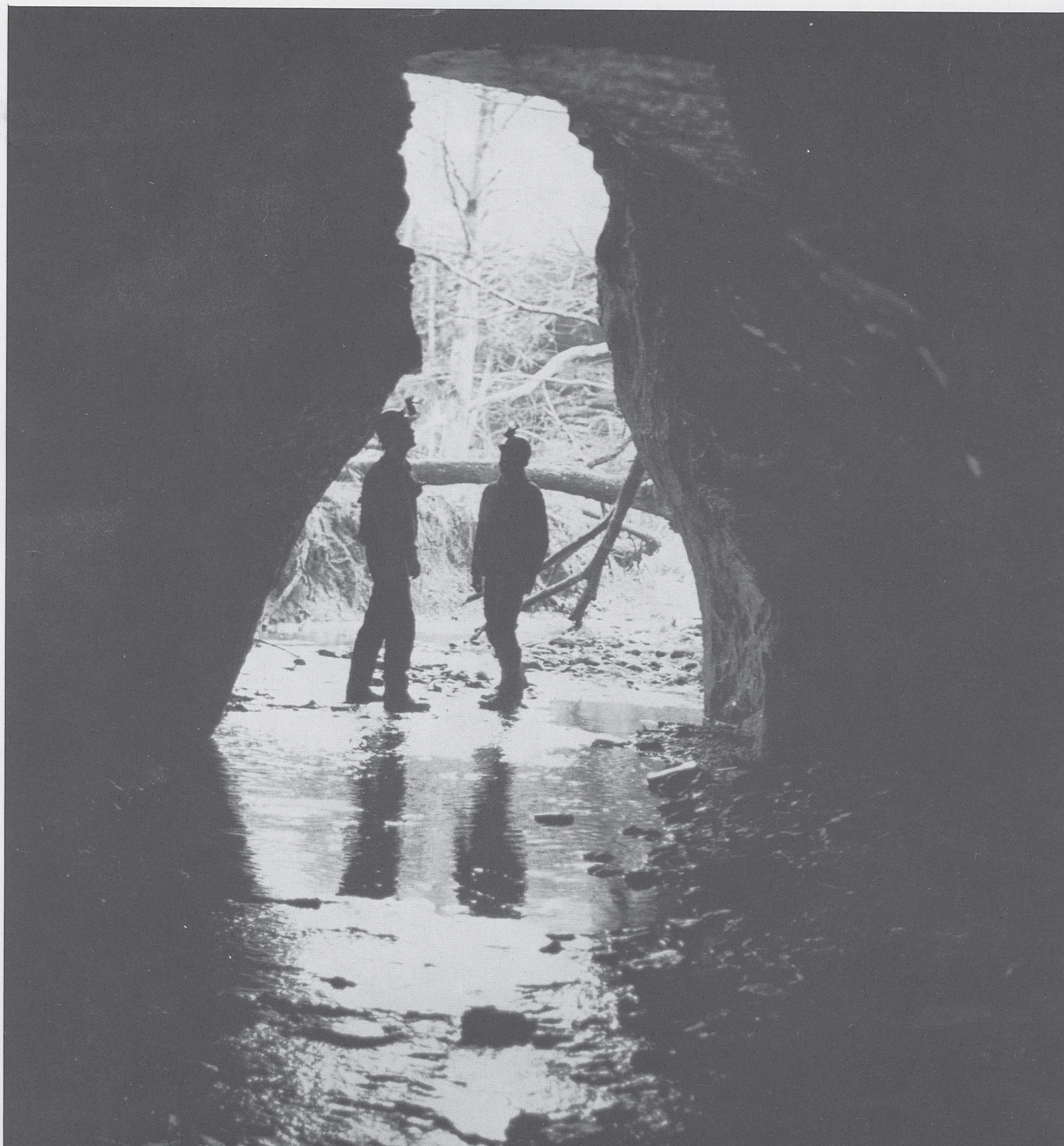
PHOLEOS

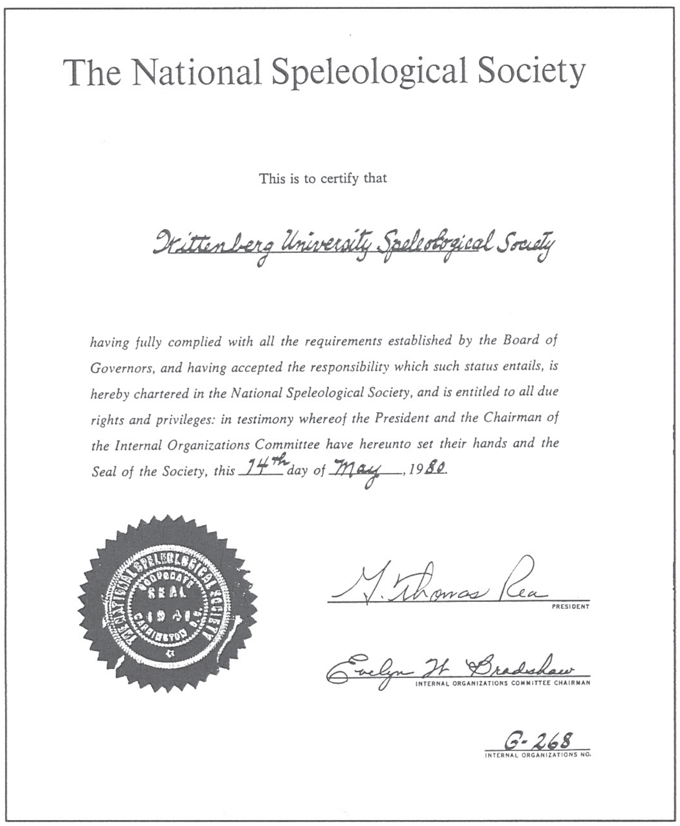
WITTENBERG UNIVERSITY
SPELEOLOGICAL SOCIETY

Volume 10 (2) June 1990



The Wittenberg University Speleological Society

The Wittenberg University Speleological Society is a chartered internal organization of the National Speleological Society, Inc. The Grotto received its charter May 1980 and is dedicated to the advancement of speleology, to cave conservation and preservation, and to the safety of all persons entering the spelean domain.



The National Speleological Society

This is to certify that

Wittenberg University Speleological Society

having fully complied with all the requirements established by the Board of Governors, and having accepted the responsibility which such status entails, is hereby chartered in the National Speleological Society, and is entitled to all due rights and privileges: in testimony whereof the President and the Chairman of the Internal Organizations Committee have hereunto set their hands and the Seal of the Society, this 14th day of May, 1980.

J. Thomas Rea
PRESIDENT

Evelyn W. Bradshaw
INTERNAL ORGANIZATIONS COMMITTEE CHAIRMAN

G-268
INTERNAL ORGANIZATIONS NO.

Front Cover Photo:	View looking out Fourth Entrance of Cool James Cave, by J. Proctor

ISSN: 0733-8864

PHOLEOS
THE WITTENBERG UNIVERSITY SPELEOLOGICAL SOCIETY NEWSLETTER

Volume 10 (2) June 1990

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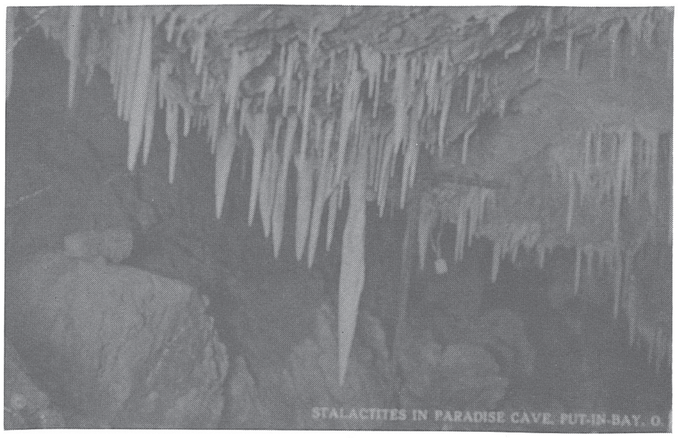
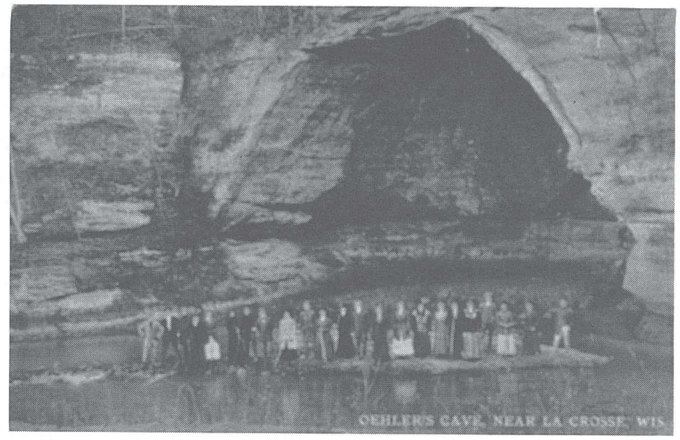
SUBSCRIPTION RATE: 1 Volume - $5.00 (2 issues), Single issue $3.00. Send to Grotto address.
EXCHANGES: Exchanges with other grottoes and caving groups are encouraged. Please mail to Grotto address.
MEETINGS: Wednesday evening, 7:00 p.m., Room 206, Science Building, Wittenberg University, Springfield, Ohio.

FROM OUR ARCHIVES

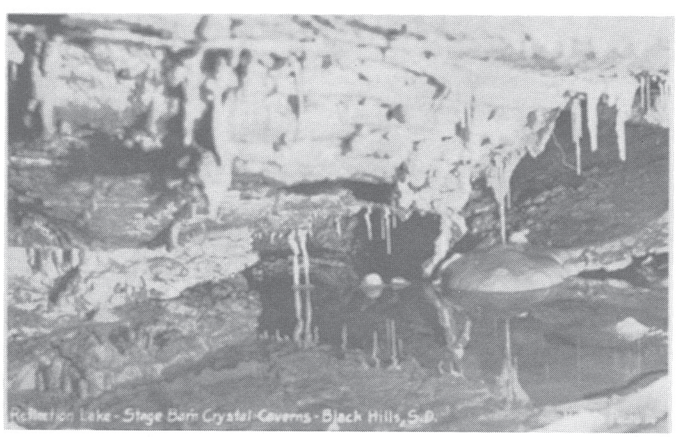


Stalactites in Paradise Cave, Put-In-Bay, Ohio



Oehler's Cave, near La Crosse, Wisconsin

Falls and overhanging ledge at Ash Cave, Hocking Co., Ohio



Reflection Lake, Stage Barn Crystal Caverns, Black Hills, S.D.

Crystal King, Ohio Caverns, West Liberty, Ohio

I. EDITORIAL

The two main articles in this issue bear the signature of Jonathan Proctor, who graduated from Wittenberg University in June 1990 with a major in geography, a field of study as interdisciplinary as speleology. John has already distinguished himself as a young speleologist about whom we shall no doubt hear much in the future. In addition, he has received the John F. Mitchell Award "honoring senior men best exemplifying the liberal arts." Grotto president Monika Palunas has also graduated, winning the Emmett Bodenberg Award "for outstanding achievement in environmental biology;" her presence in the Grotto's functions will be a "hard act to follow," to quote a hackneyed but apt old cliché. The membership, other officers, faculty advisor H. H. Hobbs III, and the current editor salute them at the beginnings of brilliant careers in their respective fields.

In a student grotto such as the Wittenberg University Speleological Society the annual turnover in membership might seem exasperating at first, especially when it's time to put *Pholeos* together; this grotto, perhaps more than other student grottoes of the N.S.S., enjoys also a large percentage (about 25%) of "townies" from Springfield and others from nearby cities as members who are equally active in Grotto activites, and who give a subtle continuity to the Grotto as student members enroll, matriculate, and graduate. This is a good balance, keeping some of the "old timers" (like the present editor) from premature psychophysiological disintegration, surrounded as we are by the vigors and malleable enthusiasm of youth, and with the annual prospect of a new batch of novices to break in to the sport and science of cave exploration.

The Grotto is much more active than what one might assume from subscribing to *Pholeos*; hardly a weekend goes by without a field trip to Kentucky, Indiana, or some more remote locality. This journal in its present format cannot report on all activities, since it appears biennially, though important discoveries and new cave maps always get prompt attention. As this issue goes to press, a new Ohio cave is being opened up in an area with several lengthy caves (long by Ohio standards) in close proximity; like many caves in Ohio it has been filled with glacial debris so the process of opening it up is precisely that—a laborious though certainly not futile chore with pick, shovel, and—careful sifting of the cave's earth for bones and artifacts. This cave has turned out to be the first Pleistocene bone repository yet known in Ohio, at least in a limestone cave with a vertical entrance; such a find might provide the Ohio Cave Survey with an additional measure of justification, since palaeobotany (or rather palaeontology) now joins the various disciplines interested in this state-wide project. Also, it proves once again that the way to get into a new Ohio cave is not by "following the water" as one does in Kentucky, but by attacking (gently, of course) a sinkhole or crawlway with anything from a hand-trowel to a backhoe. An inventory of this new cave's contents has been prepared by the Ohio Archaeological Council and the Ohio Historical Society; it will be mapped soon by Professor Hobbs and members of the W.U.S.S. We plan to publish a complete report on this extremely important discovery in the next *Pholeos*.

We are proud to announce that *Pholeos* itself received both a Merit Award and an Honorable Mention in the 1990 N.S.S. Graphic Arts Salon for its cover photographs.

Finally, the editor wishes to thank Horton Hobbs, Bob Klapthor, and John Proctor, who contributed their valuable time at the Zenith® 158 keyboard or who read and corrected proof.

—W. P. Luther

* * * ——— * * *

FROM OUR ARCHIVES, *Cont.*

Saracens Tent, Caverns of Luray, Va.

II. GROTTO ACTIVITIES

CAVE RESCUE CLINIC

by Scott Engel, NSS 32520

On the last weekend in February 1990 I attended a basic cave rescue orientation course at Carter Caves State Resort Park in Kentucky sponsored by the Eastern Region of the NCRC (National Cave Rescue Commission). We spent most of Saturday in classroom sessions discussing basic management and rescue techniques; on Sunday we practiced what we learned in a mock rescue held in Bat Cave.

The most important lesson learned is that the hardest part of a cave rescue is not getting the patient out of the cave, but in establishing the logistics to make the rescue a safe and efficient procedure. We spent much time during the mock rescue arguing over who was in charge of what. Once we set up a chain of command, we had further difficulties with accurate communication between the above-ground support and the in-cave personnel. For example, I was put in charge of an initial response team; at one point during the rescue I needed information from the underground coördinator (who is in charge of in-cave personnel), but he had left his post and could not be found.

Another important function of the surface logistics operation is locating personnel and equipment. Several times during the rescue those on the surface had to search for equipment needed in the cave but which was not readily available. They also had to handle problems such as keeping spectators and the press out of the way. In real rescues the surface operation often works in conjunction with state and local authorities, gaining access to their various services and personnel.

Caving takes on a new perspective when someone's life is at stake; we noticed hazards like low tight passages through which it would be necessary to pull a stretcher. The simulated rescue also pointed out small but important considerations, such as referring to the stretcher and its human cargo as "him" or "her," never as "it," or better yet, using the patient's name. Another phrase commonly used is "Keep his (or her) head up," reminding us not to forget we are carrying an ill or injured person.

The problems associated with cave rescue make it a very demanding task; courses such as this provide invaluable experience and training for the novice rescuer and caver. I strongly encourage all serious cavers to participate in a cave rescue course because one day someone's life, perhaps your own life, may depend on it.

If you are ever involved in or come upon a caving accident and are unsure of whom to call, contact the local law enforcement agency; they should know what to do. Otherwise call the NCRC at (800) 851-3051 from anywhere in the U.S., and they will assist you in contacting the necessary personnel.

SULLIVAN'S CAVE CLEANUP

by Emily Butterbaugh and Julie Thorp

On April 22, 1990, all who gathered for a cave cleanup at Sullivan's Cave near Bloomington, Indiana shared a successful Earth Day. It was a gorgeous day as dedicated individuals, concerned with the conservation and protection of our caves, gathered near the entrance of Sullivan's Cave to discuss the day's program. To ensure a safe and efficient trip, we divided into groups. Then, we were ready to begin our adventure.

After the brief orientation sessions, we charged up our lanterns and gathered the tools we would need. Wire brushes and cloth hauling bags were on hand to help in the cleaning effort. We waited in line as the 93 cavers slowly entered the cave through the two-by-two-foot hole at the base of a tree. A recently installed metal gate over the opening proved to be useful in helping us maintain our balance as we lowered ourselves down through the narrow entrance. It was not long after we entered that the damage of the vandals could be found; graffiti covered the walls and litter was scattered about. We spread out in order to cover the entire cave, with some groups remaining near the entrance and others moving further into the cave.

We chose to venture further in. Our first obstacle was the "Back-Breaker," a 4-foot-high and 800-foot-long passage. After travelling a few feet, we understood how it received its very appropriate name. Here the disturbing evidence of vandals covered the walls and ceiling. As we continued on past the Back-Breaker and through the Mountain Room, we encountered a waist-high, ice cold stream and an immense amount of mud, which served as a slide on a few occasions. After about an hour and a half trek, we entered the large, muddy Quarry Room, where we began to clean the graffiti from the walls and ceiling. The work continued for many hours, and we accomplished much. We emerged from the cave exhausted, having dragged out very large quantities of trash, as well as having scrubbed paint and carbide soot from the walls and formations within.

The Earth Day cleanup helped us to realize just how fragile our natural surroundings are. Having seen first hand the extent to which people abuse caves, we gained a deeper sense of the need to protect them for others to enjoy.

III. CAVE EXPLORATION

RAINBOW'S END CAVE, MT. SILALI, KENYA: A DESCRIPTION

by Jonathan Proctor, NSS 30117

On October 20-22, 1989, a group of fourteen people from the Cave Exploration Group of East Africa and one visitor—the present writer—went on an expedition to Mt. Silali, Kenya, in search of lava tubes. Mt. Silali is located in the Great Rift Valley just north of Lake Baringo. This shield volcano, as well as the many other volcanoes in the Rift, is a result of the separating of the earth's crust along this line.

I. SITE SELECTION

The site of Mt. Silali was chosen as a location to explore for lava tubes for these reasons: 1) it is a shield volcano; lava tubes only form during shield volcano activity due to the low viscosity of its lava; 2) the geological map of the area implies that the most recent lava flow from Mt. Silali overlies a thick layer of pyroclasts (this pattern has been important in the past in locating lava tubes of substantial proportions); and 3) the Cave Exploration Group had learned that possible cave entrances had been spotted in the area by helicopter.

II. DESCRIPTION

These clues proved to be correct when a lava tube of significant size was found on the morning of October 21. It was named "Rainbow's End Cave" after the rainbow that was seen the afternoon before the discovery. After a rough survey, it was estimated that over one kilometer of passage had been covered by the group, and more is likely to exist. Rainbow's End Cave may be entered from two locations at either end of a large section of collapse which measures 49 meters in length (see map). The upstream entrance is the smaller of the two and occurs at the top of the tube floor. This upstream section of passage is named "Termite Passage" and measures 221 meters in length. Within this passage is a large termite mound extending through the ceiling. Also noted in this passage were a few bats (small with white bellies), porcupine quills, and a broken piece of pottery. The downstream entrance is quite large and partly filled with a breakdown rock talus, beyond which the passage is approximately 5 meters high and 12 meters wide. Close to the entrance were found many puff-adder snake skins, porcupine quills, and stick debris washed in from outside. After a distance of 110 meters from the entrance, the main passage is joined by another tube entering from the true left (downstream left). This passage was measured upstream a distance of 393 meters at which point it ends in a boulder choke. There is evidence here of a division to the true right; a piece of tube wall (not broken rock) extends in this direction. It seems obvious that this once connected with Termite Passage but since has collapsed (see map). Upstream, the passage appeared to continue through much breakdown but was not pushed further because of its small size and apparent fragility.

Within this section of passage were found many signs of animal activity. The list includes a gazelle skull, a cow horn, a baby hyena jawbone, a baboon skeleton with fur attached, bats, some type of arthropod within the bat guano, and porcupine dung. An explanation for the large number of bones may be that the many porcupines dragged the bones in to chew on them. Therefore, not all of these animals necessarily entered the cave while alive. The downstream passage, from the point at which it meets this adjoining passage, continues approximately 350 meters but was not surveyed. This passage ends abruptly with a wall of breakdown at which point the width was estimated to be 20 meters. Obviously, the tube continued much further but has collapsed since this time. If this point can be located on the surface, an entrance to more passage may be found and could result in many meters of new discovery. This may be pursued in another expedition.

Within this passage was found an active bat colony. Our presence caused thousands of them to fly at once, causing a thick cloud of bats. Large amounts of guano were obviously present.

III. FORMATION

Lava tubes occur in the highly fluid basaltic lava of shield volcanoes. Their development begins with a consistent flow of basaltic lava which, as it flows downhill, collects into shallow channels or gullies. If the shape of these channels is deepened significantly, a lava tube often develops. This important step of channel formation may occur through a combination of many processes. In the case of Mt. Silali, the major one appears to be cutting down into the material below.

Although no direct evidence was noticed which would prove that downcutting occurred, assumptions made from studying the geological map point in this direction. As was stated earlier, one of the reasons for choosing this site was because basaltic lava overlies pyroclasts. In this situation, the advancing basaltic flow is able to gouge out the loose pyroclasts—possibly with explosive force—to form deep channels. In this way, a lava tube may develop even where the lava flow is relatively shallow; or if the flow is thick, very large lava tubes may result. Evidence of this process was discovered in the lava tubes of the Chyulu Hills where certain lower passages occur within ash deposits, as is evident wherever the cave wall has fallen inwards (Simons 1974 : 252).

Channels may also—and more frequently—be deepened through building up of the banks. This occurs when the rate of flow periodically increases, causing lava to overflow the channels. In this thinly spread shape, the lave quickly solidifies and heightens the level of the channel banks. As long as lava surges continue periodically, this process builds upon itself and may form large levees. Also, splashes and splatter from the lava stream continually accumulate on the banks and add to the structure. Actual observation of these two processes was documented by Donald Peterson and Donald Swanson with the extensive eruption of Mauna Ulu in Hawaii in 1970, during which a system of lava tubes was formed (Peterson and Swanson 1974 : 211). These processes certainly also contributed to the formation of Rainbow's End Cave.

After the lava channel has been deepened, roofs must be formed over the stream in order for a lava tube to develop. This roofing process may occur in different ways. For example, the surface lava constantly cools because of its contact with the air. Thin crusts may form directly on the surface of the moving lava flow. These crusts may become jammed because of an obstruction and block the flow of other moving crusts. In this way, crusts may merge together to form a solid roof which builds itself upstream (Peterson and Swanson 1974 : 211).

Roofs may also be formed by the slow cooling of the lava along the edges of the channels. These crusts slowly grow until they merge in the middle and thus form a roof. This is similar to another method of roof building, which occurs when overflows and splashes and splatter continue to build levees until they eventually extend towards each other. They may meet in the middle in which case a new roof is formed (Peterson and Swanson 1974 : 211).

Splashes and splatter seem to have been absent in the formation of roofs in Rainbow's End Cave; at least it is certain that they did not occur after the roof was formed. This assumption is based on observing the flatness of the roof; it is not rounded as would result from significant amounts of splash and splatter. This flat shape points to the first two processes mentioned as having formed this roof. However, no lava tube roof is formed as smoothly as explained in these examples. Rather, these processes begin to build roofs, but countless times a lava surge sweeps the progress away. Also, a roof may be built, but then the rate of flow decreases slightly, causing the roof to collapse before it has become sturdy (Peterson and Swanson 1974 : 213).

The overall shape of the explored sections of Rainbow's End Cave is that of an oxbow. This once again may indicate that the erosion of pyroclasts was involved. If the flow ran down a previously existing gully or channel, no oxbow would form; but if large amounts of pyroclasts were being pushed ahead, this obstruction could cause the flow to go around it, creating the oxbow of this cave.

In certain areas of Rainbow's End Cave, small and brittle lava stalactites were noticed. These were formed by lava dripping from the ceiling and solidifying. In many lava tubes, these stalactites are bent in the direction of flow because of the movement of lava and hot gases.

Once the lava tube was firmly established, it may have continued to grow in length by the following method: the *pahoehoe* (or smooth) lava continued to flow after exiting the final roofed section and travelled a short distance in open channel before it became *aa* (or clinkery) lava. Roofing continued to occur upstream and new pahoehoe lava extended a little further, passing over the aa lava and then became aa lava itself. The continuation of this process would have resulted in the extension of the lava tube (Peterson and Swanson, 1974). This process, which surely occurred in Rainbow's End Cave, helps to explain the importance of lava tubes in the formation of shield volcanoes; the gentle slope of a shield volcano is dependent on the continued high temperature and low viscosity of its basaltic lava. It is only because of the insulating effect of lava tubes that the lava can travel such great distances from its source.

IV. CONCLUSION

As can be seen from the aforementioned descriptions, the expedition to Mt. Silali was a success. A large lava tube was found containing many signs of fauna as well as hints of the geological methods of its formation, the major process being that of downcutting into the pyroclasts below.

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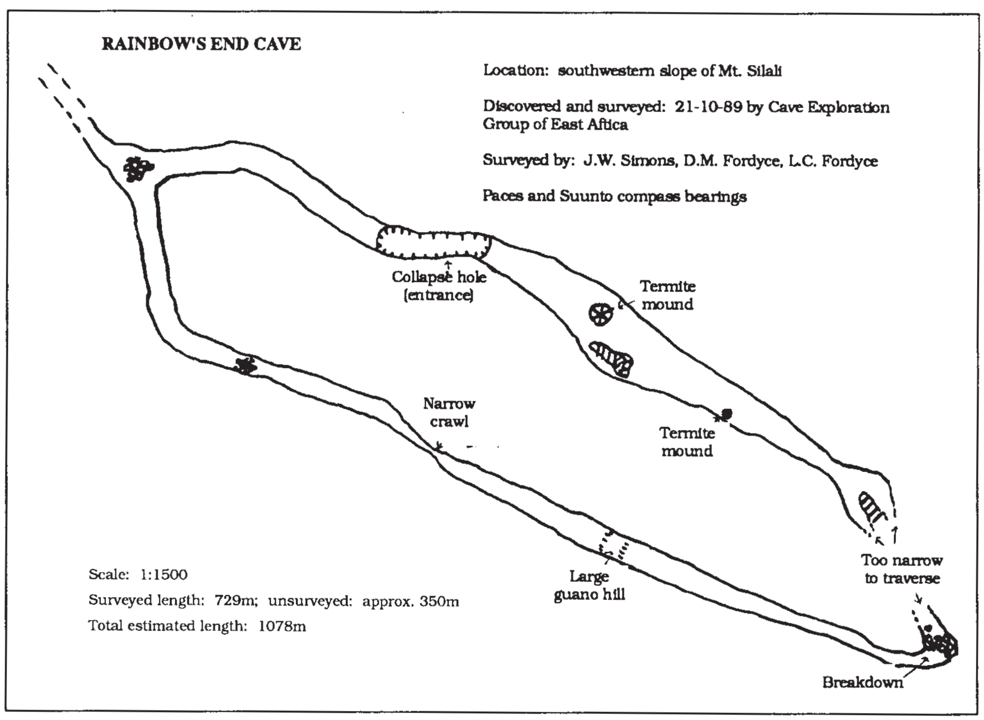


COOL JAMES CAVE, CARTER COUNTY, KENTUCKY

by Jonathan Proctor, NSS 30117

Between February and May, 1990, members of the Wittenberg University Speleological Society took part in the survey of Cool James Cave, located in Carter County, Kentucky, latitude 38° 23'30" N., longitude 83° 04'15" W. on the Tygarts Valley quadrangle. The cave continues to be formed by the water of Adams Creek, a small tributary of Tygarts Creek, which cut through and dissolved the limestone in this area.

Cool James Cave is located within the Newman Limestone Formation, which is composed of the Ste. Genevieve and St. Louis Limestones. The cave follows the lowest bedding plane of the Ste. Genevieve Limestone, and only within the last 35 meters of the cave does it cut down into the St. Louis Limestone. This is evident by the abrupt occurrence of shaly layers at this point. Seven entrances are located throughout the course of this cave, making it easily accessible along its entire length.

Twenty meters after entering the northern-most entrance, a large sinkhole (the second entrance) is encountered along the western wall. From the southern side of this feature, a very small upper passage can be reached which ends within three meters. To the east of the sinkhole lies a pool from which the stream begins. The rate of the stream's flow would suggest that a sump is present and water is flowing from beneath the wall adjacent to the pool. At this point, the cave is eleven meters wide and less than one meter high.

Continuing downstream, the western wall is intersected by many small passages that drop to the main floor overtop of a wide flowstone formation. Fifteen meters from this formation, a ten meter high by three meters wide dome rises above the passage, and finally all light from the entrances disappears. For the rest of this section, the stream meanders between sand and gravel and mud banks in a passage approximately four to five meters high by two to three meters wide, until it exits the cave and enters a large (70m) karst window (the third and fourth entrances). Immediately before this, however, is a low, wide side passage (0.6m high by 4m wide) to the west filled with gravel. Directly opposite this passage are two small passages sloping steeply uphill, one having a waterfall flowing into a square cement structure that is used by the owners of the cave for collecting water. The cave continues downstream after the karst window, averaging four to five meters high by four meters wide, until it reaches a point where the passage breaks into an upper and lower section. At this point, a large tree trunk is wedged in the rocky wall above the lower passage, signalling that during storms large amounts of water back up in this area. To the east of this point is a small crevice that loops around and once again connects to the main passage (see map).

Lower entrance to Cool James Cave, photo by J. Proctor

Beyond the low main passage the cave opens into its largest room, where another entrance lets in light from above. The stream hugs the western wall here, and is fed by a trickling waterfall flowing down a 4.5m-tall active flowstone. The eastern side slopes steeply upward until it finally reaches the surface (the fifth entrance). Near the entrance are three small passages that quickly become too small for exploration. Following the big room, the cave splits into two adjacent passages: one above and slightly to the east of the other. These passages are separated by solid rock and breakdown, and eleven meters in, a connection can be made between the two. At this point, the upper section is too steep to cross, although it does continue until it meets the lower section once again (see map). In the lower section, the stream disappears into the western wall where the floor becomes very gravelly. The stream reappears a few meters downstream where it has cut a deep, narrow channel into the bedrock. The stream soon disappears through a small tube and is observed again on the surface where it emerges from beneath a large talus slope below the sixth entrance. A few meters after the stream leaves the cave, a small passage through breakdown leads beneath the upper passage but ends abruptly. The lower level splits; east leads to the upper passage and an extensive entrance along the cliff face (the sixth entrance), while west leads to a passage where a small stream enters from beneath the western wall. A couple of connections through breakdown can be made from this area to the long, narrow entrance above. Finally, the passages reconnect into one stooping passage which turns sharply and exits in a very large cliff-face opening. The last one-third of the cave runs parallel to a steep hillside at the beginning of a karst valley; erosion of the hillside and the close proximity of the cave to the surface is the reason for the many side entrances, large amounts of breakdown and dirt, multiple passages, and instability in this area. The rest of the cave, however, seems quite stable and is decorated a variety of speleothems, mainly flowstone. Little evidence of human intervention was present in the cave, except for the water-catchment structure. The small amount of trash that was present seemed to have entered with the stream.

No graffiti were noticed. However, a pictograph of a four-legged animal was seen in the upper level before the big room.

Cool James Cave is oriented approximately 170° - 350° (see rose diagram). This is very similar to the orientation of many of the caves in nearby Carter Caves State Park, and probably indicates a similarity in the joint fractures throughout this area.

ACE BOWEN CAVE, POWELL COUNTY, KENTUCKY

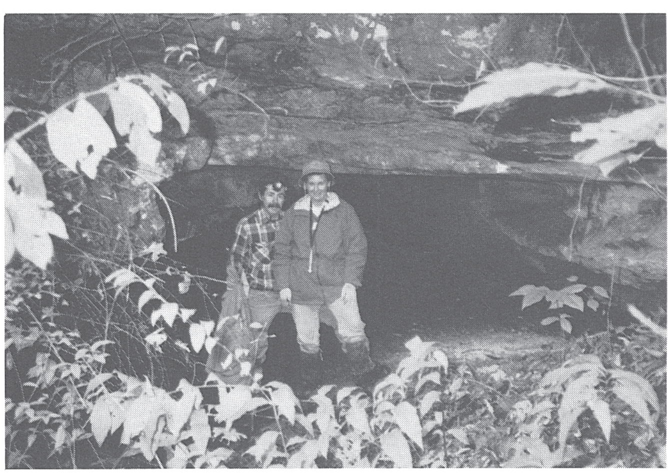
by Bill Stitzel

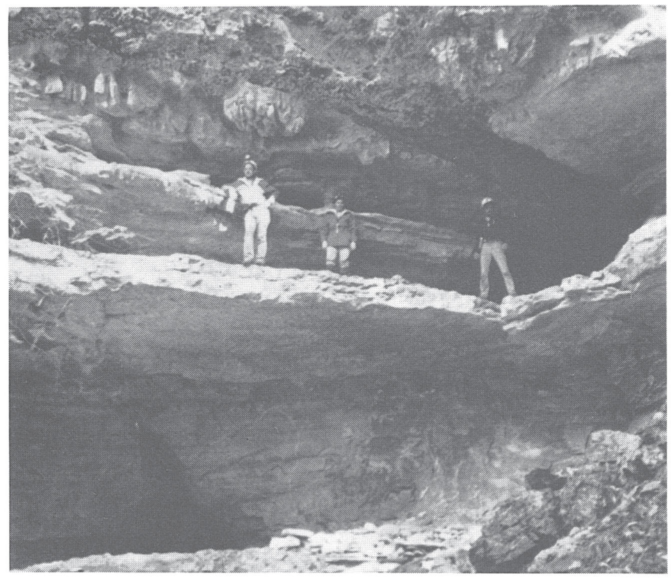
Ace Bowen Cave is located along Cave Branch in the famous Red River Valley of eastern Kentucky. Much of the bedrock in the vicinity is sandstone and shale, with the cliff-forming Rockcastle Conglomerate of Lower Pennsylvanian age capping the narrow ridges; creeks arising on the uplands cut into the Mississippian limestone, often exposing caves and sometimes sinking into them. Cave Branch begins between the settlements of Slade and Nada on the so-called Tunnel Ridge; upon reaching the limestone a large sinkhole captures the water and leads into a short low cave about 1m high. The left bank is mostly mud but the right bank is clean limestone, and the ceiling exhibits solution features. This cave finally pinches out. Farther down the sink and to the north a karst window about 2m deep appears, exposing the water from Cave Branch (see map). On the west is the entrance to a larger cave; after approximately 30m of walking, the passage forks. To the left is an insurgence of the water from Cave Branch where voice contact was made to a sinkhole about a meter to the south. Harvestmen (Opilionida) occupy this passage in large numbers. A large rock bars further exploration in this direction.

The main passage goes to the right of the fork, maintaining an average height of about 1-2m, with occasional domes up to 3-4m high. The passage's orientation seems to be controlled by two sets of joints, with numerous ceiling domes aligned along one set only (see map). It is floored with gravel and sand, though some small breakdown is present; the stream traversing the passage disappears along the north wall, reappearing in a resurgence a few meters below the cave's lower exit—a kind of balcony (see photo). By entering this stream exit one comes to a waterfall in a dome about 3m high.

Three species of bats have been observed in Ace Bowen Cave at different times. The cave seems infrequently visited, considering the increasing popularity of the Red River Gorge in recent years; some old graffiti were observed. The cave's total surveyed length is 300 meters, or approximately 1,000 feet.

[EDITOR'S NOTE: Ace Bowen Cave is a few miles from Natural Bridge Cave, described in *Pholeos* 10(1), 1990; the two caves are each an example of stream piracy as running water reaches limestone and sinks into cave passages—a very common occurrence in the Cumberland Plateau of eastern Kentucky. It would be interesting to study these caves in detail to learn if the cave passages, at least in their embryonic form, antedate the breaching of the limestone from surface erosion, and if the caves in this vicinity follow patterns typical of other Cumberland Plateau caves from southern Ohio southward into Tennessee and beyond, that is, by being confined to a narrow bench of exposed limestone and by rarely extending beneath the sandstone or conglomerate caprock.]





IV. OHIO CAVE SURVEY NOTES

OHIO'S NATURAL BRIDGES: A PROGRESS REPORT

by T. A. Snyder

[EDITOR'S NOTE: Tim Snyder's current passion is for natural bridges; while gathering material for his definitive monograph on this subject (to be published by the Ohio Department of Natural Resources), he examined many natural bridges in both carbonate and clastic rocks. Some of these features seem intimately connected to various processes of cave-formation, or to the ultimate destruction of a cave. This material, unique in itself, is a substantial contribution to the Ohio Cave Survey. The article reprinted here is one of several he has written for public dissemination under the imprimatur of the O.D.N.R.; we will print more of them in future issues of *Pholeos*.

For additional information on Ohio's natural bridges, consult M. C. Hansen's "Natural bridges in Ohio" (*O. Geol.*, summer 1988), W. P. Luther's "Some interesting Ohio caves in noncarbonate rocks" (*Pholeos*, 9[l], 1988; 9[2], 1989), and T. A. Snyder's "Woodbury Wildlife Area Natural Bridge mini-karst in Coshocton County, Ohio" (*Pholeos*, 8[2], 1988).]

We all have hobbies. One of mine at the moment is tracking down Ohio's natural bridges, arches, and pillars. Although started as a personal endeavor, it has since been given quasi-official status through the Ohio Geological Survey. Such high-powered interest has given a boost to my efforts.

The major question in such a study is, how many natural bridges does Ohio have? The answer is truly scientific: it depends on how you define "natural bridge." Terminology in this field is still fluid. The trend appears to be to call arches spanning a valley of erosion "natural bridges" and all other archlike forms simply "arches." This can be misleading, however, since not all such "natural bridges" have the tabular, architectural appearance expected of bridges. My own preference at the moment is to call everything arches and be done with it.

Size is also important. There are thousands of holes piercing Ohio's bedrock. To be considered for my list, an arch must be large enough (as someone once suggested to me) to "squeeze a graduate student through."

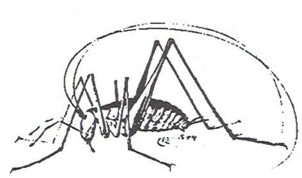
So, having made that proper scientific digression, we return to the question: Just how many of them are in Ohio? Counting only those arches carved out of bedrock (thus eliminating gravity arches formed by rock movement which are found by the dozens wherever the terrain is appropriate) we now know of 42.

I emphasize "now" because these things are popping up like mushrooms. Continuing searches of the files of the Geological Survey and the Division of Natural Areas and Preserves are regularly bringing new records to light. Field staff are stumbling across them with surprising frequency. Evidently these features are more common in our landscape than anyone realized.

From number, interest moves on to size. The largest natural bridge in Ohio is Rockbridge in Hocking County which measured 95 feet long. (In spite of the pleas of the manager of this state nature preserve, I could not get another 5 feet out of it.) Most of our natural bridges are less than half as long. But what they lack in size they more than make up in interest.

Most of our bridges are the result of a crevice parallel to a cliff face being widened by weathering. The crevice eventually breaks into a recess carved into the cliff by a waterfall or spring. The ledge of rock left behind becomes a natural bridge. There are many variations on this theme, however. In one bridge, the roof of the recess was broken by a large pothole rather than by a crevice. Two bridges in northeastern Ohio were formed by the enlarging of a crevice leading out of sheer-sided "gulfs" 15 feet deep, the presence of which is something of a mystery. A cluster of three arches in Scioto County appears to be a result of an attack on sandstone by atmospheric water, no running water being associated with it. Most of the arches found in Highland and Adams Counties seem to be the remains of solution caves. Here, too, is found one of Ohio's more impressive arches—actually a tunnel 77 feet long and 49 feet high cut through a ridge of dolomite.

Such naked facts reveal little of the adventure in this study which has led me into some of the wildest terrain in Ohio. Nor have we talked about the pillars and "tea-tables" being catalogued at the same time. But that will be another article. Or you can wait for the book.



JOHN BRYAN CAVE, GREENE COUNTY, OHIO

by Warren Phillips Luther, NSS 2438

Hikers on the main trails in John Bryan State Park, Greene County, Ohio, often pass very near one of the Park's more spectacular features without ever suspecting its existence. By parking in the Lower Picnic Area, descending to the Little Miami River behind the shelter house, walking upstream to the footbridge and crossing it, one arrives on the south bank; by continuing upstream (now on the opposite side of the river) to a plank bridge over a small stream, usually a mere trickle, one may feel a draught of cold air coming down this rather steep hollow. Two narrow trails ascend this hollow on either side of the stream; after a few feet of climbing, a very large cave entrance looms into view in the cliff face above (see illustration). Jagged blocks of dolomite nearly close the cave's mouth, suggesting that it has partly collapsed; the interior is today no more than a deep recess-type cave with any continuation sealed off by a massive wall of travertine or flowstone. Under the sloping roof one may observe what are likely stumps of former stalactites.

John Bryan Cave (so named by the present writer in honor of the former owner who deeded much of this land to the State of Ohio) is formed in the Cedarville Dolomite of Silurian age. This resistant carbonate maintains the relatively flat plateau above the gorge, and is responsible for the sheer cliffs upstream from Clifton Gorge throughout the State Park, and in Glen Helen as well. These three units of the Little Miami Gorge, each under different kinds of management, contain many interesting geological features; in this writer's estimation, the three most spectacular ones are Clifton Gorge itself, the cascades of Birch Creek in Glen Helen, and the cave now being described. Beneath the

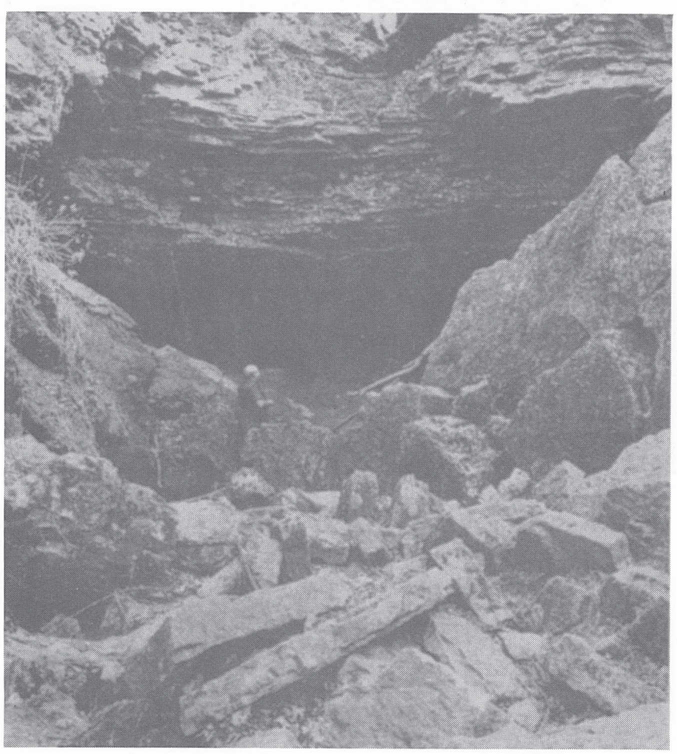


photo by William McCuddy
(Springfield Sun, Jan. 31, 1979 — by permission of Springfield News-Sun)

Cedarville Dolomite is a series of softer calcareous shales and thin carbonates that erode quickly, giving the downstream portions of the gorge their gentler contours; the Brassfield Limestone is visible beneath these shales and forms an "inner gorge" along the lower stretches of the river in Bryan Park. It is the stratum that forms the short rapids visible from the plank bridge below John Bryan Cave. Numerous springs issue from the base of the Cedarville, some from tight solution tubes, and have built up a massive deposit of travertine or calcareous tufa along the gorge slopes. The many rivulets seen flowing down these travertine slopes all come from springs in the cave's vicinity. No doubt the sapping action of a spring or series of springs has played a rôle in the formation of John Bryan Cave; solution of the dolomite is also a certainty. Above the cave an intermittent stream reaches bedrock as it cuts through the thin veneer of glacial drift, forming a waterfall in front of the cave; some of this water might sink into joint planes above the cave to enter passages either too small to admit humans, or that are effectively sealed off by travertine along the cave's rear wall. A little of this water drips continuously from the cave's roof.

In general appearance the cave resembles many other recess-type caves, including those formed in sandstone, found at the upper end of a ravine or hollow. When flowing water is present in these hollows some of it falls over the cave's mouth but the depth and configurations of the cave often suggest that falling water cannot be responsible solely for carving it. Rather it is erosion by ground water from the cave's interior or, if it is a limestone cave, solution from within. In any case, these shallow caves are enlarged further by collapse of weakened ceiling strata and ultimately destroyed by the same process.

John Bryan State Park is on the so-called Niagara Escarpment which surrounds the Cincinnati region; carbonates of Silurian age hold up a plateau rising a few hundred feet above an Ordovician drainage basin into which the Little Miami River flows. Many streams cut gorges into the Cedarville Dolomite and the Brassfield Limestone whenever they cross the escarpment, but considering the amount of carbonate bedrock exposed, caves are rare indeed. Recess caves (like John Bryan Cave) and solution tubes seem to cluster in certain areas, usually where springs are abundant or where tributary streams enter the gorges abruptly from the higher plateau level. Solution tubes are associated with John Bryan Cave, as a short hike on either side of its entrance will prove.

So many small caves in Ohio seem to have had a rather complicated history in which various and perhaps unrelated processes have played a part. Are the enormous blocks of Cedarville Dolomite leaning against the cave's entrance, and littering the creek bed immediately below, part of the roof of a formerly much deeper cave, or are they the remains of a natural bridge? Did the cave begin as a solution tube fed by groundwater, or as a bedding-plane conduit for water sinking into joints from the creek above? Or is it simply a water-carved erosional feature, with additional enlargement from surface weathering and solution? Is the cave now only a shallow remnant of a once larger and longer cave, or is it perhaps a cave yet in its formative phase? Whatever it is, it certainly is an impressive sight—an enigma deserving further study.

V. CAVES IN THE NEWS

ARTICLE REVIEW

by Warren Phillips Luther, NSS 2438

"Dark Passage," by Robert Zimmerman, in *The Sciences*, 30:14, July-August 1990.

While some of the outdoorsy ecology magazines have been printing articles recently on New Mexico's Lechuguilla Cave (two of which are reviewed in this issue of *Pholeos* and in the previous one), Robert Zimmerman has written on the science and sport of speleology—with New York's McFail's Cave as the *mise-en-scène*—for the distinguished journal of the New York Academy of Sciences. Zimmerman, currently vice-chairman of the Met Grotto of the N.S.S., stresses continually that speleology, the *sine qua non* of interdisciplinary science, draws into its lure even those whose professions might not be in science but who share a passion for caves and contribute greatly to our knowledge of caves and their contents. In this reviewer's estimation, it is the only science in which someone without credentials can be taken seriously for serious research in caves and gain the respect of degreed professionals in (for example) geology. Furthermore, Zimmerman does not fail to suggest that what might attract people to caves in the first place is not necessarily science but sport, adventure, and pleasure—to which this reviewer adds aesthetics and perhaps a need for solitude in a wholly alien environment...

Since Zimmerman is a New Yorker writing for a journal based in New York, it does seem appropriate that he chose McFail's Cave, which entered the "Long Caves List" in the 1960s by a startling discovery, that is, approximately four and a half miles of new passage in a previously known cave already long by northeastern U.S. standards at several thousand feet. In this area, the Helderberg Plateau west of Albany, a great thickness of Devonian limestones occurs but many of the caves were annoyingly short. Considering the size and depth of nearby Howe Caverns, Knox Cave, and a few others, it was only a matter of time, and of careful field work, that the potential for large integrated cave systems would become evident. Caves in the Helderberg Plateau tend to be developed in straight and very long fractures, which may be faults; joints in the limestone have been opened by solution with the former presence of glacial ice and meltwater no doubt playing an important rôle in the caves' formation. Zimmerman cites John E. Mylroie's hydrological study (published in 1977) of the McFail's Cave vicinity, in which the latter author asserted that the known caves are segmented parts of a very much larger system, and that underground water also flows between caves in adjacent fractures downdip along bedding planes. It remains to be seen, of course, if human beings can eventually pass through some of these water conduits to connect caves that, at least in theory (and with sufficient evidence), are interconnected. Mylroie believes the entire system, including Howe and Secret Caverns, McFail's, and other caves, was once 17 miles long—a formidable mileage in a region with an apparently youthful karst. Lester Howe, the discoverer and developer of Howe Caverns in 1842, turned his newly-cultivated passion for caves into shrewd geological speculation; he assumed that now-disjunct caves aligned along one prominent fracture or joint plane point the way towards other caves in the same fracture—a "Finger of Geology," as he called it, the "finger" in this case being the discreetly insinuating shape of the map of Howe Caverns.

Zimmerman brings up the importance of research and reasoned deduction in prospecting for new caves, meaning, on its basic level, knowledge of the terrain, its stratigraphy, and its drainage patterns. Moreover, he stresses the importance of subsurface hydrological research for the sake of proper land-use above ground; in this case, referring to the local karst conditions, to avoid building dams that are doomed to fail to hold water, and to ascertain the movement of groundwater by dye-tracing. Zimmerman curiously passes up the obvious conclusion regarding a greater problem in karst areas (or anywhere, for that matter), the seemingly innocent or sometimes irresponsible disposal of wastes which often sink into local or regional groundwater supplies to contaminate rivers, lakes, and drinking water—a problem that karst hydrologists can locate, if not help solve.

For more detailed information on the geology and history of speleology in the Helderberg Plateau of New York, the following volumes and articles offer lively reading:

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ARTICLE REVIEW

by Phil Mumford, NSS 313

"In beauty it is finished: Of man and caves and the lure of Lechuguilla," by Bill Donahue in *Buzzworm: The Environmental Journal*, March-April 1990, pp. 34-39.

Lechuguilla Cave contains the longest gypsum speleothems of any cave now known. The thin, pale white, hairlike strands hang from the ceiling and can attain lengths of up to 30 feet. While the gypsum strands are spectacular, they are also very fragile. Gypsum has a hardness of 2 on Moh's scale, softer than fingernails; the hanging strands are so delicate that they sway in the heat wave created by the person standing next to them. The gypsum is a secondary product of the cave's formation: while most caves are the result of the solution of limestone by acidic waters, caves in certain parts of the American Southwest, notably in western Texas and New Mexico, were formed mainly by hydrogen sulfide gas leaking upwards from deep oil and gas pools, then mixing with oxygen to produce sulfuric acid. The acid dissolves the limestone, forming gypsum as a precipitate. Lechuguilla also contains cave pearls and large chambers floored with chunks of gypsum. A microscopic fungus, Aspergillus, is trapped in the cave walls and, like a living fossil, is still growing.

Lechuguilla Cave lies within the borders of Carlsbad Caverns National Park in the Guadalupe Escarpment of New Mexico. A group of cavers led by Rick Bridges found the cave in May 1986 by prying through a pile of rubble which previously limited the cave to a 90-foot entrance pit. Lechuguilla now ranks as the nation's second deepest cave at 1,510 feet* with 43 miles of surveyed passages. While the cave is now enjoying a wilderness designation (making it immune to commercial development) there is the possibility of litigation by other parties to change this status. The residents of nearby Carlsbad would like to cash in on the potential tourist trade generated by a spectacular new attraction like Lechuguilla if it could be opened to the public.

Lechuguilla Cave is poorly suited for animal habitation. The cave's entrance is located in an arid, sparsely-vegetated area. There are no streams flowing in or into the cave which would supply organic food necessary to sustain cave fauna. Only a few arthropods are able to survive in Lechuguilla. At the base of the entrance pit spiders, ticks, and a few other species may be found. Farther in, only cave crickets and two troglobitic insects can exist—diplurans and rhadine beetles which subsist on cricket eggs and young crickets. Even in this impoverished ecosystem the inhabitants have made adaptations to insure survival; the cave crickets, for example, have an extremely long ovipositor or egg-laying tube so their eggs may be deposited deep enough to prevent beetles from eating them. Lechuguilla has no bats because of the rubble pile which kept its interior closed off for so many years.

David Jagnow is a prominent figure in the preservation of Lechuguilla Cave as a natural environment. He coordinated and oversaw the research conducted at the cave and served as the science chairman for the Lechuguilla Cave Project (LCP) from June 1988 until December 1989. He argues that commercialization of the cave could destroy much of its beauty. The LCP is laboring to find out just how vulnerable the cave's biota and formations are. In October 1989 Jagnow and eighteen other scientists spent 52 hours in the cave analyzing the atmospheric conditions to establish "baseline" data while the cave is still relatively unaltered; the cave's temperature is about 68 degrees F. with a relative humidity of 95 percent. The results of the research are intended to help avoid mistakes made in other caves and to preserve as much of the cave's original beauty as possible.

The lure of Lechuguilla Cave's wonders is great. Whether or not the cave is opened to the public or restricted to research personnel, exploration will continue; however, a small part of its unique fragile beauty will be lost with each visit —even by those attentive to all the ethics of caving. Adventurers in Lechuguilla have unwittingly broken gypsum hairs and have scraped off splinters of clear aragonite from the walls, and, merely by hiking through the cave, have compacted gypsum on the floor. To preserve this spectacular cave for as long as possible, explorers of Lechuguilla Cave must follow the National Speleological Society's motto: "Take nothing but pictures; leave nothing but footprints; kill nothing but time."

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*We have just learned that Lechuguilla Cave is now the deepest cave in the U.S.

"5BDRMS, 5BA, BMBPRF, NDS TLC"

If you're the sort who likes to sleep hanging by your feet in a darkened closet, you might consider contacting an agent in Parthenon, Arkansas, to ask if the Peterson place is up for sale. H. I. Peterson paid $2.6 million for a cave in the Ozark Mountains in August 1988 and spent another $500,000 renovating it.

He did a dandy job, too, adding five bedrooms and five baths, with gold-plated fixtures, to the 10,000-square-foot cave. A helicopter pad awaits you outside, as does a Jacuzzi and a manmade pond.

Unfortunately, the roof leaks, raising the spectre of unsightly stalactitesin the lavishly appointed cave dwelling. In addition, it's damp, musty, and cold. That's great if you want to grow mushrooms, but not if you want to rent it out to the rich and famous, as Peterson did.

Prospective buyers needn't worry about property taxes. Last year, the home was assessed at $1.7 million. This year, the assessed value could sink as low as $150,000 according to the people in the state taxation department, who think the cave dwelling is better suited for bats. As for Peterson, he's suing the seller, John Hay of Boulder, Colorado, for $13.7 million.

—reprinted from *Investment Vision*, July-August 1990, p. 4, 6.

CAVES OF GOLD!!! OR TREASURE!!! READ THESE BOOKS TO FIND THEM!

(A GOLD OR TREASURE CAVES BIBLIOGRAPHY)

Compiled by Robert W. Klapthor

The following bibliography was produced utilizing the EPIC Online Reference Service of OCLC, the world's largest bibliographic database containing over 21 MILLION bibliographic records. This subject bibliography search the OCLC database using the terms CAVE or CAVES or CAVERNE or CAVERNES intersected with GOLD or TREASURE. Books indexed by these terms (either as subject terms or title words) are contained in the list. As you can see in the edited list most of these books are fiction, but that's all right because this was done just for fun while I was at a workshop experimenting with their system. So read and enjoy them; maybe you'll unearth some treasure yourself.

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[EDITOR'S NOTE: For additional reading on this fascinating subject, the books listed below contain much information on buried treasure in caves—something that is not apparent from their titles.

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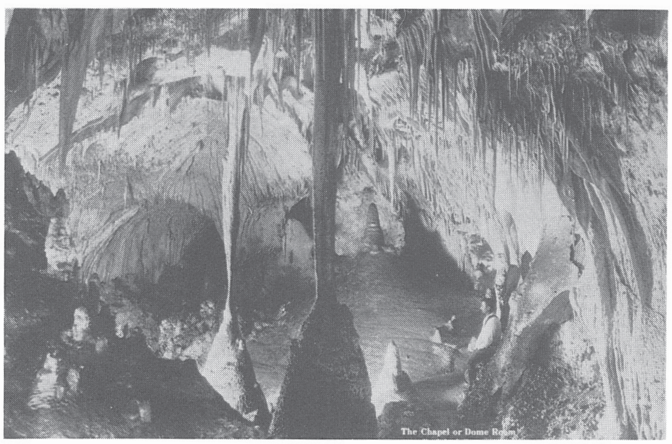
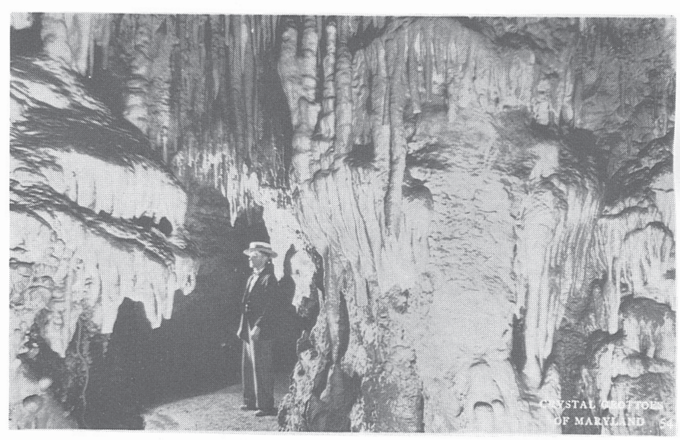


The Chapel or Dome Room, Carlsbad Caverns, Carlsbad, N.M.


Wonderful "Echo River", Mammoth Cave. Kentucky

Reception Hall Mark Twain Cave, Hannibal, Mo.



Crystal Grottoes, Maryland

VI. POETRY

MAJESTIC SPLENDOR

by S. Allen Kronk

Down in the bowels of the earth below
Is a majestic splendor that few behold.
And to the few who come and seek
Down in uncanny worlds beneath
Is allowed a memorable glance
Of this beauty as frail as glass
To emerge from this view
Enchanted and captivated anew.

You will see and come to love
This beauty well matched to that above
And long to return
To behold this vast urn
Of majestic splendor contained underearth.

[EDITOR'S NOTE: Stevie Kronk, or S. Allen Kronk as he now prefers to call himself, is no stranger to these pages. He is now sixteen years old; in spite of his youth he has tackled some of the wildest caves in this part of the world, and has come out as the person in this poem—enchanted and captivated.]

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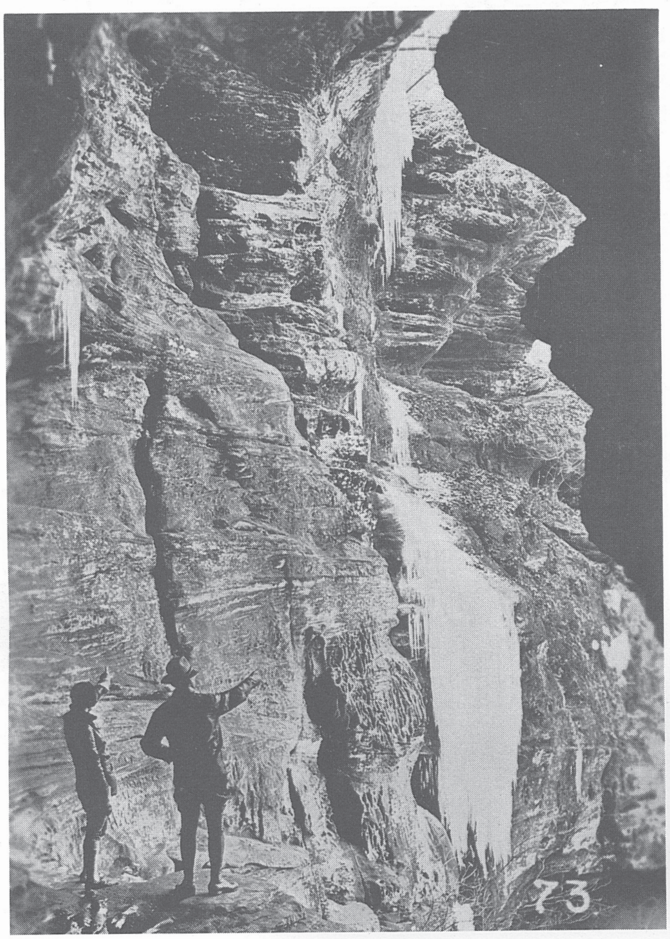
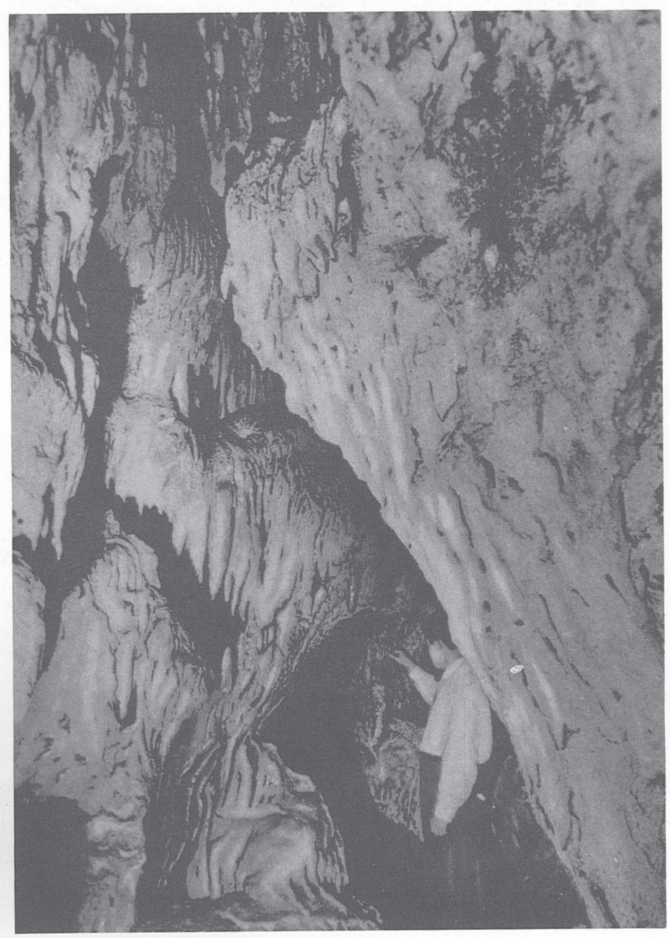
FROM OUR ARCHIVES, *Cont.*



View from rear opening. Rock House, Ohio



McKimie Cave, The 7 Caves, Ohio

A TRIP TO SLOAN VALLEY

by Dan Alsmeyer

In the middle of January,
of nineteen-nine-oh,
a place called Sloan Valley
was where I would go.

Alan and Keith
had gathered our stuff;
I certainly had hoped
we had packed enough.

Our trip started off
through Cincy on down,
from Lexington on,
'til we reached the right town.

We continued our journey
'til passing that bridge;
then one point eight miles,
when we'd just crossed a ridge.

A short gravel road
was there on the right,
and soon to the barn,
which was home for the night.

We arrived just in time
to the campfire so warm;
the soft glowing light
had lost none of its charm.

The members of W.U.S.S.
enjoyed the night air;
there's Monika (our President),
Scott. Rachel, and Claire.

And Jonathan was back
from his African trip;
the tales he did tell
kept us all in their grip.

The beginners were ready,
both Michael and Jill,
to learn about caving,
the beauty and thrill.

So, off to our knapsacks
to have a night's snooze;
indeed for this cave
no time could we lose.

The morning broke soon
to the pattering of rain,
definitely enough
for us all to complain.

The grounds were all wet,
the campfire quite damp;
thankful were we
for the barn as our camp.

Awake we soon were,
for much was in store:
breakfast to cook,
and some other small chore.

Gather up all our gear,
and off we all went;
"Scowling Tom" was the entrance—
wasn't sure what that meant!

As these things do go,
I would soon figure out;
the cause that gave Tom
a reason to pout.

The entrance was low,
and we turned to the right;
onward we crawled
past the rays of daylight.

We were covered with mud
when we reached a conclusion;
the right we had taken
must've been an illusion.

Our leader, dear Scott,
took a compass out then;
soon followed the map,
and I started to grin.

Lost in the mud
was no way to start,
but back we all went
with the aid of that chart.

Soon back on our way
an image was burned
of the name of that portal,
and how it was earned.

The mud was real sloppy,
I began to complain;
Scott simply led on,
to my personal disdain.

The gravel we passed
was painful at first,
but crawling through it
soon only got worse.

The stones became larger,
and our hands were real sore;
seemed lucky for us
that there wasn't much more.

To "Grand Central Station"
to see if we might
a new passage to find,
on back to the light.

Our leader he knew
just right where we were;
he turned us all 'round
and continued the tour.

Through a crossing of paths
we continued our way;
this journey, it seemed,
had become quite a stay.

For those that were tired
just a wee little bit,
we found them an exit
they called "Garbage Pit."

The others, we stayed,
to explore the cave more;
little did I know
of the goodies in store.

The halls became larger,
the walk was relaxing;
I pondered and thought
of the rooms we were passing.

Soon, up on a ledge,
oh my, what a sight!!
The flame from my lantern
wouldn't put out enough light.

I stood on a ledge
to a room that was large,
that must have taken years
for Mother Nature to forge.

I took out a flashlight
to see just how far:
'twas a room big enough
to palace a czar.

We all sat and gawked;
oh my, what a treat!
The ceiling, we guessed,
must have been eighty feet.

Onward we went
down the "Appalachian Trail,"
an underground wonder
of valley and dale.

The hall was real huge,
and we paused for a bit,
'til tired as we were,
we decided to sit.

We all found a spot
to rest for a while,
doused our bright lights,
and I started to smile.

The darkness was full,
the silence complete;
only at times
did we utter a peep.

We sat and we pondered
the awe of this cave,
the power and glory
to all that it gave.

We sat a short while;
how long did it last?
By chance I had noted
fifteen minutes'd passed.

We gathered our stuff
and continued on back;
this cave was enormous,
not much did it lack.

We found our way back
to the exit, we did;
the pit by the greenhouse
was where it was hid.

We rested that night
and recalled our own story,
of knowing Sloan Valley
in all of her glory.

Luray Cavern, Page County, Virginia

View from Cave Hill

The Saracen's Tent

The Cathedral (Giant's Hall)