaces than they are on smooth ones. The relationship of surface energies required for the transport of a solution over smooth calcite surfaces was not achieved in the authors' experiments. Nevertheless, this demonstrates *ex silentio* the meaning of the three-cornered relationship of calcium, air, and calcite solution in the formation of helictites. The difficulty of producing a successful reproduction of this relationship in the laboratory mirrors the relative rarity of helictites.

Closing Remarks. It can now be concluded that the "expanded capillary" theory of helictite formation has been proved completely by the authors' observations if helictites *in situ* and under the microscope, and that the drifting droplet theory has been disproved. Cases in which the drifting droplet theory would explain helictite formation have not been found, and the notably large number of subscribers to the drifting droplet theory have up to now offered no valid proof of the occurrence of capillary-free helictites. One is forced to suspect that many of their offerings are based on uncritical acceptance of unclear notions concerning physical structures and processes. At this point, the conditions which produce surface transport of calcite over the helictite have not been quantitatively described; however, the processes producing helictite growth have now been fully explained.

[1]"Surface transport" is here understood as the spreading of a fluid on a fixed surface so that it builds a monomolecular layer with a vanishing contact angle of 0°.



STRATIGRAPHY OF THE CURRY HILL AREA

Decatur County, Georgia

Florida State Caver 11(2&3):24-28 Marianne Korosy

This article grew out of a trip to Climax Cave, which lies in Curry Ridge. The trip included Chuck Machovec, Marianne Korosy and three graduate students in geology: Mel Croft, Steve Peacock and Dave Watkins.

The purpose of this trip was to give Mel, Steve and Dave a chance to look at the various fossils exposed in the walls in North Climax, and ascertain in which limestone formations the cave is predominantly located.

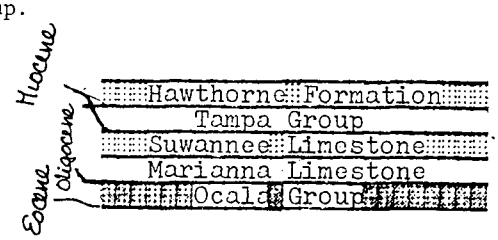
As background, the term "formation" means: "The fundamental unit in rock-stratigraphic classification, consisting of a distinctive mappable body of rock."[1] The term is often used by cavers as being synonymous with "speleothem"--generally defined to be any secondary mineral deposit formed in a cave. The former meaning is intended here.

Basically, what we learned is that the majority of the "dry" passage is formed in the Suwannee Formation, which is Oligocene in age. This means that the calcium carbonate (secreted by marine organisms), fossils and minor amounts of sand and clay that compose the rock were deposited in the ocean between 26 and 37 million years ago.

Stratigraphically, one or more limestone formations of Lower Oligocene age (slightly older than the Suwannee) are known to lie just below the Suwannee. One of these is the Marianna Limestone, which forms the ceiling of many of the caves in Jackson County, FL.

(Note: Mel informed me later that various people working in this area consider the Marianna Limestone equivalent to the Suwannee.)

Slightly older than the Marianna Limestone is the Ocala Group of Upper Eocene age, approximately 37-45 million years old. The upper member of the Ocala Group is the Crystal River Limestone. This is the predominant cave-forming formation in Jackson Co., FL. The lower levels of Climax Cave, that is, those now filled with water, may be forming in the Marianna Limestone and possibly as far down as the Ocala Group.



Relative positions of the formations discussed above

The unit which regionally overlies the Suwannee Formation is a limestone of the Tampa Group

The unit which regionally overlies the Suwannee Formation is a limestone of the Tampa Group. This is, in turn, overlain by the Hawthorne Formation--a thick sequence of interbedded sands, clays and limestone lenses. These two formations are of Miocene age--approximately 15-26 million years old.

On this trip into Climax, we were unable to find rock which could be accurately assigned to the Tampa Group. According to Mel and Steve, the Ocala, Suwannee and Tampa limestones are differentiated by the fossil assemblages each unit characteristically contains, rather than by actual aspects of the rock itself. Apparently, it is more accurate to refer to each formation as a "biozone"; for example, the Suwannee Biozone. Macrofossils visible in the cave walls, such as the echinoderms, were determined to be representative of the Suwannee Biozone.

The rock and loosely consolidated sediment exposed in the stream bed above Climax Cave and the upper levels of the cave itself are all part of the Hawthorne Formation. One of the more noticeable components of the Hawthorne is the green clay. This is the mineral Attapulgite, probably named for the town of Attapulgus (!) in Decatur County, GA. Attapulgite is a hydrous magnesium silicate which crystallizes in well-defined fibrous form. It is an inosilicate--*i.e.* the crystals have a chain structure like that of pyroxenes and amphiboles. (Pyroxenes are crystal mineral silicates containing two metal oxides, such as magnesium, iron, calcium or sodium. Amphiboles are hydrous silicate minerals composed mainly of metals such as calcium, magnesium or sodium.) Attapulgite is a non-swelling clay, but despite this, it is used as drilling mud, though in smaller amounts than swelling bentonite. It is advantageous in that it tolerates a high salt concentration without flocculating, *i.e.* the Attapulgite particles will not gather into small, loosely held clumps.

Attapulgite is a variety of fuller's earth, and thus is a naturally active adsorbent in its crude state. Spread on the floor of machine shops, factories, etc., it soaks up oil and grease and even absorbs it out of the floor. It has been used along with kaolin as an inert carrier for insecticides and fungicides. Also, it is used in treating the paper that provides copies of business forms without carbon sheets.

High-grade fuller's earth has been produced since 1895 in Gadsden Co., FL, and Decatur and Grady counties, GA. The major plants are at Quincy, FL, and Attapulgus, GA. The phosphite-bearing Hawthorne Formation is also the parent rock for the phosphates which are mined between Tampa and Bartow, FL.

The fossils and lithology of the Hawthorne indicate that it was deposited in a shallow, near-shore marine environment. The Piedmont area to the north was probably the source area. The fact that the clay is Attapulgite rather than one of the more common clay minerals remains unexplained, but is probably connected to the postdepositional history of the formation.

[1]Monroe, Watson H., 1970. A Glossary of Karst Terminology. Geol. Surv. Water Supply Paper 1899-K.

CORNFLAKES: THE ORIGIN OF CORNFLAKE FORMATIONS IN MCKITTRICK HILL CAVES

By Ed Frank

In June of 1979, I started a study of a speleothem found in certain caves in McKittrick Hill, Eddy County, New Mexico. These speleothems are called cornflakes due to their physical resemblance to the breakfast cereal.

In Caves of McKittrick Hill their origin and relation to the "warclubs" of Endless Cave are described as follows:

"Evidence of several distinct water levels may be seen on the walls /of the Warclub Room/, but these may be the result of a single flooding which receded in stages. Some of these water levels were sufficiently stable for the formation of calcite "rafts" on the surface of the water. The rafts remained behind, stuck to the speleothems and scattered on the floor when the water drained for the last time."

The purpose of my study was to determine a more detailed history of their formation. This included observing and photographing their occurrences in Endless and Sand Caves. Near the end of June I asked the BLM for permission to collect a few cornflakes for the purpose of making thin sections. Jim Goodbar, the BLM representative, and I collected some cornflakes and took photos in the Wet Room of Sand Cave the same week on June 16, 1979.

Water in pools in caves is commonly close to the saturation point in dissolved $CaCO_3$. Changes in air pressure, humidity, temperature, etc. can cause the $CaCO_3$ solution to become supersaturated. This causes $CaCO_3$ to be precipitated, either as encrustations on subaqueous surfaces, or forming a flocculent that floats on the water surface held up by surface tension. The crystals apparently form growing inward from the pools' edges or floating on the surface.

The long axis of the crystals grow parallel to the water's surface. These crystals coalesce to form rafts that form in a matter of hours, and may redissolve just as quickly if the conditions change. (Black)

One form of cornflake comes from rafts floating free on the water surface. Either they have broken free from the edges or originally formed floating on the surface. These rafts are extremely thin and show outward growth along all free edges, indicating that they formed while floating free and not attached to the edge of the pool. Minor fluctuations in water levels or ripples may have caused these rafts to break free from the edges and prevented their reattachment. It appears that these free floating rafts grew to sufficient thickness and hardness to form rigid plates up to 8 cm. across that were left on the pool's bottom when it drained. Attempts to refloat some of these rafts in Endless Cave were unsuccessful. However the pattern of crystal growth and physical configuration of the cornflakes indicate that they did form free floating on the surface. Their lack of success may be attributed to changes, such as dehydration, that have taken place in the cornflake since its deposition, altering an already marginally floatable object.

The second type of cornflake formed as a result of a thin layer of shelfstone collapsing under its own weight. In this type the raft is attached to the edge of the pool. It grows outward from the edge, thickening and hardening at the same time. It also grows by consolidation of free floating rafts. One cornflake collected showed where one raft had overriden another, they stuck together, and later layers of growth bonded into one unit. Apparently the rafts were still flexible at this stage and had collided while one of them was floating free on the pool's surface.

This hardening and thickening process continued until they formed a brittle layer of shelfstone held up partly by its own strength, and partly supported by the water. The water level changed, removing some of the support, and this layer shattered into hundreds of shards. It is these shards that make up the majority of the cornflakes on the 'warclubs' in Endless Cave. In the "Wet Room" of Sand Cave the remains of these shelves can still be seen attached to the walls of the chamber. The recementation of the shards and their encrustation has obscured and complicated this picture in many places.

Also in the "Wet Room" of Sand Cave are pieces of shelfstone that are much thicker. These chunks have formed as a result of some mechanical process, like subsidence in the cave, and are not to be confused with cornflakes which collapsed apparently under their own weight.

I attempted to make acetate peels of the cornflakes I collected in lieu of thin sections. In this process the samples are dipped in acetone and pressed against a sheet of acetate drafting film. The acetone melts the plastic and when the sample is pulled free, a thin layer of the sample remains stuck to the plastic drafting film. This peel can then be used in the same fashion as a normal thin section. However in this case the crystalline cornflake was too hard and resulted in a very thin peel that was blotchy and hard to work with. The technique is used normally on sediments and soft sedimentary rocks such as limestones. It requires a flat smooth surface.

The second form of cornflake could probably be better described as "shards", but the popular usage of the term cornflake will probably prevail.

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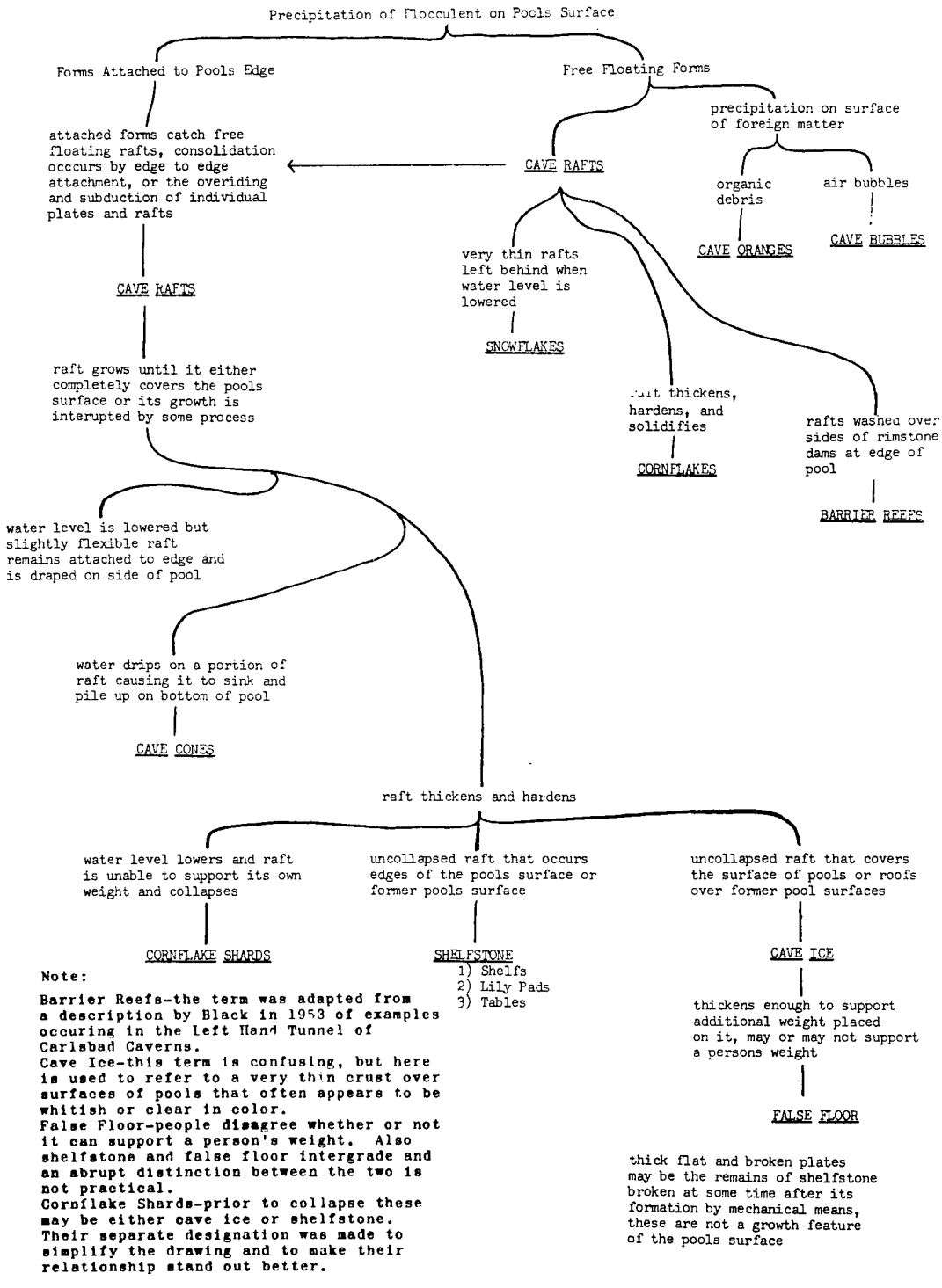
Southwestern Cavers



Note:

Barrier Reefs-the term was adapted from a description by Black in 1953 of examples occuring in the left Hand Tunnel of Carlsbad Caverns.
Cave Ice-this term is confusing, but here is used to refer to a very thin crust over surfaces of pools that often appears to be whitish or clear in color.
False Floor-people disagree whether or not it can support a person's weight. Also shelfstone and false floor intergrade and an abrupt distinction between the two is not practical.
Cornflake Shards-prior to collapse these may be either cave ice or shelfstone. Their separate designation was made to simplify the drawing and to make their relationship stand out better.

Jan-Feb 1980

Paleontology

BEAVER SKELETON AMONG VERTEBRATE REMAINS FROM BEX PIT CAVE

Lawrence County, Indiana

Bloomington Indiana Grotto Newsletter 15(3):48-51

Ronald L. Richards

In spring 1969 the author and a friend visited Bex Pit, Lawrence Co. The entrance of the 15-ft climbable pit is in a small sinkhole, just inside a thin forest, adjacent to a rolling sinkhole pasture. An overgrown, abandoned quarry is nearby. The cave consists of 60 ft of dry, breakdown and silt-clay floored passage. A live raccoon was noted in its den, a narrow "solution tube" midway down the entrance drop. The skeleton of a beaver was found below the base of the entrance drop, buried under several inches of dirt and limestone "shingles" with the skull and jaws in articulation and, lacking rodent gnawing, indicated a rapid burial originally at the locus of recovery. Several of its bones had eroded to lower, exposed, sub-entrance "pockets," marking well a trail to the main skeleton. On a return trip, a lower cave level was dug into, exposing another 90 ft of passage. Here, surface skeletal remains were undisturbed, though of minor frequency. Skeletons of cave inhabitants, fall-in survivors, and bones eroded from the upper level passage were represented. Following are the cave remains recovered.

Species	Min. # Indiv.
Entrance drop area:	
Meleagris gallopavo, wild (?) turkey	1
Castor canadensis, beaver	1
Felis domesticus, domestic cat	1
cf. *Canis* sp., (?) wolf	1
Lower "undisturbed" area:	
Eurycea lucifuga/longicauda, cave or long-tailed salamander	
Eurycea lucifuga/longicauda, cave or long-tailed salamander	1
Bufo sp., toad	1
Terrapene cf.*carolina*, eastern box tortoise	1
Agkistrodon contortrix, copperhead	1
Didelphis marsupialis, oppssum	1
Scalopus aquaticus, eastern mole	1
Blarina brevicauda, short-tailed shrew	3
Cryptotis parva, least shrew	2
Glaucomys volans, southern flying squirrel	1
Microtus ochrogaster/pinetorum, prairie and/or pine vole	12
Peromyscus sp., deer mouse	7
cf. *Sylvilagus floridanus*, eastern cottontail	1

The beaver material is noteworthy. A well-preserved, nearly complete, large adult skeleton is represented. While bones of beaver are common in Indian refuse mounds, skulls are fragmented and skeletons are only partial. Indeed, remains of the extinct giant beaver, *Castoroides ohioensis*, once were and still may be more abundant and better preserved in Indiana than those of the Recent beaver, *Castor canadensis* (Lyon, 1936). The Recent beaver was exterminated in southern Indiana by about 1840, for the commercial value of its hide (Hahn, 1910), and records for south-central Indiana were lacking. The animal was reintroduced in the 1930s and 1940s (Mumford, 1969). The subspecific status of the original beaver population of the state is uncertain. As the cave bones had been buried, leached of proteinaceous bone material, and were cave-sediment-stained yellow-brown, a sample of native beaver may be represented. A blundering, fall-in entrapment and eventual death is suspected. Although the East Fork of White River is 3/4 mi NNE of the cave, smaller ponds and streams are favored. Perhaps this habitat was once present in the local lowlands.

The *Canis* material consists of a single gnawed thoracic vertebra. It was compared with vertebrae of over a dozen dogs, nearly a dozen coyote, and two wolves in the Indiana University Ethnozoology laboratory. It compared favorably in size with the wolves, two coyotes, and a great dane dog. A wolf is probably represented. Two species of wolf (*Canis lupus*, gray wolf; *Canis rufus*, red wolf) were known from Indiana, and both were absent by 1907 (Mumford, 1969). Reported cave remains are nonexistent in Indiana, though the the Harrodsburg Crevice of Monroe Co. produced bones of the extinct dire wolf (*Canis* cf. *dirus*), and other wolf possibilities (Parmalee et al., 1978).

The turkey bone fragments closely resemble wild turkey. The mole skeleton was complete, and quite recent, lying in its own humus pile (disintegrated body tissues).

The habitats represented include: upland forest (copperhead, flying squirrel, tortoise); brushy, or thin forested areas (cottontail); marsh, pond, or stream (beaver); and cave (salamander). While all the remains were not necessarily deposited at any one time period, all the habitats (except aquatic?) are available in the area today. The lack of bat, woodrat, and paucity of snake remains is atypical. A Recent age might be assigned to the majority of the fauna.

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FAUNAL ACCUMULATION IN A PROBABLE SEED CACHE OF THE WHITE-FOOTED MOUSE IN ANDERSON PIT CAVE

Monroe County, Indiana

Bloomington Indiana Grotto Newsletter 15(3):43-47

Ronald L. Richards

The entrance to Anderson Pit Cave, a 27-ft pit cave of several hundred feet of walking passage, is at ca. 725 ft of altitude on a gently sloping hilltop, in a thin forest, at an uncultivated field edge. In spring 1971, 90 ft from the entrance in a S-SE trending passage, an accumulation of rodent-punctured hackberry seeds was noted in a depression of the flat cave floor at the side of the passage. As a colubrid snake vertebra was mixed among the debris, the limited-area accumulation was removed to the lab for the "washing" and screening of its microfaunal content. It was surprisingly diverse. The remains were as follows:

Name	Min. # Indiv.	Remains recovered
Amphibia:		
Plethodon glutinosus Slimy salamander	1	2 trunk vertebrae; humerus
Plethodon sp. Small plethodon sp.	1	trunk vertebra
Eurycea bislineata Two-lined salamander	1	trunk vertebra
Bufo cf. *woodhousei fowleri* Fowler's toad	1	L iliar portion
(*Bufo* sp. probably attributed: paired ulnoradii; parasphenoid; maxilla; frontoparietal; coccyx; 2 cranial bones)		
cf. *Rana* sp. Aquatic frog	1	paired humeri; pterygoid; ulnoradius; maxillae; tibiofibulae
Reptilia:		
Haldea/Stroreria sp. Earth, brown or red-bellied bellied snake	1	13 precaudal vertebrae
cf. *Thamnophis* sp. Garter or ribbon snake	1	3 precaudal vert., poss. attributed; L dentary
Elaphe sp. Rat snake	1	Precaudal vertebra
cf. *Carphophis amoenus* Worm snake	1	6 precaudal vert.
(Note: A darker stained precaudal vertebra may or may not belong to this taxon)		
Mammalia:		
Blarina brevicauda Short-trailed shrew	1	L dentary; L innominate; L femur; R ulna; paired scapulae; R tibiofibula; axis
(Note: Dentary measurements: total length 13.97; condyle width, 3.24; ramus depth at m2, 2.1. This isolated dentary is rather small, suggesting *B. b. carolinensis* - mandibular index of 34.14 (Graham and Semken, 1976) - the subspecies of the southern 1/3 of Indiana (Lyon, 1936).)		
Scalopus aquaticus Eastern mole	1	R ulna, terminal phalange
Myotis cf. *keenii* Keen's bat	1	L,R dentaries
(Note: Dentary c-m3 lengths: L 6.35, R 6.36)		
Myotis lucifugus/sodalis/austroriparius Little brown, Indiana, or southeastern myotis	1	L dentary
(Note: Dentary c-m3 length, 5.71. Additional *Myotis* R dentary and unpaired maxillae are unattributed.)		
Pipistrellus subflavus Eastern pipistrelle	1	R dentary
Plecotus sp. Big-eared bat	1	L dentary
(Note: A R maxilla may belong to *Plecotus* or *Pipistrellus*.)		
cf. *Tamias striatus* Eastern chipmunk	2	R ulna (ad.); Juve.: L humerus; R proximal femur portion poss. attrib.
cf. *Peromyscus* sp. White-footed mouse	2	2 fragmented L dentaries lacking teeth; 1L, 1R maxillae
(Note: One juvenile.)		
aff. *Neotoma floridana* Eastern woodrat	1	Anterior caudal vertebra resembles woodrat
Microtus ochrogaster/pinetorum Prairie or pine vole	1	m1
Indet. mouse sp.	1	4L,3R i; 4L,2R I, most probably belonging to *Peromyscus* or *Microtus*

Other: terrestrial snails: *Anguispira kochi*, 1; indet. larger zonitidae, ca. 2; reflected-lip polygyrid fragments, ca. 2; *Sphaerium* sp., sphere clam (close to *S. sulcatum* or *striatinum*), 1; crayfish pincer-tip, 1; hackberry seeds, ca. 222; 4 other seed types, 10.

Hackberry seeds formed the bulk of the collection. It is suspect that the white-footed mouse (*Peromyscus*), known to store seeds in caches often up to a pint in bulk, and known to inhabit the caves (Lyon, 1936), is responsible for their collection. All bear tiny "incisor" punctures. These punctured seeds are often common on tight, narrow cave ledges and fissures, often well off the cave floor. Lacking larger gnawed bone scraps and nuts, the influence of woodrats here seems to have been minimal.

The food input into a cave system must ultimately be brought in from aboveground (Mohr and Poulson, 1966). Organic detritus underground is at a premium. The accessible location of this seed cache, with its organic debris, would have hosted invertebrates, in turn attracting salamanders and other forms trapped or wandering in the passage. Decomposition of their remains upon death would add to the detritus. This accumulating "organic oasis" might be widespread, and be perhaps responsible for many of the localized accumulations of faunal materials in caves. Skeletons of surviving cave fall-ins are less commonly

placed randomly, but often located in an "attractive", sometimes sheltered locating, and remains tend to occur in groups.

In the Anderson Pit "cache" the incidence of presumed inhabitants is high (e.g. slimy salamander, short-tailed shrew, bats, white-footed mouse, ?woodrat, and perhaps vole). Attracted fall-in survivors might be toad, frog, snakes, and chipmunk. However, the lack of such common cave fall-ins as large snakes, opossum, raccoon, skunk, groundhog, and squirrels might indicate a nearby fissure input for some of the forms. This might include such burrowing, secretive forms as earth/red-bellied snake, worm snake, and mole. Some aquatic component is represented by the two-lined salamander, frog, sphere clam, and crayfish. Most forms recovered (except ?woodrat) inhabit the area presently, suggesting similar ecological conditions during the period of accumulation, except those related to ?woodrat range maxima, and possibly local stream activity. While some antiquity may be presumed for the accumulation, estimates are difficult with the data and resources at hand.

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TWO PECULIAR OCCURRENCES OF REPTILES IN SOUTH-CENTRAL INDIANA CAVES

Bloomington Indiana Grotto Newsletter 15(3):14-15 Ronald L. Richards

Herptiles (amphibians and reptiles) are usually regarded as being stronger indicators of local habitat than the usually more abundant mammals in recent and fossil deposits. Occasional "stray" occurrences of herptiles, however, can confuse the investigator, demonstrating that the total faunal assemblage must be assessed to reconstruct past habitats. Two such "aberrant" cave occurrences in Indiana are:

1. *Pseudemys scripta*, red-eared turtle. Kern's Pit, Lawrence Co. Collected Jan. 1969. Specific identification by Dr. J. A. Holman, paleoherpetologist, The Museum, Michigan State Univ. Several bones of a large adult were scattered at the base of the "deep" entrance drop, indicating a fall-in death. Red-ears inhabit sloughs and coves of large rivers, as well as shallow lakes and ponds, and even temporary swamps and ditches (Minton, 1972). The present cave entrance is in a forested upland. Local ponds are several hundred feet away, and East Fork, White River, is ½ mi to the south. A red-ear was also recovered from a Florida cave, very far from permanent water (Holman, 1958).

2. *Nerodia cf. sipedon*, banded watersnake. (Once known as *Natrix*.) Brinegar's Cave, Monroe Co. Collected summer 1974. Nine precaudal and two caudal vertebrae of a large individual were recovered 30-40 ft inside the cave, 6 ft off the floor on a ledge area and wall solution anastomoses. The relatively low neural spine of this natrix compared closely with *N. sipedon* specimens, presently the only local spe-ies cies of larger natricine. The relatively intact vertebrae do not show evidence of predator-prey activity, and the snake may have crawled to position. The banded watersnake inhabits warm, quiet, shallow water, usually in sunny areas. The young do travel considerably, often far from major bodies of water, thus colonizing new habitats (Minton, 1972). The cave entrance is in a sinkhole in a wooded upland. Only a small intermittent stream, usually dry, is present a couple hundred feet downhill from the cave.

Snake remains are very common in caves. Whereas a typical mammal might have a dozen or so identifiable bones, the vertebrae of snakes, quite durable and identifiable, number in the hundreds, thus biasing their chances of recovery and identification.

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VERTEBRATE REMAINS FROM PRECINCT #11 CAVE

Rockcastle County, Kentucky

The Electric Caver 16(10):120-121 Ronald C. Wilson*

Precinct #11 Cave is located on the east bank of Crooked Creek in eastern Rockcastle County, KY. Although the cave contains several kilometers of passageway, it was not explored until 1980 because of a water barrier near the entrance where airspace is limited to less than 15 cm even during periods of low water levels. Explorers from the Greater Cincinnati Grotto of the NSS, led by Gary Bush, discovered a passage containing footprints of a large animal. They reported the discovery to Bill Thoman, who invited the author to visit the cave to evaluate the tracks, which were believed to be prehistoric. The cave was visited on Aug. 16, 1980. Besides Bush, Thoman and the author, the party consisted of Mike Mezmar, Dennis Green, Jack Hissong, and Paul Knasel.

During the trip, prehistoric vertebrate remains were examined at five sites in the cave. Each is briefly described below.

1. In the north half of the Formation Ledge passage there are abundant tracks of black bear *(Ursus americanus)*. Most tracks are incomplete, but the larger ones are 10-11 cm in diameter. The tracks occur in still soft clay throughout the 5-m-wide passage, but are best preserved north of the intersection of the Formation Ledge with the main stream passage of the cave. This area of the passage also

contains two bear beds, rounded depressions scraped in the clay and used as hibernation sites by the bears. The beds are about 1.5 m in diameter and about 0.2 m deep. Both beds and many of the footprints are partially covered by a thin layer of fine grains of limestone that have weathered from the cave ceiling. The accumulation of this veneer of weathered particles in an essentially stable environment strongly supports the assumption that the bear evidence is of considerable age.

2. In the terminal breakdown at the SW end of the Formation Ledge passage, a partial skeleton of a toad *(Bufo* sp.*)* was recovered. Bones collected include 1 scapula, 2 humeri, 1 ulna, 1 femur, 2 tibiofibulae, R ilium (healed break), 6 vertebrae, urostyle (healed break), 2 astragali/calcanei, R mandible, R maxilla, and sphenoid. The bones are chalk-white and very fragile. The ilium and urostyle reveal that the toad survived a severe injury during its life before becoming trapped in the cave.

3. At the base of a virgin 30-m dome discovered near the emergency supply cache in the upper level of the cave, dozens of white-footed mouse *(Peromyscus* cf. *leucopus)* skeletons were observed. The following bones were collected: 2L, 2R mandibles; 2L, 2R humeri; 1L, 2R tibiae, 2R femora; 1R pelvis; 1R ulna; and 1R scapula. The domepit functioned as an effective mouse trap, but it seems odd that other species were not also trapped.

4. In the breakdown at the bottom of the terminal dome complex discovered several hundred meters beyond the 30-m dome, several bones and teeth were found. These included 3L mandibles; 1L, 1R humeri; L tibia; proximal epiphysis of R tibia; L ulna; and L ischium of woodrat *(Neotoma floridana)*; L mandible of white-footed mouse *(Peromyscus* cf. *leucopus)*; R I/, M/ of cottontail rabbit *(Sylvilagus* sp.*)*; and an ulna of a squirrel *(Sciurus* sp.*)*. All bones were stained lightly by the yellow-brown matrix and accumulated as the result of animals falling down the vertical shaft.

5. In the terminal dome complex and in the passage between the two dome areas, abundant black bear *(Ursus americanus)* tracks occur where the mud is soft enough. They occur in portions of the passage that illustrate the agility of bears in climbing and in crawling. No bear beds were seen in this passage.

Summary of animals represented:

Bufo sp.	Toad
Neotoma floridana	Woodrat
Peromyscus cf. *leucopus*	White-footed mouse
Sciurus sp.	Squirrel
Sylvilagus sp.	Cottontail rabbit
Ursus americanus	Black bear

Significance of the remains. Precinct #11 Cave is the only cave in Kentucky known to contain prehistoric bear footprints. It is the only confirmed bear hibernation site in the state. The possibility of bear skeletal remains eventually being discovered in the cave seems to be good. Further searching of newly discovered areas of the cave may reveal additional similar sites or bone deposits of Pleistocene age.

Conservation notes. Because the bear signs are of considerable age and represent the only examples of such signs in Kentucky, they should be preserved. Fortunately, the water barrier near the cave entrance effectively screens potential explorers and limits the number of people wanting to traverse the cave's passageways. Standard conservation techniques such as careful placement of narrow trails through sensitive areas and staying on the trails once they exist should be enough to preserve the bulk of the remains. The footprints and bear beds need to be photographed so copies of the photographs can be placed in permanent archives for preservation.

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MOLLUSK FRAGMENTS AND BONE SCRAPS IN LITTLE DULL CAVE, and A NOTE ON FORMER CAVE STREAM ACTIVITY

Monroe County, Indiana

Bloomington Indiana Grotto Newsletter 15(3):16-18

Ronald L. Richards

Two trips to Little Dull Cave, Monroe Co. (winter 1972 and fall 1974) produced only scanty faunal remains. The relatively small entrance, on a forested hillside, had been recently opened, and apparently had not permitted the entry of larger fall-ins and wandering carnivores, remains of which are numerous in in more accessible caves. Relatively moderate sized rooms were present in the 100-200 ft of cave. Only on a lower level of dry, silt-clay and breakdown floor was any faunal accumulation evident. Identified were:

Name	Min. # Indiv.	Remains Recovered
Arthropods:		
Indet. crayfish	1	"pincer" fragment
Anguispira kochi Terrestrial snail	2	fragmented shells
Sphaerium spp. Sphere clams	3	4 fragmented valves
Vertebrates:		
Bufo Toad	1	tibiofibula portion
Rana cf. *sylvatica* Wood frog	1	R ilium; 2 fragmented tibiofibulae; humerus
Indet.viperid snake Copperhead or rattlesnake	1	fragmented precaudal vertebra
Blarina brevicauda Short-tailed shrew	1	R dentary portion
Neotoma floridana Eastern woodrat	1	paired maxillae; L premaxilla; paired tibiofibulae; R humerus
Indet. mouse sp. (excluding *Peromyscus* sp.)	1	R humerus
cf. *Sylvilagus floridanus* Cottontail	1	thoracic vertebra

A. kochi is a forest snail of shaded slopes and limestone bluffs. Once abundant in southern Indiana, its numbers are becoming fewer (Goodrich and van der Schalie, 1944). As snails are often fed upon by mice and shrews (Lyon, 1936), unbroken shells in caves are few. The tiny sphere clams resemble *S. sulcatum* and *S. rhomboideum*, both inhabiting eddies in rivers and creeks (Herrington, 1962). A small stream a couple hundred yards downhill might present suitable habitat. Davis (1973) gives the characters for wood frog ilium identification. It inhabits rocky, shaded gorges, and forested bottomland (Minton, 1972). The viperids prefer forested ridgetops. The mouse, shrew, and woodrat could have inhabited the cave, and an abandoned latrine of a woodrat was noted near the bone area. This woodrat record is north of its present range (Richards, 1972). While none of the remains would indicate ecological conditions notably different from those in the area presently, the presence of sphere clams is noteworthy. Their remains are common in southcentral Indiana caves, both in sedimentary floor, as well as on perched ledge deposits. Most valves recovered are unworn, unlike the "dead" specimens recovered from stream and river gravel bars. A reproducing population of sphaerid clams has been reported in a Missouri cavern (Peck and Lewis, 1978). Sphaerid clams could be an indicator of past cave stream activity and level, perhaps with some value the correlation of local cave deposits. However, it is suspect that some animals (e.g. raccoon) might ingest these clams, showing up in the caves as stomach remains or coprolite debris. Further, as woodrat remains are often among the faunal associations of sphere clams, their collecting activity might obscure the true provenance of the clams.

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COMMENTS ON SOME VERTEBRATE REMAINS NOTED IN SMITH VALLEY CAVE

Mammoth Cave National Park, Kentucky

Bloomington Indiana Grotto Newsletter 15(3):12-13

Ronald L. Richards

In July of 1971, the author was mapping parts of Smith Valley Cave, near Cedar Sink, in the Mammoth Cave National Park with the Natural Sciences Resource Studies Group. In a dry upper level of the cave (a domeroom of the "upper expressway"), well over a thousand feet from the present entrance, several small bones were noted. No digging was attempted. Microfauna was unnoticed. The following species were represented:

Name	Min. # Indiv.	Remains Noted
Bufo cf. americanus American toad	1	L ilium
Agkistrodon contortrix Copperhead	1-2	16 precaudal vertebrae
Crotalus horridus Timber rattlesnake	1	precaudal vertebra
Terrapene cf. carolina Eastern box turtle	1	plastral fragments
vulture sp. Black or turkey vulture	1	carpometacarpus
Marmota monax Woodchuck	1	radius
cf. fox sp. Red or gray fox	1	basioccipital fragment
Homo sapiens Aborigine(?)	1	R fibula, proximal fragment

Several of the copperhead vertebrae were articulated in a sinuous pattern, suggesting that a whole snake may have worked its way into the passage through surface fissures, or a presently closed nearby entrance. The domeroom is below the slope of the aboveground hillside. A larger vertebra may indicate a second copperhead. All of the herptiles recovered are are present in the area today (Hibbard, 1936). Three vulture nestlings have been recently observed in a shallow cavity of a Cedar Sink bluff. Aborigines were exploring the nearby Salts and Mammoth caves by 3,000 years ago (Watson, 1974). The human fragment bore rodent, perhaps woodrat *(Neotoma floridana)* gnawings. Woodrats do collect (and gnaw) bones and other forst debris, and old abandoned nests, as well as living woodrats have been noted in the cave. Most of the cave remains would indicate a forested, hill country as prevails in the area today.

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NEW TROUT CAVE BONE DIG
1979 ANNUAL REPORT

Karst Kaver 14(1):3-8 Fred V. Grady & E. Ray Garton

During the past year one of the main goals of the Monongahela Grotto has been the excavation of the bone site at New Trout Cave. Many cavers have participated in this effort and this report is intended to show just what we have accomplished in the past year. We certainly couldn't have progressed as far as we have without all our volunteers who showed up to haul bags of matrix out of the cave.

In the fall of 1978, Janice Boore told us of a discovery of a "shark" jaw in New Trout Cave, Pendleton County, WV, by a party from P.S.C. With Janice's help we managed to find someone, John Reich, who kn knew where the jaw was and who could guide us to the locality. It was on Feb. 3, 1979, when we finally got the trip organized. The usual West Virginia weather of that time of the year left us with a rather small party--Ray, Mary, Ellen, Susan, Fred and John Reich. We entered the cave and quickly made our way back to the end of the second large room. Here we stopped to rest a few minutes and check our equipment. Almost at once several of us noticed scattered small bones on the dry, dusty surface. We picked up several bats, mostly *Myotis*-sized. Then Mary Ellen found a microtine tooth! Something clicked deep in the recesses of Fred's brain. Microtine rodents just don't walk a thousand feet into a cave. Fred knew that microtine rodents are excellent climatic indicators. This is just what we had been looking for--a possible Pleistocene bone site. We scraped up about 5 lbs of bone-bearing sediment and put it in a plastic bag. We would pick it up on our return from the shark.

The remainder of the trip was somewhat anticlimactic. After a considerable distance, much of it crawling, we made it to where the shark was. It was merely a peculiarly fractured brachiopod shell.

Later Fred went through our precious 5 lbs of bone-bearing earth. He put it in a fine strainer to get rid of the dust-sized particles and then picked through the rest a pinch at a time. Teeth and jaw parts were quite numerous and about a dozen different small mammals were included. None, however, gave conclusive evidence that the deposit was Pleistocene in age, though one tooth gave a strong hint in that direction. We obviously needed more sample.

Ray was planning a student trip the following Sunday. Fred figured to join him and discuss another New Trout trip. Susan had other plans so Fred called Kendall Free. Sure, he was game. Fred brought several large sacks along and they headed for cave country early on Feb. 10. Since they had gotten an early start, Kendall asked Fred if there was anything particular he wanted to do Saturday. Fred replied that he wanted to have another crack at the bone deposit in New Trout.

A couple of hours later they entered the cave. They had two sacks and a piece of plastic screen. It would be easier to haul out concentrate rather than raw dirt. Everything went smoothly and they each exited with a sack of concentrate. Later that day they found out that the student trip had been cancelled. Nonetheless, they had what Fred wanted, more sample. Over the next few days Fred picked through the concentrate. More jaws and teeth showed up, adding a number of additional species to the New Trout local fauna. One small jaw caught Fred's attention. It was different from any so far. He dug into his collection of articles on Pleistocene cave faunas. Sure enough, the jaw was *Phenacomys intermedius*, the heather vole. This mouse-size rodent has the St. Lawrence River as its southern boundary today, and is considered a good Pleistocene indicator for the central Appalachians.

Over the next few weeks we got in touch with Allen McCrady of Carnegie Museum of Natural History. He suggested that we send some of the specimens to John Guilday for inspection. John confirmed that the New Trout specimens indicated a late Pleistocene age and encouraged us to look farther. John also offered us the use of the New Paris, PA, field laboratory for washing the New Trout matrix.

On March 3, Allen McCrady and Joanne McCrady joined Ray, Mary Ellen, Janice Boore, Susan and Fred for the first large-scale dig. After getting together at the Tucker Co. fieldhouse the night before, we converged on the side with shovels and sacks. Beneath the first few inches the sediment was too moist to dry screen, so we would have to take it as it was except for large rocks that could be easily tossed aside. Allen suggested we start a trench in one-foot levels. We managed to fill all 18 sacks without even getting to the bottom of the first one-foot level, which we had designated as Level A. The area of bone-bearing deposit seemed to be much larger than our original expectations. It might take another trip or two, we speculated. Little did we know! We grunted as we hauled the 30- to 50-lb sacks out to the entrance, resolving to get smaller bags for the next trip. Ray and Fred wet screened some of the matrix back at the fieldhouse and got immediate results, including some larger mammals.

A month later another dig, coinciding with the Virginia Region meeting at Thorn Spring Park, resulted in the removal of some 43 bags of matrix. By this time, we had gotten below the first level and were into the second. Meanwhile, we'd been busy picking and finding more teeth. The next weekend while picking part of the coarse fraction, Fred found a piece of large carnivore tooth. It had to be come sort of canid or felid. The next Monday at the Smithsonian Fred started comparing the tooth to other fossils. He pulled a large jaw from a drawer marked "La Brea Tarpits." The New Trout tooth part was identical to one of the teeth in this dire wolf jaw. We now had an extinct species from New Trout.

The third weekend of April we screened the previous dig's results at the New Paris field laboratory. More surprises turned up, both large and small. Best of all were five jaws of *Microtus xanthognatus*, the yellow-cheeked vole, now known only from northern Canada and Alaska. Several other Pleistocene sites had previously turned up this species. Since the New Trout site now surely dated to the time of the last glacial episode, we had a glimpse into the past. Where would it go from here?

The May 11 trip to New Trout (becoming a monthly event) was cancelled because of other commitments. Fred was fretful. We had to keep up the momentum and he wanted something to wash at New Paris the next weekend. He decided to go to New Trout by himself and see what he could do. He brought several extra light sources and started filling bags. There was a

geology class from a college in Pennsylvania in the cave at the same time and Fred recruited bag haulers on the spot. He managed to deepen the trench into Level C. The next weekend the screens at New Paris revealed teeth of the extinct peccary *Platygonus compressus*.

Where had all these animals come in? The large number of mouse-sized mammals, birds and fish suggested a predatory bird roost, but certainly not 1,000 ft back in a cave. We had probed upward for a possible vertical entrance. Bone was found on several ledges, then the ceiling closed tight. Any vertical fissure was probably closed off long ago. The few odds and ends of large animals were probably brought in by scavenging woodrats, *Neotoma floridana*, whose remains are numerous in the side. Bats, *Myotis sp.* and *Eptesicus fuscus*, outnumbered all other species, probably the result of natural mortality over perhaps thousands of years.

On May 26, another major assault on the trench was planned though only four of us were able to make it. While Mary Ellen and Fred dug, Ray and Jim Gyorko hauled bags across the second room. We managed to fill 96 bags weighing an average of some 20 lbs each. the fourth level was penetrated and there was no end in sight. A partially filled side passage was discovered at the fourth level, "D". Fred forced his bo body in and could see bone just out of reach. Then w we started to carry out the bags. With herculean effort, the small party gradually moved the pile of ba bags toward the entrance. Progress was slow and gruelling. A line had been rigged from the entrance down to a tree near the road. The bags were tied to carabiners and slid down the rope. After loading up the truck, we headed for Franklin and a hot meal. By this time it was 9:30 p.m. It had taken 12.5 hours to dig the matrix and to get it out of the cave. Nearly a ton of matrix had been collected by four people. Back at the fieldhouse several of our companions were considering sending out a search party for us.

The large lot of matrix was washed a few weeks later and produced many specimens. On one of the coarse screens from level D Fred found a wing bone of a bat that he was totally unfamiliar with. It was larger and different from anything previously found in New Trout. Later examination of modern specimens showed that it was a part of a vampire bat. Fossil vampire bats had been recorded from Florida and California but never in the Appalachians. Further picking indicated a definite warming trend in the lower levels, suggesting that they dated from a warmer interval preceding the last glacial episode. Persistence of certain cold forms at these levels was, however, puzzling.

A modest dig early in July resulted in expansion of the trench down through the fifth or E level where large rocks impeded progress. Bone was becoming spa sparse at these depths, though we were certain that it was also older and was well worth the additional effort. Fragments of ground sloth, *Megalonyx*, teeth recovered from level E were the first such remains of this extinct beast to be recovered from West Virginia since Thomas Jefferson's report in 1799.

A preliminary report of the New Trout discoveries was presented at the NSS Convention in Pittsfield, MA, and an abstract published in the convention program. By this time the faunal list had grown to over 50 different mammals representing several thousand individuals. Birds, snakes, salamanders, frogs, toad toads, and fish are also present.

On Sept. 15, a party of five made up the digging crew and collected about 450 lbs of matrix. The rock jam was pierced and quantities of levels F and G wer were collected. The bottom had not yet been hit. This material was washed and produced disappointingly little. The presence, however, of at least some identifiable teeth and jaws showed our efforts were still paying off.

The following month our call for volunteers increased our turnout at the dig to 17. Some 1,200 lbs of matrix were easily collected. Fred feels tha that solid bottom was apparently hit midway through the 8-ft H level of excavation. However, Ray feels ha that since the hole at the 8-ft level is so small, they can't be sure until the hole is expanded laterally. This means starting at the surface of the dig agains and widening the hole all the way back down to H level. The bone-rich side passage discovered in May was then tackled. It was very tight and only one person at a time could get in and fill bags by the ha handful. Much of this passage had been cleaned out by the time we ran out of bags.

In November, the results of carbon-14 tests on the first three levels of New Trout became available. The dates were as follows:

A level = 17,060 ±220 years
B level = 28,250 ±850 years
C level = 29,400 ±1,700 years

These dates tend to confirm our data concerning the age of the fauna. Later in the month a presentation was made at the annual meeting of the Society of Vertebrate Paleontology at the Carnegie Museum of Natural History in Pittsburgh. Ray and Fred also met wit with John Guilday at his home to discuss the work at New Trout.

By this time grants had been received from the NSS, The Robertson Association, amd Mr. and Mrs. John Green. Profits from two auctions were made available to the New Trout effort. Now we had a nest egg from which we could draw to supply future digs.

On Dec. 1, the tenth expedition to dig New Trout was organized. Twenty-seven people showed up to help and the diggers could barely keep up with the haulers. We expanded the excavation laterally and collected quantities of A, B, C, D, and E levels. Bone appeared to be especially rich in the upper two levels where a large porcupine jaw and a split peccary canine were among the specimens collected during the excavation process. Samples to be analyzed for pollen were collected from the first five levels and an interesting artifact of flint was found near the cave entrance by Jim Melton.

After ten excavation trips, seven weekends at New Paris processing matrix, and hundreds of manhours picking bones, what have we learned? Actually, it is the latest of a series of lists as new information is constantly becoming available. The fauna indicated that during the late Pleistocene the environment of the area around New Trout Cave was considerably different from the present. We are also starting to se see some differences in fauna between levels.

The upper levels, particularly A and B, show a faunal picture similar to such sites as Clark's Cave in Virginia and New Paris Sinkhole #4 in Pennsylvania. Species now confined to Canada and northern New Eng-

land are present in the upper levels in considerable numbers indicating colder temperatures. Certain prairie species suggest the presence of some open grassland nearby though the dominant cover was probably spruce forest.

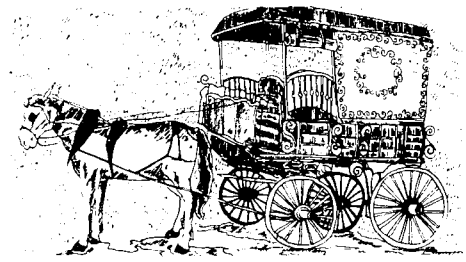
The lower levels show persistence of some northern forms but they are less well represented and the overall aspect of the lower levels is more suggestive of the Baker Bluff site in Tennessee. The presence of two genera of mammals-- *Desmodus*, the vampire bat, and *Neofiber*, the water rat--in level D is puzzling as both these general show strong southern affinities. Also present in only the lower levels of New Trout are horse, sloth, and pocket gopher. A complete analysis of the fauna is in progress.

By the time spring arrives all the matrix that has been washed will have been picked and we will be ready to begin digging, washing and picking again. The first dig of the year is planned for Saturday. The digging plan is to expand the pit laterally a few feet so that we will have enough room in the hole to dig back down to H level and beyond if possible. It was at this level we hit a large rock or the floor of the cave. However, since the bottom of the pit was o so small we can't be sure. So we must expand the dig. This expansion will result in another 3-5 tons of matrix to be removed from the cave and processed.

Back in September we were optimistic that the dig would wind down around the end of the year or early in 1980. We had predicted having a manuscript ready for the *NSS Bulletin* in April. As the site ha has far exceeded our wildest dreams, it may be ano-he ther two years before the paper appears. However, w we do plan to publish a couple of smaller papers on some of the individual taxa. Why so long? Consider that nearly 20,000 bones have been recovered and at least that many more will be recovered. Each bone must be studied, identified, measured, numbered and catalogued. All of this for the most part is being done by two people in their spare time for no pay.

Acknowledgements. Foremost we wish to thank Mr. Harlin Moyers, the owner of New Trout Cave for his permission to excavate the deposit. Second, we owe special thanks to Mr. John E. Guilday of Carnegie Museum of Natural History for his identifications. interest, the use of his washing facilities at New Paris, PA, and his continuing encouragement. Also special thanks to Dr. Clayton Ray of the Smithsonian Institution for his help in identifications and his continuing interest. We also thank the Smithsonian Institution for their assitance in obtaining carbon dates. Most important, we thank the dozens of cavers and friends who have given their time and sweat to the digging, hauling, washing and picking of the matrix.

History



the legend of CATAWBA MURDER HOLE

The Region Record 12:189 Anonymous

Here follows the legend of the Murder Hole, as reported in a 1944 newsletter of the VPI Grotto:

"It was about 5:00 on a fall morning and the traveling salesman was very anxious to get an early start. The farmer with whom he had spent the previous night had helped to harness his horse, and was accompanying him to the road. The morning was very dark with cold rain coming down in waves. The only light was an occasional jagged streak of lightning followed by a peal of thunder, echoing and re-echoing across the mountain ridges. The buggy sank deeply into the soft muddy ground causing much straining and wierd cracking on the water-soaked harness. Despite all this, the peddler was in high spirits. He was thinking of home; of his wife and children. In two more days he would be with them. He thought of the long prosperous journey which lay behind, of his buggy empty of wares, of his full pockets, and of the short journey ahead.

"The farmer's thoughts weren't so pleasant, however. He too was thinking of what a prosperous journey the peddler had had, and of how full were his pcokets. Evil ideas. How easy it would be to rob this traveler. News traveled so slowly that no one would know but what he had gotten home safely; his family could never trace him. As his plans developed the farmer grabbed the buggy whip and hit the peddler a solid blow on the temple with the whip butt. He quickly frisked him, removing all his valuables including a considerable amount of gold. Now to dispose of the evidence. The farmer drove the horse and buggy up close to a 'bottomless sinkhole.' He carefully pointed the horse's head toward the hole and gave him a sharp cut with the whip. The horse, unaware of what lay before it, plunged headlong to its doom, carrying with it the peddler and the buggy. Since this episode took place, about 50 acres of woodland have been cleared and the logs all rolled into this sinkhole to destroy them and to fill the sinkhole. Consequently the only evidence we have of the tragedy is as related to us by the lady on whose farm the holw, now known as Murder Hole Number Two, exists.--VPI Grotto *Grapevine*, March 3, 1944.

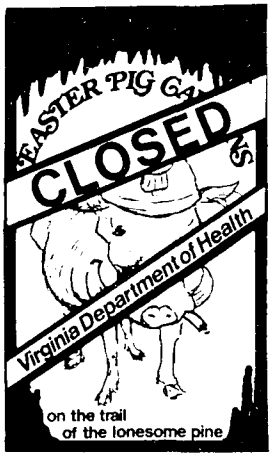
those halcyon days at PIG HOLE

The Region Record 12:186

In the mountains near Blacksburg, VA, a cave early explored by VPI cavers is Pig Hole, now closed to cavers due to landowner problems (1977). Letters from two VPI Cave Club cavers ca. 1944 tell of the first trip to the cave:

"In 1942, Pig Hole was explored for the first time. The cave was named after a dead pig in the bottom of the entrance drop, which we had to crawl around to explore going passage. I can still smell the stink! Very little was in the cave but bats and bat guano in conical-shaped stalagmites; many were up to five feet in height. I remember going into Pig Hole on a borrowed winch and rope swing seat and safety line."--Clifford G. Dorn, letter Jan. 21, 1976.

"We were certainly some of the first to enter Pig Hole, and I remember it well. It was a usual practice to smoke arrows with out lamps on the walls pointing the way back to the entrance. We could usually tell the extent to which a cave had been explored by the number of arrows. Pig Hole was hardly penetrated at all on our first trip. We went down the open shaft by rope sling and, of course, had to leave two members at the top to pull the others back out. I believe the first trip was in the Fall of 1941. I well remember the dead pig on the talus slope just at the bottom of the opening; it was just beginning to decompose and become odorous."--William E. Abriel, letter Jan. 1, 1976.



Ibinthruthesinks

A *Saturday Evening Post* article (7/12/41) by Clay Perry recounts the tale of four cavers--Jack Preble, George Dare, Schiller Martin and Neil Wilson--who were trapped by a flash flood for five hours in the Sinks of Gandy Creek, WV, on Memorial Day 1940. The 3,2000-ft stream rose three inches in an hour. The explorers fortunately discovered the emergency exit, and escaped wet and shivering. They subsequently formed the "Ibinthruthesinks" Club which later became the Ohio Grotto of the NSS.

The Region Record 12:142.

FORT STANTON CAVE: A Study in History

Southwestern Cavers 18(4):27-28 Patty Daw

To most of us the mention of Fort Stanton Cave evokes visions of the Twenty Steps slide, water in the lower passages, Crystal Crawl, Hell Hole, miles of passage, and of velvet. Unfortunately many of the people who now visit this cave know little about its actual history, both geological and human. Surprisingly, quite a bit has been written about this wonderful cave, painting quite a picture of natural development and mankind's early and recent-day explorations.

Long ago and not so far away, in the vicinity of the Capitan Mountains, groundwater was percolating away, developing voids in the earth. Its chosen victim was the limestone of the San Andres Limestone Formation of Permian age (230-280 million years), which is capped with sandstone and conglomerate. Fort Stanton Cave formed by the action of both phreatic and vadose waters shortly after the origin and development of the present surface drainage system.

The cave went through three stages before reaching its present status. First the passages were formed below the water table along joints and faults with intersections forming at the joint/fault intersections. As the water table dropped, the cave was subjected to the influence of groundwater moving downward seeking the lower water table. Passages in the cave run east to west and N-NE to S-SW, conforming to the fracture pattern. Secondly, the passageways were filled with clay and gravel. Some passages were completely filled with clay and gravel while others were partially filled. According to Hallinger (1964) the composition of the gravel indicates that at least one surface stream emptied into Fort Stanton Cave after it was formed, as there are a significant number of pebbles of igneous origin. And the third stage was the partial excavation of the clay and gravel in the passages by streams originating on the lan land surface, as is again suggested by the many igneous pebbles found in the streambeds.

Two rare types of selenite crystals are found in Fort Stanton Cave. One is a selenite twin crystal that occurs in Crystal Crawl. These crystals look l like long, flat needles with a decidedly concave prism face (Hills, 1895). The second type of selenite crystal is known from only one other cave: Crystal Cave, IN. These crystals occur individually as 1½-inch-long needles, terminated on both ends by a 6-sided pyramid. The needles have six equal sides and are 1/40 inch wide.

Some of the speleothems in the cave are unusual because of their color. One seldom observed color is the bluish-black flowstone in the New Section which resembles velvet. This flowstone has a high manganese content. An unknown impurity causes the caramel-colored flowstone.

These days Fort Stanton Cave has no flowing stream except in wet years (as in the past two years) but several perennial springs do issue from both sides of the ridge it is under. However, in the 1800s and early 1900s, it was necessary to use a boat to visit the middle part of the cave. According to an early govenrment survey, the water flowed toward nearby Government Springs and the water level in the cave was 37 ft higher than the spring. This spring

still flows intermittently although most of the known passages are dry today except after an especially rainy season. Two of the known passages of the cave end in breakdown within several hundred feet of Government Springs. On several occasions, running water has been heard through this breakdown, suggesting that there are passageways containing water behind and below it. The probable reason that the cave is not as wet as in the 1800s and early 1900s is a regional lowering of the water table.

At one time the lake room was actually a lake and canoes and boats were used to explore the cave. In 1872, J. W. Swan made a small rowboat for Quartermaster Conrad of Ft. Stanton and Lt. Boyd of Co. B, 8th U. S. Cavalry. These gentlemen spent several days in the cave and explored the lake leading from the Crystal Chamber (their description) for a distance of over "8 miles" from the cave entrance. Among their discoveries was a waterfall where a beautiful stream of water fell some distance over a precipice. By 1898 the water had receded to the other side of the Crystal Chamber where remains of J. S. Swan's boat and an old canoe were found. The water was reported to be as clear as the air, nearly transparent, at a temperature of 52°F.

In June 1965 it was reported that several people went to view the refilled lake. They found that considerable water had entered the entrance sink and had divided, some flowing west into the Bat Room and through the breakdown, the remainder going to the Washtub Room and apparently dividing and flowing both ways. No such watery sights are visible today.

Native life does exist in the cave. It is a hibernaculum, or winter roost, for Townsend's big-eared bats *(Plecotus townsendii)* and a few small-footed myotis bats *(Myotis leibii)*. Deer mice have been reported in Russell's and Crystal Crawls. More exotic animals have also been observed.

In 1965 what was believed to be a troglobitic species of campodeid was collected. These primitive wingless insects were seen and collected in the first Mountain Room, Three-Way Hill, and Hellhole #1. The campodeid is a tiny, white sliver of a beast with a body a little over a cm long, and with very long, fragile anterior (antennae) and posterior appendages. These may be the same insects discovered by the Great Divide Expedition in 1891. They described the white insect they found among the needles in Crystal Crawl as having eight legs and two long, delicate feelers, all white, of uniform size about 2/3 inch long with characteristics of both bugs and worms.

Men and women have long been fascinated by the mystery of caves, and Fort Stanton Cave has certainly had its share of probings by Indians and early settlers alike

Indians camped within 20 ft of the sinkhole long before the Conquistadores in the 1500s rode into what is now New Mexico. Fragments of pottery and other artifacts recorded their stay for present-day archaeologists. These Indians probably visited at least the sinkhole chamber.

Fort Stanton was named for Capt. Henry Stanton of the 1st U. S. Cavalry. The gallant captain was killed in an Apache ambush in the area on Jan. 18, 1855, when he remained behind (with one other man) to fight off the Indians while his men retreated. His death was the catalyst which caused a fort to be built in the area, and it was of course named after the captain.

One of the best known legends about Fort Stanton Cave took place in 1862 when a patrol of soldiers from the fort chased a band of Apache warriors to the sinkhole of the cave. The Indians disappeared into the cave, leaving their horses tied up to some trees. Planning on starving the Indians out, the soldiers settled down at the entrance for a wait. A few days later one of the guards noticed a band of Apaches, looking remarkably like the ones that had vanished into the cave, sneaking up on the Indian horses. Despite being observed, the Indians managed to mount their horses and escape before the soldiers could organize a chase. How the Indians escaped from the cave remains a mystery, although many people have tried to find a second entrance.

Few settlers explored the cave before the 1900s. The most notable early exploration was the boat visit by Conrad and Boyd in 1872. In 1877, the Wheeler Expedition made the first serious exploration of the cave. They discovered Hellhole #1, the lower Breakdown Passage, and completed one of the first instrument surveys of a cave in the country. In 1891 a newpaper-sponsored group, the Great Divide Expedition, explored the cave and chronicled its adventures in a vivid, if somewhat inaccurate, account for the readers. This group came across newspapers (New York Tribune) dated 1877 and supposedly left by the Wheeler Expedition. In 1908 the Chief of Engineers Office made another instrument survey of the cave. Except for minor discoveries, the known cave remained that which the Wheeler Expedition had discovered until the 1950s. Signatures from these expeditions can still be seen on the walls of several passages of the cave.

Not too long ago, in the late 1950s and mid-1960s, exploration was at full steam at Fort Stanton with discoveries and virgin grounds unearthed at regular intervals.

It was in 1956 that cavers penetrated Three-Way Hill, discovered the Keyhole, and the well decorated passages of the New Section. Russell's Crawl was pushed in 1962-65, and Hoeman's Passage discovered. 1963 saw the discovery of Davis Chamber, Skinner's Squeeze, and Heinz T. Schwinge Hall.

(A quote from Lee Skinner's report for a Fort Stanton trip on Christmas Day, 1962, cannot be resisted. One of the people on the trip was "a novice who had never been in a cave: Doug Rhodes." His first trip was into Russell's Crawl and Hoemann's Passage, which probably explains his often masochistic approach to caving.)

Two tantalizing questions remain: Is there a second entrance? and is Fort Stanton Cave, as some believe, merely a small part of a large cave system in Lincoln Ridge?

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DOM - the DIRTY OLD MEN

The Region Record 12:176-177 Anne Whittemore

It all began in 1961 when John Cooper, George Titcomb, Jack Voss, Bill Stephenson, Gregg and Bonnie Marland and John Holsinger got together during the Thanksgiving holidays at St. Paul, VA, to look for caves. John Holsinger remembers that Bill arrived with two suitcases full of whiskey. Titcomb talked Holsinger into banging on Bill's door to ask for a drink. John did, and was so embarrassed that he couldn't ask at all! He merely stuttered, "Just wanted to say goodnight!"

The 1962 DOMC was held in Lewisburg, WV, with caving in Greenbrier Co. This weekend is well documented in grotto newsletters and even by a *Washington Star Sunday Magazine* article by Peter Grant. During this weekend, Holsinger, Lew Bicking, Cooper and George Titcomb planned to check Crookshank Hole to look for a possible back door connection to Snedegar's Cave. Due to extremely wet conditions, the trip was aborted with Holsinger being subsequently rescued from the entrance. (See "The Great Crookshank Hole Adventure" by George Titcomb elsewhere in this issue [of the *Record*]). The rest of the 1962 DOM went smoothly. On Saturday, Cooper, Titcomb, Bicking, Ron Burnette, John Rutherford and John Davis made a long trip into Ludington Cave to see the Thunderbolt Passage. This passage had been named by Rutherford as a result of the steel tape he was mapping with in the water-filled passage being struck by lightning.

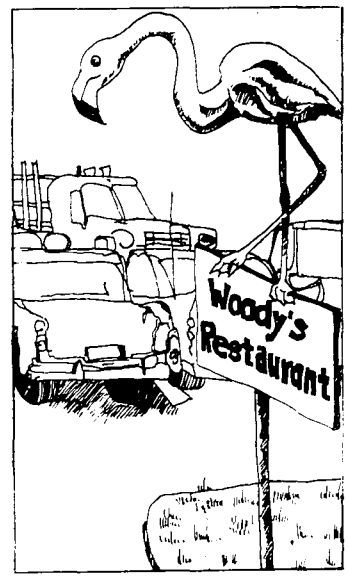
By 1964, a meeting of cavers was a tradition on Thanksgiving weekend. The cavers shifted their emphasis to southwestern Virginia to begin work that would eventually be published by Holsinger as *Descriptions of Virginia Caves*, 1975. This year Don Finley, Jack Voss, Stewart Peck, Rusty Norton, Bill Biggers, Holsinger, Titcomb and Tom Tucker piddled about looking for caves in Rye Cove.

Interest in locating caves then shifted to Lee Co., VA, and the Thanksgiving weekends from 1965 to 1977 were held at Pennington Gap, first at the Shelburne Hotel and later at the motel across the street. Holsinger relates that he has attended all but the 1963 DOM, and Titcomb has attended every one from 1961 through 1977.

In 1965 the gathering was a result of combining Holsinger's and Baroody's Thanksgiving caving groups at the same place. John's group was working mainly in Surgener's Cave, as well as checking the area for other caves, while Roger and other UVA grotto members were continuing to map in Gilley Cave.

It was during one of the mid-1960s DOMs that the following tale as related by Bill Biggers happened: "Phil Lucas was sleeping in a room with a bunch of other guys under a skylight. He woke up several times during the night thinking he was at the bottom of a deep pit with the rope gone. He was unable to get out. These bad dreams recurred through-ut the night. The following night his enterprising friends hung a rope from the handle of the skylight so that Phil could prusik up and get out of the bottomless pit."

During 1966-67, Holsinger was living in Tennessee and was able to spend much free time in locating many caves in the southwestern Virginia area. He also started the famous cavers' graffiti on the men's room wall of Woody's Restaurant (fondly known to



cavers as the BIRD due to a large pink flamingo on the restaurant sign) in Gate City. The restaurant, with its local-color interior, good food and beer on tap, became a stopping-place for cavers in the area, and all added to the graffiti each time they visited the restaurant. Stopping at the Bird was a real treat and if there were not too many locals around, female cavers would sneak into the men's room to read the graffiti!

Because very few female cavers were interested in long mapping trips, especially during a weekend such as Thanksgiving, the DOMC evolved for men only. And they seemed really put out if women showed up. Once George and Sara Corrie, not knowing the tradition, stopped by. Another year Bill Stephenson encouraged Dee Snell and Jette Feduska to attend the gathering, much to the consternation of those present

During 1966, 1967 and 1968 the DOMCs were well attended. Rocky Hollow and Hairy Hole, among many others, were mapped. Because so much work was needed in this area of Lee Co., the VPI Grotto sponsored several grotto projects in this area, as did the VAR, which held their 1968 spring project at Pennington Gap.

At the 1969 DOMC, Jim Beck [the Easter Pig], whose favorite cave was Unthanks, led Holsinger [Kaptain Karst], Baroody, Finley and others through the recently discovered Easter Pig Siphon which greatly extended the mileage of the cave.

While a lot of hard caving was done during the DOMC, much good fellowship was shared as well. There are all sorts of tales about run-ins with the permanent residents of the Shelburne Hotel by the cavers; getting stuck in the john by doors which locked from the outside; the Dunganon Monster; Easter Pig Caverns on the Trail of the Lonesome Pine; antagonizing Baroody, Biggers or Holsinger for the pure devilment of it; five or six people crowding into rooms meant for one or two; all the human interest happenings that makes caving great!

EARLY DIVING OF DEVIL'S EYE CAVE SYSTEM

Gilchrist County, Florida

[Note: The first two articles below were published in 1979 but not used in *SD 79*. The third was received in 1980, but would have made little sense without the previous segments. Since this is a significant chapter in Florida cave exploration, John Harper supplied the earlier articles at my request. Part III had not been written as of October 1984.*tlw*]

Underwater Speleology 6( ):38-39 John Harper

Devil's Eye had always been one of my special spots to go for a fun dive. Dec. 1967 was the last time I was to dive in this remarkably beautiful spring --unaware of the adventures I would subsequently experience. As my partner, Randy Hylton--who was to later play an important part in nearly all my diving explorations--and I made this 45-minute, 65-ft dive, we renewed our friendship with this system that we had heretofore assumed to be familiar. We "walled" the cave and enjoyed its tranquility. It seemed to be so innocent, so pure, but it ironically had a mystic quality, too. Devil's Eye was a very nice place to go after the ultra-serious dives we were mostly involved with.

Not until Aug. 9, 1969, did we again enter Devil's Eye. Actually, we generally entered the system by way of the Ear, thus saving time with considerably less difficulty placing safety line. My partners this time were two relatively inexperienced divers, Carl Lovo and Max Reed. I was doing my usual thing in this cave back in the Last Room. A permanent line was in place through this room, so we just sort of roamed about individually enjoying ourselves. Being an explorer, I have always spent the majority of my time checking out areas from which flow is emanating. This day again I was poking into quite small areas and was surprised to find an area in which after going around several bends it seemed to become a pronounced flow. I made a mental note to check this out further in the future. And retreated.

It has always amazed me that I, or someone else for that matter, had never found that lead before. I guess that is one of the facets of cave diving that is so appealing--there seems to never be a system so familiar that something new and sometimes quite significant cannot be found. During this period, we were enthusiastically exploring two very large systems: Hornsby and the Peacock Slough systems. We were also doing explorations in Wakulla, Eagle's Nest, Little River, and Madison Blue, to name some other major systems still being pushed. That was my excuse for neglecting Devil's Eye for over a year and a half.

I decided to check out the lead in Devil's Eye on Feb. 20, 1971, while diving with Paul Havins from Orlando, FL. Because of the nature of the restriction, it was planned for Paul to wait while I entered into the unknown area dn checked it out further. After entering a very short distance, I decided that it had to go--it was opening up, the flow was quite evident, and there was no silt problem. I flashed for Paul to join me. We then proceeded to systematically explore inward into this new discovery which I later named The Vitals.

The tunnel took on a vertical configuration. The further we went, the more promising it became. After about 140 m, we finally came to a small room with the apparent flow coming from a slightly smaller tunnel to the left. We, however, had to call the dive for lack of more safety line. I tied off, leaving the line for the next assault. To this point it had been an interesting and quite exciting dive. But if we had had just a little more line, we would have seen something we would not have been prepared for in "little old Devil's Eye"--the New Dimension Room and the fact that Devil's Eye was now a major system.

It is ironic that exactly one year after the discovery of The Vitals, the anniversary was marked by the tragic death of my very best friend, Randy Hylton. Although Randy was not present on the initial discovery, he, along with Jim Lockwood, was with me on all subsequent dives. While our team was still intact during 1971, we penetrated over a third of a mile into this fantastic cave. Sheck Exley and company took over from there.

* *

Underwater Speleology 5( ):46-47 Ken Hillier & Sheck Exley

Part I: 1971 - Spring 1972

Prologue. The continuing exploration and sur-ey vey of the Devil's Eye Cave System is probably the most exciting project in the history of cave diving in Florida. This may seem odd in that so many of Florida's underwater caves are bigger, longer, deeper, clearer and prettier. However, considerably more people have been involved in the exploration of this great system than any other, and it is through participation and the sharing of experiences such as Devil's Eye that the cave diving community gets its vitality and growth.

Another curious aspect of the exploration of Devil's Eye is that, on no fewer than four occasions, explorers have surfaced mistakenly, thinking that they had "walled out"* its main passage (at 350 ft, 2,285 ft, 3,097 ft, and 3,655 ft), yet that passage is still going to this day! Such is the tantalizing nature of this truly unique and fascinating cave system.

Early History. By the time Sheck Exley first visited the cave with Bob Gatling on Dec. 4, 1966, most of the historic section of Devil's Eye (Fig. 1) had already been explored by divers like the Florida Speleological Society (the Gainesville-based chapter of the NSS) and John Harper. According to Dave Desautels, some divers had already connected both passable entrances (the Eye and the Ear) during the early 1960s. This 500 ft or so of passage constituted the entire known extent of the cave until John Harper's discovery on 8/9/69.

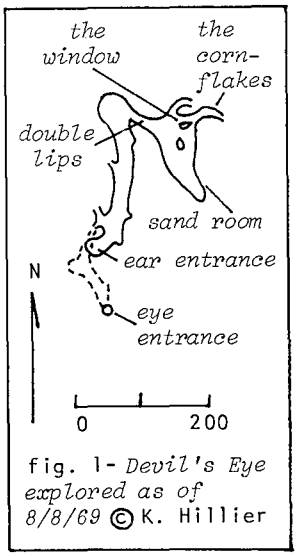


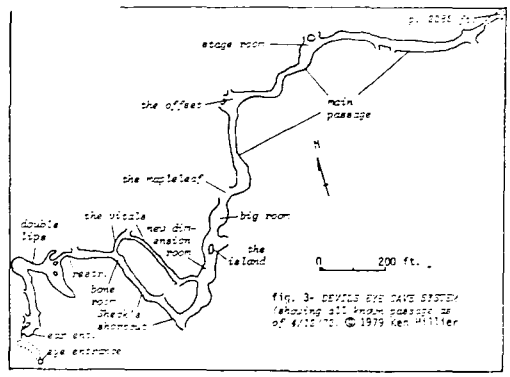
fig. 1- *Devil's Eye explored as of 8/8/69* © K. Hillier

A New Route - And Fossils. John didn't exactly broadcast his new find, but talk of a discovery "as big as Hornsby" led Dave Desautels to put a tail on him as John left a dive shop after getting his tanks filled in Gainesville. The spy followed and Randy Hylton to Devil's Eye and sat in a tree while they planned their dive, gathering enough clues for Tom Allen and Sheck to locate The Vitals on a 50-minute dive on 7/22/71, pioneering the Window route in the process. Now that heavy traffic through the cave in that area has enlarged it and removed much of the black coating, it seems hard to believe that it was so difficult to locate The Vitals. However, Sheck vividly recalls that he never would have believed a human being had gone through the Cornflakes Restriction if John's line hadn't been there!

By the end of 1971 Sheck had made a number of dives following John's line through the new area, with Dutch Vande Noord, Frank Martz and Billy Young. Finally, on 12/7/71, Reggie Batten became the 10th diver to penetrate beyond the Cornflakes Restriction, when he and Sheck turned right at the New Dimension Room and explored a corridor downstream back to The Vitals near the Cornflakes. In a room at this junction (later known as the Bone Room) they noticed a number of bones strewn along the bottom. Later Bob Friedman dubbed this new route Sheck's Shortcut and it was used in preference to The Vitals on many subsequent penetrations, not because it was shorter (actually, it is a little longer), but because it was shallower (75-85 ft deep compared to 90-100 ft) and less silty. Bob also retrieved some bones for Carl Clausen of the Florida Archives, who pronounced them as belonging to a Pleistocene alligator and a large unidentified animal similar to a mastodon. Unfortunately, since this time vandals have all but destroyed what could have been an important paleontological site by removing virtually all the bones.

Adding Line. When John, Randy, Paul and Jim ended their line some 2,085 ft back in 1971, they had made America's longest penetration to that date, though in those pre-surveying days we actually thought lines in Little River Spring Cave, Blue Springs Cave System (Madison Co.) and near the Orange Grove Sink entrance to the Peacock Springs Cave System were longer. On a dive in Devil's Eye with Frank Martz on 8/4/71, Sheck made the first dive ever made in a cave with the new twin 100 cu ft @ 2,640 psig tanks, thereby ushering in a new era in the exploration of underwater caves. In short order, he and others from the old Dixie Cavern Kings Cave Diving Club like Chuck Stevens and Reggie Batten were using these new tanks to extend exploration in virtually every cave in the state... Devil's Eye was not to be ignored.

Since Devil's Eye was supposed to be shorter, Chuck and Sheck thought adding line in that cave would be as easy as it was in Little River, Blue Springs and Orange Grove. However, not until 4/12/72 did the two finally reach the end of the Harper line, on a dive that they recall as one of the most difficult they had made to that date. They added 200 ft of line, tying off in the Mud Dome Room, where the cave appeared to end. For that reason they surfaced with the news that Devil's Eye was walled out--for the second of four times so far. Accordingly, for the next year all efforts were directed toward exploring side passages.



Underwater Speleology 6(6):54-56

Sheck Exley &
Ken Hillier

Part II: Summer-Winter 1972

Side Passage Exploration. Now that Devil's Eye was walled out, the first real look at the many promising side passages was taken. The first tentative investigation was by Lewis Holtzendorff and Sheck on 7/29/72. On that date the two installed 120 ft of line into the Hidden Passage (Fig. 4), so named because it was blocked from the view of passing divers by the Island--a 30-ft-diameter pillar in the large passage separating the New Dimension Room from the Big Room. Unfortunately, there was very little current in the Hidden Passage, so Lewis and Sheck wrote it off as a no-go. Probably the most significant aspect of this dive was that it was the first time the modern technique of installing a permanent guideline knotted at 10-ft intervals was used.

The first real excitement in side passage exploration came on 10/31/72, when Charlie Sturdivant and Sheck put 200 ft of line in the Sea Biscuit Tunnel as an afterthought on the way out from a 1,900-ft dive down the main passage. Starting just past the Cornflakes Restriction, about 350 ft back, the Sea Biscuit Tunnel had been noted by Charlie, Sheck and Bob Fuller on 1/2/72. Rory Dickens, Dave Cameron, Sam Diperna and Sheck had actually made plans to explore it on 4/29/72, but changed their minds after discovering that it was inflowing and quite silty. However, Sea Biscuit proved to be the key to a vast network of tunnels, as well as providing significant shortcuts to the more remote sections of the cave.

The "Grand Tour". Discovering that Sea Biscuit was a going lead with lots of outlfowing current, Charlie and Sheck wasted no time in installing another 280 ft two days later, noting several additional side passages on the way. Three days after that Tom Mount, Zidi Mount, Jim Nangle and Sheck returned to check one of these side passages and connected back in to the main passage at the Mapleleaf (a huge, mapleleaf - shaped pendant) just beyond the Big Room. This connection made possible the first and most popular of the many circuits in the system, the Grand Tour, which Jim Lockwood and Sheck made two days later, on 11/7/72.

Hill 400. While swimming out the Sea Biscuit Tunnel on the connection dive on 11/5, Tom Mount became intrigued with a side passage on the right and asked Sheck to wait to explore it until he had a chance to come back up from Miami the following month. With so many interesting side passages to investigate, Sheck didn't mind leaving one for Tom, especially since several of the others looked more promising.

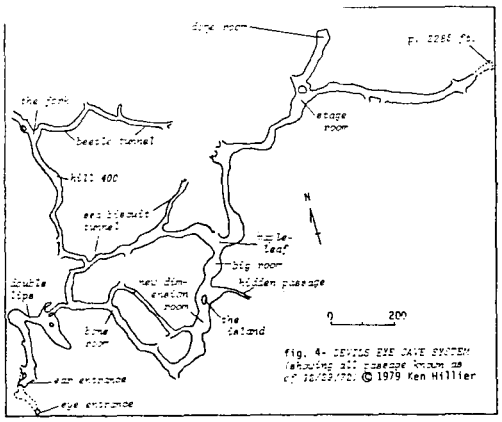
He was wrong! Tom had selected the fascinating Hill 400 tunnel, which he and Jim Nangle explored for several hungred feet into a fork. Beyond the fork the right-hand tunnel, now known as the Beetle Tunnel (named by Wes Skiles after a rubber toy beetle left on the line one day by Ed Kalakauskis), was pushed another couple of hundred feet by Dutch Vande Noord and Sheck on 12/8/72, then by Tom Mount, Jim and Sheck for a further 105 ft on 12/23/72.

Meanwhile, on 12/10/72 Dutch and Sheck explored the left offshoot 100 ft further, discovering it to be inflowing. This naturally led to speculation that a connection to nearby Ginnie Springs may exist, but to this day such a connection has yet to be made. Subsequent studies by Bill Hurst have shown that disparities in water temperature and quality between Devil's Eye and Ginnie make the existence of such a connection highly unlikely.

Christmas Camp, 1972. The excitement of the Hill 400 area was irresistible, and caused a mass pilgrimage of virtually the entire Miami cave diving community--Tom, Zidi, Jim Nangle, Ike Ikehara, Jack Banbury, Ray Hixon and others--to the Devil's Eye Cave System during the Christmas holidays. Meanwhile local divers like Lewis, Court Smith and Sheck drove over to their encampment periodically to participate. This Christmas camp, with its campfire fellowship and enthusiastic cooperation among all divers involved, epitomized the spirit of teamwork which has existed throughout most of the Devil's Eye exploration.

The first significant exploration during the camp was by Lewis, Court and Sheck on 12/22/72, when they explored Sea Biscuit 200 ft further to a fork. The following day Tom, Jim and Sheck explored another 105 ft of the Beetle Tunnel, then the day after that Jim, Ray and Sheck put 180 ft of line into a side passage heading north from Beetle. Finally, on 12/29/72, Jim and Sheck walled out the Dome Room tunnel, which branches off from the main passage at the Stage Room some 1,470 ft back (1,610 ft by the Mapleleaf route they were taking in those days).

Breaking camp at the end of the holidays meant bidding a fond farewell to many pleasant dives, but in its own way the new year--1973--would be even more exciting.



SALTPETRE MINERS OF VALLEY CAVE

Wilson County, Tennessee

Speleonews 24(2):21 Marion O. Smith

Recently, while browsing through Tennessee Confederate pension applications, the words "Salt Petre Works" drew my attention to the file of John S. Davenport. Looking more closely, I noted that this applicant had filled out his papers Sept. 10, 1911, and had been born in Cannon Co. on Oct. 10, 1839. He had been conscripted (drafted) "in the Fall of 1862" in (Sidney S.) Stanton's Regiment, but "was detailed at Knoxville, Tennessee and sent to work in a Salt Petre Cave at Statesville, Tennessee and worked there until the Federals took this country then we abandoned the work to keep from being Captured." He "served under R. J. Davenport and Louis Palmer...with other Comrades 15 in all of us."

Although an affidavit by R. J. Davenport supported the applicant's story, no pension was granted because his name was not found on the rolls of the 25th Tennessee Regiment (Stanton's). His vague claim that after leaving the "mine" he "hid out and scouted around" also probably did not help his case.

A quick check in Barr showed there was a saltpetre cave near Statesville, Valley (or Barger or Godfrey) Cave, about 0.4 mi south. Roy Davis and a friend named Bob visited it Jan. 3, 1955, and observed "There were 11 hoppers in all (in poor condition, generally), many troughs, and a pile of building materials." Tank Gorin visited the cave a few days later and "discovered a tin cup, apparently used for drinking purposes--homemade, and very antique."

Merilyn Osterlund and I visited Valley Cave Dec. 23, 1979. Although the artifacts had been badly scattered, the operations did not appear to have been large. This made sense because probably the work was only conducted a few months before the Union army occupied the Wilson Co. area in the spring of 1863. There may have been many hoppers as Davis reported, although it was difficult to tell from the remaining dirt piles. There were a few pick marks, broken troughs, and other pieces of wood. But, as far as we could tell, there were no Civil War era names on the walls. So without positive proof, it will just have to be assumed that this is the cave Davenport and his "Comrades" worked.

SOURCES

Tennessee Confederate Pension Applications, John S. Davenport, No. 13243.

Diary of Marion O. Smith

Speleonews 3(Jan., 1955):7

Barr, T. *Caves of Tennessee.* p. 527.

KARRAS AND CAVE RESCUE

The Region Record 12:242 Anne Whittemore

Some mention should be made of Bill Karras, on whom much attention was riveted in the middle '60s. Bill moved into DC-area caving like a tornado, full of cave facts, claims of past accomplishments and a desire for power and attention. He soon made himself known to all the "in" people in the DC area, the VAR, and the NSS. People who thought he was a phony were few; those who did believe him defended him angrily.

In about 1964, during which time he was elected vice-chairman of the VAR, Bill surrounded himself with a large group of young people from whom he formed the short-lived National Capitol Grotto. From this group, he branched out to form the National Capitol Cave Rescue Team.

Through one of the team's members, the group obtained an old Cadillac which they modified into an ambulance. Although the ambulance was used mainly for hauling trips, it was equipped to take a victim to the hospital.

Karras made a lot of mistakes; he tried to set himself up as the national cave rescuer; he was driven by a need for attention, power and glory. But we need not remember at this late date, the pros and cons of his actions and his claims. What is much more important is that we, today, have learned from his mistakes.

Looking back, we know that Bill's efforts to provide cave rescue personnel and equipment eventually spurred persons to form groups similar to the presently active Appalachian Search and Rescue Team. Grottos were encouraged to set up first aid courses for members and to train their members in more responsible caving techniques, as well as more effective rescue techniques. Many cavers have spent time, money and energy certifying themselves as EMTs in order to be better prepared for any situation.

We have learned since Bill's time that as cavers we are much more effective underground than in ferrying the victim to the hospital. We have learned that newspaper coverage of cave rescue is not always in the best interests of caving. And lastly, we have realized that it is in the best interests of all concerned that we work together, with no one person trying to get the "glory." The fact that we have come a long way, that we have learned from Bill's mistakes was quite apparent during the Twigg Cave rescue in Oct. 1977 and at Bowden Cave during the 1978 OTR.

THE INDEFATIGABLE *Sara Corrie!!*

The Region Record 12:248 Anne Whittemore

One of the most admired and respected cavers in the Virginia Region is Sara Corrie of Huntington, WV. Sara began caving when she was over 40, and quickly developed a desire for the challenge of vertical caving.

The first cave Sara entered was Luray Caverns. Sometime later she and George, her husband, were visiting Carter Caves State Park, KY, and Sara was lured into checking out several of these dank holes. Events happened fairly quickly after that, so that Sara became involved in helping to explore and map in James Cave, KY. Sara and George, along with Al and Janet Bailey and other cavers, helped to form the ESSO Grotto.

Sara has visited many caves all over the U.S., and with the help of Bill Cuddington and other friend friends, has seen many pits in the southeastern U.S. and Mexico.

But all this is history, and is not important in our own recollections of Sara. To those who have been fortunate enough to know Sara, who have caved with her, shot the Gauley and the New River with her, or just chatted with her around a campfire, she is what she seeks from us--courage, love of living, fellowship with all. Sara takes each day as it comes, accepting the challenge it brings in a special gutsy way that is all her own. We salute you, Sara!

Miscellaneous

CAVING AND THE GEOLOGIC QUADRANGLE

The Kentucky Caver 14(3):20 "The Mad Troll"

Serious cavers use maps to locate good caving areas and possible cave entrances. The 7½ min geologic quadrangles (GQ's) are greatly superior to the 7½ min topographic quadrangles (topos) for this purpose. The GQ has all the information of the corresponding topo, a color-coded overlay showing the surface rock formations, and a second set of contour lines showing the dip of the rock beds. This additional information gives the caver a broader, more detailed view of the area's potential for caves.

The top and bottom of limestone beds are particularly important. By scanning the bottom of a limestone bed, along the contact with impermeable or insoluble rocks beneath it, the caver can find likely resurgences which may not show up on a topo. Similarly, scanning the top of a limestone bed can reveal sinking streams, where the topo shows a continuous stream. The cave can also distinguish depressions in caprock from solution sinks in limestone.

The GQ also shows how much and what types of limestone are in a particular area. Suppose that the topo shows a large area with numerous 40- to 50-ft-deep sinkholes and no surface streams--seemingly a perfect area for caves. Visiting the area reveals only a few small entrances and no significant passages. A later check of the GQ shows 50 to 60 ft of soluble limestone over 15 ft of impermeable shale. The shale has perched the local water table and halted cavern development. The caver could have saved much time, effort, and frustration by using the GQ earlier.

The GQ also shows the dip, or angle of depression, of rock beds in the area. The dip is shown by a set of red elevation lines on the GQ, and shows the steepness and direction of dip and the elevation of the base of the reference formation (frequently the Newman Limestone in this area). This can suggest what types of passages to expect; up/down-dip passages often differ from cross-dip passages. The steepness of the dip also affects the type of passages; compare Mammoth Cave area caves to WV caves. These elevation lines can also suggest possible connections with other caves (subsurface water may follow bedding planes down-dip), and also tell of prehistoric surgace features that are now buried. The dip can also suggest possible entrances. A surface stream flowing with the dip can quickly erode through the soluble limestone, then run horizontally along an impermeable rock bed until it reaches the surface at a valley. Here it may enter limestone again, and sink once more. This would probably not show up at all on a topo.

All in all, the GQ is an invaluable tool to the caver. It gives him information in a very understandable form. However, the topo is not obsolete. The topo shows the type of terrain to be found, and its less cluttered surface makes locating and plotting of sites easier. Furthermore, the topo is smaller than the GQ, making it much more suitable for fieldwork. The serious caver should have access to, and be able to use, both types of maps. The information contained in GQ's and topos can save many hours of ridgewalking if the caver is willing to study them.

LIMESTONE, LIME, ACETYLENE, AND CARBIDE

The Windy City Speleonews Dick Flegel

In Mike Dyas' review of local newsletters in the January *NSS News*, an item from the Mid-Mississippi Valley Grotto's *Underground* is mentioned. In that article, spent carbide is said to be the same as the substance sold commercially to rot stumps, and it is also claimed to be virtually the same thing as lye. This article is a response to that.

Spent carbide is calcium hydroxide, $Ca(OH)_2$, also known as water-slaked lime. Unfortunately, the MMV author has confused this with quick lime, calcium oxide or CaO. The latter is what is sold to rot stumps. Also, lye is sodium hydroxide, NaOH. While spent carbide and lye are both hydroxides, sodium hydroxide is many times more active. Lye is poisonous because of its affinity for water; when it is dissolved in water, enough heat is generated to boil the water, which would cause burns if it were taken internally. Also, it is able to react with fats and oils in the body, causing cell destruction and chemical burns. Calcium hydroxide would have to be taken in large quantities over an extended period of time before serious problems would result.

$Ca(OH)_2$ is quite insuluble (0.185 g per 100 g of water) compared to NaOH (42 g per 100 g of water). A saturated solution of spent carbide is known as limewater. It is so innocuous that it used to be added to baby formula because it made the cassein more digestible. It also used to be prescribed for calcium deficiency--you were to drink it straight--but this was discontinued because the solubility was so low that many gallons per day would have been needed for any effect.

Calcium hydroxide, as inactive as it is, will affect the extremely fragile ecosystems within the cave. It will react with any carbonic acid present, precipitating any dissolved limestone and changing the cave water from slightly acidic to slightly basic, which will promote the growth of different bacteria and so on. However, according to what limited research has been done, the spent carbide itself is neutralized within one or two weeks, with the underground environment returning to normal.

It would be interesting to note the relationship between lime, limestone, carbide, and acetylene. The reason limestone is called that is that it is the raw material for lime. In a process known since Biblical times, when it is heated to 1,650° F (900° C), it decomposes and carbon dioxide gas is driven off, leaving lime:

$$CaCO_3 \rightarrow CaO + CO_2\uparrow$$

Lime is important commercially, being used in mortar, cement, whitewash, tanning, fertilizers, fungicides, sugar refining, iron and steel smelting, medicines, bleaches, water purification, and, would you believe, making carbide. When calcium oxide and carbon are heated to 5,400°F (3,000°C), they combine to form calcium carbide:

$$CaO + 3C \rightarrow CaC_2 + CO\uparrow$$

As we know, of course, water and carbide combine in your lamp to give acetylene:

$$CaC_2 + 2H_2O \rightarrow Ca(OH)_2 + C_2H_2\uparrow$$

Besides welding and lighting, acetylene is important in the preparation of the vinyl plastics polyvinyl chloride and vinyl acetate, acrylon fiber, chloroethylene solvents, and neoprene rubber. [There is also a polyacetylene fiber, which has interesting electrical properties but no commercial uses.--*Speleonews* ed.] Gasoline can be synthesized from acetylene.

What happens to spent carbide that is dumped on the ground or into a stream? It combines with carbon dioxide in the air or carbonic acid in the water and forms calcium carbonate--it ends up as powdered limestone!

$$Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$$

$$Ca(OH)_2 + H_2CO_3 \rightarrow CaCO_3 + 2H_2O$$

Please note that I am NOT condoning indiscriminate dumping of spent carbide in any cave, in the landowner's pasture, or anywhere else. The only purpose of this article is to eliminate the misinformation and hysteria surrounding the subject. If someone else cleans his lamp at a cave entrance and then the farmer's cow becomes sick, the caver is a perfect scapegoat. And, of course, it is unsightly.

(Actually, farmers need to add lime to some soils themselves, and some farmers might even welcome some supplied by cavers, if they had the situation explained to them.)

Spent carbide, or calcium hydroxide, is greatly overrated as a poison. The main objection to it is aesthetic. The best place to dump it is still the garbage can. If it is spread thinly on the surface, weather and erosion will rapidly destroy any traces. But use discretion; don't dump it in the landowner's front yard.

WHERE THE ____ IS IT?:

Finding Cave by Computer

Flash Back: On March 29, 1980, Jack Igoe sent a letter titled "NEWS FLASH! MEGA-SECTION ABOUT TO BE DISCOVERED IN BUTLER CAVE!" [better known as "The Great Hype Letter"] to prospective team members of crews to Marlboro Country. It announced the discovery in San Diego of a new section of cave. Following that, a large number of man-hours were expended in Marlboro Country and elsewhere, in an effort to enter the Mega-Section. It is now almost a year later and it seems reasonable to ask "Where the----is it?" In order to understand the answer it is necessary first to understand how a section of cave in Virginia was discovered in California. That will involve a bit of history.

History: The cave surveys we have been doing in Burnsville Cove have been processed by digital computer since the late 1960's. Since those days we have made considerable progress in using the computer to help us understand the caves. We began by using the computer to reduce the azimuth-dip-distance data to Cartesian coordinates of the survey stations. Then we added the ability to adjust loop data to produce zero error in closure. These techniques were detailed in Wefer (1971).

The ability to plot traverse lines as an aid in producing maps was added to the system before 1970. Then sometime in the mid-1970's we added the ability to also plot: profiles of the traverses of the cave surveys, and rosettes of the azimuths and dips of the cave surveys. All of this plotting was done on 30-inch-wide Calcomp drum plotters, first in Pennsylvania, then in California, and finally in Massachusetts. That's the way things stood when I moved back to California in the autumn of 1978. By the spring of 1980 I had completely reorganized the survey data for Butler and Breathing (and converted from punched cards to disk files) on a NOVA 3 computer. I also changed my plotting programs so that plots would be displayed on a MEGATEK-5000 CRT refresh computer graphics terminal (I no longer had easy access to the Calcomp plotter). The main plotting program CMAPFW was also modified so that it could produce a plot of the cave viewed in any direction. The viewing direction is defined by an azimuth and a dip in exactly the way a compass shot is defined for the line of sight from one survey station to the next. The plot is then done in orthographic projection at a scale defined by the user.

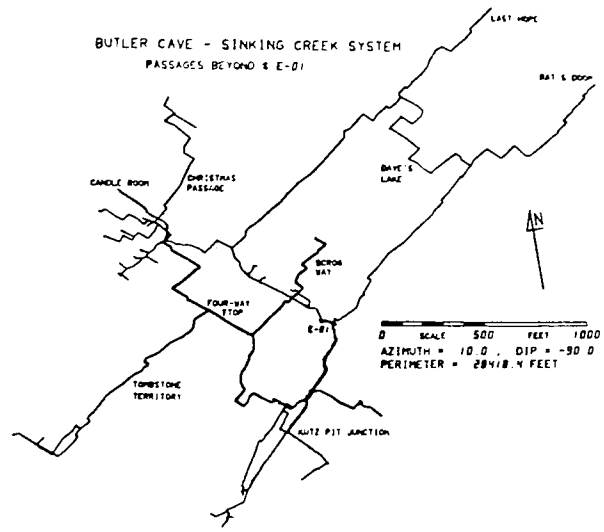


Fig. 1. Plan view of all passages surveyed (01 Jan 1980) beyond station E-01 at the Pool Room. The line of sight has azimuth 10°, dip -90°. Passages in Marlboro Country are shown with wider lines.

Such a plot is shown in Fig. 1. It is a plan view rotated ten degrees counterclockwise (line of sight = -10°, dip = 90°) of all passages surveyed beyond station E-10 at the Pool Room. It took the NOVA 3 about two minutes to produce this plot. A total of 28,418.4 ft of survey is shown.

Jack Igoe passed through San Diego in early March 1980 and, of course, I showed him how the system worked. Working together looking at the cave in various directions, we eventually plotted Fig. 2. The Evasor Gallery and Crisco Way surveys were left out so we could plot a larger scale than used in Fig. 1. Note that in Fig. 2 the line of sight has azimuth 57°, dip -15°. We are looking towards Last Hope Siphon, in a direction parallel to the most frequent compass azimuth in the downstream survey (see Table 1 of Wefer, 1979). Note the distorted appearance in Fig. 2 of the Downstream Loop and the passages running down to the siphons. That's the way passages would look (except that it is an orthographic projection) if the earth were transparent.

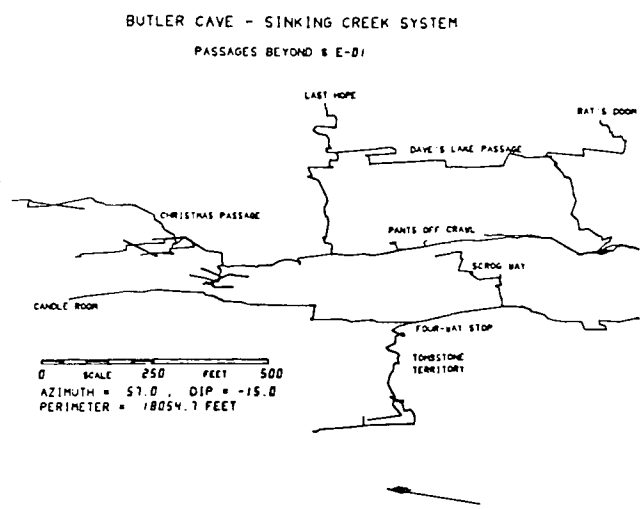


Fig. 2. Orthographic projection of the downstream area of Butler Cave. The line of sight has azimuth 57°, dip -15°. Compare this view with Fig. 1.

Then by looking more nearly horizontal in small steps, we eventually arrived at Fig. 3. We found that when the line of sight had azimuth 57°, dip -3° we were looking right down Tombstone Territory in Marlboro Country, and also right down the Slippery Creek Passage (NW side of the Downstream Loop). We were looking along the local dip. There is no vertical exaggeration in any of these plots, so the scales shown apply to both the horizontal and the vertical directions.

It should be clear from Fig. 3 that 100 ft of rock lies between the Christmas Passage in the Dynamite Section and the Candle Room in Marlboro Country. As Jack said in his letter, there is "plenty of room to contain the entire Keyser Formation in BOTH sandstones." (See Fig. 11 of Deike, 1960.) It is extremely unlikely that this would ever have been noticed from looking at numerical data.

Take a long look at Fig. 3. Measure it! Study it! That's the Breathing Cave horizon out there between the Candle Room and the Christmas Passage. How come there is no cave out there?

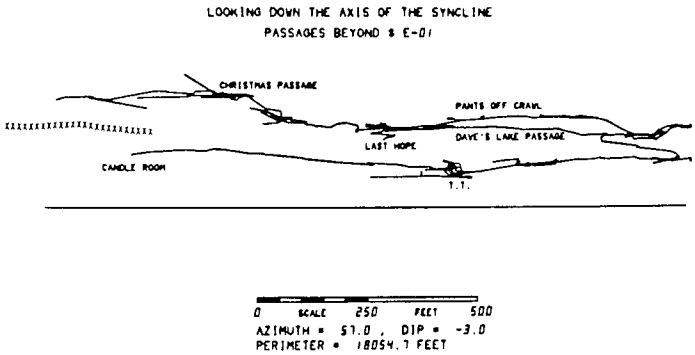


Fig 3 Orthographic projection of the downstream area of Butler Cave. The line of sight is along the local dip, with azimuth 57°, dip -3°. Compare this with Fig. 2. The Breathing Cave horizon is schematically shown by the line of "XXXXXXXXXX".

Hysteresis: It seems that the Mega-Section must be out there. It may be blocked by breakdwon or filled with cobble and mud, but it must be out there! We just haven't been able to get into it yet. There is at least one more unclimbed waterfall out of the Candle Room. We are going to climb it in 1981. And as we survey more of Marlboro Country and the passages out of the Candle Room, and finish the Dynamite Section survey, the situation out there should become more clear...

Finality: Finally, where the _____ the Mega-Section is, is out there west of the Candle Room, above the waterfalls. Keep in mind that if we do get into it, it is going to be a real bitch to explore. It takes about 13 hrs now for a large team to do a round trip from the Entrance to the Candle Room to the Entrance. Any time spent in the Mega-Section will be on top of that!

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WHY NOT?
Moderate Commercialism--
A Viable Alternative for Well Known Caves

Northwest Caving 10(1):15-16 Dale Larson

Commercialization of caves in America is as old as the country itself. Many caves have been extensively developed as tourist traps, and others have been mined for lime and saltpeter. These uses are determined by the amount of cash that can be brought in, with little, if any, thought given to protection of the cave involved. At the other extreme, well known undeveloped caves have suffered greatly due to ignorance on the part of the people who visit them. As cavers, one of our foremost concerns is the protection and preservation of caves, especially well known ones. It is in these well known caves that moderate commercialism can be beneficial to both the caves and the people who visit them.

Admittedly, the ideal situation for the cave would be that only organized caving clubs knew of its existence, and therefore only experienced cavers would visit. Reality is far from the ideal, though, and such secrets are hard to keep. Cave rumours generate interest by large numbers of the general public, most of whom are inexperienced and somewhat ignorant of caves and their formations. These factors don't deter the weekend caver. He plunges in, unaware of what he is doing, often resulting in destruction of cave features and/or injury to himself.

Commercializing a cave can serve as a method of protection of the cave while protecting the people as well. Gardner Cave in Washington is an example of this. It has been developed in such a manner as to protect and preserve what remains of the once-spectacular formations, while at the same time providing an enjoyable experience for the visitor. This type of development has its disadvantages, of course. Gating to prevent or limit human access changes air movement patterns and may limit the use of the cave by its natural inhabitants. Without gates, Gardner would still be a victim of unthinking or devious individuals who in the past have broken and/or defaced its formations, as well as bringing in large amounts of mud and dirt, changing the cave environment. This type of human misuse and abuse has far more impact on cave life than any gate could ever have. By installing such restrictive devices, we now have some control over human behaviour in the cave environment.

The advantages of moderate commercialization can be broken down into three points:

1. Control of access into the cave.
2. Control of people once inside the cave.
3. Education of the ignorant.

True, the last thing a cave needs is hundreds

"COMMERCIAL" CAVE GUIDING IN WASHINGTON STATE

Northwest Caving 10(2):20-21 Dale Larson

Commercial cave operation in Washington is young and limited. It also has a long way to go in order to be effective. As I see it, there are four basic problems to be dealt with. Three will be discussed here. The fourth has to do with Gardner being the only readily accessible, recognizably managed cave in the state. Getting back to the other--the intensity of operation, the completeness of presentation, and people--let us explore Washington's commercial operation.

One of the problems at Gardner is the extreme intensity of the operation. The guide has 45 minutes to present a story that covers millions of years and he is expected to do to 20 times a week or more in 500 ft of twisting passageway with as many as 60 tourists at a time. This can be very taxing on the guide and at times downright unpleasant. Unfortunately, the same can be said about the visitors. I say unfortunately for two reasons: The first is that Gardner is a state park and there for the enjoyment of the people. Most people wouldn't consider getting pushed and shoved by 60 others in tight quarters to be enjoyable, and this lead us to the second. The program at Gardner can be a valuable tool for educating the public about caves; however, because of its intensity, a lot of its effectiveness is lost.

The second major problem at Gardner is the lack of a complete program. Freeman Tilden said, "A cardinal purpose of interpretation is to present a whole rather than a part, no matter how interesting the specific part may be." Tilden is considered the "Father of Interpretation," and interpretation, or public education if you wish, is what cave guiding is all about. When I say that the program is not complete, I mean that it focuses too heavily on a part, that is the cave itself, rather than the whole story of a karst landscape and how limestone caverns differ from lava tubes, littoral caves, and ice caves. From what I know of Gardner and its operation, little if any thought has been given to this holistic approach and no provisions made for the development of such. If we are to educate the public, to bring them to understand our concern for these subterranean wonders, we must give them the whole story, for the partial one can be confusing or, even worse, easily forgotten.

The third and final problem is people: tourists, managers and cavers. The key to this problem is the caver. If we are to get people to respect caves as fragile environments in need of protection and gain their cooperation and support, we must make the first move. As I see it, it is our responsibility to educate the managers, and assist them in developing effective, quality programs that will bring our message to the people. It must start here because they're not going to do it alone.

In conclusion, let me state that although our commercial programs in Washington are presently inadequate, there is hope for the future. In order that this hope may be realized, we must all be willing to cooperate with the commercial manager, to make him see our interests and concerns, and to help him develop effective programs for public education.

ROCKBRIDGE COUNTY CLOSURE: An Object Lesson

The Carbide Dump 21:5 Karl N. Koon

Recent information from the Lexington, VA area is that Cave Springs Cave, the longest in Rockbridge Co., has been closed. The new owner has filled in the small entrance and sinkhole with "10 dump truck loads of dirt and rock." His reason for doing so was to put an end to the beer-drinking, pot-smoking teenagers at the cave. While the cave was well known locally and heavily vandalized, there were some unspoiled and interesting areas off the beaten path.

It is a shame that another cave has been permanently closed because of uncaring novices and poor landowner relations. Let's work more diligently to insure this does not happen to other caves in our area!

THE PREGNANT CAVER

Women Cave! 4(2):4 Frank P. Riseley, M.D.

(Caroline Brown:) During the discussion that followed Hazel Medville's presentation on "Caving with Children" at the Women's Section session during the 1979 NSS Convention in Pittsfield, MA, I mentioned having received a letter from a mountaineering medical doctor in reply to my questions on climbing during pregnancy. It does have some bearing on situations faced by women cavers who might be pregnant and in various caving situations. Here it is in its entirety:

Dear Caroline,

Your concern about climbing during pregnancy is certainly justified. The best advice I can give you is don't do it. Wait until fall to get pregnant.

During the first trimester, especially, the poor little feller needs all the good breaks you can give him. Under ideal circumstances the fetus is operating on "high altitude" oxygen tensions at sea level, even if the mother doesn't smoke. The mother who lives at high altitude builds a bigger placenta to process more blood, but you going from sea level will have no such protection for the fetus. The reason that the city of Lima, Peru, was founded was that the Spanish women habitually aborted on going to Cuzco (about 13,000 ft), the old Inca capital.

Early in pregnancy I would not take any medicines of any type or smoke or drink alcohol. Many drugs including aspirin disturb the cytochrome energy transfer systems which are vital to the fetus. Joyce, our OB instructor, was reading over my shoulder and said, "Tell that girl if she is climbing early in pregnancy to carry a box of heavy duty Kotex."

There are other problems later in pregnancy in addition to the ones you mentioned. The lower spine loses its forward curve, straightens, and finally bows backward to maintain the center of gravity. This

means that the muscles of the back and lower extremities are all pulling in new directions at new angles, and they tire very easily. Marv climbed throughout pregnancy with our children and it was very difficult to get her downhill after climbing a peak. She would get so tired she couldn't even step over small impediments on the trail.

Furthermore, the spinal and pelvic ligaments soften and become more flexible. The pubis separates considerably and the sacroiliac joints moderately. These changes make the pelvis, hips, and lower back unstable and subject to serious sprain types of injuries.

The middle trimester is the safest time to climb (from 4½ to 7 months).

There is nothing magic about 9,000 ft in terms of anoxia. Basically, you can climb as high as you are able to maintain a normal partial pressure of oxygen in your bloodstream and, of course, that is a very individual, personal finding with a wide variability between different people at any given altitude. The risk of climbing "Hundred Peaks" would be minimal. With "Sierra Peaks" it would be moderate. With climbing the Mexican volcanoes, the risk would be ver very great.

Exercise programs (at sea level) are very sound. I am enclosing a recent article concerning the value of exercise during pregnancy.

Sincerely,
s/ Frank P. Riseley, M.D.

An Analysis of Grottos of the NSS

BY RICH BREISCH

Limestone Ledger 12(6):34-39; (7):43-53; (9):66-74; (12):91-95

PART I. Introduction. This begins a look at data pertaining to the grottos of the NSS. Part I will briefly outline what is to follow and will also present the basic data. Part II will examine by state various data relating to grottos and caves. The correlation coefficient will be used to determine which factors are closely correlated. Part III will use the data presented in Part I to estimate certain conditional probabilities and growth rates dealing with grottos. Part IV will contain a model for NSS growth based on a Markov chain of four states. The numerical results from Part III will be used as parameters in the model. Predictions based on the Markov chain model will be contrasted with the exponential model given by Wefer in 1971.

Data Source. The basic data on grottos used in this study come from the *NSS Board of Governors' Manual*. These data are given in a different form in Table 1. Each grotto is assigned a number when it is originally chartered. Through record-keeping errors, some numbers were skipped and some numbers were used more than once. For example, there are no grottos numbered 109 or 157, but two grottos were assigned the number 42. Sometimes a grotto was deactivated for several years and then reactivated. In this case the grotto retains its original number. The Sierra-Mojave Grotto (#65) is an example of this. The Richmond Grotto (#4) is the only grotto to be reactivated more than once.

Table 1 gives the status of each grotto over the years. Each of the columns to the right of the name represents a year. Headings for the year are given at the beginning of the table. The key to the status is as follows: No entry is made before a grotto is chartered. "C" means the grotto was chartered that year. After a grotto is chartered, it is assumed to be active at least into the following year. "A" represents years that a grotto was active. Years where the grotto was inactive are shown by a "." in Table 1 and by "I" elsewhere in this paper. "R" represents years a grotto was reactivated. Each reactivated grotto is assumed to be active for at least one year following reactivation.

In a few cases the data I had were incomplete. Years for which I do not know the status are shown by an "X" or, in the case of the Mother Lode Grotto (#114), by blanks. The Mother Lode Grotto was omitted from all statistical computations because of this incompleteness of the data even though it has been active for a good portion (if not all) of the last 17 years.*

The following diagram shows the four states of the status of grottos and the possible transitions from one state to another.

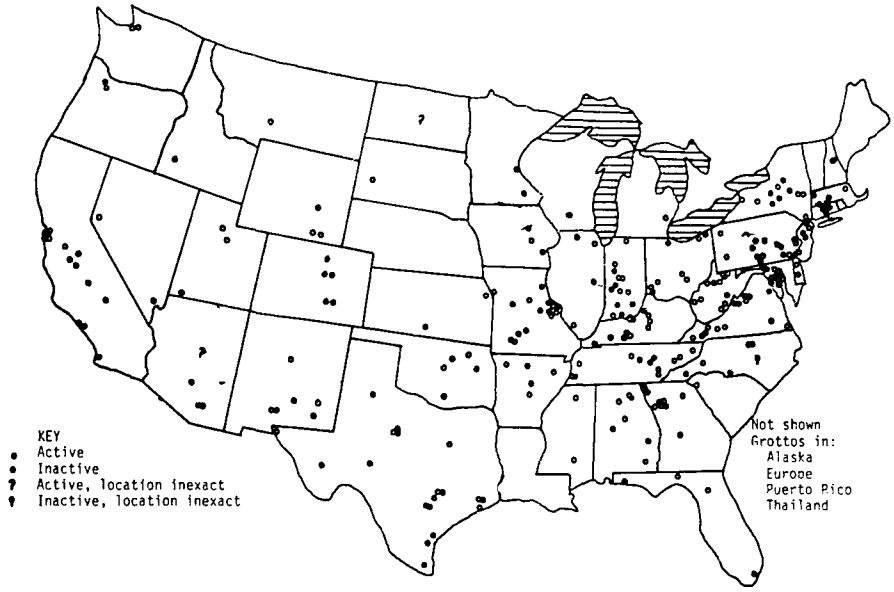
*Bill Mixon has recently rurnished me with more complete information about the grottos which was published in 1973 in the [NSS] *Internal Organizations Manual*. I have not gone back and corrected the few erroneous or missing data. Calculations done in this paper should not be appreciably different from those done with 100% accurate data.

Thus a chartered grotto will always (in this model) go to the active state the next year. An active grotto will be active the following year (represented by the arrow looping back on itself) or will become inactive. These ideas will be expanded upon in later parts of this analysis.

PART II. Distribution by States. The grottos are not distributed evenly over the U.S. It would be exceedingly surprising if they were. Fig. 2 shows where all grottos are or were located. The original data gave the name of the town or city used as the grotto's mailing address. Grottos were plotted on the map based on these locations and the Rand McNally *Road Atlas*. In a few instances neither the town for the grotto's mailing address nor the town for any of its officers was given in the atlas's index. These are shown by a question mark in the state.

There are numerous questions which can be asked about the distribution of grottos. Do grottos tend to be located near centers of population or in caving areas? Examples of each come quickly to mind. The D.C. Grotto in Washington, D.C., the Met Grotto in NYC, the Philly Grotto in Philadelphia, the Windy City Grotto in Chicago, and several grottos in the San Francisco Bay Area are all examples of large grottos in population centers but not in good caving areas. On the other hand, there are many grottos in small towns in the Appalachians and the American West. These grottos tend to be reasonably close to good caving areas. So which is more important for the establishment and continuance of a grotto, people or caves? What other factors influence the number of grottos?

GROTTOS OF THE NSS



In an attempt to answer these and similar questions, data about grottos, people, caves and the states themselves were collected. Data for each of the 50 states and Washington, D.C. were available for the following nine factors:

1. Number of grottos is the number of different grottos which have ever been chartered in a state.
2. Number of active grottos is the number of grottos which were active at the beginning of 1979, that is, those which were active (A), chartered (C), or reactivated (R) in the 1979 column of Table 1.
3. Number of grotto-years is the total of all years grottos have been in operation. For each grotto the number of years it was active, chartered, or reactivated is totalled. Then this is summed for all grottos within the state.
4. Number of "long caves" is based on Bob Gulde Gulden's list of caves over 3 km long as published in the Jan. 1980 *NSS News*. No attempt was made at correcting missed or erroneous data.
5. Length of "long caves" in meters is also from Gulden's list.
6. Number of show caves is from the main section of Sloane and Gurnee's *Visiting American Caves*. Caves listed in their supplement, pp. 218-219, were not included. This book has an overly loose definition of "caves" which includes cliff dwellings and sea caves which never get into darkness. What constitutes a show cave is also loosely defined. The aughors include caves in parks that do not charge a fee and all where all tours are self-guided. I believe most cavers would have omitted many "caves" from this book, but the data is used because it is the most comprehensive on U.S. commercial caves. (I have heard that Gurness will publish a revised edition in the near future.)
7. Number of NSS members in 1970 is taken from Wefer (1971). His data is based on the NSS membership lists published almost annually in the *NSS News*. A year (or years) other than 1970 could have been used but 1970 was selected because the counting had already been done by Wefer. Also this could be related to the 1970 census data of the U.S. population.
8. 1970 population in millions is from the 1970 census. Figures were taken from the Rand McNally *Road Atlas* and were rounded to the nearest 100,000.
9. Area of state in sq km is based on data from the *Road Atlas* where they were given in sq mi.

Table 2 gives these data. Grottos in Thailand, Europe, and Puerto Rico were omitted from this study.

There are additional factors which could conceivably influence the creation and continuing activity of a particular grotto. A grotto with a large membership may be less likely to disband than a grotto with a few members. On the other hand, a large grotto may be more likely to split because of factions developing in the club. No data on membership size were available to me and I do not know how I would use it if it were. Several small grottos seem to have been held together over the years by the effort of one or two cohesive or dominant persomalities. This factor woul would be hard to quantify, and therefore is not considered here. Student grottos are often of a transient nature, but the Nittany and VPI grottos show we cannot generalize.

In order to determine which factors have a strong influence on (or are influenced by) other factors, the correlation coefficient can be used. For two variables, x and y, defined on the integers between 1 and n, the sample correlation coefficient is defined:

$$r(x,y) \stackrel{\text{def}}{=} \frac{n\sum_{i=1}^{n} x_i y_i - \sum_{i=1}^{n} x_i \cdot \sum_{i=1}^{n} y_i}{\left[n\sum_{i=1}^{n} x_i^2 - (\sum_{i=1}^{n} x_i)^2\right]^{1/2} \cdot \left[n\sum_{i=1}^{n} y_i^2 - (\sum_{i=1}^{n} y_i)^2\right]^{1/2}}$$

Note that $r(x,y) = r(y,x)$ and $r(x,x) = 1$ by this definition. It can also be shown that

$$-1 \leq r(x,y) \leq 1.$$

The sample correlation coefficient was calculated for all possible pairings of the nine factors. These are given in Table 3. For example, the sample correlation coefficient between the number of "long caves" (factor 4) and the length of "long caves" (factor 5) is given in the 4th column of the 5th row. Its value is 0.8943. Instead of writing r(number of "long caves caves", "length of long caves") = 0.8943, the notation will be simplified to $r(4,5) = 0.8943$; $r(i,j)$ will be understood to mean the sample correlation coefficient between the ith and jth factors being considered.

Fig. 3 diagramatically displays which pairs of variables are correlated. For the purposes of this paper, two variables will be said to be

"highly correlated" if $0.8 \leq r(i,j) \leq 1.0$
"moderately correlated" if $0.5 \leq r(i,j) \leq 0.8$
"slightly correlated" if $0.273 \leq r(i,j) \leq 0.5$
and "nearly uncorrelated" if $|r(i,j)| < 0.273$

The value 0.273 was selected because by Table 7, p.214 of Crow, Davis and Maxfield, the null hypothesis of the variable being uncorrelated (i.e. $r(i,j) = 0.0$) is rejected at the 5% level of significance for sample size 51 if $r(i,j) = 0.273$. That is, when $|r(i,j)| < 0.273$, we cannot say that the ith and jth factors are correlated.

By Table 3 or by Fig. 3, note that the three factors dealing with grottos are all highly correlated and these are also highly correlated to the number of NSS members. It is not surprising that states with a large population of NSS members tend to have a large number of grottos, and vice versa. This is shown in another manner by Fig. 4 where the number of grottos is plotted against the number of NSS members by state. The two-letter abbreviations for the states are used.

Fig. 5 plots the data for another highly correlated pair of variables, the length of "long caves" versus the number of "long caves". With highly correlated variables, as one factor increases, the corresponding factor tends to do likewise. Thus the data points tend to cluster about a diagonal line going through the origin. The plots of other highly correlated variables would look similar.

This contrasts with the graphs of nearly uncorrelated variables such as the number of show caves in a state versus the area of the state (see Fig. 6). Larger states do not necessarily have more show caves, and thus there does not exist even an approximately linear relationship between the two factors.

Figs. 7 and 8 plot other factors which one might expect to be related to the number of grottos. The population of a state is only slightly correlated to the number of grottos. The number of "long caves" is moderately correlated to the number of grottos.

In summary, because the number and length of "long caves" is nearly uncorrelated or only slightly correlated to the number of NSS members and to the general population, we cannot expect new cave discoveries to significantly affect the NSS. Thus, if sizable or numerous caves were found in relatively unexplored states such as Alaska or Montana, we should not expect a sudden growth of our society in these states.

For each pair of factors considered, it is impossible for this study to say which was the driving force. The number of grottos (no matter how counted --factors 1, 2, or 3) was shown to be highly correlated to the number of NSS members. This is not saying that the NSS could get more members if more grottos were chartered, nor is it saying that the number of grottos would increase if the NSS membership did. Correlation does not imply causality.

PART III. Conditional Probabilities and Growth Rates.

Table 4 lists, among other things, the number of chartered, active, inactive and reactivated grottos as a function of the year. Fig. 9 plots the number of active, inactive and the total number of grottos as a function of time. The number of active and inactive grottos is not a smooth, monotonic curve; however, from 1950 on, the total number of grottos is extremely linear. The least squares fit for this data is:

$$\text{total} = -58.1744 + 8.0547\,(y - 1940)\ , \text{ where } y = \text{year}$$

and this is shown by the dashed line in Fig. 9

In 1971 Fred Wefer suggested that the number of grottos is growing exponentially as a function of time time. He counted and classified slightly differently because his reference source counted all charterings of grottos; thus reactivated grottos were counted twice. If the number of grottos were indeed growing exponentially, the plots would form straight lines when plotted with a logarithmic scale. The data shown in Fig. 9 are also shown in Fig. 10 but with a log scale. The data do not appear linear except for short intervals. The best fit for any of the curves in Fig. 9 or 10 is when we assume the total number of grottos is linear as a function of time.

Given states C, A, I and R for chartered, active, inactive and reactivated, respectively, define $N_{\text{state 1, state 2}}(y)$ as the number of grottos during year y which are now in state 1 but were in state 2 the preceding year, i.e. y-1. For example, $N_{AC}(1953) = 11$ since there were 11 grottos which were chartered in 1952 but which are now among the active grottos (see Table 4). Similarly, $N_{IA}(1953) = 2$ since 2 of the grottos which were active in 1952 became inactive in 1953.

Fig. 1 in Part I showed all possible transitions in the model described in this paper. Using this model, conditional probabilities can be defined. Thus the estimate of the probability during year y of an active grotto becoming inactive is

$$\hat{p}_{IA}(y) = \frac{N_{IA}(y)}{N_{IA}(y) + N_{AA}(y)}$$

That is the number of grottos which went from active to inactive during year y divided by all the grottos which were active in year y - 1. The other conditional probabilities are defined similarly but for completeness are listed below.

Figure 3:

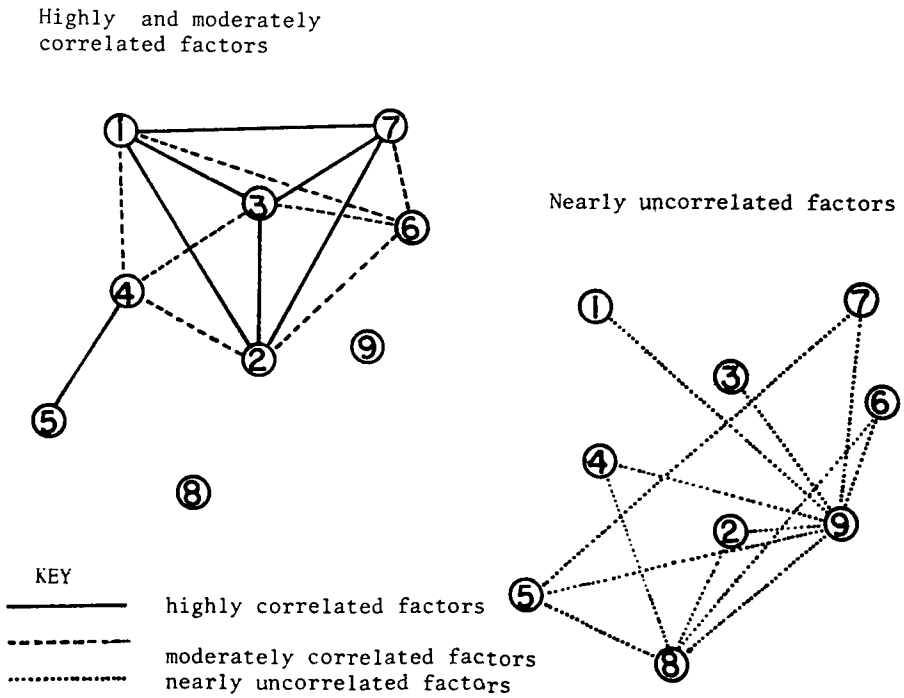


Table 3: Correlation coefficients between pairs of factors

	(1) Number of Grottos	(2) Number of Active Grottos	(3) Number of Grotto-Years	(4) Number of "Long Caves"	(5) Length of "Long Caves"	(6) Number of Show Caves	(7) Number of NSS Members in 1970	(8) 1970 Population	(9) Area of State
1	1.0000								
2	.8472	1.0000							
3	.9562	.8705	1.0000						
4	.5923	.6005	.5457	1.0000					
5	.4698	.4577	.3816	.8943	1.0000				
6	.6033	.6080	.5874	.4497	.3638	1.0000			
7	.8752	.8462	.9236	.3734	.2188	.5228	1.0000		
8	.4438	.0932	.3840	.1649	.0862	.1865	.4184	1.0000	
9	.0565	.0775	.0387	-.0801	-.0851	.0134	.0414	-.0422	1.0000

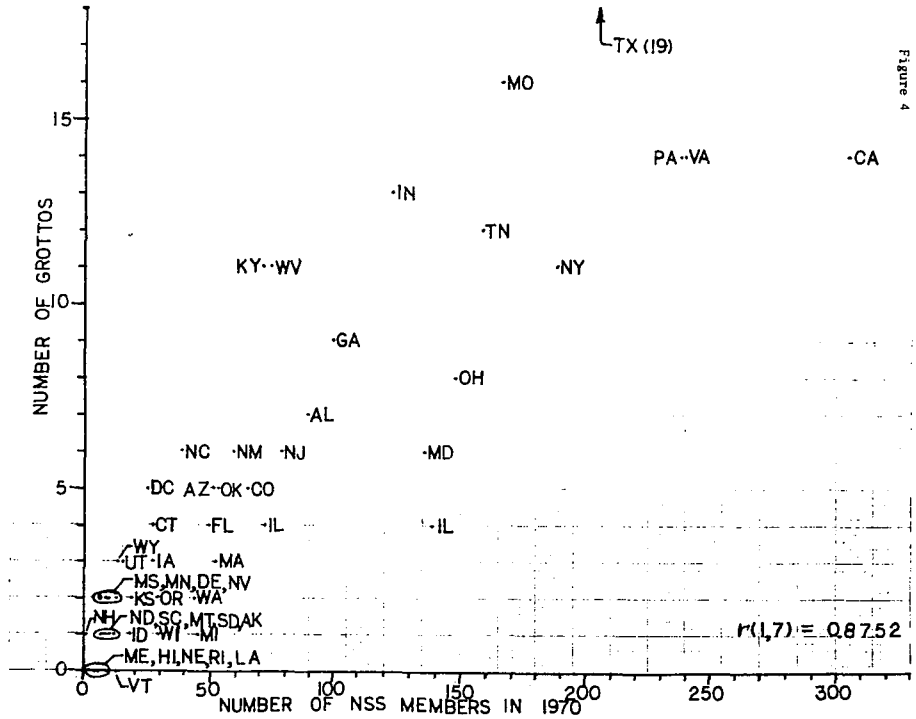


Figure 4

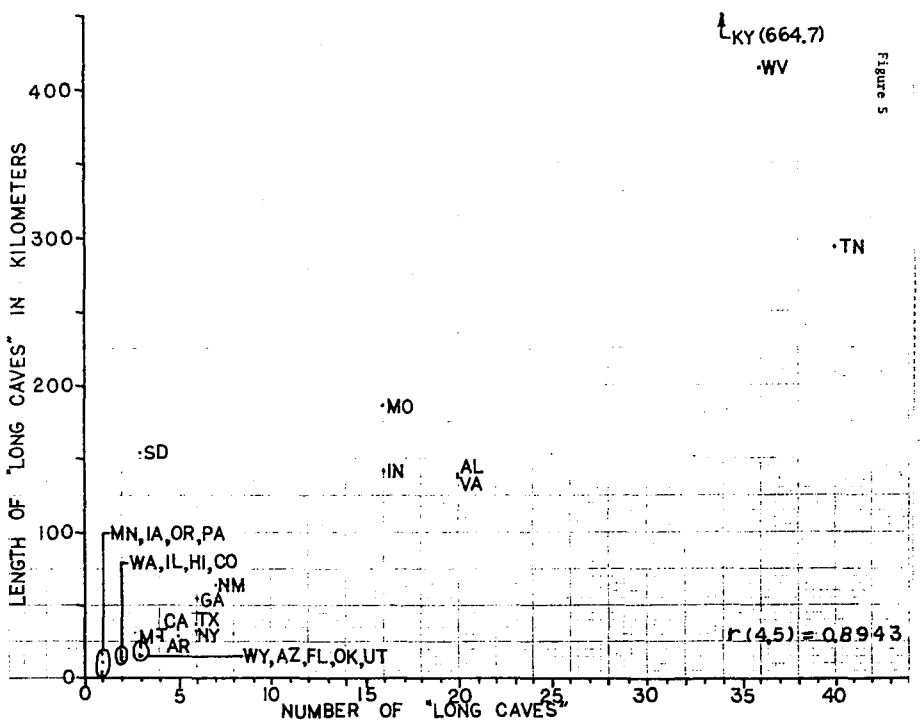


Figure 5

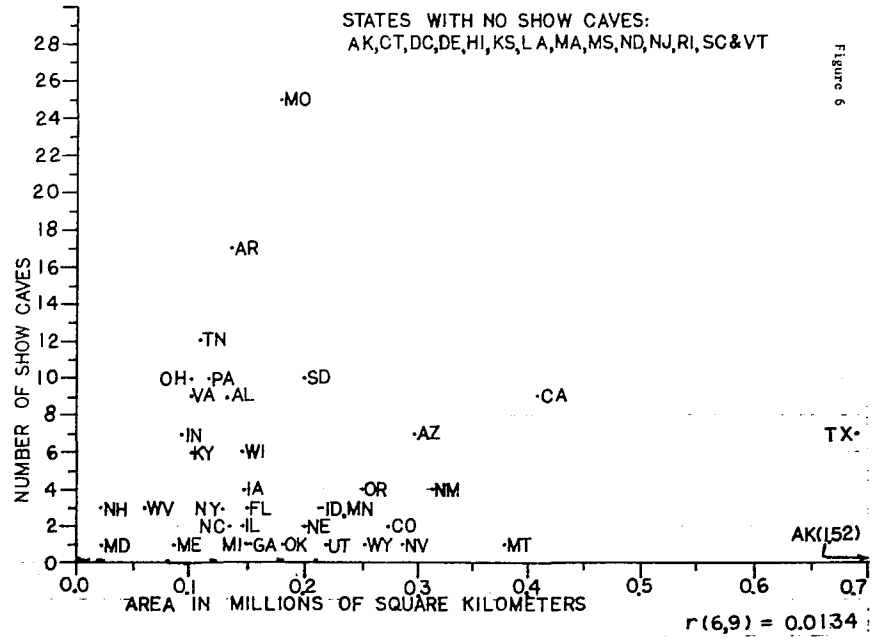


Figure 6

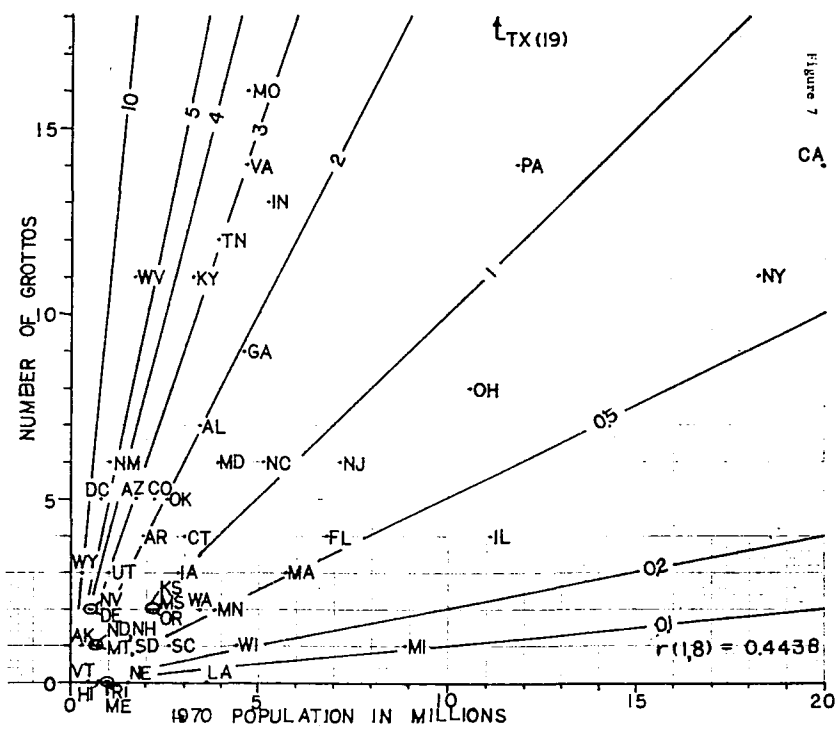
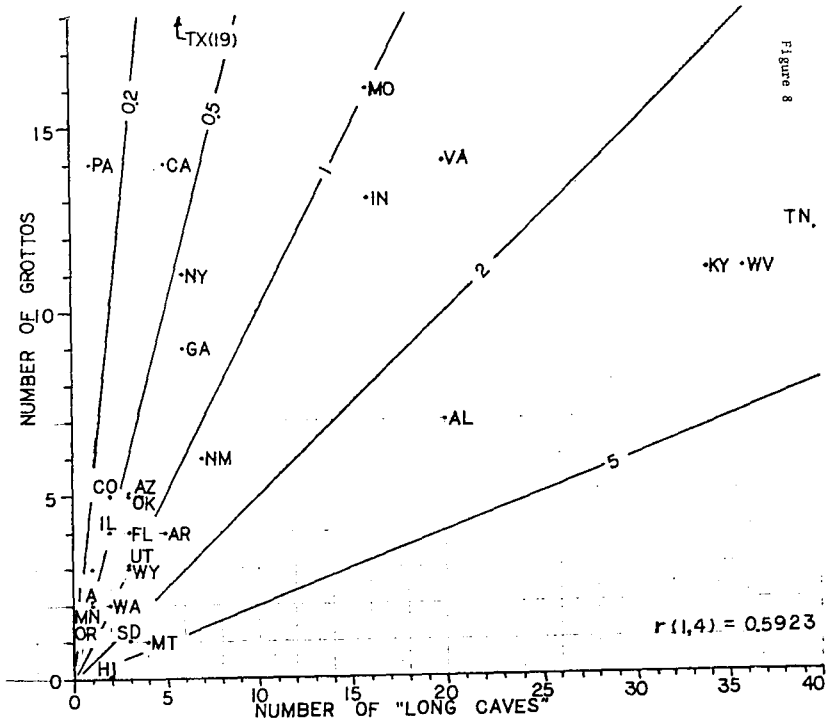


Figure 7



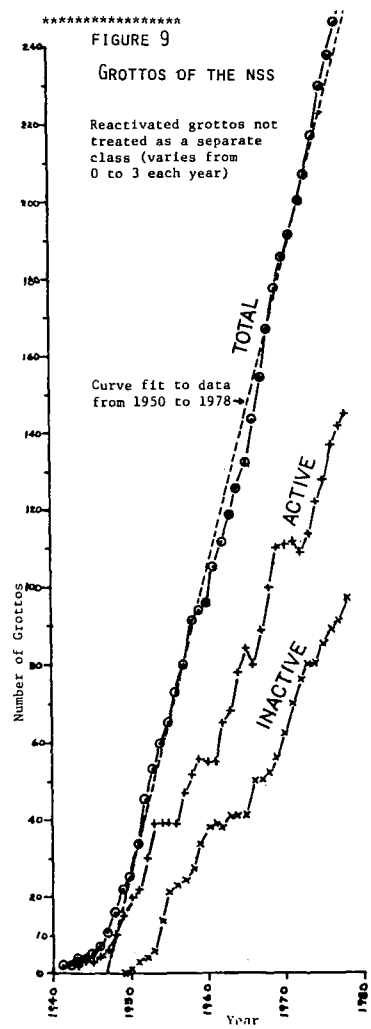


TABLE 4: NUMBER OF GROTTOS OF EACH STATE AND THE NUMBER OF TRANSITIONS BETWEEN STATES

Year	Total =	C +	A +	I +	R +	?	N_{AC}	N_{AA}	N_{IA}	N_{II}	N_{RI}	N_{AR}
1941	2	2	0	0	0	0	0	0	0	0	0	0
1942	2	0	2	0	0	0	2	0	0	0	0	0
1943	4	2	2	0	0	0	0	2	0	0	0	0
1944	4	0	4	0	0	0	2	2	0	0	0	0
1945	5	1	3	0	0	1	0	3	0	0	0	0
1946	7	2	4	0	0	1	1	3	0	0	0	0
1947	11	4	6	0	0	1	2	4	0	0	0	0
1948	16	5	10	0	0	1	4	6	0	0	0	0
1949	22	6	15	0	0	1	5	10	0	0	0	0
1950	25	3	20	1	1	0	6	14	1	0	1	0
1951	34	9	22	3	0	0	3	18	2	1	0	1
1952	45	11	30	4	0	0	9	21	1	3	0	0
1953	53	8	39	6	0	0	11	28	2	4	0	0
1954	60	7	39	14	0	0	8	31	8	6	0	0
1955	65	5	39	21	0	0	7	32	7	14	0	0
1956	73	8	39	23	2	1	5	34	4	19	2	0
1957	80	7	47	24	1	1	8	37	2	22	1	2
1958	91	11	52	27	0	1	7	44	3	24	0	1
1959	94	3	56	34	0	1	11	45	7	27	0	0
1960	96	2	55	38	1	1	3	52	5	33	1	0
1961	105	9	55	39	1	1	2	52	2	37	1	1
1962	112	7	65	38	1	1	9	55	0	38	1	1
1963	119	7	68	41	3	0	7	60	5	36	3	1
1964	126	7	78	41	0	0	7	68	0	41	0	3
1965	132	6	84	41	0	1	7	77	0	41	0	0
1966	143	11	80	50	1	1	6	74	10	40	1	0
1967	154	11	89	50	3	1	11	77	3	47	3	1
1968	167	13	100	52	1	1	11	86	3	49	1	3
1969	177	10	110	56	0	1	13	96	4	52	0	1
1970	185	8	111	62	1	3	10	101	7	55	1	0
1971	191	6	112	70	0	3	8	103	8	62	0	1
1972	200	9	109	76	2	4	6	103	8	68	2	0
1973	207	7	114	80	2	4	9	103	6	74	2	2
1974	217	10	122	80	1	4	7	113	1	79	1	2
1975	230	13	128	85	0	4	10	117	5	80	0	1
1976	238	8	137	89	0	4	13	124	4	85	0	0
1977	246	8	142	91	1	4	8	134	3	88	1	0
1978	254	8	145	97	1	3	8	136	7	90	1	1
TOTAL	3992	254	2333	1333	23	50	246	2065	118	1215	23	22

$$\hat{P}_{AA}(y) = \frac{N_{AA}(y)}{N_{IA}(y) + N_{AA}(y)}$$

$$\hat{P}_{II}(y) = \frac{N_{II}(y)}{N_{II}(y) + N_{RI}(y)}$$

$$\hat{P}_{RI}(y) = \frac{N_{RI}(y)}{N_{II}(y) + N_{RI}(y)}$$

$$\hat{P}_{AC}(y) = 1 \text{ (by this model, see Fig. 1)}$$

$$\hat{P}_{AR}(y) = 1$$

Note also that

$$\hat{P}_{AA}(y) + P_{IA}(y) = 1$$

and $$\hat{P}_{II}(y) + \hat{P}_{RI}(y) = 1 .$$

$\hat{P}_{IA}(y)$ has an average value of 0.0518 . $P_{RI}(y)$ has an average value of 0.0182 . These probabilities along with their 95% confidence limits were calculated for the measured proportions by the method given in Crow, Davis and Maxfield (1960). The confidence limits are based on the proportion itself and the sample size.

For the NSS to grow, new grottos must be chartered. Thus the rate that grottos are chartered is an important parameter describing the society. Fig. 13 shows the number of newly chartered grottos as a function of time. The least squares straight line fit of the data is

$$n = 2.5832 + 0.2103\ (y - 1940) .$$

The 95% confidence limits (assuming a linear growth) were calculated. Approximately 50% of the points do not fall within the 95% confidence limits; thus the "true" curve is probably not a straight line. However, no alternative simple curve is suggested by the data.

A slightly different method of showing gains and losses is given in Fig. 14. Gains are shown above the x-axis and include additions of grottos by charterings and reactivations. The losses (deactivations) are plotted below the x-axis. The net change is shown with o's.

Survival Rates. Another way of looking at these data is with survival rates. For instance, suppose 10 grottos were chartered this year; how many of them will still be active five years from now? 10 years from now? n years? The probability of a grotto surviving at least n years is

$$\text{Prob} = \frac{(\text{active} \geq n) + (\text{inactive} \geq n)}{(\text{active} \geq n) + (\text{inactive} \geq n) + (\text{inactive} < n)}$$

where (active $\geq$ n) is the number of grottos which have been active at least n years, (inactive $\geq$ n) is the number of grottos which did not go inactive until at least n years and (inactive < n) is the number of grottos which went inactive in less than n years. This type of data is shown in Fig. 15. By looking at the curves with "x" marking the data points, we see that slightly less than half (actually 0.471) of the grottos survive nine years. For data up to 24 years, and for grottos under their initial charterings, the probability of surviving fits the exponential exp(-0.0825(n-1)). Each grotto under its first charter has a 0.921 = exp(-0.0825) chance of surviving another year. Thus there do not appear to be any periods in the life of a grotto where it is any more (or less) vulnerable to deactivation. However, the similar curve for reactivated grottos alone is much different. A reactivated grotto has a much higher survival rate than does a grotto under its initial chartering.

Because a grotto can be deactivated and later reactivated when there is a local renewal of interest in caving, calculations of survival have to account for such factors. Fig. 16 shows that most deactivated grottos are not reactivated even 23 years after deactivation. However, grottos which are reactivated tend to have long lives thereafter. This is shown in Fig. 17. The number of years the grotto was active the first time it was chartered is shown along the x-axis. The number of years active after

****

FIGURE 10

GROTTOS OF THE NSS

(LOGARITHMIC SCALE)

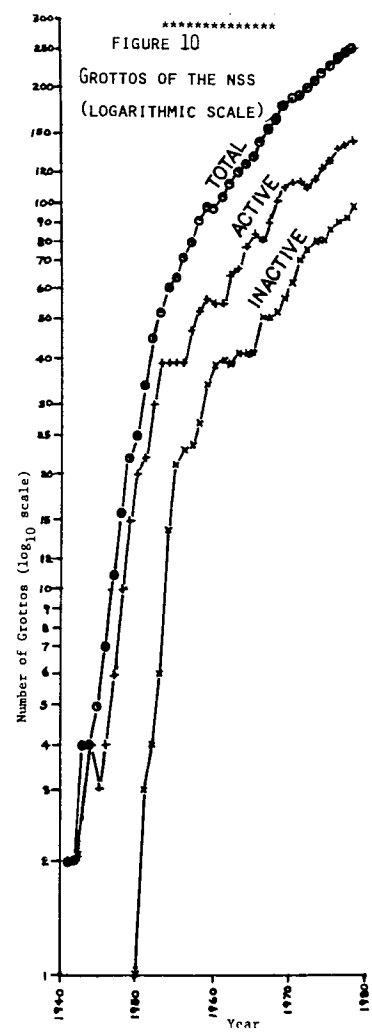


FIGURE 11

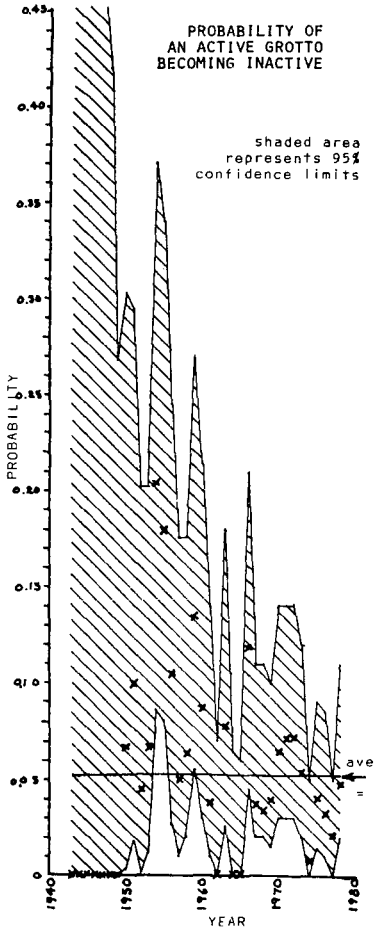


FIGURE 12

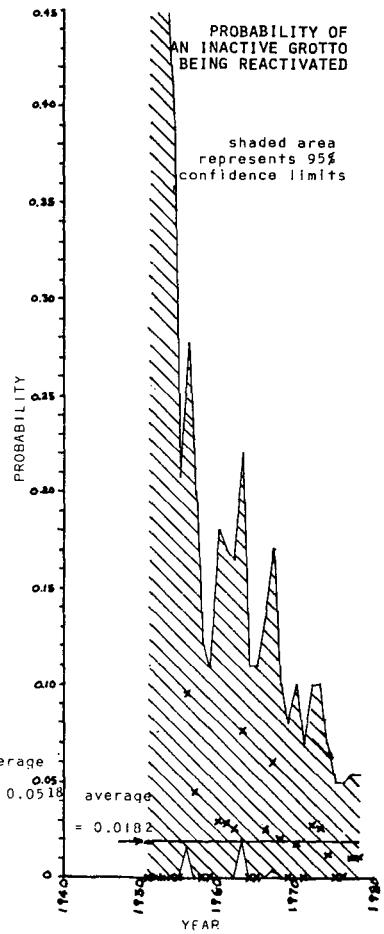


FIGURE 13
NEWLY CHARTERED GROTTOS AS A FUNCTION OF TIME

least squares line:
n = 2.5832 + 0.2103 (yr-1940)
or
n =-5.8291 + 0.2103 (yr-1900)

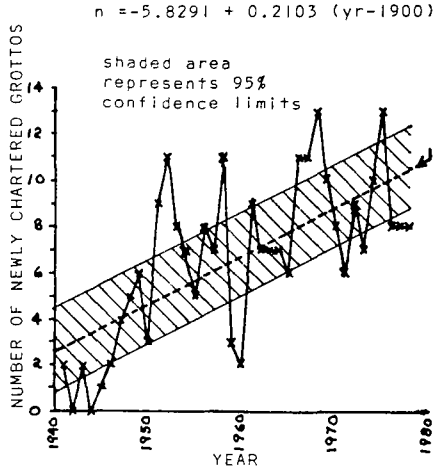


FIGURE 15

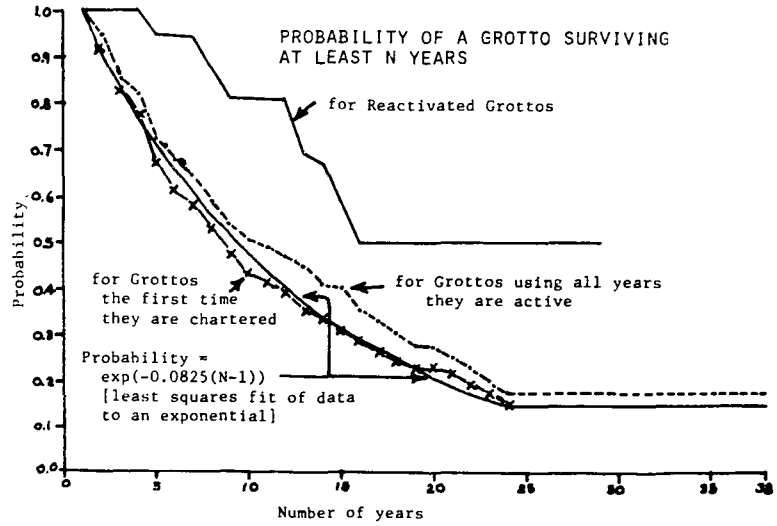
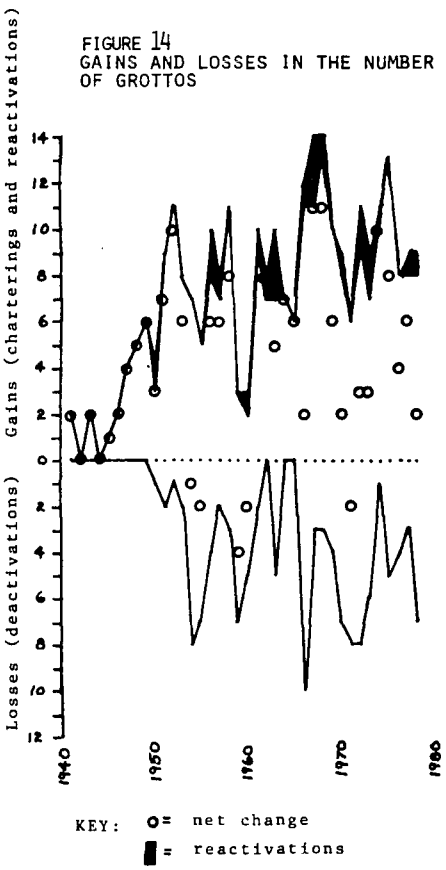


FIGURE 14
GAINS AND LOSSES IN THE NUMBER OF GROTTOS



reactivation is plotted up the y-axis. Points above the dashed diagonal line represent grottos which have had longer periods of activity after they were reactivated than during their first chartering. Of the reactivated grottos, 80% fit this category and the four which do not are currently active and do not fit into the majority category only because sufficient time has not yet passed to place them there.

Conc Conclusions and Speculations.

1. The number of grottos (the total of all four states: chartered, active, inactive and reactivated) is increasing linearly at about eight grottos per year.

2. The number of grottos (of any category considered here) is NOT growing exponentially. Thus we do not have to worry about the NSS office becoming swamped handling grotto chartering paperwork.

3. In any year, approximately 5% of the active grottos become inactive.

4. In any year, approximately 2% of the inactive grottos are reactivated.

5. The number of active grottos is increasing.

6. Most grottos which become inactive are never reactivated.

7. Grottos which are reactivated are more likely to remain in existence for an extended period than a grotto under its initial chartering. Possibly the reason for this is that often a newly chartered grotto has only marginally enough members to sustain interest in caving. Such a grotto is highly susceptible to variations in number of its members. If a grotto is being reactivated, caving in that area is probably not just a novelty and its members may have a more enduring interest in caving.

8. Placing more stringent requirements on chartering grottos will probably not reduce the rate of deactivation.

FIGURE 16

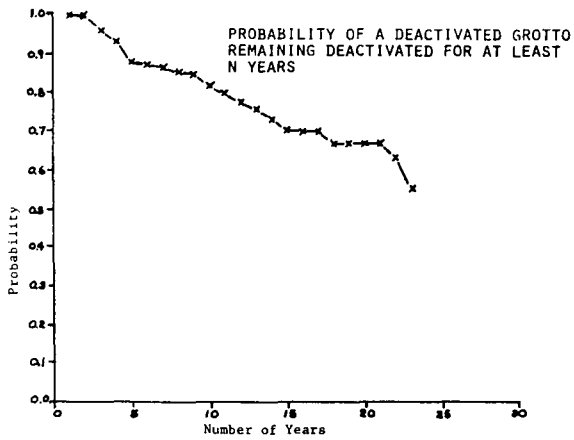
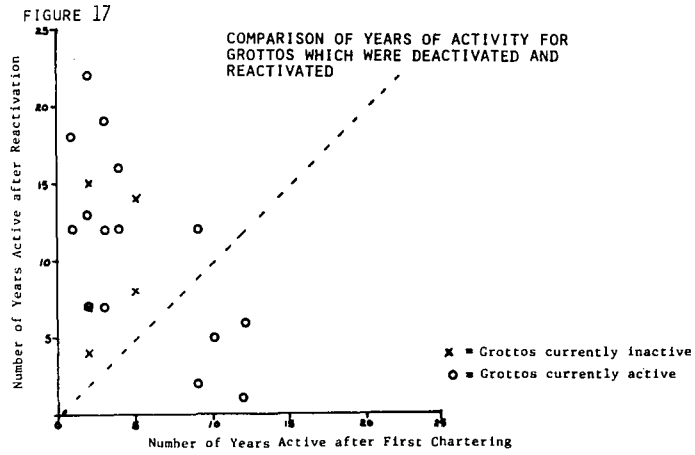
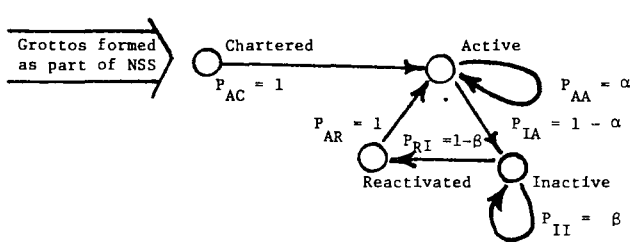


FIGURE 17



PART IV. The Markov Chain Model of Growth. Grottos fall into two very broad classes: those which have been chartered in the past and those which will be chartered in the future. For now we will only consider the activity of those which have already been chartered. By considering this historical data, we can get an idea of how many grottos will be active in the future.

At any time after a set of grottos has been chartered, we may examine them to see how they are faring. As outlined in parts I and III of this series, any grotto which has been chartered will fall into one of four states: newly chartered (C), active (A), inactive (I), or reactivated (R). Fig. 1 in Part I showed the possible transitions between states. This idea is expanded in Fig. 18 below.



Each possible transition is shown with an associated probability. For example, P_{IA} is the probability that an active grotto became inactive the following year. $P_{AC} = 1$; that is, the probability of a newly chartered grotto becoming active is 1 since by this model all newly chartered grottos are active for at least one year. Thus there is no arrow shown to represent P_{IC} because this would imply that a grotto could be chartered one year and become inactive the next. Remember that the first subscript represents the state which the grotto is moving to and the second represents the state it is moving from. For convenience, P_{AA} is represented by the single symbol α. Since $P_{AA} + P_{IA} = 1$, $P_{IA} = 1 - \alpha$. Similarly, P_{II} is represented by β.

These transitions can be shown using a 4x4 probability matrix.

$$\text{Probability matrix (form 1)} \quad M = \begin{array}{c} \\ C \\ A \\ I \\ R \end{array} \begin{array}{c} \begin{array}{cccc} C & A & I & R \end{array} \\ \begin{pmatrix} P_{CC} & P_{CA} & P_{CI} & P_{CR} \\ P_{AC} & P_{AA} & P_{AI} & P_{AR} \\ P_{IC} & P_{IA} & P_{II} & P_{IR} \\ P_{RC} & P_{RA} & P_{RI} & P_{RR} \end{pmatrix} \end{array}$$

R ← from this state (2nd subscript)

to this state (1st subscript)

The C, A, I and R on the top and left borders of the matrix are an aid for remembering the order of terms only.

The P_{ij}'s are referred to as *transition probabilities*. By this model for the allowable transitions, ten of the terms are equal to 0 and two others are 1. Thus the probability matrix becomes

$$\text{Probability matrix M (form 2)} = \begin{pmatrix} 0 & 0 & 0 & 0 \\ 1 & P_{AA} & 0 & 1 \\ 0 & P_{IA} & P_{II} & 0 \\ 0 & 0 & P_{RI} & 0 \end{pmatrix}$$

Using the other information and notation given above, the probability matrix becomes

$$\text{Probability matrix M (form 3)} = \begin{pmatrix} 0 & 0 & 0 & 0 \\ 1 & \alpha & 0 & 1 \\ 0 & 1-\alpha & \beta & 0 \\ 0 & 0 & 1-\beta & 0 \end{pmatrix}$$

A *Markov process* is any probabilistic process in which the future development is completely determined by the present state and not at all by the way in which the present state arose. A *Markov chain* is a Markov process such that the transition probabilities $P_{ij}(y)$ do not depend on y. Thus $P_{ij}(y)$ can be written as P_{ij} since it is not dependent on y. Let S be the set of states, then M = matrix of P_{ij}'s is a *Markov matrix* over S provided that

(a) for any i,j in S, $P_{ij} \geq 0$, and

(b) for each j in S, $\sum_{i \text{ in } S} P_{ij} = 1$

In less abstract terms, a Markov matrix is a matrix such that each element of the matrix is non-negative and that the sum of each column equals 1. Clearly the probability matrix for states of grottos is a Markov matrix.

THE FUNDAMENTAL ASSUMPTION: For the four states for grottos given above, the transition probabilities between pairs of states do not depend on time and thus the system is a Markov chain.

Evidence for P_{IA} and P_{RI} being constants was presented in Part III. See specifically Figs. 11 and 12. As is to be expected, the estimates of these values varied slightly with the year for which they were calculated, but over the years

$$\hat{P}_{IA} = 0.0518 \text{ and } \hat{P}_{RI} = 0.0182$$

(^ denotes a calculated estimate.) Thus

$$\hat{M} = \begin{pmatrix} 0 & 0 & 0 & 0 \\ 1 & .9482 & 0 & 1 \\ 0 & .0518 & .9818 & 0 \\ 0 & 0 & .0182 & 0 \end{pmatrix}$$

is the measured value of M.

Considering the problem abstractly again, assume that M is known. Assume also that for year y we know how many chartered, active, inactive and reactivated grottos there are. Let this be represented by the column vector

$$V(y) \overset{\text{def.}}{=} \begin{pmatrix} N_C \\ N_A \\ N_I \\ N_R \end{pmatrix}_y \quad \text{or alternatively, } V(y) \equiv \begin{pmatrix} N_C(y) \\ N_A(y) \\ N_I(y) \\ N_R(y) \end{pmatrix}$$

The number of grottos in each of these four states during the year y+1 can be caluclated by multiplying matrix M by V(y) . That is,

$$\begin{pmatrix} N_C \\ N_A \\ N_I \\ N_R \end{pmatrix}_{y+1} = \begin{pmatrix} 0 & 0 & 0 & 0 \\ 1 & P_{AA} & 0 & 1 \\ 0 & P_{IA} & P_{II} & 0 \\ 0 & 0 & P_{RI} & 0 \end{pmatrix} \cdot \begin{pmatrix} N_C \\ N_A \\ N_I \\ N_R \end{pmatrix}_y$$

The second form of M is used here. For those not familiar with matrices, this is equivalent to

$$\begin{aligned} N_C(y+1) &= 0 \\ N_A(y+1) &= 1 \cdot N_C(y) + P_{AA} \cdot N_A(y) + 1 \cdot N_R(y) \\ N_I(y+1) &= P_{IA} \cdot N_A(y) + P_{II} \cdot N_I(y) \\ N_R(y+1) &= P_{RI} \cdot N_I(y) \end{aligned}$$

These equations have a simpler notational form:

$$V(y+1) = M \cdot V(y)$$

Since M is assumed constant,

$$V(y+2) = M \cdot V(y+1) = M \cdot (M \cdot V(y)) = M^2 \cdot V(y) \ .$$

More generally, by finite mathematical induction

$$V(y+k) = M^k \cdot V(y) \ .$$

This is a special case of the Chapman-Kolmogorov equation for Markov chains.

M^k may be expressed in a closed form. This calculation can be done using eigen values and similar matrices. This was done, but the solution proved to be very messy. Alternatively, for a given M, M^k can be calculated recursively by multiplying M by itself k times. This was accomplished on a Hewlett-Packard Model 67 programmable calculator.

Assuming the Markov chain model is correct, and α and β have been found, we can test this model by looking at all grottos as of a certain date and seeing how these fared some time later. For this study all grottos chartered after the starting date will be ignored. For exmaple, in 1960 there were 96 grottos with 2 being recently chartered, 55 active, 38 inactive, and 1 reactivated. In 1978 these 96 grottos were now distributed as 46 active and 50 inactive. There are 17 years between these samplings so if the model is correct, this ought to be expressible by

$$\begin{pmatrix} 0 \\ 46 \\ 50 \\ 0 \end{pmatrix}_{\text{(1978 restricted to grottos chartered by 1960)}} = \begin{pmatrix} 0 & 0 & 0 & 0 \\ 1 & \alpha & 0 & 1 \\ 0 & 1-\alpha & \beta & 0 \\ 0 & 0 & 1-\beta & 0 \end{pmatrix}^{17} \cdot \begin{pmatrix} 2 \\ 55 \\ 38 \\ 1 \end{pmatrix}_{(1960)}$$

This calculation was found to be very sensitive to small variations in α and β. $\alpha = 0.9482$ and $\beta = 0.9818$ (as determined in Part III) did not give an especially good fit. Either α or β or both could be varied to give better fits. There was no one best value for both α and β.

After and have been tentatively selected and the matrix vector computation on the right side of the above equation has been completed, let E_C, E_A, E_I, and E_R be the elements of the left side of that equation. The minimum square of the errors, MSE, is defined as

$$MSE = (F_C - E_C)^2 + (F_A - E_A)^2 + (F_I - E_I)^2 + (F_R - E_R)^2$$

The MSE was used as the criterion for selecting the best α and β. β was arbitrarily chosen as 0.9818, the measured value. $\alpha = 0.9716$ gave the best fit for this β. For these values, $E_C = 0$, $E_A = 45.60$, $E_I = 49.51$, and $E_R = 0.89$ when $F_C = 0$, $F_A = 45$, $F_I = 50$, and $F_R = 0$. Similar calculations were done using data for 1950 and 1968. The $N_C = 3$, $N_A = 20$, $N_I = 1$, $N_R = 1$, $F_C = 0$, $F_A = 14$, $F_I = 11$, $F_R = 0$, and $\alpha = 0.9617$ when $\beta = 0.9777$. This calculation was done so that later the Markov chain model could be compared with Wefer's calculations, since Wefer had data only up to 1968.

The last few pages of calculations have dealt with grottos after they have entered the NSS. But each year new grottos will be chartered. Represent the new grottos of year y by $\nu(y)$. (ν is the Greek letter "nu".)

The complete MARKOV CHAIN MODEL can now be given by

$$\begin{pmatrix} N_C \\ N_A \\ N_I \\ N_R \end{pmatrix}_{y+1} = \begin{pmatrix} 0 & 0 & 0 & 0 \\ 1 & \alpha & 0 & 1 \\ 0 & 1-\alpha & \beta & 0 \\ 0 & 0 & 1-\beta & 0 \end{pmatrix} \cdot \begin{pmatrix} N_C \\ N_A \\ N_I \\ N_R \end{pmatrix}_y + \begin{pmatrix} \nu(y) \\ 0 \\ 0 \\ 0 \end{pmatrix}$$

In Part III it was shown that $\hat{\nu} = 8.0547$ since the total number of grottos increased linearly with this coefficient. For data up to 1968, $\hat{\nu} = 7.6316$.

Predictions up to the end of this century are shown in Fig. 19. This figure is an extension of Fig. 9 in Part III. The line to the left is the total number of grottos based on a least squares fit. + and x represent actual data points for active and inactive grottos. The dashed lines are the Markov chain model predictions using parameters calculated from the data up to 1968. The line with circles is the number of active grottos which Wefer predicted using an exponential model. For the period between 1968 and 1978 the Markov chain model fits the data much better than the exponential model as can be seen in the graph. The exponential model simply grows too rapidly.

Predictions Based on the Markov Chain Model.

(1) The number of active grottos and the number of inactive grottos will each grow at a rate which appears linear, not exponential.

(2) The total number of grottos will continue to increase at about 8 grottos per year. The number of active grottos will increase by about 5 grottos per year, and the number of inactive grottos by about 3 per year.

(3) Each year between 1 and 3 inactive grottos will be reactivated.

Summary. The Markov chain model is believed to be a convenient and moderately accurate way to think about growth of the number of grottos. The Markov chain model was based on the Markov matrix with parameters α and β and the ν which represented linearly growth of the total number of grottos. The estimated values for each of these parameters is undoubtedly slightly in error. Alternative estimates of the g growth of grottos could be obtained by varying α, β, and ν slightly. Only time will tell if α, β, and ν were carefully chosen or even if they are indeed constants as the model assumes.

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A.M.C.S. CAVE MAP SYMBOLS

AMCS Activities Newsletter 11:64-67 Peter Sprouse and William Russell

A current list of the AMCS standard Cave Map Symbols has not been published since 1975 (Russell, 1975). Subsequent evolution of the symbols is reflected in this 1980 list. In compiling it, foremost consideration has been given to the techniques of AMCS cave mappers and to the components of modern cave maps.

A revision of the NSS cave map symbols was published in April, 1979 in the *NSS Bulletin* 41(2), compiled largely by James Hedges. This list contained many unconventional symbols and drafting techniques and was widely regarded as impractical by American cavers. It contained a vast number of symbols for things rarely encountered in caves, with most of the symbols bearing no visual resemblance to what they were supposed to represent. Although the NSS list is currently under revision, there is little hope of major changes. Therefore, cartographers are encouraged to utilize the AMCS list. It should be used as desired by the drafter, who is encouraged to use his own different or supplementary symbols if needed.

Evolution and use of the symbols. Some symbols have been changed or deleted, and symbols have been added for obvious needs. But an attempt has been made to keep the list concise, and it has not changed drastically since the first edition in 1965 (Anon., 1965). Changes, additions, and suggestions for use are discussed in the order they appear in the list.

The symbol for lower level passage walls, a dotted line, has been stretched into short dashes to help show wall shape and add clarity. A symbol for breakdown walls has been added, which is essentially only an explicit use of the passage wall symbol. Ceiling height and water depth symbols have been eliminated for several reasons. These features may best be shown in cross sections and profiles in a form that conveys vastly more information. The plan view is intrinsically not designed to display these features, and their use inside the passage walls displaces floor detail, a primary function of the plan. For this reason also, the elevation above and below the entrance should be indicated outside the passage walls when possible. In surveys where loops provide statistical information on accuracy, the standard error may be indicated in parentheses with the elevation. Arrows indicating airflow direction, scallop direction, or flow direction of a large stream should also be outside the passage walls. Two new water symbols: intermittent pools, and rapids (merely an undulation in the water symbol). The depiction of water in a blue screen is desirable and increasing in use. When blue screen is used, rapids may be depicted as small parallel hachures in solid blue. The floor flowstone symbol is in common use, and is being increasingly used to also depict the direction of slope on flowstone. Rimstone dams are drawn with bold lines, and should be drawn to their correct shape and scale when possible. The old solid black symbol for flowstone on walls was unpopular since it tended to produce a dominant, lopsided effect on the map. It is replaced with the floor flowstone symbol attached to the wall. The stalactite, stalagmite, and soda straw symbols remain unchanged, but again, these features may be best shown in profiles and cross sections, so their use should be minimized. Breakdown may be drawn "stacked" to indicate slope, and the larger breakdown blocks should be drawn to scale and shape, rather than as a standard block shape. Shading or block detail may be shown, and if covered with mud, guano, etc., these symbols may be drawn on the breakdown. The symbol for survey stations should be used for the datum, or very important station; the depiction of all stations detracts from true floor detail and is of little interest to the reader. A trail symbol has been added and is useful in caves where there has been much prehistoric (or modern) use. The splayed "crow's foot" slope symbol is another symbol that like ceiling heights, is being phased out of the modern cave map. Slopes are best shown in cross section and profile, and the use of the slope symbol in a plan displaces floor symbols that depict the actual floor content. In large rooms with complex relief, contour lines with elevations may be used. A symbol for organic debris has been added; the drafter may wish to draw larger branches and logs to shape and scale. The use of the geology symbols greatly increases the value of a cave map; these should be more utilized than they are. Again, these generally appear outside the passage walls.

Such basic map components as a scale and north arrow hardly need pointing out; this article isn't intended as a complete guide to cave map drafting. However, we believe that these symbols can be used to construct a "state of the art" cave map. Such a map would have three views, all necessary for depicting a three-dimensional cave: plan, profile, and cross sections. Floor detail should be complete, with no blank spots in the passage, for there is a symbol for any floor composition. The use of graphic symbols (that look like what they represent) and the de-emphasis of number and letters in the drawing have resulted in more informative and visually pleasing cave maps.

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PASSAGE SYMBOLS	SIMBOLOS DE PASAJES
Passage walls	Pared del pasaje
Lower level passage	Pared de nivel inferior
Upper level passage	Pared de nivel superior
Unsurveyed passage; indefinite walls	Pasaje de no está levantado
Breakdown walls	Paredes de cantos rodados
Sharp drop in floor; down in hachured direction	Tiro en el pasaje
Pit; if so indicated, entrance pit	Tiro; tiro de entrada
Cross section of passage, viewed in direction shown by barbed arrow, and rotated to horizontal	Sección
761 Depth below entrance (or datum)	Profundidad baja la entrada
35 Height above entrance (or datum)	Elevación arriba de la entrada

WATER SYMBOLS	SIMBOLOS DE AGUA
Direction and course of flowing stream	Chorra de agua corrienda
Direction and course of intermittent stream	Chorro seco
Standing water, lake or pool	Agua estancada
Intermittent or relict pool	Laguna seca
Sump (cross-hatched)	Sifón
Large stream, rapids	Río, rápido

STAL SYMBOLS	SIMBOLOS DE FORMACIONES
Flowstone on floor; may indicate slope contours, with bulged side downslope	Piso de travertina
Rimstone dams, drawn to scale and shape when possible	Gours
Flowstone on walls	Paredes de travertina
Stalactite	Estalactita
Stalagmite	Estalagmita
Soda straws	Macarones

CEILING SYMBOLS	SIMBOLOS DEL TECHO
Sharp drop in ceiling; hachures point toward low ceiling	Techo bajo
Dome	Domo

FLOOR SYMBOLS	SIMBOLOS DEL PISO
Bedrock floor	Piso de piedra
Mud or clay	Lodo, barro
Sand or silt	Arena
Gravel	Grava
Rounded stream cobbles	Guijarros
Talus	Piedras
Breakdown	Rocas
Large breakdown, drawn to shape and scale	Cantos rodados
Guano	Guano
Pottery or other archeological material	Materia archeológica
Slope, down in splayed direction	Pendiente
Organic debris	Materia orgánica
Trail	Vereda
Survey station, survey datum point	Estación topográfica

GEOLOGY SYMBOLS	SIMBOLOS DE GEOLOGIA
Strike and dip of strata; dip in degrees	Echados
Vertical joint	Fractura
Dipping joint	Fractura inclinada
Fault, D side moved down relative to U side	Falla

Mt. St. Helens

NOVEMBER - South Side Observations

The Speleograph 16(12):118-120 Clyde M. Senger

Thanks to the efforts of Dr. Halliday, I was able to participate in investigations of the Caves Basalt Lava Flow on the south side of Mt. St. Helens Aug. 23-24 and Nov. 10, 1980.

Surprisingly, at first glance there was little evidence on the south side of the nearby violent eruption that caused such devastation north of the mountain. The trees and the landscape seemed to have a grayish hue due to the ash (tephra) in August, but even that was gone in November, washed away by the first fall rainstorm. There were differences from last year, of course. The roads appeared neglected with a scattering of rocks and limbs which were the result of normal weathering. There were also some tops of alders which could not bear the weight of the earlier ashfalls, the ash itself, and both debris and erosion from the fall rain flooding. Many of the alders were bent over the road as if leaning down to inspect the snowlike gray ash. Many of these alders were returning to an upright position in November as wind and rain cleansed them of their unusual burden. I wonder if they will now succumb to the wet winter snows that so often hit the area about now...

By November, much of the ash had apparently been blown or washed from the driving tracks of the road. However, where the ash was deeper and wet, it readily squished out from underfoot and clung to the boots.

It is impossible to say without a detailed study what problems the wildlife in the area is having. We can say that some have survived. Deer and elk tracks were abundant in the mudflow material in August and we even saw the tracks of a small bear and signs of a Douglas squirrel feeding on fir cones. Several chipmunks were seen darting here and there and a Clark's Nutcracker flew in to check up on us. Perhaps they appreciate the quiet and lack of hunters in the area.

Late summer flowers such as foxglove, purple lupines, pearly-everlasting and a dainty white saxifrage were in bloom in August. The large purple huckleberries were ripe and abundant. Of course, we had to check on their flavor. The flavor seemed normal but such things are difficult to judge, so I had to do quite a lot of sampling.

The caves apparently were not damaged by the earthquakes based on our sampling. However, there is another danger to the caves--mudflows which are redepositing the ash apparently in very deep layers in certain spots. Part of the ash is very fine and apparently this tends to fill in cracks where water might otherwise seep into the ground. Thus, the snow meltwater and rain seemed to run over the surface more than normal. Many people I have talked to seem to think that the snow on the south slope melted during the first eruption

to think that the snow on the south slope melted during the first eruption in May. I doubt it. A thin layer of ash, say 1/16th inch, would probably absorb more solar energy than the snow and transfer much of that to the snow below, thus increasing the rate of melting. In August, we could see waterfalls and streams high on the south face of the mountain. Whitish areas in several places appeared to be exposed ice and snow. Much of the ash appeared to be darker than surrounding ash, suggesting it was wet.

Whatever the source, thin films of water trickled out of the brush in several places near Gremlin Cave and a very muddy stream ran along the north edge of N818 nearby. This stream flowed into a depression where there was a large pond. Some of this was then flowing across the road in shallow channels. Near Little Red River and Little People's caves, a channel that was dry in the morning was running a fair stream by the afternoon. I do not recall seeing running water in any of these sites before, even in the winter.

In November, the mountain was covered by a pristine mantle of snow which extended down to the upper caves area at about 2,800 ft elevation. Although everything was peaceful at the time, there were signs of an earlier violence. Rocks, mud and a small tree stripped of limbs and bark were scattered across N818. A number of new channels had been eroded across the old roadbed, one of which I recall being about 6 ft deep...

The caves had survived the runoff much better than I had expected. Or at least they had up to November. The situation might be much different when the snow melts in the spring. Spider Cave had no runoff leading to it and appears to be safe for the moment. Flow Cave had received only a little material from very local drainage. Little People's had gotten a little mud from the edge of a broad flow in that area sometime before August, but apparently nothing significant since then. Of the upper caves, Gremlin has received the most debris and appears to be in the most danger of being filled. A thin sheet of material had been left around the cave before August and that seemed to be much thicker upslope from the entrance in November. There was more material in the cave, some of which seemed to have come down the inside rather than into the lower entrance.

There seems to be a difference of opinion about trying to protect the caves from "natural" rpocesses such as mudflows. I think a small number of sandbags would be likely to significantly reduce the mudflow into Gremlin and would be worth the effort (and risk). Upslope, small but interesting Manhole Cave was still open in August, but I did not locate it in November when we went by on the way to Gremlin Cave. The new surface was confusing and I may have been looking in the wrong place. It certainly appeared to me that most of the other small surface tubes around there were now filled.

Mudflows had passed the lower entrance of Ape Cave by August. There was perhaps 6 inches of material on the road at the sharp bend north of the parking lot. Some material had entered Ape Cave through cracks, but only in small amounts. When we arrived in November, there was water running over most of the parking lot and extending down to the parking lot for Lake Cave. Debris and erosion made it obvious that the water (mud) had been much deeper.

I really expected to see a stream running down the floor of Ape Cave. Fortunately, there was none. There were bits of debris and fir needles stranded on elevations on the floor, suggesting there had been some running water but there seemed to be little additional mud. A quick check of the upper entrance of Ape Cave indicated no significant runoff in its valley so it appears to be safe. I am still concerned about the skylights but there was not enough time to check on them. We could hear running water west of there in November, which seemed strange, We had been across the drainage a half mile upslope just 30 min earlier and there had been NO running water. Perhaps much of it was from the ridge to the west.

One cave did not fare as well as the others. Hopeless Cave just north of the lower Ape Cave entrance now fits its name even better: it is no more. It was pretty well filled by August and appeared to be covered by another foot or two of material in November. The site now appears to be a flat surface stretching north and east from the Ape Cave road with a few projecting limbs and twigs. I don't recall the slope of the land just east of Ape Cave and thus if the mud is likely to flood into Ape from that side. I hope not. I think that the road to Ape Cave will be covered by mud and thus impassabl by spring. That, in turn, will make it difficult to check Ape Cave.

PROPOSED CLOSURE OF MT. ST. HELENS CAVES FOR HIBERNATING BATS

The Speleograph 16(6):57 Mark Perkins

This article is to acquaint you with the proposed caves that are to be recommended for seasonal closure, to lessen the disturbance of hibernating bats. I hope to present several valid and convincing reasons for cavers to honor and support this proposed action. The caves being recommended are Bat Cave, Powerline Cave, Spider Cave, and the upper end of Ole's Cave. Closures would be from Nov. 1 to mid-April or April 1, depending on the weather. I realize there is also one immediate problem; the mountain may make this whole thing moot if there is a magmatic flow.

The closure is basically to protect Townsend's big-eared bat, *Plecotus townsendii*, which is now an endangered species in the eastern U.S. The following data apply to this species.

This species of bat has never been known to have a nursery colony or hibernating colony divide to form two colonies, an old and a new one. This indicates that once a colony drops below critical survival numbers, it will never be replaced by another one which could occupy the empty niche left by it. Townsend's big-eared bat shows some of the most stressful reactions to human disturbance. Mt. St. Helens' populations have dropped precipitously and the largest drop occurred when banding and intense visitation was taking place in the mid-60s to the early 70s. Graham, a California bat researcher, stated in 1966 that "with ever more persons exploring limestone caves, *Plecotus (townsendii)* may disappear entirely." When this was written, three major colonies had been abandoned, and last year only one of 20 was still present. I spent 30 days in 1978 researching all previously known Willamette Valley locations of this species. Over 30 collecting points and/or nursery sites which were still known in the late 50s were sampled. None of these existed in 1978. Other than a few stragglers at a Clackamas cave, this bat has not recently been recorded from an area in Oregon with a population of greater than 50 persons per square mile. (This includes about 80% of the Willamette Valley.)

When M. Tuttle was here, he and I talked extensively of bat travels and the winter movements of bats. Many species not only have winter hibernacula, but alternates to which they move when disturbed, or for reproductive resaons. Bats disturbed at Spider have been seen at Little Red River and Flow caves. Bats disturbed at Bat Cave have been seen at Ole's, Powerline, Prince Albert, and the upper section of Bat.

For two springs I have found at least one female at Powerline Cave. This may act as an important stopover for the bats in their move down the mountain. Neither Clyde Senger nor I are reluctant to see the monitoring visits limited to every other year. However, yearly monitoring would provide more information.

It is hoped that this will benefit the bats and help to increase or at least maintain present populations and have them be healthy. If the bats should totally die off due to other factors, the caves would then be opened again year round.

It is also thought that this may be the beginning of an actual cave management program by the Gifford Pinchot National Forest. I hope that you find this of sufficient importance for a seasonal closing of the caves mentioned.

NOVEMBER - Mt. St. Helens Update

Northwest Caving 10(2):7-10 Clyde M. Senger

The Caves Basalt Lava Flow area south of Mt. St. Helens, where the "Mt. St. Helens Caves" such as Ape Cave are located, has been closed to general entry since last spring. Some people seem to have assumed the caves were destroyed in the initial blast of 18 May 1980 and others expected extensive collapse of the caves as a result of the earthquakes...

The initial landslide and blast was to the north and northwest. Thus, the devastation seen on television and in the papers is not seen on the south side...

The restrictions on visitors to the area limited the caves that could be checked and the extent to which one could enter a cave. The caves that were seen--Ape, Little Red River, Little People's, Spider, Gremlin and the Utterstrom's Caves--appeared to be unchanged by the earthquakes. There was, of course, some ash in the entrance areas. The lack of obvious breakdown due to the recent earthquake activity is really not surprising if one is aware of the history of the area. The caves basalt was formed about 1,900 years ago based on carbon dating of the remains of

stumps which were covered by the flow. There have been several eruptive periods since that time which probably were similar to the present one. Thus, unstable caves should have collapsed hundreds of years ago.

Wildlife has survived... I was impressed by the number of ants that were about. This likely was because they tended to stand out as they scurried across the crusted ash. Some had been too inquisitive and had been trapped in the fine mud left at the ends of mud flows.

In August, there was some evidence of mudflows in the Ape Cave area but very little had entered the cave itself. What was coming in seemed to be entering through small cracks. The same was true in November. I hoped that these might tend to seal up but am less optimistic after the November trip. The fine material seems to move with little water flow.

Extensive mudflows were present in the upper cave area along N818 in August. Most were dry iwth a smooth, flat, hard surface. These had cut channels in some places and filled other places with an estimated 10 ft of new material. One lobe had covered the fairly level area west of Little People's Cave with 6-8 inches of material. The root systems of the small trees in the area apparently had been smothered as the trees were turning brown and the needles were dropping. It will be interesting to see if the magnificent old trees in the area also are killed. Fortunately, this flow barely reached the cave and no further flows seemed to have come through that area by November. A thinner flow had covered the ground around Gremlin Cave and entered it in several places. Near there, patches of pumice were seen where they had apparently been captured or screened off the surface of the flow by brush. Some of these patches wer were 6 ft in diameter. In August, the water was running several hundred feet upstream from Gremlin Cave early in the day. Apparently daily melting of the ash-covered snows on the south slopes of the mountain fed these flows. There seemed to have been no further significant deposit at Gremlin Cave's lower entrance by November, but there had been a reworking of material by recent rains. The deposits just upslope from there appeared to be much deeper. There was additional material in the cave but some apparent removal of material, too. I presume the material is still somewhere in the cave, since I know of no lower entrance where it could be washed out. If protective measures are to be taken to protect some of the caves, that cave appears to be a good candidate for assistance.

An active stream was cutting a small channel along the north side of N818 NW of Gremlin Cave in August. That material crossed the road further to the SE and drained toward a road between Flow and Spider caves. By November, that channel had become much deeper and wider, apparently reducing the flow toward Gremlin. The road by Spider had been eroded a foot or more deep and about 3 ft wide in most places. This had exposed the lava bedrock in much of the bed. This new seasonal streambed would seem to present no danger to nearby caves, but surely will be a challenge to the elk hunters in their Jeeps.

The most impressive change as far as I was concerned was on N818 where the road takes off for Little Red River Cave. That was the area of extensive mudflow in August, and at that time there had been the development of a few small channels in the original deposit and one was running water in the late afternoon. Apparently it was the heavy rains of the previous days that had caused a flood through the same area in November. A new major channel perhaps 6 ft deep and 10 ft wide was present. Rocks to over a foot in diameter were wedged between nearby trees and the bases of the trees were badly damaged by passing rocks. Obviously more material was leaving than was coming in. I was afraid it might all have been heading for the upper entrance at Ape Cave. When we checked that area, there was no sign of a runoff channel, but water could be heard in the west. There was no question about water around the lower (main) entrance of Ape Cave; it was everywhere. Most of the deposition of material seemed to be to the east of Ape Cave, which thus seemed to be in little danger at the moment. However, if more material comes down as seems likely, the stump casts near Lake Cave, and perhaps that cave, are in real danger of being filled with mud.

Of course, while I was in the area, I had to look into Spider Cave for a few minutes to see if the Western Big-Eared bats had returned for the winter. They had. There were only 13 near the entrance, one of which was banded in 1970, but that was good for the small section that was checked. I have changed my mind and now essentially agree with the recommendations of the Perkins Committee regarding a 5-year winter closure of the bat caves (see *Northwest Caving 10(1):13-14*). However, I see no need for a check after only three years. I think we have enough data on populations already and we should let them rest for five years...

What is in the future for Mt. St. Helens? Past history suggests continuing activity for some time, probably years... A long-range possibility is that the present crater will continue to fill in and thus rebuild the mountain. If so, I would suspect that the danger on the south side would increase since it is now protected by the south rim. It may be a very long time before the area is open again. On the optimistic side, we may have had the last eruption in this series. It may be business as usual at the caves next year at this time. I hope so, but doubt it.

[Note: The above reports have been edited to minimize overlap, while presenting the story from several points of view. Deletion of more than a sentence or so has been indicated in most places by ellipses.]

[See also *NSS News (Jan. 81):3-6*]

POST-ERUPTIVE MUDFLOW IMPACT ON THE MOUNT ST. HELENS CAVES, WASHINGTON

Introduction

William R. Halliday

On August 23 and 24, 1980, members of the Cascade and Oregon Grottos of the National Speleological Survey conducted a second post-eruption speleological reconnaissance of the Caves Basalt Lava Flow south of Mount St. Helens in Skamania County, Washington. The significance of this area was outlined in a report on the first post-eruption speleological reconnaissance here (Halliday, 1980). Observations recorded in this report were extensively photodocumented, and the photographs will become a part of subsequent overall reports on the effects of the eruption on the caves.

As on the first trip, operations were stringently limited by a requirement by the administration of the Gifford Pinchot National Forest that all research be conducted within 15 minutes of an escape vehicle, together with another restriction on research during cloudy or rainy weather. The latter caused a two-hour delay in operations on August 23.

The study group was provided radio assistance in the field by former Oregon Grotto member Tom Luther and by his son, Jeff Luther, of K7HFW and WB7TBE, respectively. Base station radio support was provided by Russ Townsley of K7SUX and Ron Campbell of WB7NAU on August t23 and 24, respectively. Cited tephra measurements were by Rod Crawford. The assistance of all participants is gratefully acknowledged. Clyde Senger provided extraordinary assistance in dealing with the permit system during the week before the studies.

Caves south of road N818

As planned previously (Halliday, 1980), the caves about 1 km south of U.S. Forest Service road N818 comprised the primary study area. On 8-23-80 Little Red River, Little Peoples', Flow, Spider, Gremlin, and Manhole Caves were visited. Because of the terms of the permit, only the entrance areas could be visited in most cases, and studies could not be systematic.

1) Little Red River Cave was studied as far as the base of the entrance pit. The entrance was found to be funnelling tephra into the cave through gravity sliding. Rainwash and a strong in-draught appear to have additional roles. However no perceptible new ash accumulation was noted beyond the lip of the entrance pit (a few meters past the gate), and only a thin film was noted at the lip itself.

2) The entrance sink of Little Peoples' Cave is in the path of a tongue of one of the mudflows which cross road N818. This was the first cave visited in this area, and the nature of the overall mudflow problem was not yet appreciated. In retrospect, this cave is at high risk from these mudflows. At present, most of the mud is entering the cave through the "false entrance" in the rubble at the north end of the entrance sink. To date, it amounts to an estimated 0.5 cm or less, and it was observed to extend only to the entrance of the crawlway. No stations were

placed in this cave, but spatter points showing the depth of the accumulation were photodocumented.

3) Flow Cave was found to be almost unaffected by the eruption. Small mudpuddles were noted in the upper level near the entrance, atop a tube-in-tube. They appeared to be the result of rain-generated local inwash. 36 mm of tephra was measured near the entrance of this cave.

4) Spider Cave appeared unaffected by the eruption. A dusting of ash was perceptible for a few cm beyond the overhang line. The cave was checked only to the mouth of the crawlway, however. In retrospect, this cave may be at hazard from downslope extensions of the Gremlin Cave mudflow discussed below.

5) The Gremlin Cave area is the site of a major mudflow. At the time of study, it was observed to be enlarging due to runoff of meltwater from snow and ice high on the mountain. Atop the central part of the cave an intricate series of mudflows has caused an accumulation of debris with an apparent depth of several meters. From a central mud plain overlying the main course of the cave, a narrow tongue extends southeast, downslope. The upper entrance is several meters higher than the new mud plain and the part of the cave immediately inside is affected only by downward funnelling of ash like that described for Little R ed River Cave. The lower entrance sink, however, is at the edge of the tongue which extends southeast. Considerable mud already has spilled laterally into the cave apparently to a depth of several tens of cm. The entire sink is lower than the present level of the surface of the mudflow, and this part of the cave, at least, is at high risk. Three stations were installed in the room inside the lower entrance, consisting of wire stakes with plastic flags which provide easy visibility. They are similar to the stakes installed in Ape Cave in June 1980 and readings are made similarly (Halliday, 1980).

Station 2 is at a central point, slightly to the right of the axis of the talus slope near the west wall of this room. It is in midchannel of a mud tongue. 74.4 cm of stake extended above the mud when installed.

Station 1 is about 12 feet uptube from station 2 on a wider mudflat. 42.9 cm of stake extended above the surface of the mud when installed.

Station 3 is at the lower end of the entrance chamber. It is double. 3A is left of the centerline of the mouth of the stoopway leading downtube, in a mudflat containing a newly-incised channel 2.5 cm deep. 43.3 cm of stake extended above the mud when installed. 3B is near the right wall here, in a secondary tongue of mud. 60.9 of stake extended above the mud when installed.

This cave clearly is at extreme risk and quick action will be necessary to save it from inundation. 2.5 cm of tephra was measured near the lower entrance, but the bulk of the flows appear to arise high on the mountain and probably enter this area as a result of blockage of normal drainage channels leading to Kalama Spring.

6) The entrance of Manhole Cave funnels tephra onto an entrance debris cone. Otherwise this small cave appears unaffected by the eruption. It is high enough above the upper entrance of Gremlin Cave that it appears unlikely to be engulfed.

Caves of the Ape Cave Area

Parts of Ape Cave immediately accessible from the main (lower) entrance were studied on the afternoon of August 23 and the morning of August 24. Because of communications difficulties, less of lower Ape Cave was studied than on the previous trip but all stations were rechecked. Upper Ape Cave was studied as far as the first lengthy breakdown-free section up-tube from the Big Room. At the lower east end of this breakdown-free area and on an extensive breakdown area down-tube from it, a fine-grained mud was found to have spattered quite widely from the ceiling. Two stations were placed and photodocumented. Maximum accumulation to date appeared to be less than 0.5 cm.

Similar fine-grained mud had entered lower Ape Cave via at least two points since the June 1980 studies. The first was about fifty feet down-tube from the base of the metal ladder, from a break in the west wall. At station 3-W (Halliday 1980) a thin film of mud had accumulated alongside the stake. At station 4, 0.8 cm had accumulated; this appeared to be the greatest accumulation in this part of the cave. The thin mudflow extended downtube for several hundred feet before becoming imperceptible. A smaller mudflow began at a spatter point below a small breach in the center of the ceiling some dozens of meters uptube from station 5. At that station it was braided and too thin to measure. Observation of these rudimentary mudflows was easy because of their distinctive color.

On August 24, an attempt was made to perform similar studies in the central part of Ape Cave by entering through the Dug Entrance. Reaching the main corridor by this route, however, proved too slow for the terms of the permit and the attempt was abandoned. In this area, however, local mudflows were noted to have engulfed Hopeless Cave. Only about three inches of the east wall of its entrance sink protruded above the surface of the flow. This represents an accumulation estimated at more than one foot since June 22, 1980. One tongue of another, larger mudflow was observed to have invaded the unnamed system of shallow sinks and short caves north of Hopeless Cave along the Ape Cave trail. The relation of these caves to Ape Cave is not known.

Utterstrom's Caves

On August 24 the Utterstrom's Caves area was briefly revisited. Additional tephra measurements were made at Railroad Tracks Cave: 6.9, 6.2, 6.0, 5.3, and 2.0 cm, respectively. A small ash slide was present in the entrance area of this cave. No significant changes were noted in any of these caves since June 22, 1980. However, a few hundred meters east of the upper Utterstrom's Caves, an extensive series of torrential ash flows has caused a major sequence of aggradation and degradation since June 1980, and a small lateral tongue of one of the flows has extended southwest across a small flat

toward the entrance sink of Breakdown Cave. New U.S. Geological Survey in stallations were observed here, and the risk to this cave and to the instruments must be considered moderate.

Other studies

Others participating in this field work undertook additional studies of the mudflows, of tephra accumulations, and other phenomena, including speleobiolotgical studies. These will be reported separately. It is worthy of remark that despite extensive searches of parts of several caves where bats have been seen previously, none was observed on this trip.

Conclusions and Future Studies

The studies of August 23 and 24, 1980 contributed significant information on mudflows of the Mount St. Helens cave area and their threat to several caves. The extent and dynamic nature of these flows previously had been underestimated. Several of the caves are at immediate risk and action must be taken quickly to save Gremlin Cave and others. Recommendations for protective action are beging prepared for the U.S. Forest Service. Present restrictions on research are preventing a full inventory of the risk to other caves in this area, and to major parts of Ape Cave and others. In view of these studies, attempts to study the impact of the eruption on all the caves of this area will be intensified. The nature and location of future studies here will be dependent on the outcome of these negociations. It now seems likely that the sandy tephra present in Ape Cave and other caves of this area resulted from sequential mudflows of the type now being observed, rather than from a single volcanic firestorm as previously believed. This implies reorientation of spelean studies here to anticipate conditions including aggradation and degradation of thicknesses of similar material of more than one meter in Ape and other caves.

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BIOLOGICAL OBSERVATIONS ON THE CAVE BASALT LAVA FLOW,
MT. ST. HELENS, WASHINGTON, 22 JUNE 1980

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I. ASH AND MUDFLOW CONDITIONS

Moderate to heavy ashfall was noted throughout the area investigated (Fig. 1). Table I shows ash depth data taken by me. Most depths were measured on the surface of flat rocks. Recent rainfall had wetted down the ash and formed a crust on the surface; thus, depths were probably somewhat less than when the ash first fell.

Table I
Ash Depth Measurements
22 June 1980

Locality	Depth in mm Mean	Range	Distance from Summit, Miles
Cougar (front of restaurant)	8.5	*	11.5
Swift Res. overlook (drift)	32	*	9.1
Ape Cave parking lot area	30.0	23.5-45	6.1
Jctn roads N818-N818A	45	*	4.5
Arch and Surprise Caves	45.7	39-55	3.5

*Only one measurement taken. Due to the small number of measurements and uncertainties of drifting, some of the above values may not be representative.

At Ape Cave, the ash appeared to be layered: a thin (2-3 mm) layer of coarser, darker material overlain by a much greater quantity of finer, lighter ash. Possibly the lower layer was deposited during the May 18 eruption.

Some 1-2 cm pieces of pumice were scattered over the surface of the fine ash at all sites examined; however, at Utterstrom's Caves, the highest site visited (elevation 3100-3300 ft.), a large proportion of the ash consisted of small (3 mm or less) pumice particles.

A distinct sulfur odor noted by some party members in the Utterstrom's Caves area suggested the possibility of acidity in the ash at higher elevations. However, all samples taken showed essentially neutral pH in aqueous suspension.

Only one mudflow was seen in the areas visited. This flow passed to the east of Utterstrom's Caves in two deep, newly-formed gullies perhaps 50 feet wide. The flow then turned west, broadened to a width of several hundred feet, and crossed road N818 just north of its junction with N818A. A large number of boulders were deposited on the road (see Fig. 2).

The further course of this mudflow was not investigated. Possibly, mud deposits noted next to road N816 just north of the main entrance of Ape Cave were from this source.

A distinct fishy odor was noted in and near the mudflow area on Road N818, perhaps due to decaying vegetation buried by the mud and ash. Off the road near the center of the flow, mud reached depths of 2 meters or more. Most of the mud was solid enough to walk on.

II. OBSERVATIONS OF SURFACE VEGETATION

The effects of ashfall on vegetation varied with the size of the plants and especially with the surface area of the leaves. The weight of ash collected on leaf surfaces was evidently the most important factor affecting plant life. Coniferous trees generally had branches heavily weighted down but trunks unbent, whereas deciduous trees had trunks strongly inclined, bent double, or broken (see Fig. 3). Broken deciduous trees were noted as far downslope as the intersection of N90 with the Merrill Lake road (N818). At the Swift Dam overlook, all alders were strongly inclined; near Ape Cave many appeared to be dead. Woody shrubs with small leaves such as huckleberry appeared to be surviving. Some grasses remained standing, but most small herbaceous plants appeared to be buried. A group of crushed ferns is shown in Fig. 4.

Douglas Fir, dominant tree species in the area, was not severely affected by ashfall as shown by several inches of fresh growth at tips of branches, contrasting sharply with the older foliage tinged gray with ash.

Effects of the May 18 eruption appeared to be minimal on the south slope. However, one possible effect was noted. Beargrass, Xerophyllum tenax (Pursh), was moderately common at the higher elevations visited (2500-3300 ft.), and most plants of this species had a characteristic double bend in the flower stem as shown in Fig. 5. The stems were first bent in a direction away from the mountain, then resumed vertical growth. This suggests that the initial bend was due to explosive force of the May 18 eruption, after which the plants resumed vertical growth. The phenomenon could also be explained as a result of ashfall, bending the stems in a downhill direction.

III. OBSERVATIONS OF SURFACE ANIMAL LIFE

A. Vertebrates

No carcasses were observed on the surface, so there has apparently been little or no mortality of large vertebrates in the Cave Basalt area as a result of ashfall. There was, however, some evidence of migration out of the area. A herd of elk was noted in the vicinity of Yacolt, significantly below the usual preferred elevation (as given by Larrison, 1970). Also, the number of bird species present, as indicated by both sight records and songs, decreased substantially with elevation gain, until at Utterstrom's Caves (3100-3300 ft.), only two species were noted.

A considerable population of mammals remains in the Cave Basalt area. Tracks of deer and elk were abundant on the crusted ash throughout the area visited, and several deer were seen; one deer was observed shaking off ash. Freshly opened rodent burrows were present in road cuts. At least one pika (Ochotona princeps) was audible near Moss Cave, Utterstrom's Cave System; and fresh scats of the Golden-Mantled Ground Squirrel, Callospermophilus

lateralis, were present outside Surprise Cave in the same system.

B. Invertebrates

In contrast to vertebrates, there appeared to be a sharp reduction in numbers and diversity of invertebrates in localities exposed to heavy ashfall. This was probably due in part to the habitat of small ground and soil dwelling species being buried.

A few species were notable for their presence. Ants seem especially well adapted to survive ashfall. Ants of two or three species were present in almost normal abundance crawling over the crusted ash surface, and several ant nests were observed where communal effort had succeeded in penetrating the ash layer and even, in one case, a thin covering of mud. The only spider noted in abundance was a species of wolf spider (Lycosidae), Pardosa mackenziana, which is also one of the first spider species to colonize fresh clearcuts.

Other invertebrates were present in lesser numbers. A few flying insects were noted at the Ape Cave parking lot; mosquitoes were present over the mudflow crossing road N818; a few beetle burrows were noted in the crusted ash in the same area; a large beetle larva, a moribund bumblebee (Bombus sp.), and an Oedomerid beetle, Ditylus quadricollis, were all observed crawling on the ash surface in the Utterstrom's Caves area. D. quadricollis reportedly breeds in logs of Douglas fir, red cedar, and Engelmann spruce (Hatch, 1965). Web-building spiders were seen only in sheltered locations such as restroom buildings and cave entrances.

IV. OBSERVATIONS OF CAVE BIOTA

A. Influence of Ashfall on Cave Biota

As of June 22, ash had not penetrated more than a few feet into any cave visited, with the exception of Moss Cave where ash had fallen about 15 feet down the steep, exposed entrance slope. Beyond these small areas actually covered by invading ash, the cave biota and environment appeared to be essentially unchanged. The entrance moss and fungus flora was thriving in Ape Cave, Moss Cave, Arch Cave, and Surprise Cave. Ape Cave normally has a very small fauna due to high human impact, so absence of fauna on this occasion was not surprising.

No bats were noted in Ape Cave, but this was not unusual as only a very small part of the cave was visited and many inaccessible sites exist where bats could roost. Senger (1969) detected small summer bat populations in Ape and Lake Caves by mist netting in 1966-68. However, according to M. Perkins (personal communication, 1980) the same technique in the last few years has yielded few or no bats. Bat populations have been strongly declining throughout the area due to human impact, and very careful studies would be needed to isolate any adverse effects on the bats due to ashfall.

Contrary to expectations, no evidence was found of surface fauna taking refuge from ashfall in caves.

No new breakdown was noted in Ape Cave or in the entrance areas of the Utterstrom's Caves.

Barring catastrophic changes in the landscape by lava or mudflow, it appears likely that the major effects of volcanism on cave biota will be indirect. Even if ash eventually washes into the caves, this will have

little effect on the walls and ceiling. The decrease in surface vegetation is certain to decrease the amount of organic matter of surface origin that enters the cave by various means and forms the basis of all cave-limited life. Decrease in surface invertebrate populations would adversely effect cave-dwelling predators which forage outside, such as bats. The extent of such changes will have to be determined by long-term monitoring. These effects will presumably be reversed when the present eruption cycle ends and surface conditions return to normal.

B. Other Observations

The partially decomposed carcass of a domestic cat (Felis catus), undoubtedly an abandoned pet, was discovered in Ape Cave approximately 1300 feet downslope from the main entrance. The mandibles were collected to confirm identification. The carcass supported a large population of fly larvae and several of these were also collected. The fly larvae proved to belong to the family Trichoceridae (winter crane flies), and represent a unique habitat record. Trichocerid larvae have previously been reported only from vegetable matter, such as dead and decaying leaves, fungi, rotting potatoes, and other similar materials (Alexander 1920, Keilin 1928).

The finding of Trichocerid larvae in carrion is most unusual. Normally, the main consumers of carrion are Calliphoridae (blowflies), with some Sarcophagidae (flesh-flies) and Phoridae (coffin-flies) (Oldroyd, 1964)--all "typical flies"--and beetles. This is the first record of Trichoceridae or indeed of any gnat-like fly doing so. Apparently none of the normal carrion-feeding flies were present in the cave and the Trichocerids took advantage of an unoccupied habitat. A return visit to the cave to collect adult flies would be highly desirable.

V. FURTHER INVESTIGATIONS NEEDED

On future visits to the Cave Basalt area it would be extremely valuable to visit more remote caves such as Bat Cave, Ole's Cave, and Little Red River Cave which have a larger normal biota due to lesser human impact. Little Red River Cave is especially important to visit because it is the only cave in the area with a permanent stream where groundwater fauna may be sampled. Powerline Cave and Column Cave, also relatively remote, should be visited in order to evaulate impact of the eruptions on bats, since summer bat populations have been observed there in recent years.

A longer return visit to Utterstrom's Caves, long enough to study the interiors of several of the caves, would be valuable both because these caves normally have a large biota and because they are the highest caves in the area and thus would be most affected by the activity of Mt. St. Helens.

It would also be interesting to determine the effects of ashfall on surface soil and litter invertebrates. Samples taken before the eruptions in the Cougar and Ole's Cave areas are available for comparison.

In order to fully evaluate the biological effects of volcanic activity in the Cave Basalt area, regular monitoring visits should be made during all seasons over a period of several years, both during and after the present eruption cycle.

ACKNOWLEDGEMENTS

I would like to express gratitude to Dr. William R. Halliday for undertaking the immense task of organizing the June 22 expedition; to our amateur radio operator and the other expedition members for their participation; and to Mr. J. P. Pelham for identifying the Beargrass species.

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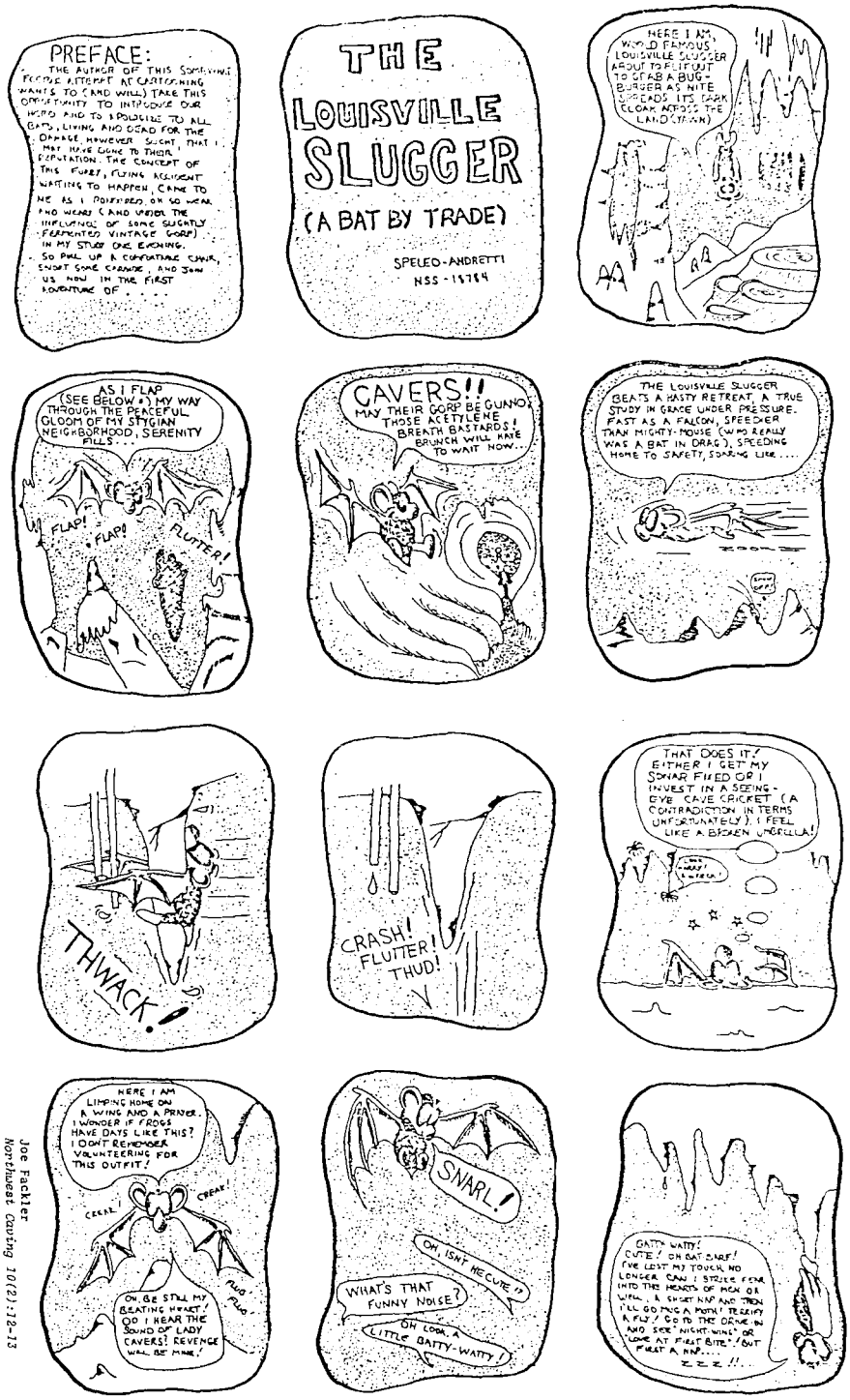
Explanation of Figures

1. Stairway, main entrance of Ape Cave, showing ash accumulation.
2. Mudflow crossing road N818 just north of its intersection with road N818A.
3. Young fir and alder trees near Ape Cave parking lot.
4. Dead ferns near road N83 just south of its intersection with road N816.
5. Beargrass, Xerophyllum tenax, adjacent to Moss Cave, Utterstrom's Cave System.

All photographs taken by the author on 22 June 1980.

HUMORE



Joe Fackler
Northwest Caving 10(2):12-13

The Miracle Trip Report Form

Terry Butler
Cleve-O-Grotto News 26(4):31

It has been heard from time to time (approximately every time a newsletter is printed) that just not enough members write articles for the newsletter. Now, I know exactly what you're going to say, that the editors should be satisfied with a 2-page newsletter, or that you get sweaty palms just thinking about writing an article, but I have the solution for all of you illiterate cavers out there who can't even write a simple trip report.

Now, with "THE MIRACLE TRIP REPORT FORM" you too can be the Hemingway of the underworld, the Faulkner of karst, the Shakespeare of speleology. Impress your friends and relatives with your newfound literary skills. Just clip out the following article, cross out the inappropriate words and--miracle of miracles--you're a writer. Yes, you get all this and the cost to you is only $1.00. Send your check or money order with the finished article to your favorite newsletter editor.

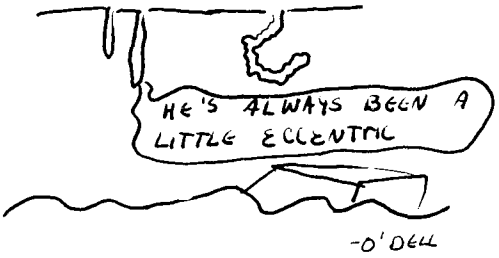
---------- C L I P H E R E ----------

Last [week, month, year, ice age] I went on a cave trip with [fellow cavers, a bunch of nurds, some crazy s.o.b.'s]. We went to [*insert the name of the cave*] Cave located in [W. Va., Ky., Ind., Pa., Tenn., the Earth].

My decision to go caving was made because [I didn't know any better, I was under the influence of drugs, I had nothing better to do]. This turned out to be the [best, greatest, silliest, most foolish] decision of the week. On the trip down my whole life flashed in from of my eyes as I [rode in Dan Molter's truck, chug-a-lugged the Jack Daniels, was pulled over by the Somerset Police, all of the above].

We were in the cave for [2 hrs, 4 hrs, a long time, too long]. We mapped [the going leads, everything in the cave, nothing, all the bars en route]. There were [hundreds of, many, two, no] [bats, formations, beer cans]. For the most part the cave [was horizontal, was vertical, was wet, sucked]. After the trip we found that [nobody, half, everybody] [was, were] [killed, injured, lost, hung over].

I think that [caving is fun, I'll be going back, I must have been out of my mind, this was my last caving trip].



CARBIDE AND WATER

SFBC Newsletter 23(6):6 Warren Hoemann

(To the tune of "Scotch and Soda" by Dave Guard)

Carbide and water
Flame in the night
Baby, now that's my light
Oh, yeah, that's right
That's my light

Clean reflector
Spare tip or two
Think of the caves they got me through
All right
That's my light

People won't cave with me
They say that it's too dirty
But just one charge will last five hours
And six will get me thirty

All I need is
The top screwed on tight
Make any darkness bright
Oh, yeah, that's right
When I go crawlin' down into the night
Give me carbide, baby
That's my light

HIDDEN BEAUTY

The Underground 22(12):10 Jane Fisher

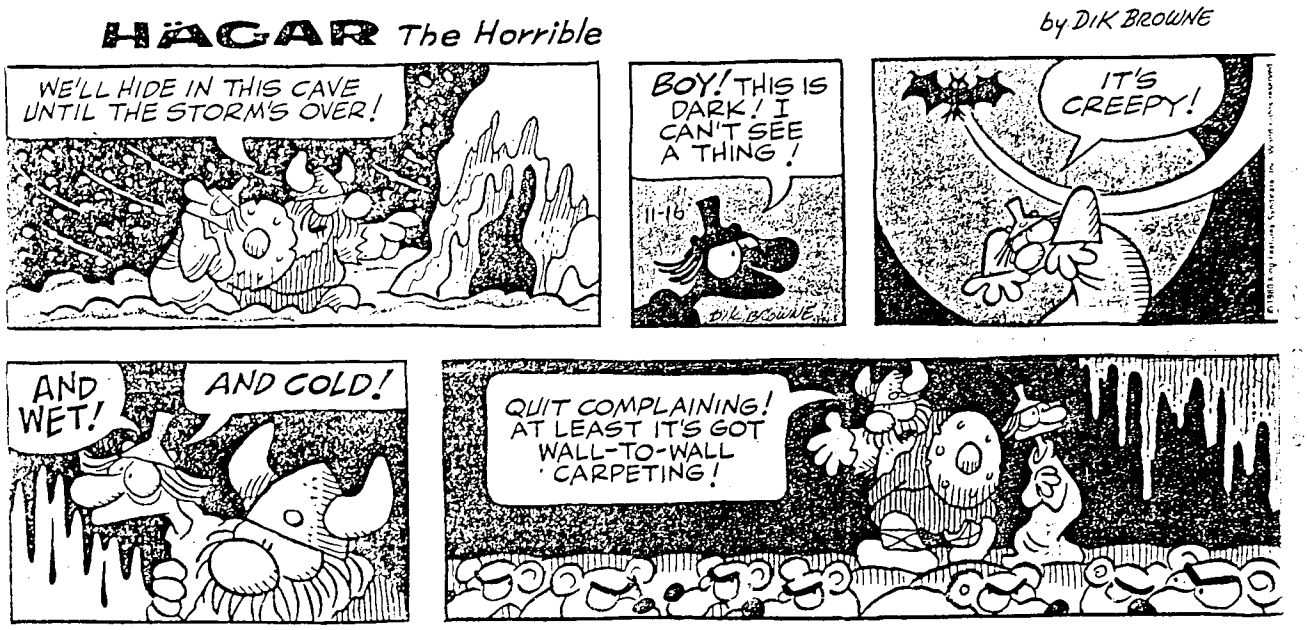
Beauty grows for endless ages,
Deep within the ancient mountain,
Ever hidden from the daylight,
Slender icicles and columns.

Those who long to see this splendor
Search each mountain nook and cranny,
Till at last they find an entrance
Leading down into the mountain.

Carbide lamp and sturdy helmet,
Climbing rope and steely piton,
Coveralls and supple boots are
Necessary for this journey.

Those bold ones who dare to venture
Down into the pit of darkness
Through the mud and icy water,
Tumbled rock and broken crevice,

View this beauty by dim lamplight,
Wondrous sculpture from the eons,
Wrought alone by the Creator--
Seen at last by humbled humans!



MATHEMATICS FOR CAVE SCIENTISTS

The Exploiter (parody) "Billiard Heartburn"

Every budding cave scientist must eventually learn the art of expressing equations in a clear and concise form. Although there is no "cookbook" procedure for performing this operation, the following example will illustrate the general principles.

$$1 + 1 = 2$$

Obviously the above equation is confusing and ambigusous. But

$$1 = \ln e$$

and $$1 = \sin^2 x + \cos^2 x$$

and further: $$2 = \sum_{n=0}^{\infty} \frac{1}{2^n}$$

Therefore the original equation may be more succinctly expressed as

$$\ln e + \sin^2 x + \cos^2 x = \sum_{n=0}^{\infty} \frac{1}{2^n}$$

This may be further simplified by use of the following relations:

$$1 = \cosh y \sqrt{1 - \tanh^2 y} \qquad e = \lim_{z \to \infty} (1 + 1/Z)^2$$

The original equation may therefore be written as

$$\ln[\lim_{z \to \infty}(1+1/Z)^2] + (\sin^2 x + \cos^2 x) = \sum_{n=0}^{\infty} \frac{\cosh y \sqrt{1-\tanh^2 y}}{2^n}$$

At this point, it sould be obvious that the above equation is much clearer and more easily understood than the original equation. Further simplification is possible. It is left as an exercise for the reader.

A METHOD FOR CALCULATING THE ABSURDITY FACTOR OF A CAVING TRIP

george dasher

D. C. Speleograph 36(9):12

As you may know, all caving trips have an absurdity factor; some, of course, are higher than others. The following is one method which has been used with good success in Laurel Creek Cave in Monroe Co., WV. The survey data is for a small pit near the terminus of the Beartooth Passage:

Stn.	Dist.	Azi.	Inclin.	L	R	Floor	Ceiling
Y10							
	3.3	58.0	- 70.5	2	2	5	9
2							
	15.3	93.0	- 56.0	0	5	1.5	2
3							
	5.9	140.0	9.0	3	3	2	1
4							

Many people, once they have completed a survey, add the total distance so they have something to brag about to their friends. In figuring an absurdity factor, one totals all the figures: the stations, distances, azimuths, inclinations, right wall, left wall, floor, and ceiling height. In this case one arrives at the following figures:

19.0	24.4	291.0	-117.5	5	10	8.5	12

The second step is to add all these totals together, resulting in a grand total of 252.5. This in turn is divided by the number of stations within the survey, in this case 4: 252.5/4 = 63.125. Lastly, this number is multiplied by the number of people on the trip. There were 3 on this trip: Chuck Thomas, Steve Dower and me.

$$(63.125)\ (3) = 189.37$$

Rounded off, this survey had an absurdity factor of 189. Now we really have something to brag about to our friends.

Dear Capt. Carbide,
I have sinkholes all over my land. Big ones, little ones. Everywhere. Sinkholes.
(signed) R.J. Grady, Rockport, Pa.

Dear Mr. Grady,
I believe you, but I can't tell from your letter whether you wish advice or are merely bragging.

---C.C.

Advice From Captain Carbide
San Francisco Bay Chapter
Newsletter 1980 issues

Dear Capt. Carbide,
We're buying a new car and haven't decided what to do with the old one. We thought of giving it to our sone for use on his caving trips, but we don't want to embarrass him among his friends. Will they laugh at a '78 Chrysler Newport with 30,000 miles already on it and no air conditioning?
(signed) Concerned Parents, Roanoke, Va

Dear Concerned,
Your fears are well founded. Although your car has the advantage of nc air conditioning, the low odometer reading would subject your son to utter derision. Unless the car has some other redeeming feature, such as a smashed windshield or missing floorboard, it just won't make it as a cavin vehicle. Why don't you give your sone a hundred bucks and let him buy his own?
--C.C.

Dear Capt. Carbide,
Every time I check the carbide in my lamp, it's a soggy mes. I turn the water valve down, and it still comes out soup. What can I do?
(signed) Slurpy, Baker, Mont.

Dear Slurpy,
Keep those kernels dry, guy, 'cause I'm comin' to help you! Your carbide is getting too much water. Could be a misaligned water valve or something else hard to fix. But that needn't stop you--for you can remote-control the water! Just do this: Remove the water door and in the opening fit the little black nipple from the water bottle of a hamster cage. Into that insert some plastic tubing, bend and cut it to length so that it rests comfortably in your mouth. Now, let your pattern of breathing control the rate of water flow to your carbide. Every exhalation brings light! Just don't sneeze, or you'll burn the britches off someone ten feet away.

--C.C.

Dear Capt. Carbide,
I've trained my kid brother to push those really tight leads no one can get into and am ready to offer him to cavers at 10 cents a foot, plus expenses. If he's successful, I've got five more like him and we'll hit the road with "CAVER TOTS -- NO CRAWL TO SMALL". Think it will sell?
(signed) Entrepreneur, Hidden, Fla.

Dear Entrepreneur,
Hold your siblings, brother, that ro9ad show won't go! The NSS Standards Council foresaw that gambit and redefined "cave passage" as that "entered by a person who has attained his puberty". Besides, buddy, approaching a caver with that offer is like suggesting to a bridegroom that you can help with the wedding night--doing it oneself is the whole point.
--C.C.

Dear Capt. Carbide,
I've invented a template for drawing maps of lava tubes. All you have to do is ad scale, direction and appropriate cross-sections! How do I go about marketing it?
(signed) Tubeworm, Bryant, Wash.

Dear Tubeworm,
Sorry, fella, but that market is already filled. Folks who map lava tubes long ago learned to use hot dogs, cigars and cigarettes as templates. They work just as well as an artificial template and have one significant advantage--they can be consumed, removing all evidence that you have been lava tubing.
--C.C.

Dear Capt. Carbide,

I'm throwing a party for my bridge club and think a cave motif would be a splendid idea. Do you have any suggestions as to decorations?

(signed) Mrs. B. L. Findahl, Concord, N.H.

Dear Mrs. Findahl,

Cave motifs are becoming ever more popular at house parties as hosts strive for the unusual. Fortunately, decorations are easy to make. Take several hundred popsicle sticks, dip them in marshmallow creme, and clip them to the clothesline outside to solidify into stalactites. A drop of crazy glue will attach them to your ceiling, and if any of your guests breaks one off and tries to eat it, it will shatter his teeth -- a valuable lesson in conservation. Do you have a staircase? Pour a bucket of paper mache' down it for a realistic flowstone cascade? Greet your guest at the door with a belycrawl under the sofa. Spread coffee grounds and warm water over your bathroom floor like guano. And for a dallop of verisimilitude, leave carbide dumps of unsifted flour in the ashtrays. There's so much you can do with a little imagination! (And don't forget to turn off the lights!)

--- C.C.

Dear Capt. Carbide,

I did a time study of typical caving trips and as a time and motion man I found the results disheartening. Fully 70% of the time in the cave was spent waiting around, looking at stuff, or talking about last year's trip to the cave. It was even worse when cave photographers were along. How can you justify spending so much time on it?

(signed) Timekeeper, Moran, Mo.

Dear Timekeeper,

Put down that stopwatch, buddy! Your meager minutes mean little to a cave who waited a geologic age to be born and who grows in beauty with each thousand years. You may measure time, but a cave is Time. You may clock a caver's movement, but a clock cannot count the cadence of his heart. A caver may move slow or fast and hard, but his pace is that of the cave and his heart beats to the lingering drops of water on the stalactites, not to the mechanical ticks of a timepiece. He feels the ebb and flow of the flowstone. You cannot measure that.

I'm sorry you did not venture upon the quickened pace of exploration or the relentless drive of the long push--there are trips like that, too--but if you cannot stop to smell the gypsum flowers or to lean against the water-sculpted rock and feel the pulse of the earth, then take your studies elsewhere. Out time is not your own.

--C.C.

Dear Capt. Carbide,

For years now I've had a bad case of what only can be called "entrance fever"--I'm scared to death of cave entrances, although once inside I'm fine. Sometimes it takes me half an hour to make that first step. Can you help me?

(signed) Starter Problems, Phoenix

Dear Starter,

As they say, old buddy, the first step is a dilly! "Entrance Fever" is not all that uncommon, although it is more prevalent among those who don't want to go in a cave anyway. In my first caving club we had a fellow with such a strong aversion to cave entrances that we used him to lead us away from caves--to which we would then backtrack easily. I'm sure you've tried blindfolds and night caving, so let me tell you how our friend overcame his "entrance fever". He would stand with his back to the entrance while we all acted as if the trip were just finishing instead of beginning--"Good Trip!", Blimey, I'm tired!", "Lets have a beer!"--and when he looked relaxed, someone would say to him, "Hey, I left my pack by the register. Could you get it?" Worked every time. Only problem was that we got so into our roles that twice when someone said, "Let's have a beer", we left.

--C.C.

Dear Capt. Carbide,

I would like to develop a "biggest" cave list, like the "longest" and "deepest" cave lists we often see. Do you know of a relisble, field-tested procedure for volumetric measurement of caves?

(signed) Unlisted, Gary, Ind.

Dear Unlisted,

Always happy to lend a hand, my friend! I suggest you look at the method employed by cave researchers in Perry Co., Missouri. Starting from the premise that what once was in the cave (now its volume) must have gone somewhere else, they distributed questionaires to 2,500 households near five of the county's largest caves asking residents what portion of their property originally came from the caves. Of the .2% responding, all siad none of it came from the caves, indicating that the Perry Co. caves do not exist. Certainly there is room for statistical error in this procedure, but at least it holds out the promise of a reduced workload in compiling your "biggest cave list.

--C.C.

Dear Capt. Carbide,

Our grotto is trying to map Kelley's Cave and we're having a hell of a time with its stream crawls. Either the Brunton gets waterlogged or the tape muddy or we just can't read them when we're flat on our bellies. Is there any other way to survey those confounded places?

(signed) Swamped, Trenton, N.J.

Dear Swamped,

I hear you splashing, mapper, but keep your wetsuit on! Your trials and tribulations in subterranean tributaries are over if you've got a carbide lamp reflector, a digital watch and a pea shooter. Load up that old shooter and take aim on the reflector. Put your digital in the stopwatch mode and time the shot. It's easy, and as you'll quickly remember, a whole lot of fun peashooting in the dark! And its works. The math you need to calculate distance, azimuth and slope--plus instructions for such advanced techniques as the skip shot and the ricochet--are all found in my new booklet "From Ptui to Ping", available for just $2 plus postage. Happy Mapping!

--C.C.

Dear Capt. Carbide,

Are there really hodags? Really and truly?

(signed) Tricia, age six

Dear Tricia,

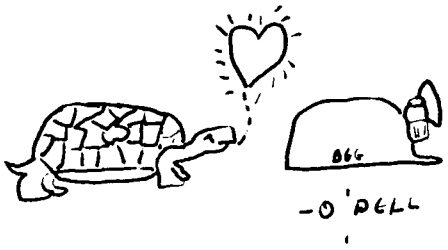
If hodags didn't exist, cavers would have invented them. But hodags are real. They are the subterranean sprites responsible for all sorts of caving mischief, and are distantly related to the gremlins who steal socks from dryers, put parking spaces on the other side of the street and write Congressional legislation.

So it's okay to believe in hodags, Tricia. Lots of grown-up cavers do, too. Because believing in them reminds us to be careful.

--C.C.

DO YOU HAVE THE FULL FACTS ON CAVING?
Just what are those bats up to? Send for Capt. Carbide's informative booklet, "Guano and You" today. Only $1.25 postpaid. Also available in eight-track tape or cassette.

Send your questions to: Capt. Carbide, Box 1133, Bowers Beach, Del. 19946



OLD STONEY CAVERNS

Diablo Grotto News Letter 13(10):11 Warren Hoemann

Sometimes I wonder
About this crazy life I found
Out of sight in the dark of night
Of a hole underground
Came to you for quiet
And it's quiet that I got
For all the years and the miles we traveled
Everyone's forgot

Old Stoney Caverns
You seem almost like a friend
Gave my best, then you took the rest
Before I ever saw your end
Can't say you were begrudging
For there's one thing that you gave
An honest chance for an honest effort
And forty years of cave

Seems like, Old Stoney Caverns,
Our time has run too fast
They talk about the future
We think about the past
Forty years we've been together
It doesn't seem so long
You never done me right, but then
You never done me wrong

In '57
You were really in your prime
I pushed a crawl for a mile in all
Was a lot at the time
But you never had formations
And you hardly had a pit
Now no one but a few oldtimers
Will think of you a bit

--chorus--

I heard them talking
Said a quarry's coming through
And any way that the boundaries lay
Gotta take a cave or two
Now, Johnson's is still going
And Crystal is too nice
The old and tired and the long-forgotten
Will have to pay the price

--chorus--

The Carbide Lamp Glossary

by ??

(To prove that our editor is not alone in his plight, we have reprinted the following from the *Nittany Grotto News*, 27(1), Fall 1979.)

In an effort to fill space left by a conspicuous lack of interesting articles we offer this rather boring presentation of technical definitions. While most cavers are certainly familiar with all of these terms, they are offered anyway in the hope that they may interest a few novices.

Carbide Lamp: A lighting device that is most often useful for raccoon hunting and nighttime ice skating. Since its inception miners and cavers have at various times attempted to use it underground, always with dismal success. It has been adopted by cavers nevertheless as a purely decorative and symbolic device.

Carbide: CaC_2 A hydroscopic material that serves mainly as a dessicant to keep carbide lamps from rusting when in damp environments. This material needs to be changed from time to time as signalled by formation of a large crack in the base of the lamp. When this material is spent it forms a fine white powder ($Ca(OH)_2$) which can be used as a novel decoration for otherwise drab and dirty caves.

Tip: Attachment to carbide lamp designed to prevent gas from escaping. If gas pressure becomes excessive it also acts as a safety release by blowing out of the gas delivery tube.

Felt: A device which prevents carbide particles from entering the gas delivery tube and causing annoying rattles. Also, if water is stored in the lamp, the felt soaks it up and immediately acts as a second line of defense to keep gas from escaping through the tip.

Striker: By rotation of the steel wheel against the flint an instantaneous spark is generated. Cavers with photographic memories may use this as an emergency light source.

Gasket: Rubber ring which separates the two metal sections of the lamp and prevents irritating squeaks. CAUTION: this gasket is made from highly flammable materials and has been known to ignite without warning. It may however be useful momentarily as an emergency light source.

Reflector: A shiny curved metal surface added by the manufacturer as an attempt at decoration. It is essentially useless but its reflective surface has been known to cause momentary blindness. Novices will note that most experienced cavers cover theirs with mud or carbon deposits as a precautionary measure.

Water Reservoir: A storage receptacle for emergency drinking water and other important fluids.

Dropper: Filtration system which removes particulate material from emergency drinking water.

causes a reaction which releases a nasty smelling gas. If the lamp is properly sealed the pressure from this gas must be released through the water door. During this time the door may emit a pretty fountain of water. This is perhaps the most pleasing and very often the only feature of the lamp's operation.

Bottom Rubber: Device to prevent cavers from injury as they repeatedly strike their foreheads with the carbide lamp.

Water Door: A safety feature which keeps water from the water reservoir from entering the lamp base where the dessicant is stored. It operates by leaking excess water whenever the lamp is not perfectly vertical. Just after the lamp is turned on and until the dropper plugs with particulate material a small amount of water is allowed to reach the carbide. This

BROKEN BOTTOMS? - IMPOSSIBLE!

by Gordon Dayton

Said the novice to the veteran: "How much carbide should I put in my lamp?" Said the veteran to the novice: "Pack it in til the bottom bursts and then remove 14.6%."

I have noted unfortunately, that it is possible to destroy the bottom receptacle of a carbide lamp through a combined process of overfilling and delayed cleaning. Observations and aural research indicate that this is not a unique experience nor need it be fatal. If the carbide charge fills no more than half the lamp's volume (reportedly), or if the spent material is removed within a few hours of using up the charge (obviously), no damage is incurred. Further, I have discovered that if the bottom is cleaned with a dose of half strength nitric acid (hydrochloric may work as well) and scrubbed with steel wool, then the bottom which is nearly peeled away may be rewelded using low melting silver solder and an acetlyene torch. The use of a borax type flux is also important, and I found that I had to reseal the top seam with soft solder. The free use of such equipment makes this less expensive than a new bottom, however the investment in time caused me to investigate further the cause of the failure.

The chemical reaction is:

Mole Wt.	64.10 gm/mole	74.09 gm/mole
Density	2.22 gm/mole	2.24 gm/mole
Mole Vol.	28.87 cm^3/mole	33.08 cm^3/mole

Since one mole of calcium carbide produces one mole of calcium hydroxide with a subsequent increase in molecular volume of 4.21 cm^3/mole we can determine the percent increase in volume: 14.6%. This does not explain the disaster. I normally fill to 2/3, and even if I mistakenly overfilled to 3/4 that still leaves 25% excess vol. I don't have the answer, but here are some interesting speculations:

1) The density used above is that of the perfectly packed solid and doesn't account for spaces between particles in a powder. The relative efficiencies to which various powders can fill space can be determined from their tap densities or the weight of powder that can be tapped into a known volume container. Most powders have tap densities that are 10-40% of theoretical density. This value is a strong function of grain size, with fine grained materials having a very low packing efficiency. If the fine grained hydroxide has a significantly different tap density the pressure required to force it all to stay in the volume of the container may exceed the strength of the bottom.
2) Most of us have noted that as we delve deeper into our dirty bottoms, the spent carbide is more difficult to dig out. This indicates that it is only the material in the very bottom of the lamp that is involved in pushing out the bottom. If this is true then the degree to which the lamp is filled may have very little to do with protecting the bottom. It may be that only quick and complete cleaning will insure bottoms with no holes and keep us from burning our lamps at both ends.

MISSIN' YOU
a gen-u-ine country cave ballad

CHORUS: i'm just sittin' down here in a cave-

Missin' you.

1. You know I love you, Flora Seen,
But you left me all alone.
I know I took you for granite,
How could I have been so dome?
(chorus)

2. Baby, I'm really in the pits,
It's not gneiss to call a halt.
That's when I started to breakdown,
You know it really ain't my fault.
(chorus)

3. I'm cryin' quartz of tears for you,
And my poor heart is in a sink.
If you loved me, why didn't you talus?
Now I don't know what to think.
(chorus)

4. I only asked you to kiss me
Because I thought you dolo-might,
Now all I got is my weed and my bottle,
Gettin' lime-stoned and stalac-tight.
(chorus)

WHAT IS THE ATTRACTION?

The Kentucky Caver 14(3):21 Laura Culbertson

What is the attraction
Of a cave deep in the ground,
A tract of virgin land
Longing to be found,
That it calls to a caver
With an enticing sound?

What is the attraction
Of a caver's awful fight
With the smallest tunnel
That is too goddamned tight,
That it calls to a caver
For just one small sight?

What is the attraction
Of mud and grime and grit,
Or seeing the bottom
Of the deepest, darkest pit,
That it calls to a caver
To explore each little bit?

What is the attraction?
What makes him sigh and stare?
What makes him wonder
And what makes him dare?
You'll never know unless you're a caver,
But his heart is always there.

OH LORD, WON'T YOU TAKE ME OUT OF CHURCH CAVE
-- to the tune of "Oh Lord won't you buy me a Mercedes Benz"

1. Oh Lord, won't you take me out of Church Cave;
My knees are all bloodied;
my arms won't behave;
Just look at my elbows;
there's nothing to save;
Oh Lord, won't you take me out of Church Cave.

2. Oh Lord, won't you get me through the Tight S;
My legs won't bend backwards, as you might have guessed;
Stuck in this passage is more than cruel jest;
Oh Lord, won't you get me through the Tight S.

3. Oh Lord, the Venturi is more than I can stand;
I'm claus-tro-phobic with my face in the sand;
Raise up the roof here and I'll feel just grand;
Oh Lord, the Venturi is more than I can stand.

(Repeat 1st Verse.)

Janet Sowers
November, 1980

MARBLE MOUNTAIN LULLABY

Diablo Grotto News Letter 13(9):3 Janet Sowers

Brilliant white the rocks above,
Snow in patches aglow,
Tiny flowers adorn the cracks
That lead to the caves below.

Rock and water meet, they say
When snow meets the summer thaw.
Eons of time that trickle must take
To carve the caves we saw.

Chill and cold the winds above;
Cold and wet in the cave.
One must either be a fool
Or be extremely brave.

Marble Mountain mystery
Captures all who come near--
Cavers, campers, dogs and kids,
Bigfoot, bear and deer.

THE TWELVE DAYS OF CAVE SEASON

Gem Caver 13(6):47 Jim Hathorn

On the first day of cave season,
My true love gave to me
A helmet that didn't fit.

2nd day: Two prusik lines
3rd day: Three Gibbs ascenders
4th day: Four standard ovals
5th day: Five locking D's
6th day: Six Blue Water ropes
7th day: Seven carbide light tips
8th day: Eight Forrest seat slings
9th day: Nine caving packs
10th day: Ten bags of gorp
11th day: Eleven grylloblattids
12th day: Twelve limestone caves

HAL AND SAMMY

Was a cold November and the wind began to blow
Dying leaves and broken twigs across the patio
Sammy popped a Falstaff and stared out at the day
While seconds raced around the clock and hours fell away

Letter yesterday from Hal, ten cents postage due
"Reached a thousand meters down, could use a man like you"
Sammy felt the wind reflect from rock to garden wall
And wondered why the echoes rang the loudest in the fall

Hal and Sammy started caving back some twenty years
Wet beneath their wetsuits and still wet behind the ears
Sammy took a steady job and later took a wife
Hal took off for Mexico and made the caves his life

And over the years the times they met
Reliving in a word or two the times they'd not forget
"And Hal how are things there underground?"
"And Sammy it must sure be nice to have a home around"

Sammy heard the baby cry and set the letter down
Glanced up at the kitchen clock and marked it with a frown
There in his November the clouds were gathering
While somewhere near Huautla it was eternal spring

Warren E. Hochmann

IF--

If I could have me a cavern
And could have any cave at all,
I'd pick me a cave just two hours drive
And in among trees so tall.

This cave would be miles from the highway,
Yet it's just a ten minute hike;
The entrance lies deep in a forty foot pit
Which none but a caver would like.

Dripstone, flowstone, drapery
Up on a mountainside;
If you believe in fantasies,
Come, we'll go caving tonight.

Inside would be white formations
Which no one had e're defiled,
A mudslide, a crawlway just for fun--
A spelunker could go wild!

My cave would be next to a farmhouse;
The 'fridge would be stocked with beer;
The yard would be choked with caver folk;
A hot springs for swimming near.

Dripstone, flowstone, drapery
Miles of borehole inside...
If you believe in fantasies,
Come, we'll go caving tonight.

If I could have me a cavern,
And could have any cave at all,
I'd pick me a cave that has no end
So I'd never explore it all.

Quiet pools and waterfalls,
58 degrees inside...
If you believe in fantasies,
Come, we'll go caving tonight.

--Janet Sowers
August, 1980

THE BALLAD OF ACE.P. LUNKER

I knew he was a caver when he came into the room.
He had that certain groady look and wore that strange perfume
Of limestone must and carbide dust.
A troglodyte, full bloom.

No doubt he was a caver 'cause he ordered with a gleam
Some twenty-seven pancakes (large!) and syrup in a stream.
A cup or two of Java brew
And never mind the cream.

He had to be a caver, true, for eating was no chore.
He swiftly swallowed everything the bulky platter bore.
And just for fun, when he was done,
He ordered up some more.

"I sense you are a caver, sir," I summoned up to say.
"I often thought I'd cave, myself, if ever that I may.
"And so kind sir, could you be sure
"To take me down, some day?"

And then he smiled....

Distinctly like a caver, how he smiled like a cat.
"I've got some extra stuff," he said, "Lights, and things like that.
"It's no con or I'm not John,
"I'll take you where it's at."

No one but a caver could appreciate the ride
Within the decomposing car on which he so relied
With much ado to get us to
That porous mountain side.

In every seat a caver in that dusty caravan.
Two Scouts, a Bronco, and a Jeep, and any car that can
Negotiate and tolerate
Our risky travel plan.

Rather like a caver, I, all bundled up in gear.
A carbide lamp, and metal hat with strap from ear to ear.
But otherwise to other eyes
Just like a mountaineer.

About a dozen cavers boldly challenged with a grin
A tiny crack in limestone that could trap a cricket's kin.
They were game. With lamps aflame
[illegible]

I wondered if the cavers would reduce to basic wear
To handle such contortions as would give an ogre scare.
But none denied rewards inside
Were worth the getting there.

And then they smiled....

Amazing to the cavers was a passage just as high
As some old subway tunnel (although doubtless not as dry!),
And then a hall down to a crawl
To make the toughest cry.

Then the leading caver was upright upon his feet.
The splendor of the lovely dome impossible to beat.
It was no crime to take the time
To stretch our legs and eat.

But then the feisty caver who was taking up the rear
Announced he'd heard a rumbling in the stone and said, "I fear
A ton of rocks and breakdown blocks
Has left us buried here."

A very little caver poked around and looked about.
"I figure in a week or two," she mentioned with a shout,
"The folks outside we notified
Could excavate us out."

Six or seven cavers settled down to hibernate.
Another countered frimly, "Though I'd rather not debate,
It seems to me that it would be
Much better not to wait."

Johnny as a caver barely worried 'bout a fall,
Displayed his climbing talent as he sauntered up the wall
And hollered down, "I've looked around;
It goes no place at all."

And then he smiled....

"One day an older caver took me to this very place.
Myself, I wanted out of here, but he said we should trace
This trickle here that flows so near,
Evaluate its pace."

"So now I'm glad that caver showed that if we push the drain,
A six-foot sump will take us to the Avenue of Pain.
And then a flit above a pit
Will get us back again."

In darkness all the cavers held their breath to clear the flood,
And slithered through a narrow tube all filled with rocks and mud,
And here and there left bits of hair
And spots of skin and blood.

Squeezing several cavers into where they would not fit,
Our battered bones and shredded flesh we relished not a bit.
I thought it bad because I had
To yet confront the exit.

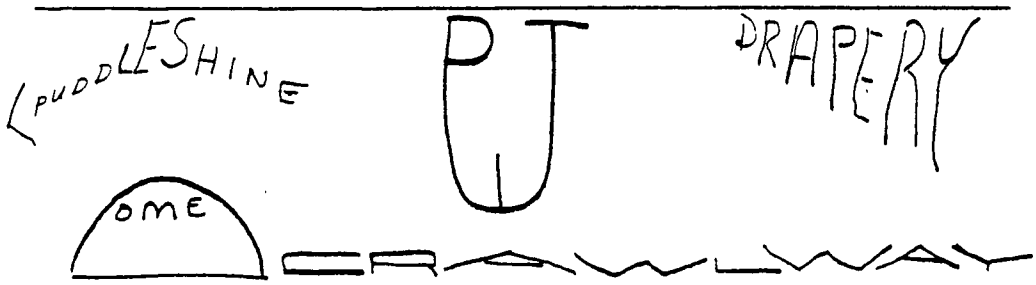
Finally every caver staggered out into the sun.
If I'd known what I'd go through, I'd never have begun.
All should know that trip below
Had not been very fun.

Every muddy caver threw his gear into a mound.
And on the journey back to town I noted that I'd found
I'd be insane (defective brain)
To venture underground.

And then I smiled....

They knew I was a caver when I came into the room.
I had that certain groady look and wore that sweet perfume
Of limestone must and carbide dust.
A troglodyte, full bloom.

Duane Vore 20170



THE SECRET OF WINDELER CAVE

I shall tell of a caver whose life was undone,
By the cruel cave of Windeler just before a trip was done,
His camera was poised and close to its mark.
The flash bulb exploded; glass flew through the dard.

CHORUS
It was a pink and white helectite and it looked just like a swan.
And it's Oh! and Alas! now the whole thing is gone.

He licked his burned fingers crying "What shall I do?"
"If Ernie finds out, my caving days are through.
For every formation is prized like gold,
And the Diablo Grotto will kill I am told."

CHORUS

He turned off his electric which he had borrowed for the trip,
For all had decided carbide just wasn't hip.
"If I had some epoxy things would work out okay,
But with just bubble gum I don't think calcite will stay."

CHORUS

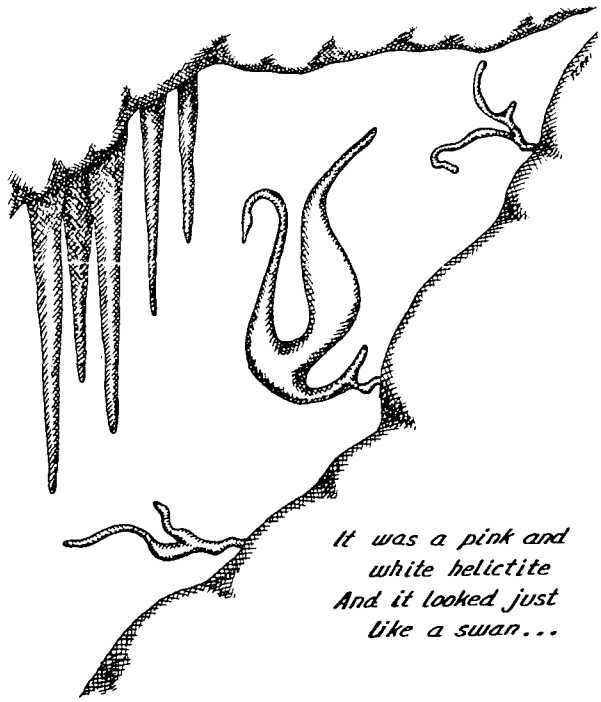
"I could bury the pieces, but they'd soon find out,
For Ernie and Rich know this cave inside out.
My only recourse is to carry them back,"
He said as he stuffed every piece in his pack.

CHORUS

Now cave justice works in mysterious ways.
Our caver will see that deception never pays.
As he crawled off the ledge his foot, it did slip,
And he fell to his death in a bottomless pit.

CHORUS

Janet Sowers
April '80



HOW TO RATE YOURSELF AS A CAVER

"The Exploiter" (parody) Anonymous

Simply find the range that your ASS [American Splunker Society] number falls into and read the appropriate rating.

ASS Number	Rating
1-100	Gods. Omnipotent. Can do no wrong.
101-1000	Minor deities. Make at most one mistake during lifetime, but it has nothing to do with caving.
1001-5000	Superhuman. Almost immortal, but didn't join the ASS early enough.
5001-10000	Super macho. Can go caving anywhere, anytime, and not be answerable to anyone.
10001-12000	Macho. Levitates through caves so as to not touch formations, walls, or floors.
12001-14000	So-so cavers. Barely tolerable by anyone with a lower ASS number. Good grunt labor.
14001-18000	Untouchables. This group knows absolutely nothing. It is impossible for them to make any contribution to caving.
18001 on	The undead. Zombies. Individual specimens in this group make good chockstones and can be used in place of firewood.

"It's about time" NEW MAP SYMBOLS

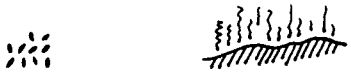
The Speleograph 16(12):115 Donald W. Denbo

The October announced that the Cave Map Symbols Committee has been reorganized. They are asking for input for possible revision or additional symbols.

I feel that the mapping of Northwest lava tubes has inherent problems that are inadequately allowed for in the present acceptable symbols. The symbols that I propose not only fill this heretofore unresolved inadequacy, but do so with a fair amount of art and decorum.

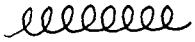
The first group of symbols is designed to map those features of Bend, OR, caves that I have personally encountered:

RAT GUANO:



DIRTY MAGAZINES:

BARBED WIRE:



FALLING ROCKS:

The Mt. St. Helens area caves also contain features and life-forms not normally found. The following are symbols for features not yet seen, but for which one should always be prepared:

BIGFOOT:

LAVA FLOWS – Still Molten

The final group is general purpose in nature. These are features that are found in (unfortunately) most caves:

The final group is general purpose in nature. These are features that are found in (unfortunately) most caves:

GRAFFITI:

GARBAGE:

SUDDEN CHANGE IN CEILING HEIGHT:

!@=†?%**[$%†!

The preceding are just suggestions, but I have confidence that they will be quickly adopted en masse. The need for up-to-date and descriptive cave symbols is immense.

CAVER'S SOLILOQUY
(with apologies to Willie)

Central Jersey Caver 2(2) Thomas J. Pollock

To bathe or not to bathe-- that is the question:
Whether 'tis nobler in the mind to suffer
Winter's chill and wet enhanced by a watery cave swim,
Or to deny hypothermia and withstand the taunts of
  peers and remain warm?
To plunge--to swim--
To wade through vaulted corridors with coveralls wet
  beyond the knees;
The shivers, the clammy cold, the thousand chilling
  shocks that reduce the health of the flesh.
'Tis a consummation devoutly to be denied.
To shiver--to shake--
Chilled, thinking of dry and warmth. Oh, God!
Shine brightly the sun and fulfill the dream of warmth
That we may fend off the dreaded hypothermia,
And find rest. There's the respect
That makes calamity of a caver's life;
For who would bear the cuts and scrapes earned while
  crawling through time,
The passage ever squeezing, the desire for virgin cave,
The pangs of hunger, the breakdown's delay,
The insolence of rock and the demands upon
The patient merit of the unworthy
When he himself might his quietus make
With a bare bodkin? Who else would sound
Of grunts and curses, pursuing his weary strife?
Whyfor beckons the Deepdeep Cavepit from beyond?
Ever to remain an undiscovered country from which
No traveler ever returns, a puzzle to test the will,
And makes us rather bear those ills we find
Than fly to others that we know not of.
Thus have the caverns enslaved us, forever labeling us
  "Hardcore Caver."
And thus are we driven by native resolution
Into ever deeper, ever darker holes with water and
  tight passageways,
And with great enterprise passing breakdown and sumps
With no regard for current or silt all afly.
Caver, earn thy name through action! --But warmth now,
And dry, all left behind except in dreams.
Wet or cold, Cave on! Let all our deeds be remembered.

JOE CAVER'S HARD-CORE RATING SCALE

Speleonews 24(2):24 Larry Johnson

The following test was designed to give the Tennessee caver an idea of where he ranks in the status of spelunker. Fill in the appropriate number (you MUST be honest!) for each question. Add up your totals and find yourself on the scale provided.

1. How many days per week do you go caving? ____
2. Number of caves of 300 ft deep you have found. ____
3. Average depth (ft) of water in caves you explore. ____
4. A.M. time (rounded off to nearest whole number) you crash during the traditional party after cave trips. ____
5. Total number of 4-wheel-drive vehicles you own. ____
6. Total number of descents to "Bitter End" of Luminary. ____
7. Number of miles ridgewalked each month. ____
8. Condition of your wetsuit: None=-1, New=2, Fair=3, Ripped to shreds=5 ____
9. Average number of miles surveyed each month. ____
10. Home grotto (grotto where your heart is): Out of state=0, Chattanooga=5, Nashville=5, Other=0 ____
11. Importance of caves in your life: More important than anything=10, Almost as important as life=5, More important than family=3, More valuable than wine=2, Other=1, Not important=-30 ____
12. Would you take a million dollars to never explore caves again? Yes=50, No=15 ____
13. I would rather meet: Tom Barr=30, Jimmy Carter=0 ____
14. Number of Mexico cave adventures. ____
15. Average total (in hundreds of ft) of rope you cover (one way) each month: (Example: 1,500 ft=15, 900 ft=9) ____

Now add up your score and rate yourself according to the following scale:

0 to 25 = Wimp	71 to 80 = Stout
26 to 35 = Clone	81 to 90 = Hard-Core
36 to 50 = Tourist	91 to 100 = Professional Cave Explorer
51 to 60 = Caver	
61 to 70 = Medium-Core	100+ = Fanatic

THE WILD CAVER

Northwest Caving 10(1):25-26

The song of the Cambridge University Caving Club
(To the tune of "The Wild Rover")

My first day in Cambridge, a freshman so neat,
Some boozy old cavers I happened to meet.
I asked to go caving; they answered me, "Nay,
Such ouigees* as you we can find any day."

CHORUS: And it's No, Nay, Never
No, Nay, Never no more
Will I play the Wild Caver
No, never no more.

I drew from my pocket a chequebook so bright,
The Treasurer's eyes opened wide with delight;
"With pleasure we'll greet you as one of our rank
As soon as your cheque has been cleared by the bank."

They sold me a light at exorbitant price
And a little brown helmet--'twas ever so nice.
I went with them caving--P8 was the place--
There were only two killed and three lost without trace.

I've been up to Yorkshire, to Mendip and Wales,
I've been down to the pots and I've sampled the ales.
And now I'm returning with stories to tell
Of waters that rose and of boulders that fell.

Now all I have left is a tatty wetsuit,
A clapped-out Nife cell and a half of a boot;
My clothes are so ragged, my beard is so long--
Thank God that's the end of my horrible song!

*novices

MARBLE MOUNTAIN LULLABY

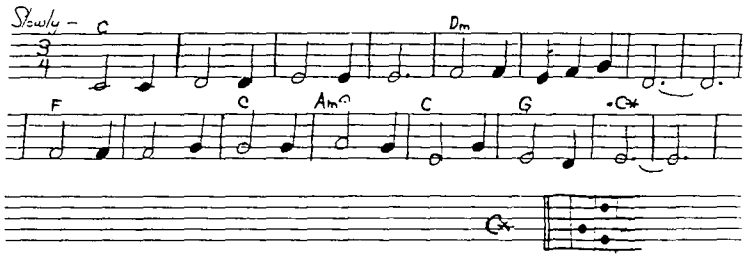
Brilliant white the rocks above,
Snow in patches a-glow,
Tiny flowers adorn the cracks
That lead to the caves below.

Rock and water meet, they say
When snow meets the summer thaw.
Eons of time that trickle must take
To carve the caves we saw.

Chill and cold the winds above;
Cold and wet in the cave.
One must either be a fool
Or be extremely brave.

Marble Mountain mystery
Captures all who come near-
Cavers, campers, dogs and kids,
Bigfoot, bear and deer.

--Janet Sowers, July 1980



DRINK FAULT-FINDING CHART

Northwest Caving 10(2):10-11

(Lifted from *The British Caver, 77:16* (Summer 1980), who stole it from the *Border Caving Group Newsletter 8(4)* with no apologies, as they pinched it from *Surrey University Rag Mag 1978*.)

SYMPTOM	FAULT	ACTION TO TAKE
Drinking fails to give satisfaction and taste, shirt front wet	Mouth not open while drinking, or glass being applied to wrong part of face	Buy another pint and practice in front of mirror. Drink as many as necessary until technique is perfect
Drinking fails to give satisfaction and taste, beer unusually pale and clear	Glass empty	Find someone who will buy you another pint
Feet cold and wet	Glass held at incorrect angle	Turn glass other way up so open end points towards ceiling
Feet warm and wet	Incorrect bladder control	Stand next to nearest dog. After a while complain to owner about lack of housetraining. Demand pint as compensation.
Bar blurred	You're looking through bottom end of	Find someone who will
Bar blurred	You're looking through bottom end of empty glass	Find someone who will buy you another pint
Bar swaying	Air turbulence high--may be due to darts match	Insert broom handle down back of jacket
Bar moving	You are carried out	Find out if you're being taken to another pub--if not, complain loudly that you're being hijacked by Salvation Army
The opposite wall has ceiling tiles and a fluorescent light	You have fallen over backwards	If your glass is still full and your drinking arm free, stay put. If not, get someone to help you up and lash yourself to her
Everything has gone dim. You have a mouthful of dog ends and broken teeth	You have fallen over forwards	See above
Everything has gone dark	The pub is closing	Panic
You have awakened to find your bed hard, cold and wet. You cannot see the walls and ceiling	You have spent the night in the gutter	Check watch to see if it's opening time. If not, treat yourself to a lay-in

Cavers' Calendar (Katherine St. Clair)

The carpeted fields are now crisper than hay,
Are deliciously brittle and old.
The farm-acre rimmings have forestry trimmings
That burn against blue with their gold.
The wind-courted leaves, twitching, reckless and gay,
Are curling to earth in a flood.
October and heather are dancing together,
But---I'd rather be down in the mud,
In the mud, in the mud,
In Missouri cave mud,
Oh, I'd rather go down in the mud.

The ground glistens white and the candles glow red,
While holly-green knocks on your door.
There isn't a Doubt when the bells have rung out,
And Wassailing's scheduled at four.
The Santa Claus man, for a moment of ease,
Drops his pack on your stoop with a thud.
December, beloved, is wrapping up Love,
But---I'd rather be down in the mud,
In the mud, in the mud,
In Missouri cave mud,
Oh, I'd rather go down in the mud.

The rumors of Springtime are thawing each root.
The littlest rills are in spate.
Trees plan to be dressed in their frilliest best.
Every worm-seeking worm hunts a mate.
The sun and the world are rehearsing for April,
Each day is a burgeoning bud,
The catalogs shout: "Ol' Man Winter is Out !"
But---I'd rather be down in the mud,
In the mud, in the mud,
In Missouri cave mud,
Oh, I'd rather go down in the mud.

The doors of cooked buildings have opened up wide,
And out spew the pasty white things
That fly, swim and boat or tranquilly Float,
As they fish their way down to Big Springs.
Nearly everyone plays, nearly everyone pairs,
It is something that gets in the blood.
June combines picnic larder with romantic ardor,
But---I'd rather be down in the mud,
In the mud, in the mud,
In Missouri cave mud,
Oh, I'd rather go down in the mud.

Great Moments in Speleology
STRAIGHT AS A BAT

SFBC Newsletter 23(2):5-6 Warren E. Hoemann

"How do they do it?" Frank muttered as another bat darted by, headed unerringly for the cave entrance. Tom looked at him quizzically. "You should know, Frank; it's like radar..." "No, no," Frank interrupted, "direction... How do they find the way out?" "Beats me," Tom shrugged, unconcerned.

But Frank Mudlin was concerned. Finding the way out had haunted Mudlin's mind every since he grew up at the dead end of a one-way street that was going the wrong way. Throughout his life Mudlin sought outlets for his concern--installing EXIT signs in public buildings, completing a countywide survey of elevator shafts. Only a smooth tongue and ingratiating personality won Mudlin positions on these and other projects, such as the two years at $20,000 he spent checking the alignment of manhole covers. "I told the City Engineer that changing traffic patterns and the shifting tides of inflation might have altered the holes," confessed Mudlin, with a twinkle.

Promising a fresh perspective on pathfinding, Mudlin talked a group of cavers into letting him join their subterranean journeys. At first the others joked that Frank was an "outstanding" caver because he could always be found out standing by the entrance. But they soon realized Mudlin was merely contemplating the way out.

Mudlin, on the other hand, realized that, while scientists had unlocked the key to the ability of bats to fly and avoid obstacles, no one had yet uncovered how bats negotiate the labyrinthine passages of a cave in their nightly exit. The bat darting by Frank alerted him to this question, one he saw as offering the ultimate answer to his quest of finding the way out. He would investigate the bat flights.

Mudlin chose Grunge Grotto as his test site. Deep in the cave was a large bat colony. To ascertain the route of the bat flight, Midlin tied Magic Markers to the wingtips of 43 randomly selected bats. The ensuing defacement of the cave walls (in canary yellow, sky blue, and three shades of orange) was defended by Mudlin against cries of vandalism from cave conservationists and rank opportunism from critics who watched him peddle 3 x 5-ft full color posters of the walls as "bat art" for $7.95 a throw.

With the exit route determined, Mudlin introduced subtle changes in the cave environment, attempting to isolate the factor which controlled bat direction finding. First he tested the influence of texture, lining entire passages in naugahyde to no avail. Next he placed traffic signs along the route (he thoughtfully used the international symbols because of the presence of Mexican free-tailed bats). While the nightly flight remained unaffected, a discernable increase in tickets for double-parking was recorded and bumper stickers ("DON'T FOLLOW ME--I'M IN THE DARK, TOO") began to appear among the colony. Attachment of cowbells succeeded only in terrorizing the local populace with proverbial visions of flying cows.

No closer to a solution, Mudlin decided to try from the other end. In a bold move, he completely closed the entrance to Grunge Grotto. One, two nights he watched and waited--and no bat flight took place. Mudlin found this significant. Obviously the existence of the entrance affected the ability of the bats to leave the cave. The same effect would obtain, Mudlin noted, if the bats flew in a direction other than that of the entrance. That was the key. Flight and entrance coming together. And fortunately for Grunge Grotto's bats, they happened to fly in the direction of an entrance.

Mudlin thus concluded that there was no factor controlling bat direction finding. Bats flew in a predetermined direction, "fixed flight" as he called it, and only by chance alignment of the cave entrance with that "fixed flight" were bats able to leave a cave at night. "If my theory is correct," Mudlin reasoned, "there should be a positive correlation between the direction of a bat's flight and the location of the cave entrance." And the ink-stained walls of Grunge Grotto bore witness to Mudlin's theory; all of the 43 randomly selected bats had flown only in the direction of the entrance.

"Fixed flight," Mudlin noted, also explained why certain caves have large numbers of bats, others have fewer, while many have none. "The entrance to caves with large bat populations fortuitously coincided with the 'fixed flight' of those bats. If such coincidence occurred with only a portion of the resident population, fewer bats would be found. And if no coincidence were present, the bats would not escape the cave and would die out altogether." The latter case occurred without fail in caves which had no entrances. "The innate bat population just withers away--or have you ever found a bat in such a cave?" Mudlin would ask rhetorically.

The Mudlin theory of "fixed flight" and its coincidence with cave entrances has never been challenged in serious speleological literature. That is not to say Frank Mudlin, with the ready smile and glib phrase, has quit selling the idea. "How did the bats get in to begin with?" someone would ask. "Here I show you the way out and you want to go right back in," Mudlin would retort with a wink. "But if your theory is correct," another would press, shouldn't there be large deposits of dead bats in those caves where the entrances happened not to coincide with the 'fixed flight'?" At the mention of that questions, Mudlin's large, soulful eyes would become misty, and in a soft voice he would answer, "Mortality affects us all. Each of us has known the loss of a loved one...a pet...a bat. How many lives of these sensitive, poetic creatures have passed by unnoticed, doomed by some cruel fate to blind repetition while their spirits longed to be free? But you, while you may choose, can touch those lives. For only $7.95, in full color..."

ASLEEP AT THE WHEEL

8275-R
John A. Clardy

Gnarled oak limbs reach outward,
Their mass brushing stars aside,
Rushing past to challenge
Any thought of escape
From a moon swept asphalt ribbon.

A dream landscape has its spells
Of black mesa shapes in movement,
The hills are sentient,
With unyielding serpentine ways that warp
Exhausted souls into dire peril.

Where space and time take form
In mystic visions of the unknown
Beyond flesh or mortal desire,
An extension of self occurs,
A transformation projecting inner eyes outward.

Poets may remark upon shoals that mark
This extraterritorial gulf between awareness and not;
Where man may emerge within a blink
With no sane memory of trespass into limbo,
Save fear of being asleep at the wheel.

CAVE BALLAD

For those interested in cave ballads, especially old ones, we reprint the following:

THE DEATH OF FLOYD COLLINS

1. Oh come all you young people and listen while I tell;
The fate of Floyd Collins, a lad we all know well;
His face was fair and handsome, his heart was true and brave;
His body now lies sleeping in a lonely sandstone cave.

2. How sad, how sad, the story, it fills our eyes with tears;
Its memories too will linger for many, many years;
A broken-hearted father, who tried his boy to save;
Will now weep tears of sorrow at the door of Floyd's cave.

3. "Oh! mother don't you worry, dear father don't be sad.
I'll tell you all my troubles in an awful dream I've had;
I dreamed that I was a pris'ner, my life I could not save;
I cried, 'Oh! must I perish within this silent cave?'"

4. "Oh! Floyd," cried his mother, "Don't go my son, don't go,
'Twoud leave us broken-hearted if this should happen so."
Tho Floyd did not listen to advice his mother gave,
So his body now lies sleeping in a lonely sandstone cave.

5. His father often warned him from follies to desist;
He told him of the danger and of the awful risk;
But Floyd would not listen to the oft advice he gave;
So his body now lies sleeping in a lonely sandstone cave.

6. Oh! how the news did travel, Oh! how the news did go;
It traveled thru the papers and over the radio;
A rescue party gathered, his life they tried to save;
But his body now lies sleeping in a lonely sandstone cave.

7. The rescue party labored, they worked both night and day
To move the mighty barrier that stood within the way;
To rescue Floyd Collins, this was their battle cry;
We'll never, no we'll never let Floyd Collins die.

8. But on that fatal morning, the sun rose in the sky,
The workers still were busy; we'll save him by and by.
But oh! how said the ending; his life could not be saved;
His body then was sleeping in a lonely sandstone cave.

9. Young people oh! take warning from Floyd Collins' fate
And get right with your Maker before it is too late;
It may not be a sand cave in which we find our tomb;
But at the bar of Judgment we too must meet our doom.

. . . . . .

ONE TON OF GUANO

(to tune of "Guantanamera")

Guanos noches, Senora
Could I please have refresco?
I come from deep in caverna
Where my amigos wait rescue
Across the guano we stealing
When we got sinking feeling

One ton of guano,
I feel like one ton of guano
One ton of guano,
I feel like one ton of guano

One of our loco compadres
Was a North 'mericano
And to show he tough hombre
We enter room full of guano
Because he thought it was macho
We land in batshit gazpacho

--chorus--

Adios, my Senora
Thank you for the kind favor
Pardon please my aroma
For I'm no longer a caver
I knew I'd come to my limit
When they asked me to swim it

--chorus (twice)--

Warren E. Hoemann

GOLONDRINAS

The road creeps with the future
A long and rocky way
A path leads on by mud and stone
And huts of wood and clay
On burro pack and peasant back
To mountaintop each day

And the swallows
And the swallows
Mornin' time
Leavin', climb
Up to day

The huts cling to the hillsides
The trees cling to the land
The limestone bare and village square
Against each other stand
Where time has lain the rocks reclaim
A field once cleared by hand

And the swallows
And the swallows
Mornin' time
Leavin', climb
Up to day

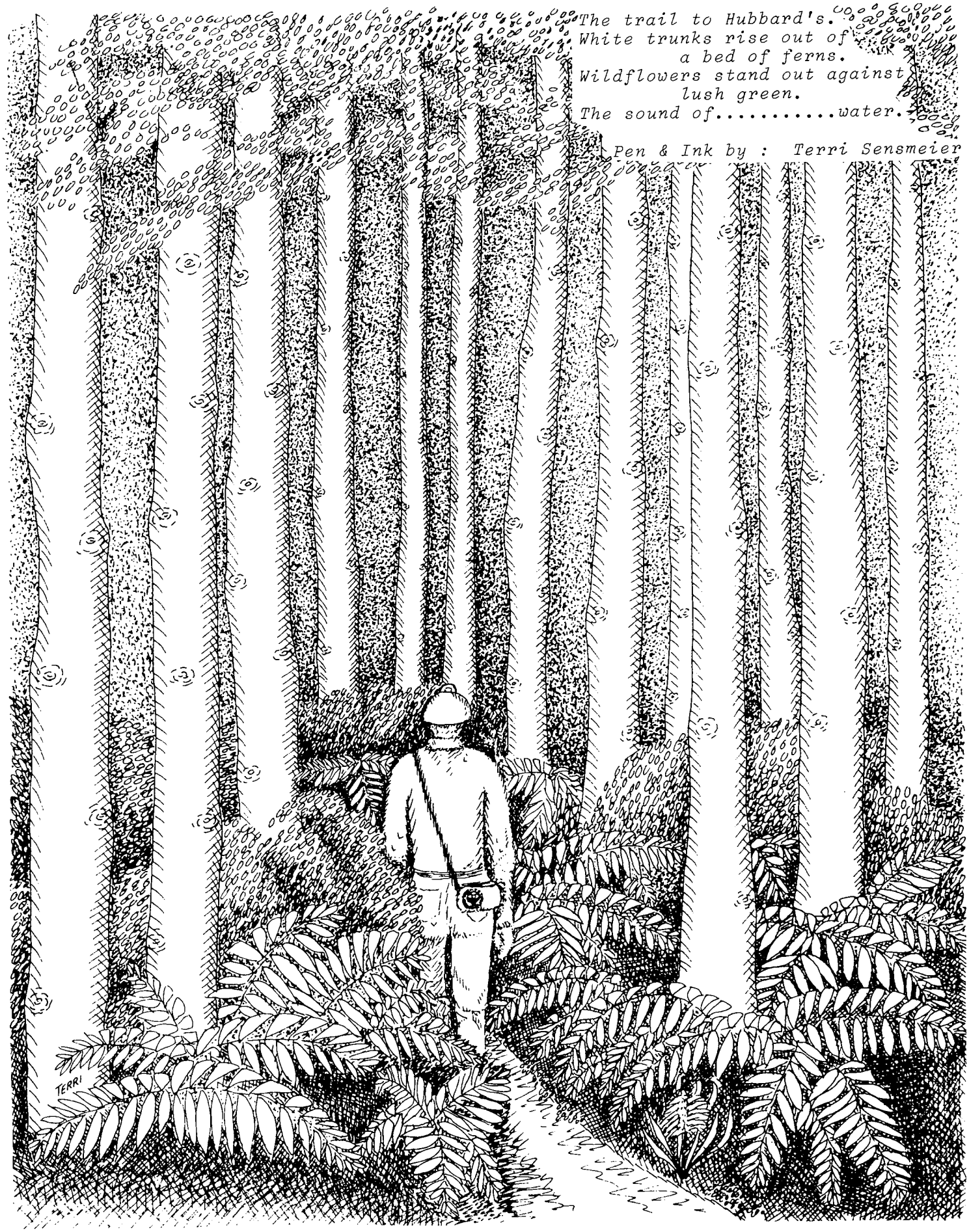
The sound rolls like the ocean
Awakening the dawn
The spirals grow from far below
And to the east are gone
With early light we enter night
With sunrise journey down

And the swallows
And the swallows
Mornin' time
Leavin', climb
Up to day

Daylight done
Setting sun
In the ground to stay

Warren E. Hoemann

Cover Art



The trail to Hubbard's.
White trunks rise out of
a bed of ferns.
Wildflowers stand out against
lush green.
The sound of.....water.

Pen & Ink by : Terri Sensmeier

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

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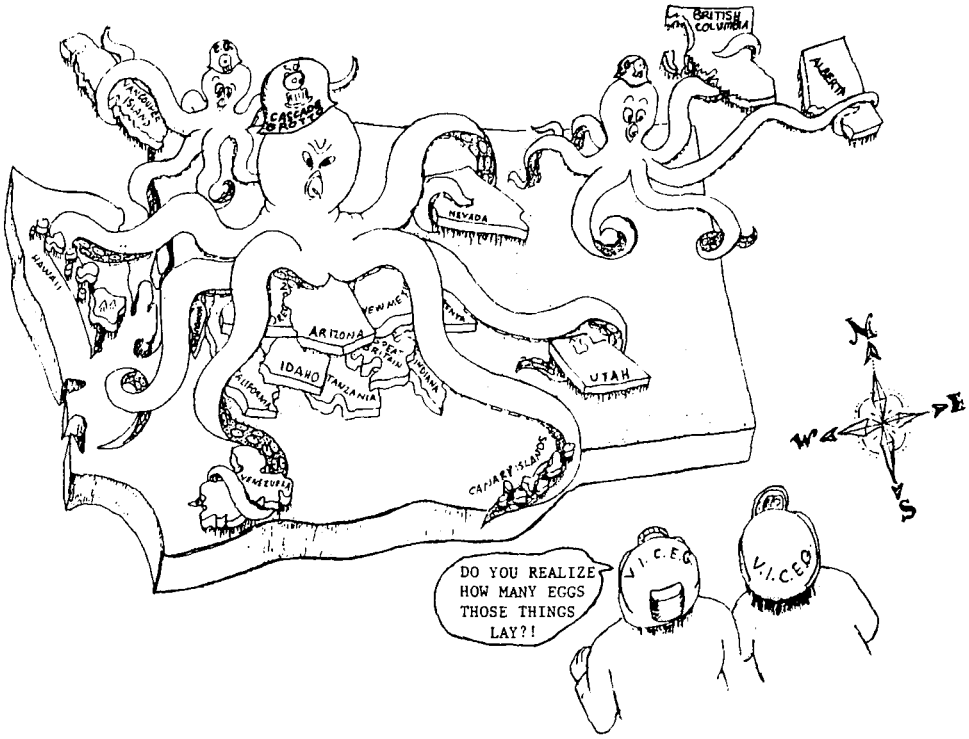

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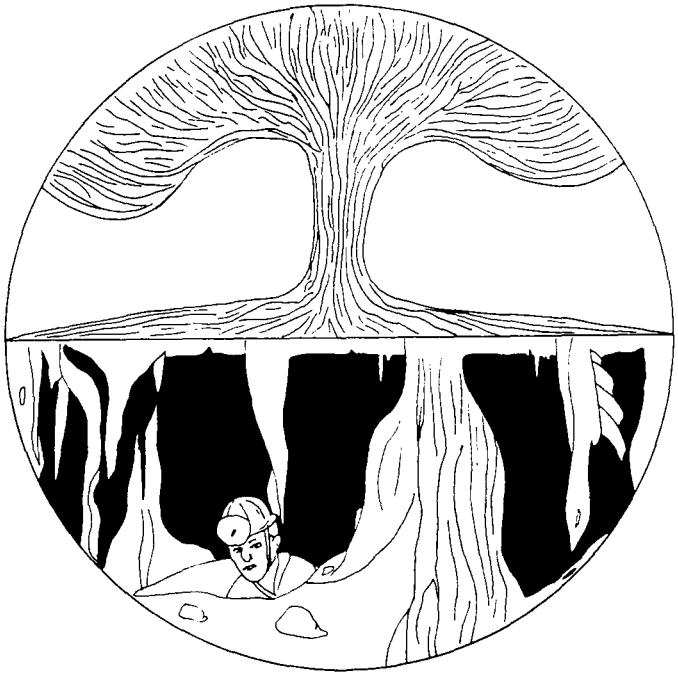

Michael Schuster

AUGUST SEPTEMBER 1980

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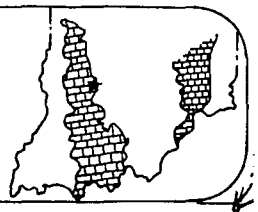

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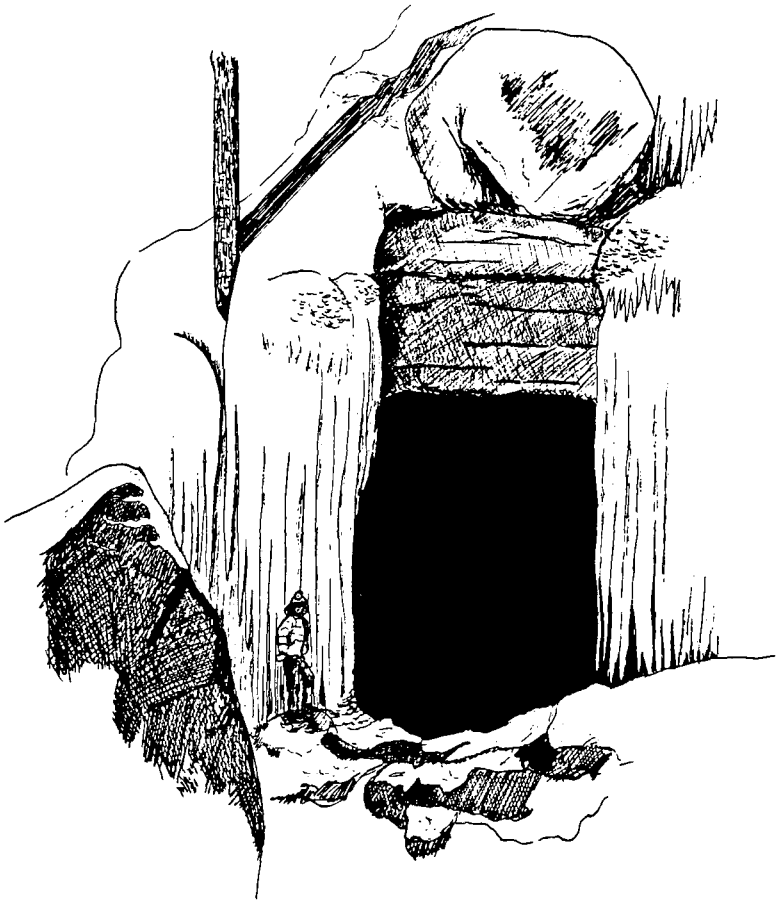

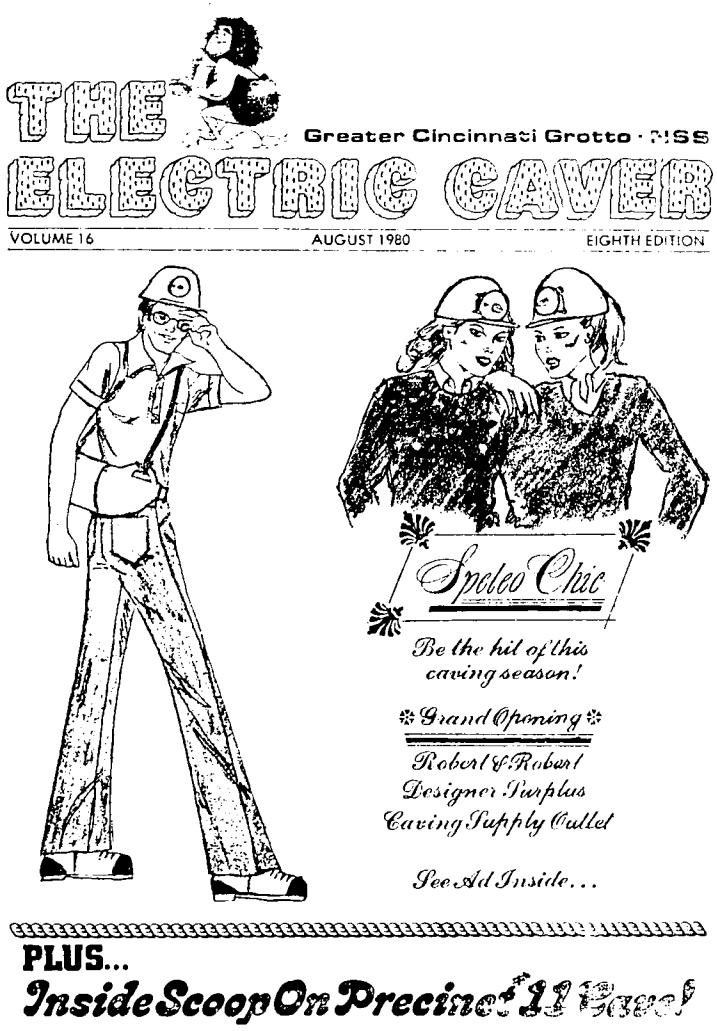
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Be the hit of this caving season!
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See Ad Inside...
PLUS...
Inside Scoop On Precinct 11 Cave!


THE EXPLORER
OCTOBER 1980
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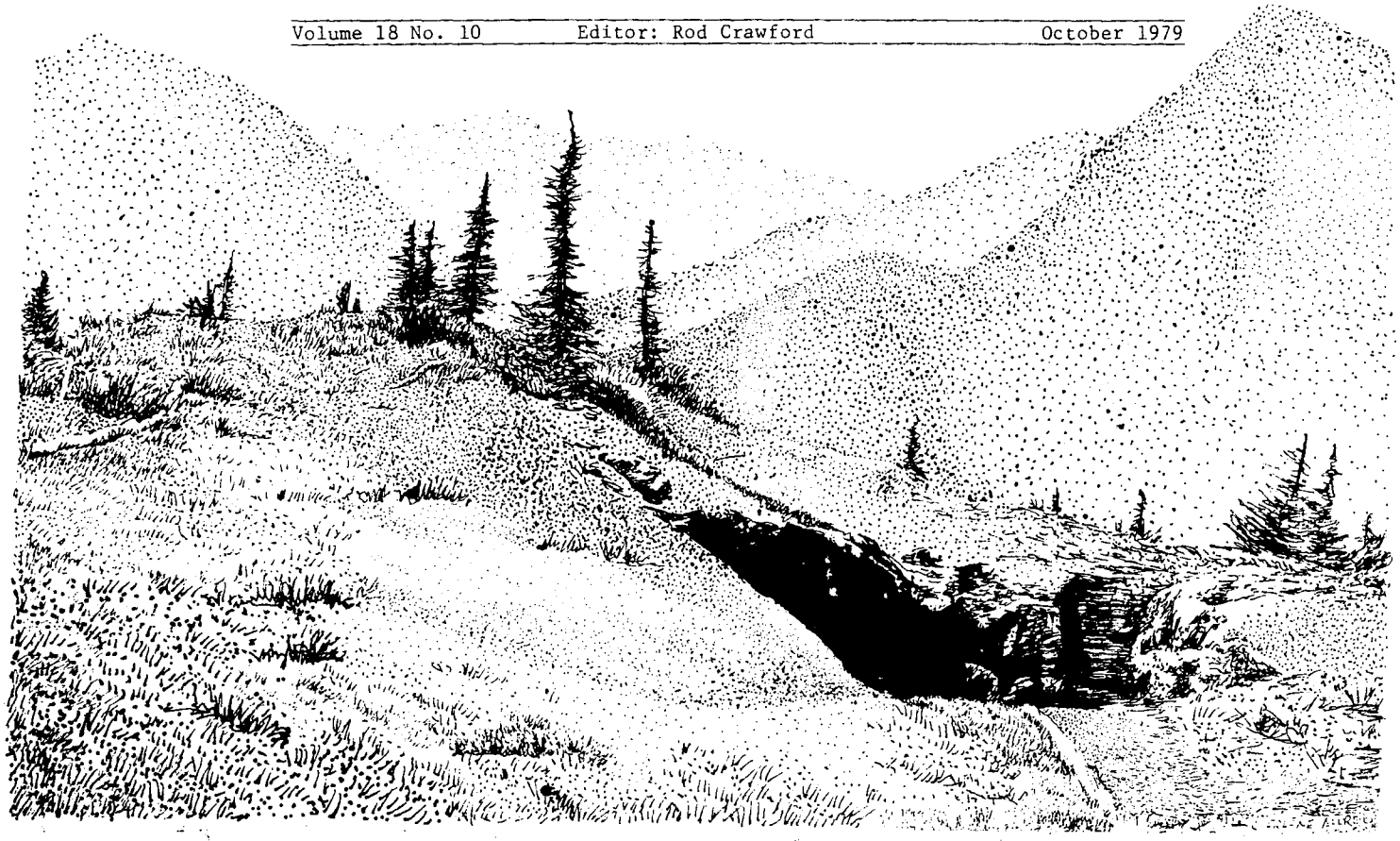

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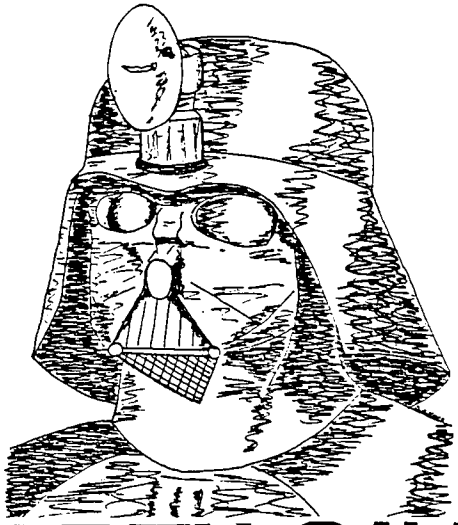
Volume IX Issue 5 MAY Published 4/30/80



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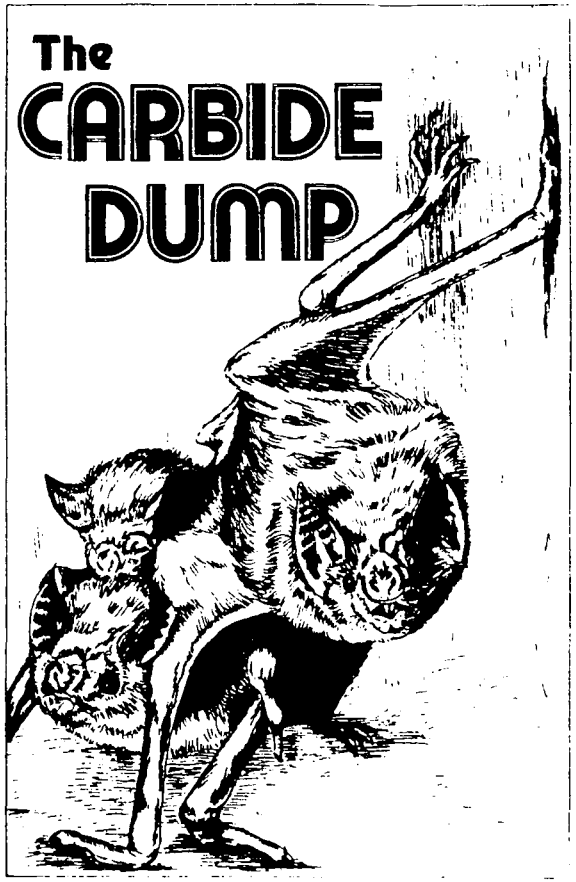
SOUTHWESTERN CAVERS

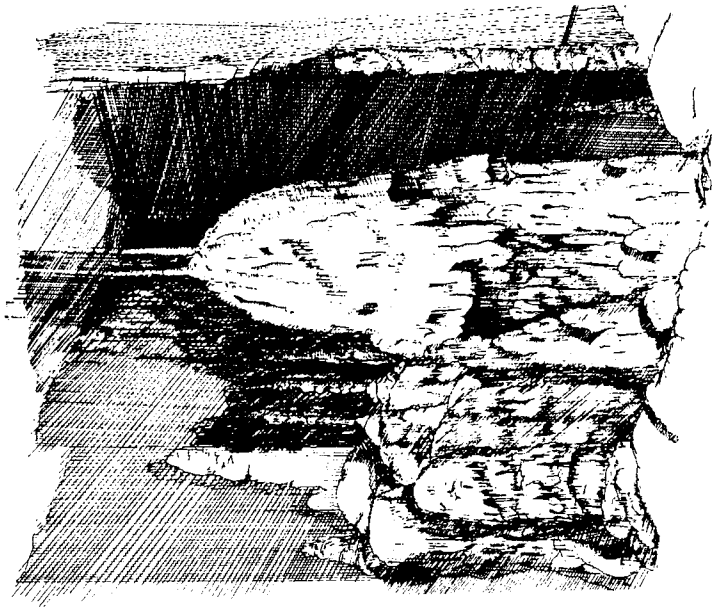
Volume 18, No 2 & 3 March—June, 1980

The Underground
volume 23 numbers 1 & 2

A PUBLICATION OF THE MID-MISSISSIPPI VALLEY GROTTO
A CHAPTER OF THE NATIONAL SPELEOLOGICAL SOCIETY
AN AFFILIATE OF THE MISSOURI SPELEOLOGICAL SURVEY

MVOR - Drawing by Marilyn Oesch





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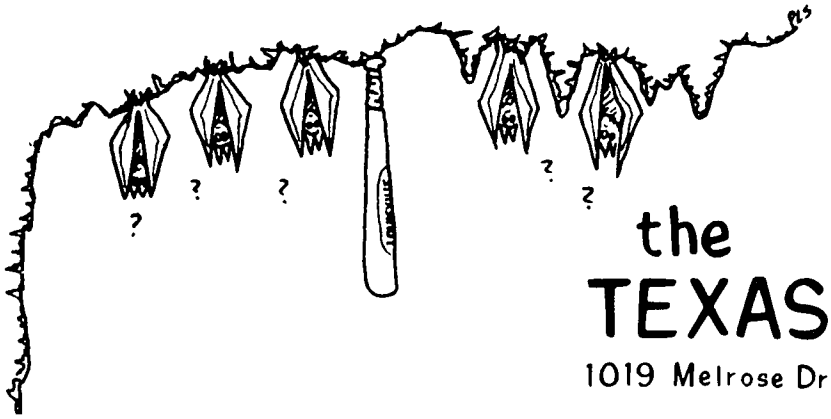
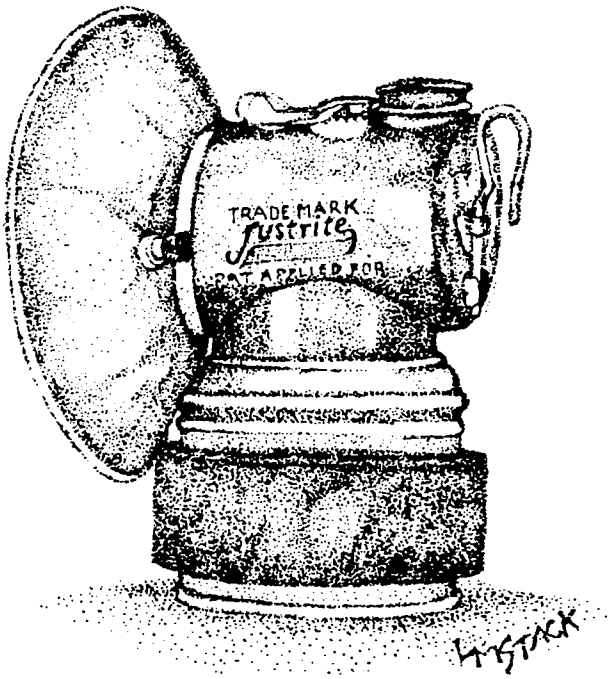


the TEXAS CAVER

1019 Melrose Dr Waco, TX 76710

D C SPELEOGRAPH 36(12):21

"One of the 2 or 3 drawings the late Rose Marie Fields gave us soon after she joined the grotto."



Linda Stack
York Grotto Newsletter 17(2)fc

Graphic Art

SW Cavers Jan-Feb 80

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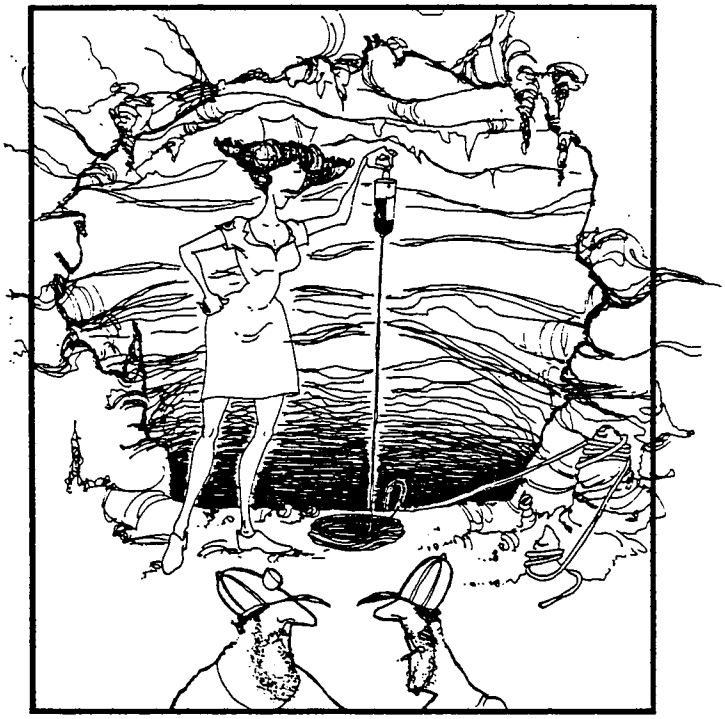
Oliver Holler
Der Fledermaus
8(9, 10):9

"A gentleman never caves before noon"



HGN

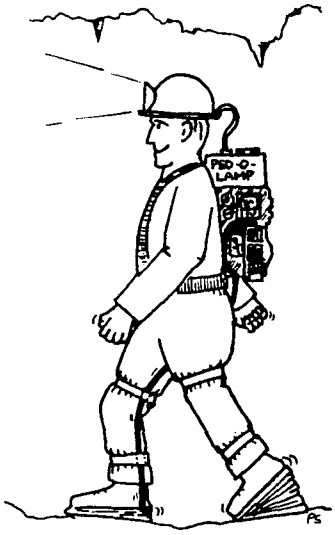
"WE CAN'T GO ON SEEING EACH OTHER LIKE THIS!"

Doug Bradford
Diablo Grotto News Letter 3(1)

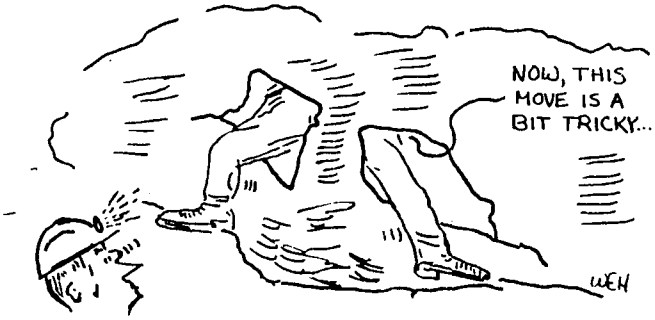
Becky Taylor
The Speleologist 16(11):96

Cave Lamp Sources, September 1975, 14 (9): 100-101.

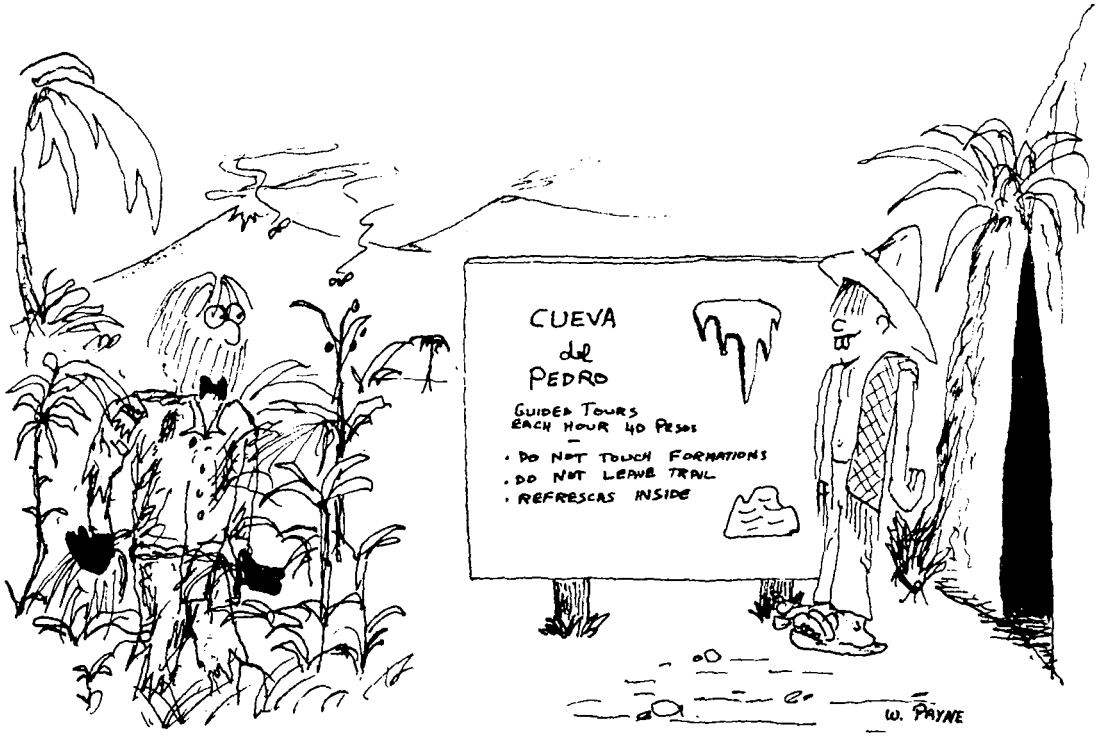
IN ORDER THAT WE REDUCE OUR DEPENDENCE ON IMPORTED CARBIDE, I FELT IT APPROPRIATE TO PROPOSE SOME ALTERNATIVE FORMS OF HEAD LAMPS FOR CAVING IN THE COMING YEARS.



Texas Caver



SFBC 23-4



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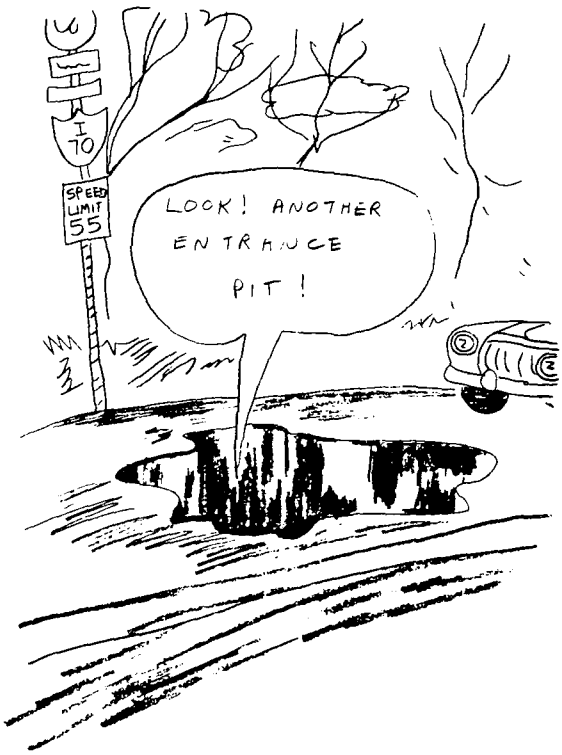


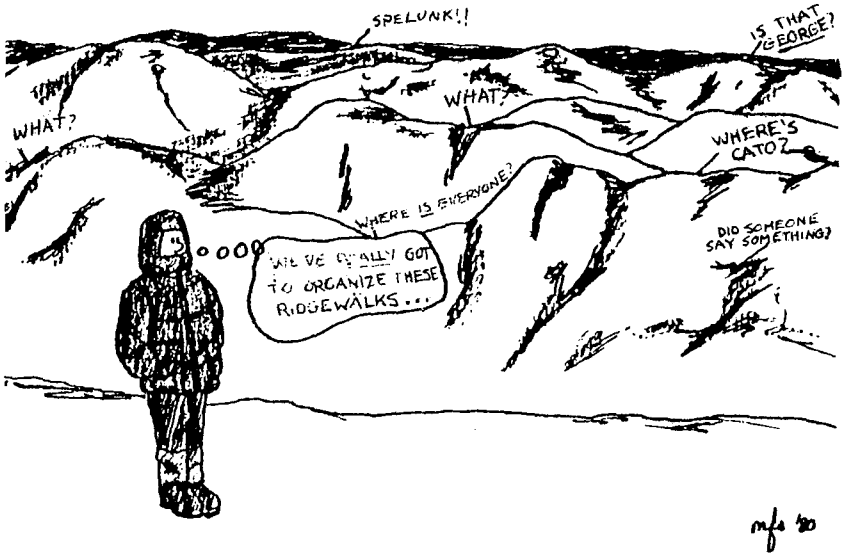
Drawn by: Tom Ryan
Cartoon by: Fred Held,
N.S.S. #20769

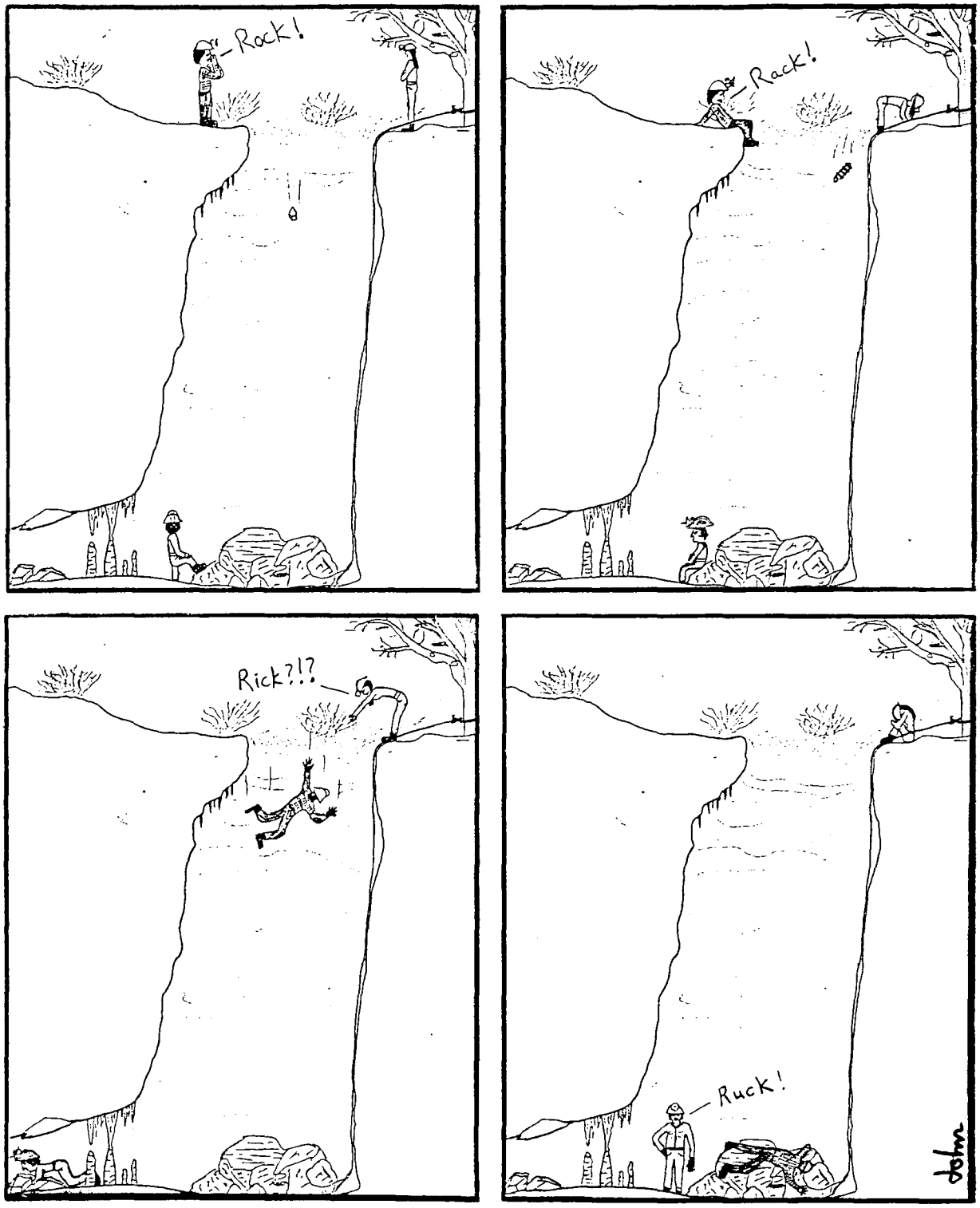
(ASK JOHN STADE)

The Underground 22(12):4

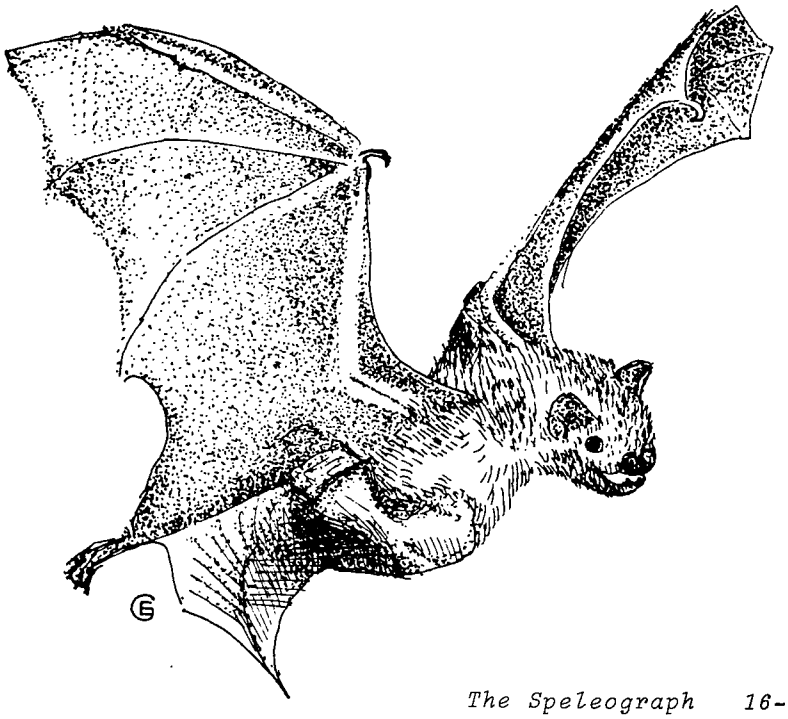
BEWARE THOSE NANTAHALA EXPEDITIONS!

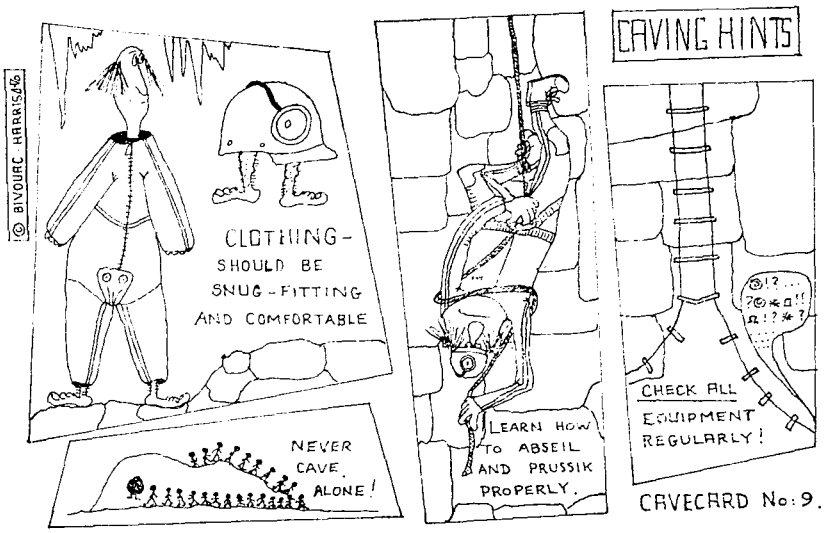
Becky Taylor
The Speleograph 16(10):86




Rock!
Rack!
Rick?!?
Ruck!
John

Peter Keys AMCS #10





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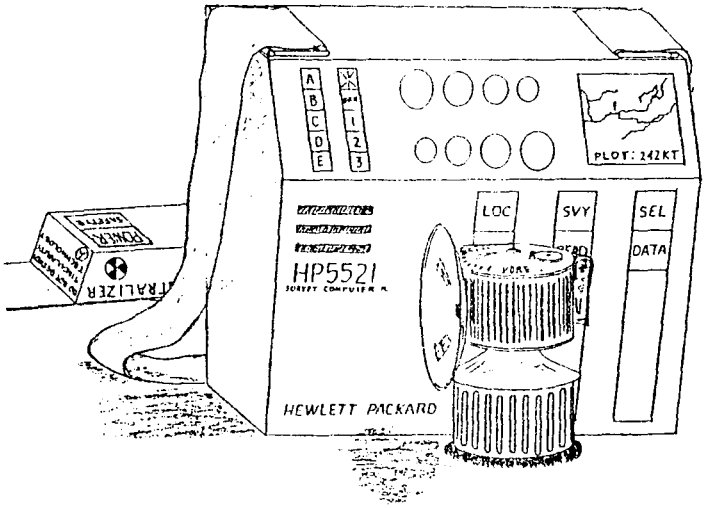

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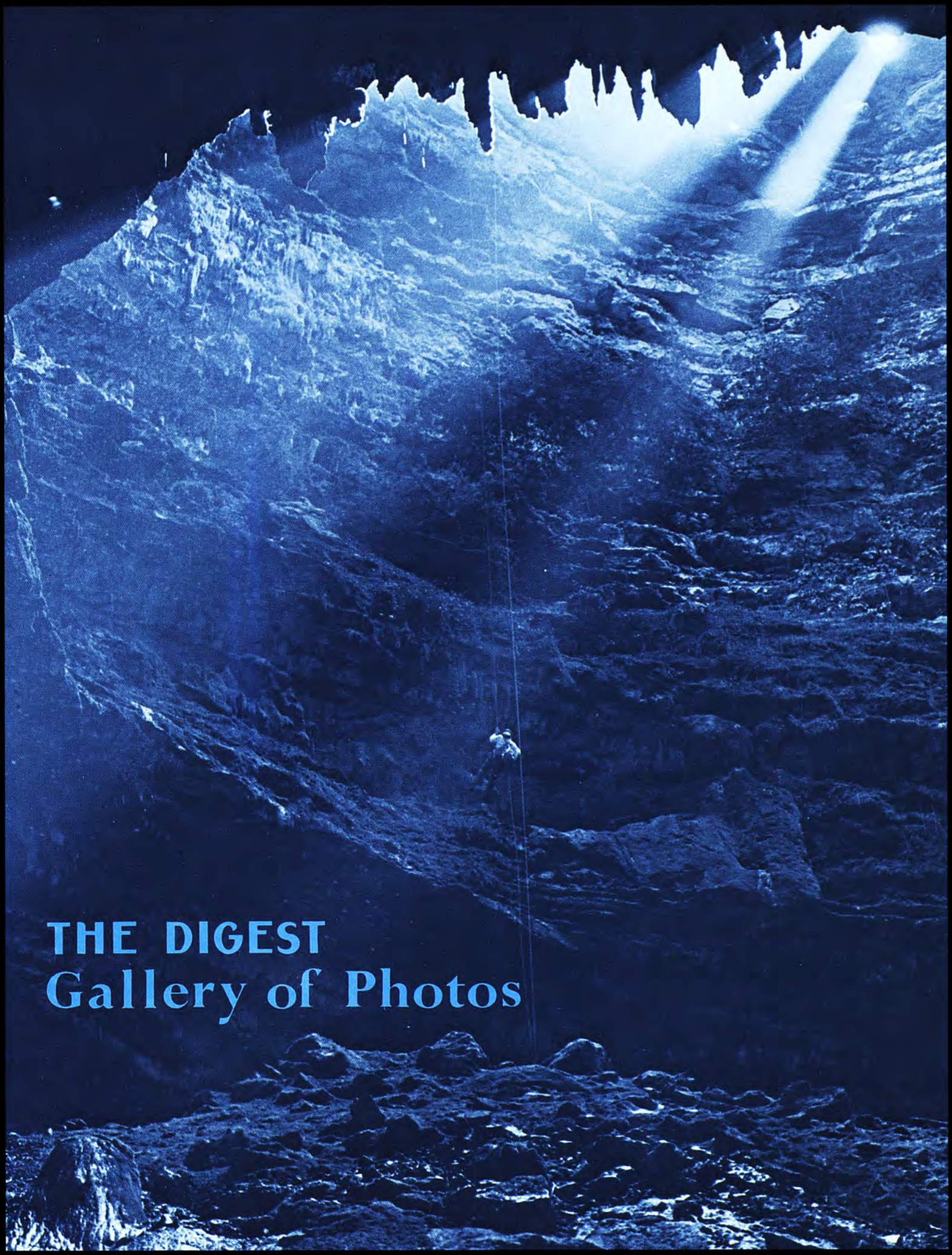

THE DIGEST
Gallery of Photos

MILES DRAKE ... after 50+ hours in Simmons Mingo

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