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Bulletin Number Five

National Speleological Society

Caves in World History

(with an Index and Bibliography)

. . . *By* ROBERT MORGAN*

CAVES have always played an important part in the life of man. In fact, men used caves for habitation and for storing purposes before the beginning of recorded history. During the thousands of years from the arrival of the first men up to the present time these rock shelters and grottoes, in addition to serving as homes and refuges from storm and cold, have been used as burial places, religious shrines and churches, art galleries and museums and, more recently, as places for sightseeing. In times of war, caves have also been used extensively for the mining of saltpeter, used in the manufacture of gunpowder; and, now, in countries on a score of warfronts, they have become natural air-raid shelters.

Man's interest in caverns and underground exploration is shown by the frequent use of caves in literature and in stories of romance and adventure.

To show further the extent of interest in the beauty and romance of the "underworld," one need only consult the travel books on the shelves of any public library to find that one out of every two or three such books will make some reference to caves or grottoes.

Caves are very important to the archæologist and ethnologist, since they provide one of the most fertile fields for the discovery of prehistoric remains.

Just as caves provided a shelter for the ancient man himself thousands of years ago, they have provided a shelter for his remains and tools in the intervening thousands of years. Thus the explorer of today can reconstruct the life of the ancient people and has been able gradually to extend man's history to earlier periods. In most cases the best preserved bones, tools, paintings, and other relics of earlier times are found in caves or rock-shelters.

The importance given to such finds is illustrated by the excellent book written by Mr. G. Fowke, describing in detail the results of the exploration of well over 100 caves in Missouri, Alabama, Tennessee, Illinois, and Indiana. Mr. T. L. Bailey has made similar investigations in the State of Tennessee.

Where the question of authenticity of remains has been questioned, they can often be definitely dated and authenticated by the amount and type of stalagmitic deposit which has covered them. For these reasons, several important archæological expeditions to the Southwest and to Central America have specialized on the exploration and study of caves, some even concentrating on one or two specific caves.

The people who inhabit underground homes are referred to as troglodytes. This term applies not only to the popular cave man of Europe, but also to the cliff dwellers of the southwestern United States and to the people of Asia in Turkestan, India, and China, who lived in vast underground cities often of several thousand population.

Even today we find the descendants of these people living in homes scooped out of the mud and loess. Some natural caves in limestone, sandstone, and hard rock have been enlarged artificially to meet the requirements of an increasing civilization. According to Ella K. Maillart in her book *Forbidden Journey*, thousands of China's peasants not only live on the good earth but also live in it.

Modern troglodytes are found in the southwestern United States, the Elgen Mountains of Kenya and Uganda in Africa, Bukhara and Turkestan in Siberia, and in China.

The oldest-known human remains are those found in a cave near Cro-Magnon in France. The oldest known remains of a white person were found at Neanderthal in Germany. Hence, the Neanderthal man is generally assumed to be our oldest ancestor.

Bones and stone implements were also found at Aurignac and La Madelein from which the names Aurignacian man and Magdalenian man have been taken. As pointed out by Broca, the remains found at these places though close together, were of widely separated periods and represent people living in different cultural environments.

It is possibly true that art was developed in pre-historic cave-dwellings, since paintings are found on the walls of many caves throughout the world. In them, too, have been found sculptured figures and carved bones.

According to Casteret there are 60 caves, presumably all in Europe, in which paintings are found. If we are to include the carvings and paintings of Indians and aborigines found in other parts of the world, this figure is much too low. Casteret also states that only two

*A vast amount of labor went into the compilation of this article, and the editors wish to extend particular appreciation here for the N. S. S. to Mr. Morgan for his excellent job.

caves—those at Tuc d'Audoubert and Montespan—are known in which large, sculptured figures are to be found. These are profusely illustrated in his book, *Ten Years Under the Earth,* and in an article, "Discovering the Oldest Statues in the World," appearing in the *National Geographic Magazine,* for August 1924.

An exhaustive study of cave paintings has been made by G. Baldwin Brown in his book, *The Art of the Cave Dweller,* which is illustrated with many photographs, sketches, and maps.

As pointed out by Mr. Brown, the paintings are of varying degrees of perfection. Some of the drawings may be compared to those of a school child, while others may be accorded equal honors with our more modern masterpieces.

This ancient art has been classified by students into two definite periods. The oldest is that of the Aurignacians and is the crudest of all. These paintings over a long period of years gradually showed improvement. It was not until the Magdalenian period, however, that the drawings and paintings approached perfection.

Probably the most famous of these decorated caves is that of Altamira in Spain where very good representations of bulls were discovered.

There appears to be some disagreement among authorities as to the purpose of these paintings and drawings. A large portion, however, depicted contemporary animals with terrible wounds and with arrows sticking in their sides. Some authorities hold that these paintings were made to cast a spell over the particular animal so that it might be more easily caught by the tribal hunters. The scarcity of human figures is thought to be related to the potency of the spell and the reluctance of the tribesman to endanger their fellow men.

Another type of decoration on the cavern walls of Europe is the illustration of human hands in various stages of disfigurement. Casteret shows instances of these hand prints, and suggests that they were records of sacrifices made to the deities worshiped by this particular group.

It is known that similar sacrifices of fingers have been made in other parts of the world. One is reminded here of the famous Sacred Well of Chichen Itza in Yucatan, originally explored by Thompson, and about which much has been written by such popular authors as Richard Halliburton and Mrs. Ann Morris.

The decorated stones of the Mas d'Azil cave in France are considered by many to be of greatest importance in discovering the height of the civilization of the Magdalenians. Some writers believe that these pebbles, which were found in great numbers, were once used as money. However, the discovery of the same designs painted on the wall of one of the large caves leads us to suppose that the designs might be letters or numerals of an ancient alphabetical system. The cave might have been one of the world's first schoolrooms!

In all parts of the world, caves have been used as burial places by ancient people. It appears that most of the skeletons, mummies, and well-preserved human bones found in the famous European caves, such as the Grimaldi caves of northwestern Italy, were carefully and purposely placed in the positions in which they were found.

In many instances the personal belongings of the deceased were placed in the cave or tomb so that they could be used in the after-world. This practice was especially prevalent in Mexico and Central America. Such objects as vases and urns which have been recovered by the modern grave-robbers, are invariably mutilated. In this way the belongings of the dead were "killed" so that they, too, could go to the great beyond.

The modern practice of burying the dead in the ground has doubtless evolved from the early cave burials.

Carvings and paintings in varying stages of perfection have been found in caves in many other places in the world, from the West Indian Islands to the mountains of Persia. The Persian carvings, which have been translated and carefully studied, are of unusual interest. They are comparable to those at Mt. Rushmore and Stone Mountain in the United States in that they were apparently made for the purpose of perpetuating the memory of certain people and historical records for a far future. The inscriptions are carved both on the face of cliffs and in caves, and commemorate the reign of King Darius. These carvings, together with their contemporary history, are discussed in *A Doctor's Holiday in Iran,* by Rosalie S. Morton, and *The Pageant of Persia,* by Henry Filmer.

In addition to the apparent use of certain European caves by their ancient inhabitants as places for religious ceremonies, similar extensive use has been made of caves in other parts of the world, even in modern times. Probably the best known religious shrine of this type is The Grotto of the Nativity in Bethlethem. The Grotto of Bom Jesus Da Lapa in Bahia, Brazil, is another instance.

The present war has brought forth still other than civilian protection uses for caves. Since they present the most practical protection from the airplane, National archives, art treasures, and war materials are stored in them.

Many lengthy articles have been written on the formation of these caves which have served humanity so variously for so many years. It is generally agreed, however, that limestone caves are formed by solution, through a combination of processes in which water

enlarges faults and cracks in the limestone. Some foreign matter, clay deposits for example, may be washed out, and the underlying limestone dissolved by water seeping through vegetable matter on the surface. Carbonic acids are formed which act chemically upon the limestone and cause solution. To some extent, also, the cavities are enlarged by corrasion. This, of course, is the simplest form of stating the theories of the development of limestone caves. Other types of caves are formed by wave action and by certain conditions of lava cooling. These, and many other problems, such as the uplifting and subsidence of limestone and its effect on caves, are discussed at length by such authorities as Bretz, Davis, and Swinnerton. Some "questions" about caves will never find answer.

★

Partial Index to All the Known Caves of the World*

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UNITED STATES

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*This index supercedes all similar cave lists carried in the *Bulletin*.
†Numbers refer to references in *Cave Bibliography*, p. 13.

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W. M. Davis in "The Origin of Limestone Caverns" states "little ornamented caverns are known in moderate numbers." He also states that caverns and sinks caused a drop in the level of Florida but if this land is ever raised again cavities will be drained, leaving many caves.

Other authors continually mention caves existing in Florida. The cave at the Florida Caverns State Park near Marianna, however, is the only specific cave I have found of record.

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Bucher	Pulaski Co.	88
Campground	Pulaski Co.	88
Cathedral	Crawford Co.	172
Clemmens Creek	Pulaski Co.	88
Cliff	St. Louis	172
Cold Water Creek	Fredericktown	172
Crystal	Joplin	99
Crystal Caverns	Cassville	171
Daerhoff	Miller Co.	88
Davis Caves (3)	Pulaski Co.	88
Day's		172
Devils Ice Box	Iron Co.	172
Double	Pulaski Co.	88
Dry Creek	Pulaski Co.	88
Fairy	Stone Co.	99
Fisher	Franklin	103
Fossil	Camden Co.	88
Gentry	Stone Co.	99

MISSOURI—Continued. Name of Cave	County or Nearest Town	Bibliographical Ref. No.
Goat Bluff	Phelps Co.	88
Gourd Creek	Rolla District, Phelps Co.	88
Graham	Pulaski Co.	88
Grandgulf Caves	Oregon Co.	99
Green's	Crawford Co.	103
Greer	Oregon Co.	99
Guthoerl	Dent Co.	88
Hurricane Bluff	Maries Co.	88
Indian Ford	Maries Co.	88
Jam Up	Shannon	99
Jewel	Humphreys Co.	103
Jones	Phelps Co.	88
Juggenmeyer	Miller Co.	88
Kerr	Pulaski Co.	88
Klingler's	Miller Co.	99
Lackaye's Bluff	Marries Co.	88
Lane's	Pulaski Co.	88
Luckenhoff	Miller Co.	88
Mammoth	Dent Co.	88
Marble	Stone Co.	99
Mark Twains	Hannibal	107
Marsh	Phelps Co.	88
Marvel	Branson, Stone Co.	172
Maxey	Pulaski Co.	88
Meramec Highland Quarry	St. Louis Co.	103
Miller	Pulaski Co.	88
Mix	Pulaski Co.	88
Money	Dent Co.	88
McWilliams	Pulaski Co.	88
Natural Bridge	Cole Co.	88
Onondaga	Crawford Co.	103
Onyx	Phelps	88
Phelps	Phelps Co.	88
Phillip's	Pulaski Co.	88
Pillman's (Spring Creek)	Pulaski Co.	88
Pine Run Caves	Stone Co.	99
Polar Bear	McDonald Co.	172
Pool Hollow	Phelps Co.	88
Portland	Portland	99
Powell	Stone Co.	99
Railroad	Pulaski Co.	88
Ramsey's	Pulaski Co.	88
Renaud Cave	Phelps Co.	88
Rice's	Jefferson Co.	103
Richland	Pulaski Co.	88
Riddle	Pulaski Co.	88
Riden's	Pulaski Co.	88
River	Osage Co.	172
Rockhouse		80
Rollins (2)	Pulaski Co.	88
Roubidoux	Pulaski Co.	88
Round Spring	Near Round Spring State Pk.	107
St. James Tunnel	Phelps Co.	99
Saltpeter	Dent Co.	88
Saltpeter	Oregon Co.	99
Saltpeter	Pulaski Co.	88
Saltpeter	Texas Co.	88
Sell	Pulaski Co.	88
Short Bend	Dent Co.	88
Smith Caves (3)	Texas Co.	88
Speerg	Morgan Co.	88
Spring	Oregon Co.	99
Stark's	Miller Co.	88
Stratman	Maries Co.	88
Stark's	Miller Co.	99
Steuffer	Osage Co.	88
Sugar Tree Hollow	Stone Co.	99
Tavern Creek	Miller Co.	88
Tick Creek	Phelps Co.	88
Truitt's	Lanagan	107
Tunnel	Pulaski Co.	88
Tunback	Near Marionville	80
Watson Caves (Twin or Onyx) (2)	Dent Co.	88
Welch's	Shannon Co.	88
Wild-Hog	Phelps Co.	88
Wilson's	Miller Co.	88
Wilson	Sarcoxie Co.	80
Woodland Hollow	Pulaski Co.	88
Wright	Miller Co.	88
Yancey Mills	Phelps Co.	
Yoark	Pulaski Co.	88
Montana		
Chasm in the Snowies (ice caves)	Judith Gap	172
Chestnut	Bozeman	172
Ghost	Crow Indian Agency	99
Inscription	Crow Indian Agency	99
Lick Creek	Monarch	172
Morrison (Lewis & Clark)	Butte (Whitehall [P. O.] and Three Forks)	170
Ramshorn	White Sulphur Springs	172
Shell Creek	Enis	172
Spring Hill	Bozeman	172
Woodwards	Near Lahood Park	172
Nevada		
Gypsum	Las Vegas	126
Lava	Pyramid Lake	99
Lehman Caves	Baker, White Pines Co.	171
Northumberland		171
Paiute		99
Smith Creek		172
New Hampshire		
Center of the Earth	Kinsman Notch	104
Judgment Hall of Pluto	Kinsman Notch	104
Cave of Lost Souls	Kinsman Notch	104
Cave of Shades	Kinsman Notch	104
Shadow	Kinsman Notch	104
Smuggler's	Kinsman Notch	104
Rumney	Plymouth	171
Polar	North Woodstock	171
New Jersey		
There are 9 Indian rock shelters reported by Henderson.		99
New Mexico		
Over 100 caves in Carlsbad area according to Thos. Boles, Supt. of Carlsbad Park. This statement published in the *White City News*.		
Burnet	Carlsbad	35
Carlsbad Cavern	Carlsbad	99
Conklin	Organ Mts.	99
Davis	Near Sandia Cave	101
Deep Cave	Carlsbad	172
Ellis Ranch	Los Huertos	101
Guano	Near Sandia Cave	101
Isleta		101
Manzano Caves		101
Sandia		101
Shelter	Organ Mts.	99
Sitting Bull Falls	Queen	99
Supai Falls		172
New York		
Ball's	Schoharie Co.	170
Bentley's Cavern	Berlin	172
Howe Caverns	Cobleskill	72
Jamesville Lake Caves	Jamesville Lake	29
Knox	Altamount	171
North Carolina		
Bat	Chimney Rock	169
Boone's	Davidson Co.	169
Lake Lure Caves	Hendersonville	169
Linnville Caverns	Linnville	169
Moonshiners	Chimney Rock	169
Refrigerator	Rumbling Bald Mt.	169
Rumbling Bald Caves	Rumbling Bald Mt.	169
Ohio		
Ash Caves		143
Bear	Highland Co.	99

OHIO—Continued. Name of Cave	County or Nearest Town	Bibliographical Ref. No.
Blue Hole	Castalia	
Brewery	South Pass Is. Put-In-Bay	99
Buckskin	Ross Co.	99
Buzzard's Glory	Highland Co.	99
Canters	Jackson	143
Cave in Rock		171
Coon	Highland Co.	99
Crescent	Highland Co.	99
Crystal	Put-In-Bay	171
Crystal Rock	Erie Co.	165
Dancing	Highland Co.	99
Dry	Highland Co.	99
Ellison	Highland Co.	99
Fox	Highland Co.	99
Good's	Seneca Co.	99
King's Wardrobe	Highland Co.	99
Lawrence	Delaware Co.	99
Mammoth	Put-In-Bay	171
Marble	Highland Co.	99
Mason's		171
Miami River	Shelby Co.	99
Ohio Caverns (Reames Cave)	Liberty	171
Old	Logan Co.	99
Old Man's		143
Painter's Creek	Miami Co.	99
Paradise	South Pass Is. Put-In-Bay	99
Perry	Put-In-Bay	171
Rocky Fork	Highland Co.	99
Seneca Caverns	Bellevue and Tiffin	143
Seven Caves	Bainbridge	171
Smith's	South Pass Is. Put-In-Bay	99
Thompson's	Miami Co.	99
Underground River	Wyandotte Co.	99
Wet	Highland Co.	99
Zane	Liberty	143
Oklahoma		
Alabaster	Woodward	171
Oregon		
Arnold (lava)	Bend	171
Lava River Caves (State Park)	Bend	170
Oregon Caves (Nat'l (Monument)	Grant's Pass	166
Sea Lion Caves	Florence	171
Pennsylvania		
Aitkin	Mifflin Co.	152
Alexander Caverns	Mifflin Co.	152
Allensville	Mifflin Co.	152
Antes Creek	Bald Eagle Park	172
Arch Spring	Blair Co.	152
Baker Caverns	Franklin Co.	152
Bally	Berks Co.	172
Barton	Fayette Co.	152
Bear Cave	Westmoreland Co.	152
Bell (Branch Run)		151
Bethlehem	Northumberland Co.	152
Beverly Hills	Lebanon Co.	152
Blessing Mountain Wells	Lycoming Co.	152
Boden	Perry Co.	152
Boggs Run		151
Boiling Springs Caves	Cumberland Co.	152
Bowmansdale	Cumberland Co.	152
Boyer	Snyder Co.	152
Brownstone	Dauphin Co.	152
Brukerhoff	Centre Co.	152
Butler	Butler	171
Calipso	Northhampton Co.	151
Carnegie	Cumberland Co.	151
Carpenter	Northumberland Co.	152
Casparis	Fayette Co.	152
Castle Rock	Delaware Co.	151
Chicken	Shippensburg, Cumberland Co.	172
Cleversburg Caves	Cumberland Co.	152
Cold Air	Northumberland Co.	152

PENNSYLVANIA—Continued. Name of Cave	County or Nearest Town	Bibliographical Ref. No.
Conondoguinet	Cumberland Co.	152
Conrad Weiser	Berks Co.	152
Craighead	Cumberland Co.	152
Crystal	Berks Co.	152
Dales	Union Co.	152
Dauphin	Dauphin Co.	151
Dean's	Bucks Co.	151
Devil's Hole	Bucks Co.	151
Dietrich	Berks Co.	152
Dougherty	Lycoming Co.	152
Dragon	Berks Co.	152
Dreibelbis	Berks Co.	152
Dries or Six Mile House	Berks Co.	151
Dulany	Fayette Co.	152
Durham	Bucks Co.	152
Eiswert	Lycoming Co.	152
Fleming	Huntington Co.	151
Flood (Stauffer)	Huntington Co.	151
Forney	Cumberland Co.	152
Frankstown	Blair Co.	152
Fry	Center Co.	172
Gable	Lancaster Co.	152
Girty's	Perry Co.	152
Goods	Franklin Co.	152
Goss	Mifflin Co.	172
Greshville	Greshville, Berks Co.	152
Gromiller	Blair Co.	152
Haas	Snyder Co.	152
Hartman	Monroe Co.	152
Hay's	Mifflin Co.	151
Hay's Farm Cave	Mifflin Co.	172
Hineman	Armstrong Co.	152
Hipple	Bedford Co.	152
Historic Indian	Huntingdon Co.	152
Hogo	Berks Co.	152
Hollidaysburg	Blair Co.	152
Huber Coy	Cumberland Co.	172
Hummel	Cumberland Co.	172
Ickesburg Caves	Perry Co.	152
Indian	Northumberland Co.	152
Indian No. 2	Blair Co.	172
Indian Echo	Dauphin Co.	152
Johnson Caves	Mifflin Co.	152
Keyhole	Blair Co.	172
Kooken's	Huntingdon Co.	172
Lemoyne	Cumberland Co.	152
Lewis	Adams Co.	172
Lisburn	York Co.	152
Lincoln Caverns (Wm. Penn)	Huntingdon Co.	152
Logan's	Blair Co.	172
Lost	Northumberland Co.	152
Madisonburg	Centre Co.	152
Mammoth Cave of Pennsylvania	Perry Co.	171
Mapelton	Huntingdon Co.	152
Markel	Juniata Co.	172
Mechanicsburg	Cumberland Co.	152
Merkle	Seyfert-Quier, Berks Co.	152
Milroy	Mifflin Co.	152
Mohrsville	Berks Co.	152
Montello	Berks Co.	152
Morgan	Berks Co.	152
Mt. Dallas	Bedford Co.	152
Mount Joy Caves	Lancaster Co.	152
Moyer	Center Co.	172
Mower	Cumberland Co.	172
Naginey	Mifflin Co.	152
Narehood	Montour Co.	152
Naremore		172
Needy	Franklin Co.	152
New Paris	Bedford Co.	152
Nice Warmer	Franklin Co.	172
Noecker	Berks Co.	152
North York	York Co.	152
Onyx	Berks Co.	152
Parker	Cumberland Co.	172

PENNSYLVANIA—Continued. Name of Cave	County or Nearest Town	Bibliographical Ref. No.
Penn's	Centre Co.	152
Pequea Church Caves	Lancaster Co.	152
Phillips	Berks Co.	152
Pinnacle Caves	Berks Co.	152
Port Kennedy	Montgomery Co.	152
Rebersburg	Centre Co.	152
Redington	Northumberland Co.	152
Reedsville	Mifflin Co.	152
Reese	Franklin Co.	152
Refton	Lancaster Co.	152
Rolly's	Westmoreland Co.	152
Rossman	Centre Co.	152
Rupert	Mifflin Co.	152
Saltpeter	Armstrong Co.	172
Schoefer	Berks	152
Schull	Perry Co.	172
Seawra	Mifflin Co.	152
Shalter Farm	Center Co.	172
Sharps	Cumberland Co.	172
Sharpsburg	Huntingdon Co.	152
Sink Hole	Cumberland Co.	172
Sinking Spring	Berks Co.	152
Slate	Berks Co.	152
South Temple	Berks Co.	152
Stone	Berks Co	172
Strangford	Indiana Co.	152
Stover	Centre Co.	152
Swatera River		172
Taylor	Bedford Co.	172
Taylor	Mifflin Co.	172
Thrush	Dauphin Co.	172
Tippery	Huntingdon Co.	172
Tuckerton	Berks Co.	152
Unmaned No. 1	Adams Co.	172
Unnamed No. 2	Huntingdon Co.	172
Unnamed No. 3	Jefferson Co.	172
Wentz	Perry Co.	172
Veiled Lady	Centre Co.	152
Walnut Bottom	Cumberland Co.	152
West Reading	Berks Co.	152
Wind Cave (Cold)	Lancaster Co.	152
Winfield	Union Co.	152
Wolf	Northhampton Co.	172
Womer	Perry Co.	172
Wonderland Caverns	Bedford Co.	152
Woodward	Centre Co.	152
South Dakota		
Crystal	Elk Canyon	161
Davenport	Sturgis	161
Ice	Galena	161
Jasper	Jewel	161
Jewel	Custer	161
Nameless	Rapid City (9 miles west)	93
Onyx	Wind Cave	161
Rushmore	Hayward	81
Sitting Bull	Rockerville Gulch	161
Stage Barn	Piedmont	150
Wild Cat Cavern	Rapid City	172
Wind		91
Wonderland	Piedmont	161
Tennessee		
Account's Cave No. 1	Marion Co.	88
Account's Cave No. 2	Marion Co.	88
Allen	De Kalb Co.	53
Allen	Overton Co.	53
Arklow	Sullivan Co.	88
Bailey	Clay Co.	53
Bear	Pickett Co.	53
Big Bear	Grundy Co.	53
Big Bone	Van Buren Co.	53
Big Bone Cave Branch	Van Buren Co.	53
Big Petty	Smith Co.	53
Bilbrey's	Putnamco	53
Blowing	Sevier Co.	124
Bone	Pickett Co.	53

TENNESSEE—Continued. Name of Cave	County or Nearest Town	Bibliographical Ref. No.
Briar Hill	Overton	53
Bridgewater	Smith Co.	53
Bunkum	Pickett Co.	53
Burial	Jackson Co.	53
Buthy's	3 Springs	106
Butram	Pickett Co.	53
Buzzard	Smith Co.	53
Caldwell's	Marion Co.	88
Cave Springs	Knoxville	124
Cherry	Jackson Co.	53
Cline	White Co.	53
College	Bledsoe Co.	88
Crawford	Overton Co.	53
Crystal	Grundy Co.	53
Cumberland Mammoth	Elk Valley	71
Daly	Clay Co.	53
Dry	Franklin Co.	53
Dunbar	Montgomery Co.	88
Ealy	Putnam Co.	53
Falling Water	Overton Co.	53
Fisher Cave	Smith Co.	53
Fowler	Jackson Co.	53
Garrets	Overton Co.	53
Gin Bluff	De Kalb Co.	53
Haile	Jackson Co.	53
Harris	White Co.	53
Harrison	Pickett Co.	53
Hell Hole (Hawkins Cove)	Franklin Co.	53
Henson's	Bledsoe Co.	88
Henshaw	Warren Co.	53
Higginbotham	Warren Co.	53
Hixon's	Sequatchie Co.	88
Hood	Pickett Co.	53
Hubbard (Bat)	Warren Co.	53
Hublin's (Bat)	Grundy Co.	88
Hughes	Smith Co.	53
Hull	Smith Co.	53
Ice	Pickett Co.	53
Indian	Jefferson Co.	172
Indian Mound	Montgomery Co.	88
Jewel	Dixon	107
Jim	De Kalb Co.	53
Johnson	De Kalb Co.	53
Johnson	Putham Co.	53
Journigan	White Co.	53
Keith	Franklin Co.	53
Ladd	Smith Co.	53
Lakey's	Sequatchie Co.	88
Land Company's	Sequatchie Co.	88
Lee	Smith Co.	53
Linville	Sullivan Co.	88
Little	Franklin Co.	53
Little Petty	Smith Co.	53
Lookout Mountain	Chatanooga	171
Lost Cove	Franklin Co.	53
Lost Greek	Grainger Co.	138
Milligan	Putnam Co.	53
Morrell	Sullivan Co.	88
Myers	De Kalb	53
Nickajack Cavern*	Shellmound	171
North McElroy	Van Buren Co.	53
North Spivey	Jackson Co.	53
Officer	White Co.	53
Peter	Overton Co.	53
Peter Rock	Grundy Co.	53
Phillips Cave No. 1	Pickett Co.	53
Phillips Cave No. 2	Pickett Co.	53
Pickett's Cave	Sequatchie Co.	88
Piper	Smith Co.	53
Piper's	Smith Co.	53
Pratt	Pickett Co.	53
Prichard	Smith Co.	53
Quarles Cave No. 1	Overtown Co.	53
Quarles's Cave No. 2	Overton	53
Rattlesnake	Newport	73

*Extends under Georgia and Alabama.

TENNESSEE—Continued. Name of Cave	County or Nearest Town	Bibliographical Ref. No.
Rich's	Clay Co.	53
Rip Van Winkle	Smith Co.	53
Robinson	De Kalb	53
Rogers	Warren Co.	53
Roundmouth	Clay Co.	53
Ruby Falls	Chattanooga	171
Ruskin	Dixon Co.	140
St. Mary's	Franklin Co.	53
Saltpeter	Franklin Co.	53
Saltpeter	Grundy Co.	53
Saltpeter Cave No. 1	Jackson Co.	53
Saltpeter Cave No. 2	Jackson Co.	53
Saltpeter	Marion Co.	53
Saltpeter Cave No. 1	Overton Co.	53
Saltpeter No. 2	Overton Co.	53
Saltpeter No. 3	Overton Co.	53
Saltpeter Cave No. 1	Putman Co.	53
Saltpeter Cave No. 2	Putman Co.	53
Sheals	Clay Co.	53
Snow Hill	De Kalb Co.	53
South McElroy	Van Buren Co.	53
Saltpeter	White Co.	53
Tally Fork	Franklin Co.	53
Taylor's	Red Boiling Springs	73
Tenn. Caverns	Chattanooga (closed)	
Thomas	Sullivan Co.	88
Van Hoover	Jackson Co.	53
Ward	White Co.	53
Wash Lee	Overton Co.	53
Webb	Clay Co.	53
Webb	Putnam Co.	53
Webster	White Co.	53
West McElroy	Van Buren Co.	53
West Spivey	Jackson	53
Wet	Franklin Co.	53
Williams	Clay Co.	53
Williams Cave No. 1	De Kalb	53
Williams Cave No. 2	De Kalb Co.	53
Wolf Branch	Overton	53
Wonder	Grundy Co.	53
Woodley	Warren Co.	53
Texas		
Cibolo		71
San Marcos		80
Utah		
Cigarette Spring	San Juan Co.	107
Clinton's	Lake Point	138
Logan	Logan Canyon	82
Moki Canyon Caves	Moki Canyon	112
Promontory Point Caves (2)	Near Salt Lake	148 171
Timpanagas		
Skinner's Hollow	Mt. Equinox, Manchester	172
Virginia		
Allen's	Front Royal	169
Baldwin Caves (4)	Front Royal	169
Battlefield-Crystal Caverns	Strasburg	133
Beatty	Milboro Springs	169
Betsy Bell	Staunton	171
Big Stony Creek	Giles Co.	138
Bill Hill Quarry	Rockbridge Co.	172
Blowing	Milboro Springs	170
Blue Grottoes		140
Cable	Staunton	171
Cave Hill	Harrisonburg	172
Cave in Field	Rockbridge Co.	172
Clark's Cavern	McClung	170
Cudjo's	Cumberland Gap	171
Dehaven		172
Devil's Den	Carroll Co.	170
Dixie New	Back of Dixie Caverns	172
Dixie Caverns	Salem	133
Ellis Miller	Rockbridge Co.	172
Erhart's	Montgomery Co.	138

VIRGINIA—Continued. Name of Cave	County or Nearest Town	Bibliographical Ref. No.
Endless Caverns	Newmarket	133
Fountain	Augusta Co.	171
Front Royal Caverns	Front Royal	169
Giant Caverns	Narrows	133
Gibson Hole	Waynesboro (Weyer's)	172
Grand Caverns	Waynesboro	133
Grandpappy's (Ogden)	Middletown	169
Horseshoe	Front Royal	169
Jenning's	Lacy Springs	169
John's	Warren Co.	169
Keezie	Massanutten	172
Limekiln	Rockbridge Co.	169
Linville Quarry	Harrisonburg	172
Bob Little's	Rockbridge Co.	172
Luray Caverns	Luray	133
Lynville Depot Cave	Harrisonburg	172
Madden's	New Market	168
Massanutten	Harrisonburg	133
McGuffin	Greenville	172
Melrose	Harrisonburg	172
Mill Creek	Blacksburg	172
Mock	Luray	171
Ogden's (Grandpappy's)	Middletown	170
Madison	Augusta Co.	138
Nelly's Hole	Blacksburg	172
New River Fault	Newport	172
Overall	Front Royal Rd.	172
Porter	Milboro Springs	171
Practice Hole		172
Read's	New Market	168
Rhea's	Bath Co.	168
Riverside	Rockbridge Co.	172
Roanoke River	Dixie Cave	172
Rock House	Frederick Co.	169
Ruffner's	Luray	171
Saltpeter	Luray	172
Saltpeter	Natural Bridge	107
Saumsville	Shenandoah Co.	172
Shenandoah Caverns	New Market	133
Showalter	Lexington	169
Skyline	Front Royal	172
Slusser's		172
Smoke Hole	Newport	172
Stephen's		172
Strasburg		172
Spencer Run	Giles Co.	138
Spring Hill	Lexington	169
Spruce Run	Giles Co.	138
Sugar Nut	Mauzy	169
Tony's	Newport	172
Turkey Hill	Rockbridge Co.	172
Unnamed No. 2	Rockbridge Co.	172
Widow Stewart	Rockbridge Co.	172
Windles	Woodstock	172
Withero	Lexington	168
Wood's (Landon's)	Page Co.	170
Wytheville	Wythe Co.	172
West Virginia		
Bender's	Jefferson Co.	169
Berryville-Charlestown Road	Charlestown	169
Big	Lewisburg	172
Bird Orchard	Middleway	169
Blair		172
Blow Hole	Petersburg	172
Brandywine (Prop's)	Pendleton Co.	169
Briar Sink	Summit Point	169
Bruce Town	Bruce Town	169
Castle Rock	Castle Rock	172
Cedar Hill	Pendleton Co.	169
Great Cave of Cheat River	Beverly	111
Clyde Cochrane Sinks	Pocahontas Co.	170
Crystal Lake	Jefferson Co.	169
Darkesville (Pig Cave)		172
Dead Dog	Charlestown	169
Donaldson	Berkley Co.	169
Dyer's	Wardensville	171

WEST VIRGINIA—Continued. Name of Cave	County or Nearest Town	Bibliographical Ref. No.
Falling Water		172
Ferris	Pendleton Co .	172
Frog Pond	Martinsburg	172
Gandy Sinks	Tucker Co.	169
Geardstown		172
Georgetown	Martinsburg	172
George Washington	Charlestown	168
Greenville	Salt Sulphur Springs	172
Hamilton	Pendleton Co.	171
Harper's Ferry Caves	Jefferson Co.	169
Hell-Hole	Riverton	170
Hermit's		169
Higginbotham's		169
Jameson's	Charlestown	172
Jewel's Cavern	Lewisburg	172
John Brown's	Harpers Ferry	168
Jones' Quarry Cave	Berkeley Co.	170
Limestone Mountain	Parsons	169
Milslage	Hampshire Co.	172
Mitchel's	Milam	171
Mohler's	Shepherds Town	168
Mower's	Jefferson Co.	169
Mystic	Mouth of Seneca	171
Mystic	Teterton	172
Nestle's Quarry (Indian Church Cave)	Martinsburg	170
Organ	Lewisburg	172
Peacock	Pendleton Co.	169
Pig	Berkeley Co.	171
Preble's		168
Propst	Pendleton Co.	170
Roaring Springs	Pendleton Co.	172
Rocky Bottom Caves	Jefferson Co.	169
Schoolhouse	Pendleton Co.	171
Seneca Caverns	Riverton	171
Silers		170
Small	Lewisburg	172
Smokehole Caverns	Petersburg	171
Snedegar's	Greenbriar	169
Snodgrass		169
Standard Quarry		172
Third Quarry	Martinsburg	171
Trout (E. S. Simmon's Cave)	Pendleton Co.	170
Vance	Pendleton Co.	172
Vertical	Lewisburg	172
Whitings Neck	Berkeley Co.	170
Wisconsin		
Crystal	Spring Valley	172
Devil's Island Caves (wave cut)	Devil's Island	99
Cave of the Mounds	Blue Mounds near Madison	99
Eagle	Muscoda	171
Pictured	La Crosse	99
Pokerville	Blue Mounds	86
Wyoming		
Shoshone Cavern	Cody	99
Table Mountain	Federal	99
Alaska		
Haenke Island (wave action)	Yakutat Bay	46

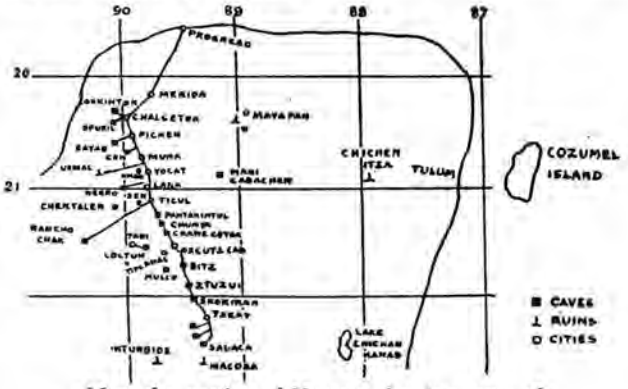
CANADA

Hovey lists 30 caves which were compiled by Dr. George Gibb in Sept. 1859, and makes the remark that some may not be caves but all are at least the remnants of caves. These are listed here with about 10 others which have come to my attention. The only one which has been personally inspected by the writer is the Cave-Pool at Banff, Alberta, which is only about 100 feet long and is probably typical of the other caves listed.

CANADA—Continued. Name of Cave	County or Nearest Town	Bibliographical Ref. No.
Bass Islands Caverns	Lake Erie	102
Bigsby's Cavern	Murray Bay	102
Bouchette's Cavern	Kildare	102
Cave-Pool	Banff, Alberta	170
Chatham Caverns	Ottawa River	102
Colquhoun's Cavern	Lanark	102
Deutschman's	Br. Columbia	99
Eremosa Cavern		102
Five Mile River	Hants Co., N. S.	99
Flower Pot Island	Lake Huron	102
Frenchman's	Hants Co., N. S.	99
Gaspe Bay Arched Recesses	Gaspe Bay	102
Gibb's Cavern	Montreal, P. Q.	102
Granite Grottoes	Bay of Fundy, N. B.	102
Great Manitoulin Is. Subteranean Passages	Lake Huron	102
Henley Island Caverns		102
Iron Island Caverns	Lake Nipissing	102
Kingston Caverns	Kingston, O.	102
Little River Caverns	Chaleur Bay	102
Magdalen Island		102
Mecattina Empty Basaltic Dykes		102
Michilimacanac	Lake Huron	102
Miller's Creek	Hant's Co., N. S.	99
Mingan Islands	Mingan Islands	102
Mono Cavern		102
Murray's Cavern	Ottawa	102
Nakimu	Br. Columbia	99
Niagara Caverns		102
The Old Woman Rock	Gaspe Bay, P. Q.	102
Oliver	St. John, N. B.	102
Perce Caverns	Perce, P. Q.	102
Pictured Rocks	Lake Superior	102
Pilasters of Mammelles	Lake Superior	102
Pillar Sandstones	Gaspe, P. Q.	102
Quartz Cavern	Leeds	102
Rockwood Caves	Rockwood, O.	99
St. Ignatius	Lake Superior	102
Steinhauer Cavern	Labrador	102
Thunder Mt. and Pate Island Pilasters	Lake Superior	102
Wakefield Cave	18 M. n. Ottawa	99
BERMUDA		
Crystal	Walsingham District	153
Devil's Hole Grotto	Hamilton Parish	153
Submarine		102
Walsingham	Walsingham	102

MEXICO

The caves of Mexico, and especially those of Yucatan have been of great interest to archæologists, and most of the caves listed here have been taken from the records of these expeditions. Due to the different ways of spelling names and the fact that the same ground was often covered by more than one party, it is possible that some of these caves may be listed under two separate names. Rather than make ommissions, all caves mentioned have been reported. To aid in locating these caves, a rough map has been copied from Mr. Mercer's book on the *Hill Caverns of Yucatan*.



Map of a portion of Yucatan showing route of Mercer's expedition. (Latitudes, longitudes and scale are approximate.)

It is interesting to note that very few burials have been found in caves in this portion of Mexico, although the walls are often decorated by animal carvings.

MEXICO—Continued.

Name of Cave	*County or Nearest Town*	*Bibliographical Ref. No.*
Actun Benado (Ceh)	Yucatan	123
Actun Spukil	Yucatan	123
Alpatlahua	Vera Cruz	144
Balaam Canche	Chichen Itza, Yucatan	139
Cacahuamilpa		160
Chacaljas	Yucatan	139
Chac Mol	Chichen Itza	139
Chambak	Yucatan	123
Chanz Coyok	Yucatan	123
Chapultepec Grottoes	Chapultepec	77
Chekt-A-Leh	Yucatan	123
Chumya	Yucatan	123
Cinquo de Mayas	Yucatan	139
Chakxix	Yucatan	139
Coyok	Yucatan	123
Cush-Hu-	Yucatan	123
Ebizt	Yucatan	139
Garcia	Monterrey	160
Gongora	Yucatan	139
Has	Yucatan	123
High Priest's	Chichen Itza	127
Hoctun	Yucatan	139
Itush-Hal	Yucatan	60
Kaua	Yucatan	139
Kobak	Yucatan	123
Kot Munos	Yucatan	123
La Quemada	Zacatecas	100
Lara	Yucatan	123
Loltun	Yucatan	123
Luchil	Yucatan	139
Mani	Yucatan	123
Maravilla Mine Cave	Chihuahua	
Mulco	Yucatan	123
Muruztun	Yucatan	139
Negro	Yucatan	123
Oxkintok	Yucatan	123
Oxolodt	Yucatan	139
Pantak Intul	Yucatan	123
Pedregal Lava Caves	Mexico City	77
Petcot	Yucatan	123
Puz	Yucatan	139
Rancho Chak	Yucatan	123
Sabaka	Yucatan	123
San Bulha No. 1	Yucatan	139
San Bulha No. 2	Yucatan	139
San Isidaro	Yucatan (Merida)	139
San Miguel	Chalma	77
San Roque Road No. 1	Yucatan	139
San Roque Road No. 2	Yucatan	139
Sayab	Yucatan	123
Sazich	Yucatan	139
Sitz	Yucatan	123
Skokikan	Yucatan	123
Tepahuanaian Caves	Durango	100
Tiplamas	Yucatan	123
Topochico	Monterrey	160
Tzuzui	Yucatan	123
Xconsacab	Yucatan	139
Xkyc	Yucatan	139
Xmahit	Yucatan	139
Xmak	Yucatan	123
Xtoloc (artificial)	Chichen Itza	139
Yunchen	Yucatan	139
Zapotec Tian Caves	Tehuantepec	100
Ziz	Yucatan	139
Small Nameless	Yucatan	123

Central America

Costa Rica

The caves of Costa Rica are very small and are of two types: along the coast are small, wave-worn caves; and in the volcanic regions are found lava tunnels and caves. No specific names have been found.

Name of Cave	*Location*	*Bibliographical Ref. No.*
Guatemala		
Cunen Caves	Cunen	130
Jobitzmaj Caves	Peten	130
Lanquin	Lanquin	130
San Juan Chamelco	Alta Verapaz	130
San Pedro Martir	Palin	130

While there are doubtless many caves in other Central American countries, no published information has been found to date.

West Indies

Cuba

Ashton	Los Mangas	80
Alacrares		80
Canas		80
Cajio		80
Carbonera "M"	Carbonera	80
Carbonera "Donkey"	Carbonera	80
Concordia	La Paz	80
Insurrectos	Carbonera	80
Dragon	Los Mangas	80
Isabella Cave		80
Matanzas	Matanzas	
Modesta		80
Pedragales	Matanzas	80

Bahama Islands

Inagua	Inagua	58
Indian Hole Caves	Rum Cay	58

Caicos Islands

Alladins Pallis		58

Jamaica

Lord Oliver in his book *Jamaica the Blessed Island* states that there are many large caves in Jamaica. He mentions only two by name, however. Other authors seem to be just as vague.

Dry Harbour	Dry Harbour
Half-Way-Tree	Half-Way-Tree
Oxford Caves	Mandeville
Three-Fingered Jack	Kingston

Navassa Islands

Navassa Island Caves		13

South America

The literature describing caves in South America seems to be very sparse. There are probably many thousand caves in this area. Most authors speak vaguely of many caves, and Vera Kelsey in her guide books on Brazil claims that there are over 400 known caves in the state of Minas Geraes, Brazil, alone.

Brazil

Belo Horizonte Cave	Belo Horizonte	113
Bom Jesus Da Lapa	Bahia	5
Lagoa Santa	Minas Geraes	114
Maquina, Gruta da	Minas Geraes	114
Salitre River Caves	Bahia	6
Tocas Caves	Caxoeira, Bahia	6
Ubajara, Gruta da	(12 different caves)	113
Morcegos, Gruta dos		114
Pedro Leopoldo		114

Chile

Fell's Cave	Valley of Rio Chico	35
Palli Aiki	20 miles east of Fell's Cave	35

Columbia

Jaguar		163

Ecuador

Charles Island	Galapagos Islands	171

Peru

Huallanca Silver Cave	Huallanca	102

Europe

Name of Cave	Location	Bibliographical Ref. No.
Austria		
Adelsberg Grotto	Carniola	102
Salzberg caves	Salzberg	102
Belgium		

There are many caves and grottoes in Belgium which are reported in *Cavernes et Les Rivieres Souterraines De La Belgique*, by E. Van Den Broeck, E. A. Martel, and E. Rahir. Since this work comprises two volumes of over 1700 pages in French, and in view of the limited time at my disposal, these volumes were merely noted. The caves listed below are probably not enough to be representative but are the only ones found in the other references consulted.

Han, Grotte de		71
Naulette, Trou de		71
British Isles		
England		

According to Rev. Buckland, a Mr. Farley has made a Survey of Derbyshire in which he lists 28 caves.

Baules Cave	Wirksworth	102
Brixham	Brixham	68
Chapman		
Cheddar Gorge	Bath	147
La Cotte de St. Brelade	Jersey	
La Cotte de St. Ouen	Jersey	
Cresswell	Cresswell	68
Eldon Hole	Derbyshire	102
Hutton	Mendip Hills	68
Kent's Cavern	Torquay	68
Kirby Moorside Caves		68
Kirkdale	Yorkshire	68
Muggendorf	Muggendorf	68
Peak Cavern	Derbyshire	102
Sark Island Caves	English Channel	102
Speedwell Mine Cavern	Derbyshire	102
Wookey Caves	Wookey	68
Scotland		
Fingals Cave	Island of Staffa	102
Wales		
Paviland Cave		68
France		
Abri Mege	Lourdes, Dordogne	
Arbon		71
Aurignac Grotto	Haute Garonne	102
Bernifal	Eyzies	71
Bourdeilles	Brantome, Dordogne	
Brambian		11
Brassempouy	Landes	
Cabrerets Caverns	Lot	71
Cagir	Comminges	71
Cap-Blanc	Dordogne	71
Chaffaud	Vienne	67
La Chapelle aux Saints	Sourdoire, Dordogne	
Cigalere		71
La Clotilde		67
Combarelles Grotto	Les Eyzies	71
Courniou Grotto	Herault	71
Creux du Souci	Auvergne	71
Cro-Magnon	Cro-Magnon	
Duruthy	Landes	67
La Ferrassie		
Font de Gaume	Les Eyzies	71
Frepillon	Frepillon	102
Gargas	Montrejeau	71
Girosp	Haute-Garonne	71
Goueil di Het	Haute-Garonne	71
Grand Roc	Dordogne	71
La Greze Grotto	Les Eyzies	67
Herm, Grotte de l'	Arriege	67
Hornos de la Pena		67

FRANCE—Continued Name of Cave	Location	Bibliographical Ref. No.
Isturitz	Basses-Pyrenees	71
Labastide Grotto	Haute-Garonne	71
Laussel	Dordogne	71
Lortet Grotto	Vallee d'Aure	71
La Madelein	Vezere, Dordogne	71
Malarnand	Ariege	
Mairie, Grotto de la	Dordogne	67
Marsoulas Cavern	Garonne	71
Mas d'Azil	Ariege	71
Massat	Ariege	71
Mery	Merv	102
La Micoque	Dordogne	
Montrouge	Montrouge	102
Montsaunes	Pyrenees	71
Le Moustier Grotto	Vezere, Dordogne	71
La Mouthe	Les Eyzies	71
Niaux	Ariege	71
Pape, Grotte du	Landes	71
Pair-Non-Pair	Bordeaux	67
Pene-Blanque	Haute-Garonne	71
Portel	Pyrenees	71
La Quina	Gardes	
La Squgue	Lannemezan	71
Spy, Grotte de	Namur	
Tourtoise Grotto	Ariege	71
Trois Freres		71
Tuc D'Audoubert	Ariege	67
Germany		
Franconia Caves		102
Fromages, Grotte des	Baden	102
Luege Caverns		138
Neanderthal		102
Ofnet	Bavaria	102
Gibraltar		
Forbes's Quarry		102
Genista		102
St. Michael's		102
Greece		
Antiparos Grotto	Antiparos	102
Appollo Grotto	Mt. Hymettus	102
Corycian	Mt. Parnassus	102
Sibylla, Grotto del	Lake Avernus	102
Nemean Lion		105
Iceland		
Dufferin Cave (Lava)		102
Sheep Pen (Lava)		102
Singing Caves		102
Shurtsheller (Lava)		102
Italy		
Blue Cave	Sicily	102
Cane, Grotto del	Lake Agnano	102
Circe, Grotto del	Foot of Mt. Circeo	167
Green Cave	Capri	102
Blue Grotto	Capri	172
Grimaldi Cayes	N. W. Italy	102

There are seven Grimaldi caves now existing, and two additional ones have been covered by the sea. Each cave has a name and a history. They have been carefully developed and explored by the Prince of Monaco.

Polifemo, La Grotta	Favignana	95
Jugo-Slavia		
Krapina	Croatia	102
Monaco		
Monaco Caverns		71
Norway		
Frederichstahl		102
Marienstadt		102

Name of Cave	Location	Bibliographical Ref. No.
Portugal		
Cesareda Cave		102
Azores		
Lava Caves		102
Spain		
Alquerdi	Sp. Navarre	71
Altamira	Cantabrian Mts.	71
Bat	Granada	
Castillo	Santander	67
Murcielagos	Andalusia	102
Pasiega		71
Pindal	Santander	67
Woman's	Alhambra	102
El Piton	Canary Islands	
Sweden		
Lake Wetter Cave	Lake Wetter	146
Flaskegrafven	Balby	146
Kivik Grotto	Skane	146
Switzerland		
Fairies, Grotto of	St. Moritz	71
Holl-Loch		71
Topazes	Pfeiffer Glacier	102

Asia

Ceylon		
Adam's Peak Cave	Adams Peak	56
Ella Cave	Ella	56
Kurugala Cliff	Molamure	56
China		
1600 Buddhas	Tunyang, Gt. Gobi Desert	87

Dutch East Indies

Mr. W. M. Davis, in the *Origin of Limestone Caverns,* suggests that these islands are raised coral islands, and that there are therefore many cavities which have been drained out and are just waiting to be discovered.

India		
Nanda Devi Caves	Br. Garhwal	159
Indo China		
Surprise, Grotte de	Tonkin	90

Mr. Frank states that this is the largest of many caves in this region, and that one of these caves is two miles long. He also mentions many caves in Annam. These caves are used as temples, homes, and as storage places.

Malay States		
Batu Cave	Pahang	57
Petchaburi	South of country	167
Palestine		
Arbela Cave	Gennesaret	102
Nativity, Grotto	Bethlehem	129
Trachoniyis		102
Persia		
Tak-I-Bustan (2)	Kermanshan	129
Tak-I-Gerreh	Sarpol	
Syria		
Akoura		102
Dog River		102
Mt. Lebanon		102
Thomson's Cavern	Lebanon	102

Oceania

New Zealand		
Glowworm Grotto	Waitomo Caves	102

Africa

Name of Cave	Location	Bibliographical Ref. No.
Ampelusia Cave	Morrocco	102
Broken Hill Mine	Rhodesia	171
Hercules, Caves of	Spanish Morocco	158

Peter Mac Queen, in *In Wildest Africa,* tells of caves on both the Kenya and Uganda sides of the Elgin mountains, and goes into detail as to how they were discovered and how they are at present used. They are also described by Synge. These caves were originally believed to have been carved out of the rock by a vanished race, but they are now thought to be natural.

EDITOR'S NOTE: Since this list of caves was compiled, there have been turned in to the files of the Society, data upon several caves not mentioned here. These will appear, of course, in subsequent Logs of the Society.

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Cave "List" of 1859

As contrast to Morgan's excellent listing of the known caves in the United States, it is interesting to read a list printed nearly 90 years ago. It appears in an excerpt from a book, *A Treatise on Gems,* etc. 1859, by Dr. Louis Feuchtwanger, Chemist and Mineralogist, Member of the New York Lyceum of Nat. Hist.; Amer. Assoc. of Science; of the Mineralogical societies of Jena, Altenburg, etc. Appleton & Co., New York.

P. 380-2. "The greatest localities of this mineral (stalactite and stalagmite) are the Grotto of Antiparos and Bauman's Cave, in the Hartz, which I visited in 1827 and which displays gigantic stalactites; also in Derbyshire. In the United States are very celebrated caves which yield this article.

"These have been described by my friend, Charles Cramer, Esq., late Russian Vice Consul at New York, now of the Isle of Wight, an enthusiastic mineralogist of St. Petersburg, in a pamphlet published in the German language by the Imperial Mineralogical Society of St. Petersburg, and as this interesting little work is not accessible to all, I will here translate the list of all the caves enumerated by him as North American. We would observe that these are not all situated in limestone regions, neither do they all furnish stalactites:

Connecticut—West Rock cave, New Haven.

Georgia—Nicojack cave. (sic.)

Indiana—Epsom Salt cave; cave near Corydon.

Kentucky—Boone's cave; Russell's cave; White cave; Mammoth cave; cave on Crooked creek.

Maryland—Hughes' cave; cave at Harwell.

Massachusetts—Natural bridge and cave at Nahant; natural bridge over the Hudson brook; cave near Sunderland; cave in Berkshire; two caves near New Mariborough; cave near West Stockbridge; cave in Lanesboro; cave in Adams; Purgatory, near Sutton.

Mississippi—Abode of the Great Spirit on the North West Coast; cave on Copper river.

Missouri—Ashley's cave.

New Hampshire—The Devil's cave.

New York—Cave near Watertown; cave at Niagara; Ball's cave; Knox's cave; Monito, at Wigwam, or Devil's Abode; Esopus cave.

Ohio—Mason's cave; Nature's Building, or Cave in the Rock.

Pennsylvania—Devil's Hole, in Bucks county; cave on the Swatera river.

Rhode Island—Purgatory, near Newport; Spouting cave, near Newport.

South Carolina—Great Flat Rock cave; Lover's Leap.

Tennessee—Big-stone cave; Arched cave.

Vermont—Caves in Bennington; caves in Dorset.

Virginia—Weyer's cave; Wreast's cave; Madison's cave; Zane's cave; Blowing cave, near Panther Dale; Greenbriar's cave; Johnson's cave; Allen's cave; Ruffner's cave; Roger's cave; Reid's cave; Natural Tunnel in Scott county; Natural Bridge in Rockbridge county.

"Mr. Cramer mentions the size of the stalagmites in the antechamber of Weyer's cave, as being twelve feet high; those in Solomon's Temple, of the same, twenty-five feet high, which are nearly transparent; and its Hermit's Chandelier, four feet high and twelve feet in circumference; the colossal stalagmite in Washington Hall, which is said to represent the Father of his Country wrapped in his cloak; Pompey's column, thirty feet high; also Babylon's Tower, thirty feet in circumference. (Five foreign countries' caves in Western Hemisphere omitted.)"

The Gem of Caves

... *By* DALE WHITE

[EDITOR'S NOTE: This article has been written with the permission of the State Park Commission, in coöperation with Bruno Petsch, resident guide.]

Back in 1902 Dan Morrison discovered an opening three feet across high up on a sheer cliff overlooking the Jefferson river in Montana. He was prospecting for mining claims when he came upon this "hole in the mountain" which has since been acclaimed by geologists to be of unusual beauty and possessing a most impressive display that ranks with anything seen before or since in any cave in the country. With the aid of ropes and rope ladders the cavern was explored for about 900 feet, the walls and side chambers being examined by candle light.

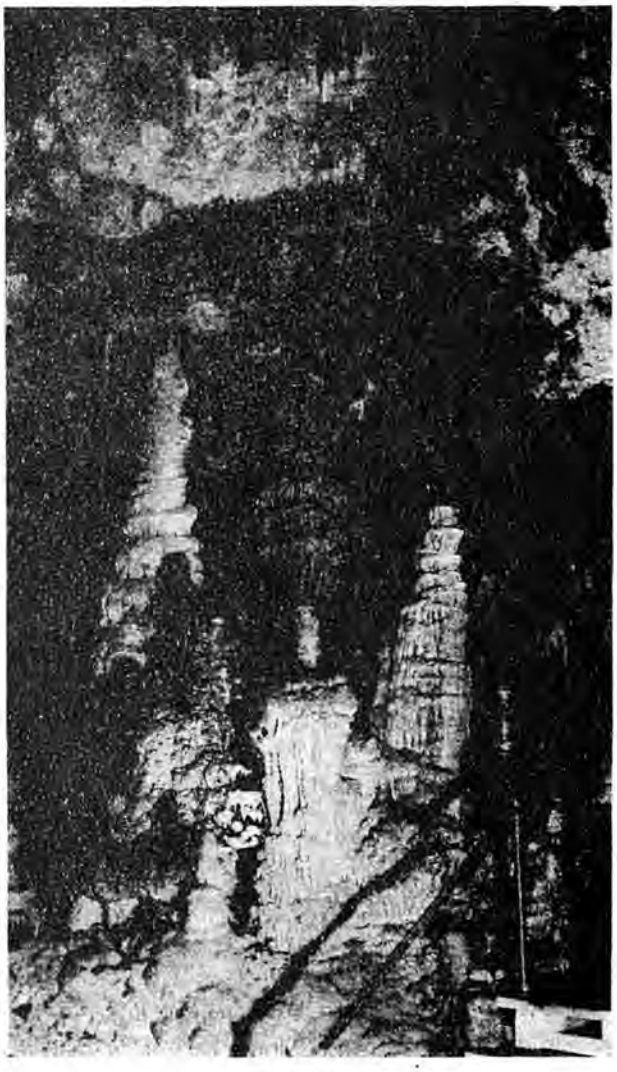
Morrison and his brother decided to develop the cave and operate it as a private industry. The general shape of the cave is that of a fissure in very steeply inclined limestone. Because of its perpendicular formation, it was necessary for Morrison to construct stairways between the various levels. Heavy timber for twenty-two flights of stairs was carried up a steep rough path from the valley below and then lowered into the dark abyss by rope. The carpentry work was done underground by men suspended in slings. Small entrances into some of the more beautiful chambers were chiseled out to permit easier passage for the public.

After developing the cave, Morrison applied for a patent. The Northern Pacific railroad filed an adverse claim and was given title to the land by the courts. Soon after the cave was turned over to the federal government. In 1908 President Theodore Roosevelt issued a proclamation making this cave a national monument and in 1911 issued a second one proclaiming this land as Lewis and Clark cavern. In 1935 the cave was taken over by the National Parks Service and in November of that year, through the efforts of the late Governor Frank H. Cooney, a Civilian Conservation Corps was stationed at nearby LaHood Park to improve and develop the cave and to construct a road from U. S. Highway number 10 to the cavern. Formal dedication as one of the great subterranean wonders of the West was in May 1941.

This gem of caves, small but unsurpassed in beauty and variety of formation, lies deep within the foothills of the Tobacco Root mountains. It is housed wholly within Cave Mountain, a prominent topographic feature of the park. This mountain is composed of the highly tilted limestone of the Madison formation and in the geologic past conditions were such that underground water action created a system of innumerable underground chambers which are now the chief attraction. It is a long curved ridge with a crest 5,906 feet above sea level, is about 1½ miles long and ½ mile wide.

The scenic gravel-surfaced road from the highway to the cave is a monument to CCC labor. It rises 1,000 feet in 3.2 miles and was literally built by hand, little machinery being available. It winds through a canyon and along the mountain side. Half way to the top is a spacious improved picnic ground in an aspen grove along a small stream. There are rustic tables, fireplaces and a water system for campers. For the road alone it is estimated that CCC labor of 83,000 man-days represents approximately $147,000 for labor.

The road terminates in a parking area before a stone and rustic construction head house. Here are the administrative offices of chief guide, Bruno Petsch, concessions and museum as well as a large open lookout for visitors who wish to view the valley and surrounding mountains before proceeding to the cave proper. This is



THE GROTTO

reached by a broad foot trail cut into the side of the mountain with three lookout areas. From the cave entrance the visitor can look south and see the peaks bordering the northern rim of Yellowstone National Park, eighty miles away.

Only one-fourth of the known area of Morrison cave has been developed. This is divided largely into two magnificent rooms overflowing with beautiful and weird displays. Trails, steps, bridges and ladders have been constructed by CCC boys with the view of giving the visitor an easy trip but have been designed and built so as to preserve as far as possible the naturalness of the cavern. Concealed indirect lighting provides well lighted trails but is not so bright as to distort the beauty of the formations. The passages and rooms are in their natural state, unspoiled by souvenir seekers and commercial exploitation. The explanation given by the guides to the thousands of tourists who go through the cave each season is informal and comprehensive and does not remind one of a memorized spiel endlessly run off day after day.

EMPIRE STATE COLUMN

The guides take note of the various descriptions or names given the formations on the trip and when the same name is given a certain display repeatedly, then the name is established and noted in the cave itinerary.

The original entrance through which Morrison had to descend and ascend an almost vertical passage with the aid of ropes is now closed. Several yards away another entrance was found and developed because it afforded a horizontal entrance. After descending several flights of stairs the enclosing walls become covered with stalactites of pure white and cream color. This tortuous but safe passage is jokingly referred to as "Fat Man's Misery." In a side alcove can be seen the Coffin, a formation having the appearance of an ornamental casket with fringe of small stalactites around the lid, a candle at the head, and handles.

It is amusing to note how the name of a formation may change with the advent of a popular artist. Prior to Disneys' creations an odd formation was called the Brownies Battlefield, but now is referred to as the Seven Dwarfs. One outstanding figure has been named Doc and greets all visitors to the cave. Evidence of the third earthquake instrumental in forming the cave is seen by the Fallen Idol, a prostrate column, with its original base and the small cone that nature has since started to replace with minute drops of water. Two gigantic formations, the Cathedral Tower and the Kremlin, dominate the room although the weirdest and most eerie effect comes from the Ghost Forest, an irregular group of stalagmites resembling the burned over area of a forest.

As the sightseers circle this large room with the aid of stairs, they are reminded that every step hand hewn from rock required the hard labor of two CCC boys for a day and a half, and that the cement steps were made from materials packed in the cave on the backs of these boys.

The ceilings in the Cathedral room are vaulted and studded with crystal filigree work. It is almost like a huge art gallery with a central figure and several side galleries. Massive marble-white pillars extend over thirty feet to the ceiling. Here the elevation is 5,485 feet above sea level but 109 feet below the entrance gate.

The curious thing about Morrison cave is that it has no Indian folklore nor is there any evidence that it was ever used as an animal refuge. The obvious reason for this is that the only entrance was so precipitous as to make use of the cave impossible. Some fifty bats are known to frequent the cave at the present time.

Certain types of formations usually characterize individual caves. Those of Morrison are stalagmites which

build up from the floor, and columns which are formed when the stalagmite growing up and the stalactite growing down connect to form a column from floor to ceiling. Some stalactities are not circular in section but appear in vertical bands, like tapestry hanging from a sloping roof. There are also helictites, a twisted form of stalactite, some box-work, cascades, magnificent flowstone, crystals and clusterites. The last mentioned are seen on both the floor and roof of the cave and resemble a bunch of grapes of different sizes growing together. The chief guide at the cave, Bruno Petsch, named these peculiar shaped formations. "Cluterites" and that term has been accepted by the National Parks Service to designate such growths. There are some pools or catch basins, misnamed springs, throughout the cave. The water is crystalline clear and cool but unfit for drinking.

Before the advent of the CCC boys' explorations and ingenuity, the cave trip consisted of a few more sights such as the Bridal Chamber and the Princess Palace on the Mountain. This unusually delicate formation has added beauty due to an unusual perspective afforded sightseers as they glimpse it through a natural stone arch. At about this point the visitor is 5,390 feet above sea level but 204 feet below the entrance gate. The trip Dan Morrison had to offer ended a short distance away at the Brown Waterfall, a superb example of flowstone and columns, and then the tourists had to retrace an ascending trail with multiple staircases to regain the entrance.

Since 1936 however, the CCC explored and opened several passages beyond this point which lead ultimately into the largest and most awe-inspiring room in the entire cave. At one point in this passage, radium has been detected. Another has been called Cooney passage, honoring the man who did so much toward the development of Morrison cave. Cooney passage has an elevation of 5,289 feet above sea level, but is a long 305 feet below the head gate. This area is one mile high underground.

The Paradise Room, never seen by Morrison, is very moist and the formations glisten in the indirect lighting. This room is 176 feet directly *below* the Cathedral room but the visitor has to descend approximately a half mile of circuitous route before entering its vast, compelling expanse. Here is located the Empire State column, considered by members of the society who viewed it in 1941 as the "most impressive display of all and one ranking with anything seen before or since in any cave." The Empire State is 24 feet tall and 7 feet in diameter and has remained unblemished through the years. It is a perfect specimen of cave rock, surpassed in size but not in beauty by the "Pillar of the Constitution" in the Wyandotte cave in Indiana and "Mr. Big" in the Nickajack cave in Tennessee. Lesser formations in this room are of consummate beauty and recall the Italian baptisteries and carillons of the Renaissance period. A final view of the Grand Finale and the visitor leaves the cave through a tunnel 538 feet long. This tunnel, bored through solid limestone, is an exceptional feat for CCC labor to have accomplished. All of the work was done by enrollees with the exception of the actual blasting. It was a nine months' job and though it was a dangerous project, especially for boys who were inexperienced in underground work, this was completed without an accident.

An interesting sidelight of CCC life occurred in connection with the construction of this tunnel. It was surveyed three times, once by an enrollee who was classed as an illiterate when he first entered the corps. By taking advantage of the studies offered at the camp, among which was surveying, in the progress of his work he surveyed the course the tunnel was to take. He came

THE GRAND FINALE

within three inches of the survey made by the camp engineers.

Heavy doors at two points along the tunnel control the wind current and prevent blasts of air from entering and drying up the Paradise Room. The outlet gives onto a path considerably lower than the entrance trail but one on a level with the parking area and head house.

The park season extends from April to December. The fact that outside heat or cold does not affect the temperature of the cave, which never varies from 44 to 48 degrees, makes it possible to schedule year-round trips providing the road to the parking area is not blocked with snow. Though the humidity is great within the cave, it is not sufficient to warrant special clothing. Morrison cave is well ahead of many caves in regard to scientific data. A precise survey has been made, each benchmark has an altitude, latitude and departure on record, as well as a study of fauna, insect life and underground cosmic ray investigations.

In the not too distant future, a third huge cavern filled with massive and impressive formations entirely snow white will be open to the public. At present the passage to this area, Hell's Half Acre, is too narrow and difficult to allow more than passage to explorers and scientists.

Revisiting the Snails of Skyline Caverns

... *By* J. P. E. MORRISON

On May 16, 1943, a party of four, consisting of Muma, Beardsley, Weed, and the writer, visited Skyline Caverns through the courtesy of the manager, Mr. Dutrow.

The rumors concerning flood damage to the caverns were found to be somewhat exaggerated, there being no great changes observed[1] as a result of the October 1942 flood, except damage to the electrical installations and the walkways in the lower, commercialised portion of the cave. The Helictite Rooms seemed more splendid than ever, if that is possible.

The first object of the trip was to determine how the two species of cave snails previously collected[2] in Long Lead fared in the flood. The ability of these snails to survive flood conditions is reflected by their normal abundance in May 1943, after what must have been severe conditions in October 1942. In addition to the malacological survey, the uppermost available reaches of Long Lead were more thoroughly explored and mapped.

That part of the Long Lead area above the muddy Elbow Crawl and the Rock Filter was resurveyed with a special surveyor's compass to determine the direction of all passages. All distances were as carefully estimated as possible, since no tape was at hand. There were two unexpected results of this re-mapping project: the stream has been seen further upstream than ever before, to my knowledge; and—there are four passages in this uppermost portion of the cave, not just one!

The longest corridor turns northward shortly after leaving the Rock Filter behind, circles around the Rabbit Box, and finally ends in a medium-sized cleft chamber with lots of seepage water in evidence, almost directly opposite the travertine pool tributary branching east off the middle of the accessible part of the Long Lead stream. This end chamber has noticeably bad air after a short time (CO_2), and from the cleft roof and drift must be near the surface.

Turning southward is another passage which forks in three directions: west—to the Long Lead stream, in a room with "Amos 1937" and other dates on the roof; southeast—to another upstream portion of this stream, where I had again to dig some clay and rocks out of the floor to get through the tightest squeeze; and northeast. The northeasterly fork was reported by Weed as a 150 ft. crawl, and he had to *back all the way out!*

These cave snails are upstream farther than man has been so far. The uppermost point seen yet is approximately 300 ft. farther upstream (as the stream meanders) than the last point reached in anuary 1941, as the muddy Elbow Crawl. The condition of the cave snail species was seen to be good, in spite of Hubricht's and my repeated samplings of the population, but I would still like to see their eggs. After surviving all of nature's forces to the present time, it will take more than a couple of malacologically-minded speleological interlopers to exterminate these minute troglodytes.

After a most profitable five-hour stay in the cave, the surface area outside was explored. ———— Creek, the northflowing stream, due east of the cave entrance, was noted where it sinks into the stream bed. This sink is a gradual affair; the creek gradually disappears over a stretch of about 50 feet of the stream bed. There is not one sink opening, but a filtering through gravel, sand, and rocks, down into the underground channels.

The stream runs westward through this part of Dickey's Hill by way of the Skyline Caverns passage-

[1] It should be mentioned here that the shaft leading up to the Rabbit Box is no longer in existence. The old mildewed wood of the shaft has rotted until it has now completely given way, the clay has slumped down to refill the shaft, and this part of the cave is now at least temporarily inaccessible.

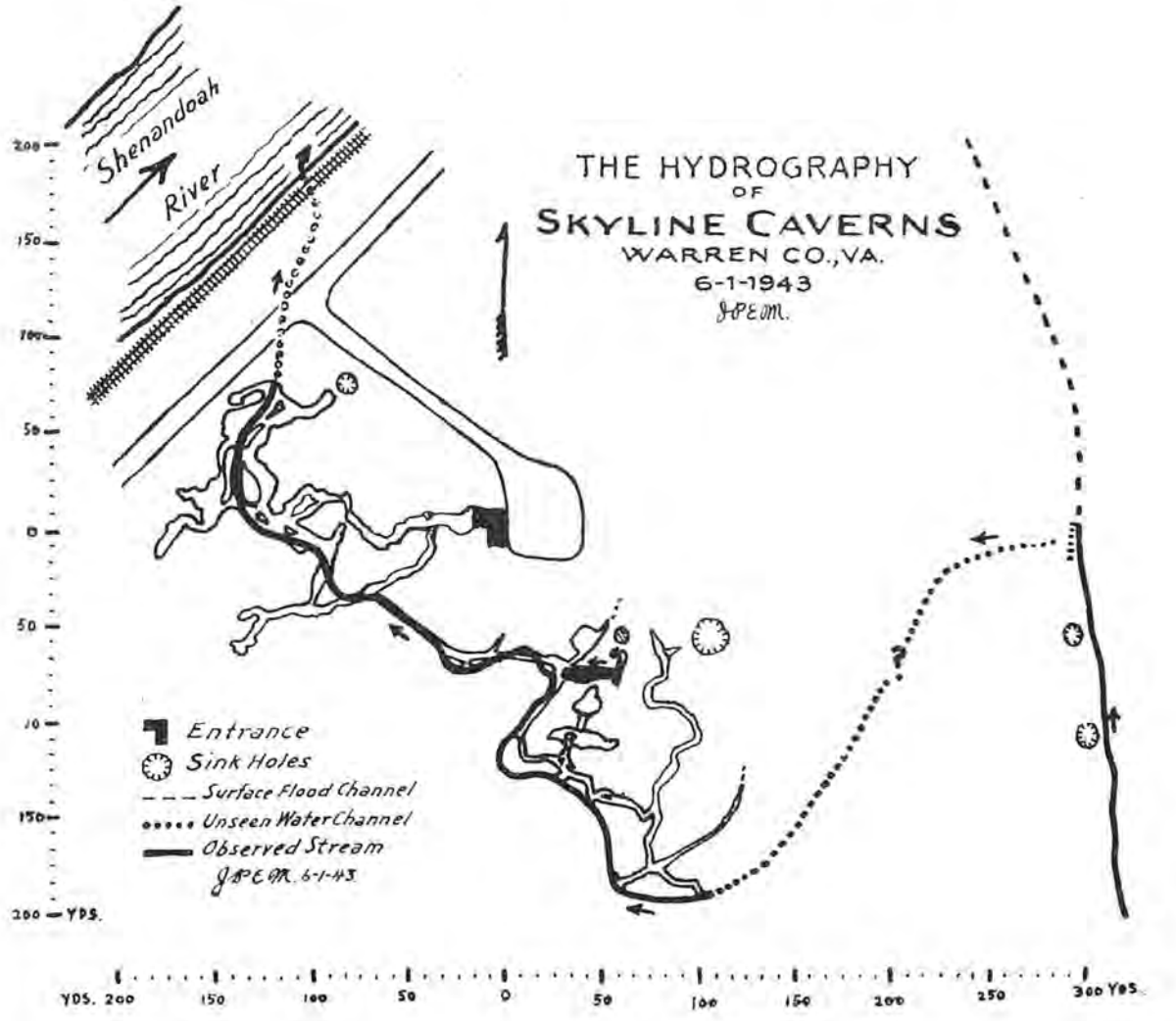
[2] Previous trips in July 1938, July 1940, and January 1941.

ways, turning a little to the northward, and opens through a jumble of rocks at the base of the railroad embankment on the Shenandoah River bank, directly northwest of the Skyline Caverns entrance. This is some distance south of the old surface channel of the stream, at present in use only as a flood channel between the sinks and the river.

There are no snails of this family at the surface, either in the stream above the cave system, or at the outlet on the bank of the Shenandoah River. It is a real privilege to be able to study all the features of these two snail species limited to the underground course of ——— Creek, in Skyline Caverns. These two species are even more remarkable when it is realized that they live as close as ten feet to each other, but not together. One lives in the main stream, on the gravel and rocks; the other in the travertine pools of the tributary passage only. Since one is blind and the other has eyes, it is obvious that they first crawled into the cave system at different times; how long ago is anybody's guess. They've been caving a long time at any rate. When and if the sink of the Creek becomes an open channel instead of a sandy filter, nature might try an experiment and let the eyed species of snail crawl on upstream on the surface. Until then, however, man has to go underground to see them in their native habitat.

No more bats were found in the upper portions of Long Lead to add to the record of one taken in January 1941. It seems probable now that there are no open exits at the upper end.

Perhaps additional trips to Skyline Caverns will result someday in the trapping of those elusive cave beetles (only 2 specimens are known) that live there. Also, a check on the measurements of the upper passages is necessary to "prove out" the estimates of length of the newly mapped parts of Long Lead.



Assessment Value of Cave Property for Taxable Purposes

...By HARRY H. WILSON

All laws and decisions of courts present a conflicting and confused picture wherein questions concerning caves are involved. This confusion will continue until a sufficient number of courts recognize that a cave is an underground estate and, as such, is entitled to the same rights and protection in the eyes of the law as the estate on top of the ground.

The only jurist ever to attempt such a determination was the last Justice M. M. Logan of Kentucky.

In the case of Edwards et al vs. Sims, Judge, 24 S. W. (2nd) 619, Mr. Logan said, "It sounds well in the majority opinion to tritely say that he who owns the surface of real estate, without reservation, owns from the center of the earth to the outmost sentinel of the solar system. The age-old statement adhered to in the majority opinion as the law, in truth and fact, is not true now and never has been. I can subscribe to no doctrine which makes the surface owner also the owner of the atmosphere filling illimitable space. Neither can I subscribe to the doctrine that he who owns the surface is also the owner of the vacant spaces in the bowels of the earth."

Judge Logan continued in his dissenting opinion: "A cave or cavern should belong absolutely to him who owns its entrance, and this ownership should extend even to its utmost reaches if he has explored and connected these reaches with the entrance. When the surface owner has discovered a cave and prepared it for purposes of exhibition, no one ought to be allowed to disturb him in his dominion over that which he has conquered and subjected to his uses. . . . When the wonders were unfolded and the ways were made safe, then Edwards patiently, and again through the years, commenced the advertisement of his cave. First came one to see, then another, then two together, then small groups then small crowds, then large crowds, and then multitudes. Edwards has seen his faith justified. The cave was his because he had made it what it was, and without what he had done it was nothing of value. The value is not in the black vacuum that the uninitiated call a cave. That which Edwards owns is something intangible and indefinite. It is his vision translated into a reality." May it be suggested that all lovers of caves should read all of the dissenting opinion of Judge Logan.

So much for that. The question before us now is "How should a cave be valued for taxable purposes?"

There is but little law on this question—in fact, no special laws or decisions are known to the writer. At present, the writer along with other attorneys are engaged in litigation involving the value of the certain cave properties and have been giving the matter of taxable value considerable study.

Our theory is that the surface lands over the cave should be valued at exactly the same amount as other lands of like quality in the community or county; that the value of the cave itself and such improvements on the surface as have been made that are an integral part of the cave's operation, is determined from the net income. In other words, the net income would be arrived at by the same method as it would be determined for Federal income tax. It appears to us that there is no other fair method available. A thing is worth no more than what it can produce. If a net income from a cave and environs of the lower and upper estates amounts to $10,000, then it appears that the cave for taxable purposes should be valued at a sum of which $10,000 would represent, say, 6%.

The operation of caves involves many expenses and, in arriving at the taxable value, these all must be taken into account. There may be some questions as to whether or not the cost of all advertising in any one year should all be charged off as expense, since goodwill created by advertising is a continuing thing and profits may accrue in years in the future. But even on this point a complete study leaves the impression that all advertising costs are deductible as expenses in the taxable year.

It is doubtful that the tax-assessing bodies and the courts will accept this theory in full because there is a tendency to penalize businesses and industries which are classed as nonessential or luxuries. To most people a cave is a hole in the ground, and it is most difficult to impress upon officials and other interested parties that the many questions affecting cave operation should be seriously considered.

Mr. Wilson, an attorney at Munfordville, Ky., is at present engaged in litigation involving Floyd Collins Crystal Cave. His article is both timely and authoritative, and opens a new field for articles.

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NOTICE TO MEMBERS

Costs on the Bulletin have increased all the way around. This makes it necessary to charge 75c. for *extra* copies, which is practically cost. These may be obtained from the Secretary, or from

THE EDITOR.

For Pete's Sake

or

How Kay Kayoed Her First Cave

This is a tale
  Of daring thrills
In chasing caves
  Thru Virgin' hills.

With Don, Herb, Al,
  Pete led the way;
While for the girls—
  There's Stell and Kay

To find a cave
  Is quite a task;
You ride, then walk,
  And search, and ask.

A tyro thinks
  Of caves as big
But finding one
  Is quite a jig.

No matter what
  Your map may say;
You'll find it takes
  Most of the day.

But don't give up
  And don't despair;
There's bound to be
  A cave somewhere.

Then sure as fate,
  Pete spies a hole,
And you begin
  To act the mole.

Pete totes a rope
  To get inside
Since caves are wild
  And must be tied.

Wriggle, waggle,
  Slide and slump,
Be careful how
  You take that bump.

First up, then down,
  An endless way;
Gone out for ever,
  Light of day.

Why do they keep
  The caves so dark,
When there's no time
  Nor place to park.

Kay would not stop
  But followed on,
While Stell turned back
  To wait for dawn.

Then all at once
  She cracked her head—
But let's forget
  The words she said.

All tears and fears
  She fain would banish,
And try to act
  Somewhat more mannish.

Though once or twice
  A panic thought
Would raise its head
  On taut nerves wrought.

She hopes they find
  A cul-de-sac,
(The only thing
  That turns Pete back).

The minutes toll
  But seem like ages,
While heart beats fast
  And headache rages.

Then all at once
  They see a lake
And its sheer beauty
  Dulls all ache.

If there had been
  A hick'ry limb
They would have found
  The time to swim.

And so, quite sad,
  They turn away
That they had not
  The will to stay.

Now they are found
  In vaulted dome,
With stalac' ceil
  And wond'rous throne.

So they seat Kay
  Upon that place;
But first they daub
  Mud on her face

And then they take
  A picture rare
That is no prize
  In that dank lair.

But all good things
  Must come to end
As they find Al,
  Lost, round the bend.

And when once more
  Kay sees the day:
She drops a sob
  And kneels to pray.

For then at last
  She learned to know
The things that tick
  And make us go:

"All caves are diff'rent,"
  Maybe so;
But mud is mud
  Where'er you go.

A spel'ogist
  Need not be mad;
But it does help,
  She's heard it said.

What tangibles
  Did Kay take back?
Potatoes rare—
  She culled a sack!

Written, under poetic license, from an oral report of Catharine Harper, by a friend of hers, unknown to any of the others mentioned, who was not along on the trip taken May 15, 16, 1943 to Lexington, Va., with locale and incidents occurring in Showalter's, Watts', and Miller's caves in that area, and the Safeway Food Store. [Ed. Note: Last named *not* an Adv.! We were tired the evening the above got by. A cave trip report in rhyme, however, appealed to the "curious" in us. . .]

Hawver Cave—California

. . . *By* ERWIN W. BISCHOFF

The following reports on Hawver's Cave constitutes one of the most interesting and complete examples of cave reporting which has come to the attention of the Society. This group of reports was prepared by Mr. E. W. Bischoff, Chairman of our Explorations committee, and fully shows why Mr. Bischoff was chosen for this position.

Members are asked to study these reports carefully as they give a full and complete insight on what may happen to a cave during the time that its existance is known to the public. It is an interesting coincidence that each of the reports follow in approximate interval of thirty-five years and that each of the reports seem generally to agree as to the dimensions of the main rooms of the cave and other prominent features. Attention is particularly called to the fact that apparently the destruction of the interior decorations of the cave began almost on its day of discovery, and has apparently continued to the present time where it is actually now being gradually filled by inwashing debris. The report of 1907 is of particular interest as Mr. Furlong apparently thought that he was the cave's first explorer even though, as shown by the report of 1870, the cave was actually operated priorly as a commercial venture but had long since been forgotten.

Many of our members no doubt have encountered, and probably will encounter in the future, caves which the natives believe to be entirely unexplored but which like Hawver's cave will have a long and interesting history if such can be properly ascertained. The research of Mr. Bischoff in connection with his exploration of Hawver's Cave should be an incentive for other of our members to do likewise. The reports now being published in our Bulletin may at some future date be able to serve the same purposes as the old reports on Hawver's cave which Mr. Bischoff has herein discovered.. [Editor's note.]

Quoted from: *Scenes of Wonder and Curiosity In California*, by J. M. Hutchings. Published in 1870.

"A ledge of limestone rock, resembling marble in appearance, cropped out by the side of the El Dorado Valley turnpike road, which, after testing, was found to be capable of producing excellent lime. Early in the present year, Mr. William Gwynn employed a number of men to quarry this rock and build a kiln. To these works he gave the name of 'Alabaster Lime Quarry and Kiln.' On the 18th of April, 1860, two workmen, George S. Halterman and John Harris, were quarrying limestone from this ledge, when, upon the removal of a piece of rock, a dark aperture was visible, that was sufficiently enlarged to enable them to enter. A flood of light pouring in through the opening made, they proceeded inward some fifty feet. Before venturing further, they throw a stone forward, which falling into water, determined them to procure lights before advancing further.

"At this juncture Mr. Gwynn, the owner, came up; and upon being informed of the discovery, sent for candles, to enable them to further prosecute their explorations. The result of these, after several hours spent, cannot be better described than in Mr. Gwynn's own language, in a letter dated April 19th, 1860, addressed to Mr. Holmes, a gentleman friend of his, residing in Sacramento City; and first published in *The Sacramento Bee:* 'Wonders will never cease. On yesterday, we, in quarrying rock, made an opening to the most beautiful cave you ever beheld. On our first entrance, we descended about fifteen feet, gradually, to the centre of the room, which is one hundred by thirty feet. At the north end there is a most magnificent pulpit, in the Episcopal church style, that man has ever seen. It seems that it is, and should be called, the 'Holy of Holies.' It is completed with the most beautiful drapery of alabaster sterites, of all colors, varying from white to pink-red, overhanging the beholder. Immediately under the pulpit there is a beautiful lake of water, extending to an unknown distance. We thought this all, but, to our great admiration, on arriving at the centre of the first room, we saw an entrance to an inner chamber, still more splendid, two hundred by one hundred feet, with the most beautiful alabaster overhanging, in every possible shape of drapery. . . .'

"As soon as this interesting announcement was noised abroad, hundreds of people flocked to see the newly discovered wonder, from all the surrounding mining settlements, so that within the first six days, it was visited by upwards of four hundred persons; many of whom, we regret to say, possessed a larger organ of acquisitiveness than of veneration, and laid Vandal hands on some of the most beautiful portions within reach, near the entrance. This determined the proprietor to close it, until arrangements could be made for its protection and systematic illumination; the better to see and not to touch the specimens.

"At this time, Mr. Gwynn leased the cave to Messrs. Smith & Halterman, who immediately began to prepare it for the reception of the public, by erecting baricades, platforms, &c.; and placing a large number of lamps at favorable points, for the better illumination and inspection of the different chambers.

"The discovery being made in the spring, considerable water was standing in some of the deepest of the cavities; but signs were already visible of its recession, at the rate of nearly six inches per day; and in a few weeks it entirely disappeared, leaving the cave perfectly dry. This afforded opportunities for further explorations; when it was found that a more convenient entrance could be made, with but little labor, from an unimportant room within a few feet of the road. This was accordingly done, and this, in addition to its convenience, allows of the free circulation of pure air. . . ."

* * *

"When entering the cave from the road . . . we descend some three or four steps to a board floor. Here is a door that is always carefully locked, when no visitors

are within. Passing on, we reach a chamber about twenty-five feet in length by seventeen feet in width, and from five feet to twelve feet six inches in height. This is somewhat curious, although very plain and uneven at both roof and sides. Here also is a desk, on which is a book, inscribed 'Coral Cave Register.' This book was presented by some gentlemen of San Francisco who believed that 'Coral Cave' would be the most appropriate name. The impression produced on our mind at the first walk through it, was that 'Alabaster Cave' would be equally as good a name; but, upon examining it more thoroughly afterward we thought that—a greater proportion of the ornaments at the root of the stalactites being like beautifully frozen mosses or very fine coral, and the long icicle-like pendants being more like alabaster—the former name was to be preferred. But, as the name 'Alabaster' had been given to the works by Mr. Gwynn, on account of the purity and whiteness of the limestone found, even before the cave was discovered, we cheerfully acquiesce in the nomenclature given. The register was opened April 24th, 1860 and on our visit, September 30th ensuing, 2,721 names had been entered. Some three or four hundred persons visited it before a register was thought of, and many more declined entering their names; so that the number of persons who entered the cave the year of its discovery, must have exceeded three hundred.

"Advancing along another passage, or room, several notices attract our eye, such as, 'Please not touch the specimens,' 'No smoking allowed,' 'Hands and feet off,' (with FEET scratched out)—amputation of those members not intended! The low shelving roof, at the left and near the end of the passage, is covered with coral-like excrescences, resembling bunches of coarse rock-moss. This brings us to the entrance of

THE DUNGEON OF ENCHANTMENT

Before us is a broad, oddly-shaped, and low-roofed chamber, about one hundred and twenty feet in length by seventy feet in breadth, and ranging from four to twenty feet in height.

"Bright coral-like stalactites hang down in irregular rows, and in almost every variety of shape and shade, from milk-white to cream-color; standing in inviting relief to the dark arches above, and the frowning buttresses on either hand . . . . Descending toward the left, we approach one of the most beautiful stalactitic groups in this apartment. Some of these are fine pendants no larger than pipe-stems, tubular, and from two to five feet in length. Three or four there were, over eight feet long; but the early admitted Vandals destroyed or carried them off. Others resemble the ears of white elephants . . . while others, again, present the appearance of long and slender cones, inverted . . . (here is deleted more description on the coral-like formations) . . . . Leaving these, by turning to the right we can ascend a ladder, and see other combinations. . . . Here is the loftiest part of this chamber.

"Leaving this, you arrive at a large stalagmite that resembles a tying-post for horses . . . its altitude is four feet three inches and its circumference, at the base, three feet one inch.

"Passing on, over a small rise of an apparently snow-congealed or petrified floor, we look down into an immense cavernous depth, whose roof is covered with icicles and coral, and whose sides are draped with jet. . . . On one side of this, is an elevated and nearly level natural floor, upon which a table and seats have been temporarily erected, for the convenience of choristers, or for public worship. . . . We must not linger here too long, but enter other little chambers, in whose roofs are formations that resemble streams of water that have been arrested in their flow, and turned to ice. In another, a perfectly formed beet. . . . A beautifully bell shaped hollow, near here, is called 'Julia's bower'!

Advancing along a narrow, low-roofed passage, we emerge into the most beautiful chamber of the whole suite, entitled

THE CRYSTAL CHAPEL

(Here is deleted a great deal of fanciful description) . . . ceiling is covered with myriads of stone icicles . . . the most prevailing (color) being of a light pinkish-cream. Moss, coral, floss, wool, trees, and many other forms, adorn the interstices between the larger of the stalactites. At the farther end is one vast mass of rock, resembling congealed water, apparently formed into many folds and little hillocks; in many instances connected by pillars with the roof above. Deep down, and underneath this, is the entrance by which we reached this chamber.

"At our right stands a large stalagmite, dome-shaped at the top, and covered with beautifully undulating and wavy folds. . . . This is named 'The Pulpit.' In order to examine this object with more minuteness, a temporary platform has been erected, which, although detractive of the general effect . . . affords a nearer and better view. . . .

"Other apartments, known as the 'Picture Gallery' &c., might detain us longer; but, as they bear a striking resemblance . . . to other scenes already described, we must take our leave. . . ."

Quoted from: "Reconnaissance of a Recently Discovered Quaternary Cave Deposit near Auburn, Calif." *Science, N. S.* 1907, 25, pp. 392-349; by Mr. E. L. Furlong, first explorer of the cave.

"A perpendicular crevice gives access to the first part of the cave. The opening is partly filled with angular limestone fragments and red dirt to within eight feet of the top. From the entrance the slopes extend down in a southerly direction for approximately 40 feet. At this point, two irregular narrow openings give access to a well-like grotto twelve feet deep.

"From this grotto a small circular hole leads to the main portion of the cave. To reach this a rope is fastened in the grotto and lowered through the circular opening to a depth of 22 feet. The rope drops vertically, hanging free from the walls of the inner cave, and the lower end is immediately over a small subterranean lake.

"Near the end of the rope is a narrow tunnel about a foot above the water. This extends for about 6 or 8 feet south, where another pool is encountered. Here a raft, consisting of an air mattress is called into service, and paddling across the water for 30 feet, a landing can be made on a mud-covered bank. From the south edge of the water and running in a southerly direction for approximately 50 feet is a tortuous series of narrow passages leading into grottoes of varying dimensions; some of them are very large."

Preliminary Reconnaissance: September 26, 1942.

Trip to cave made by automobile from Oakland, California by Erwin Bischoff and Fred Presley.

LOCATION: Hawver's Cave is a limestone cavern located in the Sierra foothills near Auburn, California, at Latitude 38-43-36 plus; and Longitude 121-04-45 minus. The cave has been located on map by the U. S. Geological Survey (Sacramento, Calif. sheet).

ROUTES TO CAVE: No. 1—From Sacramento by way of Highway 50 to a point two and three-quarter miles beyond Folsom, where the Pilot Hill road turns off to left (north) and crosses the south fork of the American River. The cave is approximately 10 miles north on this road. There is one fork at about 8 and ½ miles, the right branch going to Pilot Hill and Placerville and the left branch to Rattlesnake Bridge. Take the left road toward the bridge. Approximately one and one half miles is a second road junction. Fifty feet up the road to the left (west) is the cave, which is located 20 feet from the north edge of the road. It is plainly visible from the road.

No. 2—From Auburn by way of Rattlesnake Bridge road six miles south to the bridge, crossing the north fork of the American river, then continuing ¾ mile east along the road to the cave. This road is not recommended as it necessitates crossing the Rattlesnake Bridge which is old and unsafe and closed to heavy vehicles.

All roads to the cave are paved and in fair condition.

DESCRIPTION: The cave exists in a belt of Pennsylvania limestone in the Sierra foothills in El Dorado County. There is no commercial development, and no permission is required to enter. The area is a hilly sparsely wooded country. Immediately in front of the cave is a paved road, and across the road 50 feet south is the creek bed. Across the creek is an actively worked lime quarry.

The cave consists of two parallel channels which converge at the inner end. The other ends of this narrow "V" emerge as two separate entrances on the side of the road about 30 feet apart. Both entrances are on the same level and are in the bottom half of a small hill. The right entrance is a level tunnel 7 feet high by 5 feet wide, and appears to have been artificially enlarged. The left entrance is a small hole 3 x 3 feet, into which one may wriggle and slide down a pile of rubble some 10 feet to the floor of a chamber.

The two channels of the cave run side by side in a generally north-westerly direction from the entrance, and are separated from each other by from 15 to 30 feet of intervening rock. About 30 feet in there is an opening which connects the two channels, another at about 100 feet, and a third at the far end of the two channels.

The limestone appears to be in large horizontal beds with considerable vertical fracture.

Entering by the right entrance there is a 5% down gradient for 60 feet through a tunnel 15 feet wide and 8 feet high in a north northwesterly direction. The down gradient then steepens to 10%, the direction changing slightly to due northwest. The tunnel widens to a large room, the ceiling height varying from 4 to 25 feet. The large chamber which one then enters is approximately 50 x 50 feet with an average 20 foot flat ceiling. At the end of this room the tunnel continues for 30 feet where it ends.

From this point one climbs over debris to the end of the other channel, which here joins the first. Two smaller tunnels continue inward from here. The left one terminates in 20 feet, but the right one continues for at least 50 feet more. This center spur is the probable continuation of the cave, but at present it is a small tunnel 4 feet wide and from 2 to 3 feet high requiring crawling. The bottom of the tunnel is covered with soft and sticky mud to a depth of several inches. An attempt was made to crawl this tunnel, but was abandoned due to the muddy condition. The quantity of mud and moist earth in the cave was surprising, considering that the time of this visit was September (the end of the dry season). There was no drip at any place in the cave, but much of the rock of the walls and ceiling were coated with beads of water.

The return trip was made by the second channel

which emerges on the roadway at the tiny entrance previously mentioned. At first this second channel is small and narrow, averaging from 4 to 6 feet in height and 15 feet in width, then it emerges into a long room measuring about 100 feet in length, 30 feet in width, and with a 20 foot ceiling.

The deepest part of the cave, at the inner end, is not more than 50 feet lower than the entrance. The over-all length of the cave (as far as negotiated) was 250 feet from entrance to inner end, or a 500-foot round trip by way of one channel and returning the other.

The limestone of the interior is of a striped variety, with shadings from very light gray to dark gray. Some tan colored stone found, but apparently due to stain. In the most of the vertical fracturing, earth and black rock were squeezed as intrusions, giving the stones in the ceiling the effect of having been cemented there. This illusion is heightened by the extreme flatness of the ceiling throughout. The chambers particularly, where not marred by roof collapse, are as singularly flat-roofed and smooth as a ceiling in a house. The temperature at the extreme inner end was 61 degrees Fahrenheit, representing a gradual drop of only 10 degrees from that outside the cave.

Vandals have destroyed all the formation in the cave. There is evidence that the formations were once very numerous and beautiful, judging from the many stalactite and stalagmite stumps. Vandals have painted their initials and otherwise daubed with paint the ceilings and walls throughout the entire cave.

The front (or south end) of the cave has been destroyed, evidently when the highway pavement was constructed directly across the original opening. Much of the highway bedding and gravel has been carried into the cave by waters draining into the cave from the roadway. Previous reports on this cave indicate that it was much larger at one time—but a combination of highway construction, roof collapse, vandalism, and fossil-digging have destroyed what once must have been a beautiful cave.

No flora of any type was discovered. No fauna found, with the exception of some very tiny neutral-shaded frogs near the entrance.

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CRINOID STEMS NEAR TERRA ALTA

After passing E. S. Evans' farm West of Terra Alta, take the first road at the hilltop known as the Old Road to Kissgood for quite a distance. You will pass over an old bridge and there, to the right, is an old quarry. I have found many nice specimens of Crinoids there.

—WALTER S. AMOS.

NOTES ON C. O. CONTENT OF CAVE AIR

Air contains normally 20.94% oxygen. When the oxygen percent is reduced to 17% a man compensates the deficiency by breathing a little faster and a little deeper. With air at 15% most men become dizzy, have a buzzing in the ears, have a more rapid heart-beat and sometimes suffer from headache. Very few men are free from these symptoms when the oxygen falls to 10%. Most men become unconscious when the oxygen percentage falls to 13. The safety lamp goes out at 16½%. At 19% the flame is only about ⅓ the brilliancy of the lamp burning in normal air.

—DR. R. H. HOLDEN.

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CAVE RAT AT CAVE NEAR MORGAMTOWN, W. VA.

In the summer of 1928 we drilled a rock that was in the opening to a cave on the southwest side of the hill near the creek. We could hear the passing of cave rats in the lead. We prepared the dynamite charge, lit the fuse and shot the rock, returning to see what effect the charge had made. We found a cave rat that had become too curious and was blown up, too badly mangled for a specimen. This rat was a little larger than the ordinary cave rat, had extra long whiskers, and had *fur on its tail like a kitten.*

—WALTER S. AMOS.

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CONTIRBUTORS, PLEASE NOTE!

It will be essential, hereafter, that *all* copy submitted to the Editor for use in the BULLETIN be typewritten, double-spaced, and edited for data inclusion (i. e., do not leave blanks in copy for Ed. to guess words, names, places, measurements, and the like) and grammar. Do not send in carbon copies; send only *originals*. Type your articles and reports up as you wish them to appear, guided by make-up in the current issue. If you wish reprints of your articles; or wish to submit illustrations, this so that you may be properly serviced and billed for this extra service.

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PREVIOUS BULLETINS

Bulletin No. 1—Speleological Society of District of Columbia—June 1940 (exhausted).

Bulletin No. 2—National Speleological Society—May 1941 (few copies available).

Bulletin No. 3 — National Speleological Society — January 1942 (exhausted).

Bulletin No. 4 — National Speleological Society — September 1942 (available).

President's Section

The "Speleologist" Defined*

... By W. J. STEPHENSON

Speleology is not just a branch of geology. It is a broad term and covers a most extensive field. One cannot attempt the study of caves until he is properly equipped to enter a cave with a reasonable expectation of returning to the surface safely, and returning, moreover, with scientific data or records covering his trip underground. To test equipment and develop the technique of safe sub-surface travel is, therefore, one of the first fields which speleology embraces—one which, offhand, would not be apparent as lying within the definition of the term "speleology."

To bring back scientific data of any value from underground requires considerable skill, for example, in photography, in engineering, and perhaps the ability to collect and observe all forms of living cave matter. Speleology, therefore, all embraces the fields of photography, engineering, zoology, and botany. Those who might have imagined speleology as a branch of geology or another highly restricted science should by now begin to sense the error of their concept.

A more complete realization of the breadth of the term accrues as one is remined that a speleologist should be somewhat of an archeologist, paleontologist, folklorist, doctor or sanitary engineer, mineralogist or chemist, lover of hiking, alpinist, conservationist and, as it is now turning out, draftsman, author, clerk or typist—all this in addition to being a geologist.

To explain this a bit, many of the world's archeological discoveries and material are found in caves, especially in our western caves and those in Europe. A good speleologist, therefore, definitely must know enough of the science of archeology to recognize its materials when present. Also, he must know how to conduct his particular studies without destroying or injuring the site for further study by a fully trained archeologist.

This latter principle, incidentally, applies in all the other above-mentioned fields. One speleologist must always conduct his particular field of study with such skill that it will not injure the cave for subsequent students of his own or of some other field. Folklore enters importantly into speleology, since the history of caves is oftentimes tied in closely with the history of the country. Many a patriot, criminal, soldier, spy, is known to have made a cave his refuge, thus making it of national importance. The preservation of such caves is perhaps to some degree as important as other landmarks made famous by similar events. Moreover, many caves have their own local legends: the duck or dog which went into the cave and days later came out in the next county; the cave with the buried treasure; the cave was used as an arsenal in the Civil War, etc. While many such tales may have no factual background, the old saying "Where there's smoke there's fire" holds as good here as elsewhere. Many wild sounding stories when investigated are found to have basis in facts that aid often in the exploration of a cave or in tracing out and studying its rate of natural change or destruction.

Often sources of underground water pollution are encountered that require the speleologist to enter the field of Public Health. Any active field worker should always be well trained in first-aid for obvious reasons.

Why a speleologist should also be an experienced camper, hiker or alpinist hardly needs explaining even though it must be admitted that one can make valuable contributions to the science without necessarily being any of the above. The same is true as regards to the desirability of the speleologist's being a mineralogist, zoologist, botanist, paleontologist, geologist, etc.

As records must be kept, results of field work and other studies written up, the speleologist must also be office clerk, author, etc. whether he likes it or not.

How States May Help the Society

As it relates to the work and everyday operation of the various state geological surveys and conservation boards, speleology can now be discussed with the feeling that the reader has at least some notion of what it means and of what the National Speleological Society is attempting to do.

Our first problem is that of cataloging and locating specifically all the caves of the country which are at present known. Since caves may possess considerable military and economic value for us, it is therefore doubly urgent that the problem of listing them together with all readily available data concerning them be attacked without delay. This task, far from complete yet, remains one in which the various state geological survey and conservation boards can obviously be of great assistance. A few States have to some degree surveyed their own caves. Pennsylvania has published a pamphlet

*This article somewhat abridged here, appeared originally in the July 1942 issue of *The Journal of the American Association of State Geologists.*

by Dr. R. W. Stone on the caves of the State; Virginia describes its commercial caves only, in *Caverns of Virginia*, by Dr. Wm. McGill of the State Geological Survey. A number of caves in Alabama are described in *Ground Waters of Northern Alabama*, by Dr. Walter Jones, Chief of the State Department of Conservation. The Academy of Sciences of Tennessee devoted one issue of their bulletin entirely to caves. Indiana, Ohio, Kansas, Missouri, have also published some work on their caves. No States excepting Pennsylvania and Alabama, however, to the knowledge of the Society at present, has made any comprehensive attempt to catalog thoroughly all their known caves.

This problem offers no real technical difficulties, though in some States it may prove to be quite a physical task because their great number. This work, however, can often be woven with but little difficulty into field programs. A man on any field trip may inquire of the natives the location of any caves in the area and add the answer to his field notes. This could be made routine procedure and should in a short time result in the locating of the majority of the caves in the State. By merely publishing the fact that it is compiling a list of the State's caves and requesting volunteer information, a sizable catalog of caves would probably be received without the necessity of any field work at all. Of course most all of the information received in this way is unreliable with the exception of data regarding location. Since location is the main factor in this and all preliminary work, however, this method of location is obviously acceptable. Final location data on caves should be converted into latitude and longitude if possible.

Whenever any survey of cave location is attempted, a number of people naturally interested in caves are also discovered as a by-product of this work. These people are all embryo speleologists, but usually will need a little encouragement and development. When and wherever encountered they should be told of the existence of the National Speleological Society and its work; how the Society can furnish them with general cave information; and how they, by becoming members and using the Society's facilities (such as the library), can individually study up on speleology and through the medium of our bulletin can keep up with what is being done in this field. They should further be told how they can get in touch with others in their area who are also interested, and thus form a group for working and studying together.

When a considerable number of such interested people in the state become members of the National Speleogical Society or when an active grotto has been established in the state, the problems of gathering detailed field information on the state's caves should, from the standpoint of the State Geological Survey, be more or less solved.

A state group of speleologists should include all the types of people comprising the Society's membership, that is, from layman or farm boy to scientist. The common factor is enthusiasm and interest in cave study. The farm boy without any technical training whatsoever will usually be found to have an ability to penetrate and explore which is generally far beyond that possessed by the average scientist. When such a boy has a small amount of technical instruction (usually picked up by mere association) and works under the guidance of the scientist, a team is produced that should be able to solve the mysteries of any cave. Moreover, cave exploration and study is recreation to the speleologist and is stimulating to both mind and body.

If close relationship is maintained between the State Survey and the state's speleologists, the study of the state's caves should proceed apace. The speleologist should be able to cover the state with a fine-tooth comb to locate all caves which the Survey might have missed. He should be able to start active exploration and mapping of the caves and to initiate and help in research projects, many of which may well be undertaken jointly by the state and the Society. The field and scope of such projects is limitless: they may include nationwide projects initiated by the Society, State projects, or studies attempted by individuals, in any field from geology through archeology, zoology, photography, to folklore.

The Society and its members should be able to help publicize the state through their work and expected discoveries, and by creating and maintaining a general public interest in caves, thus aiding the state's commercial cave and tourist business, which in many states is of considerable importance.

The state Geological Surveys and Conservation Departments can aid the Society and its work by loaning (similar to "seed loans") technical equipment to the Society for technical projects. Examples of such equipment are compass and tape for mapping, etc., sampling apparatus and laboratory facilities for specific projects such as cave earth and cave water studies, etc.

By publishing the results of joint undertakings as a state publication or a joint publication the Society will be greatly aided by being relieved of such printing expense, and the state will benefit thus as from any other state publication. By furnishing technical help and advice the state may be of further obvious help. By close coöperation with national headquarters of the Society, especially in keeping the Society informed and supplied with information as to articles and other material bearing on speleology which comes to the state's attention, it may actively help in the establishment and maintenance

of a complete speleological library and bibliography for general reference work. The latter especially will probably prove to be of more value to the states themselves than to the Society's individual membership. Finally, by actively sponsoring a state grotto of the Society the culmination of state aid would be reached.

From the above it may appear offhand that the Speleological Society is asking a lot from the various states. This is not believed to be the case. Speleology is a field that should long ago have received attention in this country. It is a field which has been seriously neglected by most of our states, and one which should be and is primarily a state's responsibility to foster. The reason is that this field cannot be effectively studied by a single individual or small group even though working full time. The field is too great, the cost too heavy, and the value of the results highly speculative as far as immediate monetary returns are concerned. For these reasons it has been neglected. What is the answer? How can this science be studied effectively, efficiently, and at reasonable cost? The answer is by a large National organization of volunteer bodies to do most of the routine work. Therefore anything which the state can do to promote such an organization is of direct benefit to the states and aids them to attack a problem which is otherwise beyond their means to tackle effectively without the tools (both manpower and specialized knowledge) that will be furnished by the establishment of such an organization.

Though the war has curtailed the activities of the Society somewhat as it has every activity not directly related to the war effort, work done now may be perhaps needed before this war is over. In any event, all work done now will serve as a foundation upon which to build when we have established a lasting peace.

Random Notes

Chiefly on Cave Deposits Prepared for the Blacksburg Meeting of the National Speleological Society, Sept. 5th to 7th, 1942

EDITOR'S NOTE: Although these notes were not prepared with the idea of publication it seems a shame to deny members who could not attend the trip to Blacksburg access to this material. Authorship of the notes is not stated, but it is believed that Dr. R. J. Holden deserves principal credit, even though he may not wish to claim authorship in their present form.

It is perhaps carrying "coals to Newcastle" to talk on such a topic before an organization of this type whose members have probably seen more of cave deposits than the writer. No generally accepted nomenclature covering all phases of cave deposits has yet been devised. Of course many popular terms are widely known and generally accepted but these cover only the more general types of cave deposits and features which are known wherever caves abound.

From some standpoints it is highly desirable that any classification of cave deposits be on a genetic basis. The trouble with this idea is that the origin of all types of cave deposits is not so thoroughly established as to gain universal acceptance. It seems to the writer that we might well recognize four types of deposits. Three of these are the result of deposition of solid material from solution, the fourth is residual and consists of the remaining materials which have not been dissolved by recent geological processes. Another difficulty is that certain deposits may be of mix origin and it is not always possible to say with certainty which process is dominant.

The writer can see three agencies or forces or whatever one sees fit to call them, which are active in the formation of materials which are taken from solution. The first of these are those which owe their external shapes to the action of gravity, another will be due to the force of crystallization, and a third will result from the action of capillarity. One must always remember to take into account the chemical character of the material composing the deposit. Dominantly cave materials are calcium carbonate. As is well known calcium carbonate as such is comparatively insoluble. Calcium bi-carbonate on the other hand is comparatively soluble. Waters which are free from carbon-dioxide have very little solvent power for calcium carbonate. On the other hand carbonated waters have a strong solvent action. So far we have looked into this from the standpoint of the going from a solid to a solution. Actually we are more concerned with the reverse process of the going from the solution to the solid. In other words deposition of calcium carbonate from solution. Saturated solutions of calcium bi-carbonate are exceedingly sensitive to the carbon-dioxide of the solution and furthermore such solutions on exposure to the air readily lose some of the carbon-dioxide content. When ever this happens normal calcium carbonate is formed and deposited. For illustration let us take a stalactite which carries on its lower extremity a drop of saturated calcium-bicarbonate solution. Along comes a breath of air and carbon-dioxide from the exterior of the drop escapes and a corresponding amount of calcium carbonate is rendered insoluble and precipitated. Remember that this is on the exterior of the drop. The upper margin of this drop would be in contact with the tip of the stalactite and the calcium carbonate formed in that immediate contact will attach

(*Continued on page 63*)

Committee Reports

Catalog of the Literature in the Library of The National Speleological Society

... *Prepared by* ROBERT S. BRAY

The literature listed in the following catalog is available to members of the Society at the rate of ten cents a week per book, postage to be paid both ways by the borrower. Pamphlets are excepted, and special charges are made on them according to the number borrowed at one time. It is hoped that by means of the fees collected the collection may be enhanced through the purchase of additional books.

The collection has doubled within the past year in a half, partly by purchase, but mainly through the generous contributions of authors who have been solicited for a copy of their work.

The Librarian, in his capacity as a reference assistant at the Library of Congress, endeavors to answer bibliographical questions on the literature of speleology, drawing material from that institution or from the rapidly growing list of references on file with the Library of the Society.

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Steidtmann, Edward.
Humidity and Waters of a Limestone Cavern Near Lexington, Va. 1936. *Bulletin 46-E, Virginia Geological Survey*.

Stevens, Frank.
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Pennsylvania Caves. 1932. With a Chapter on Penn. Cave Fauna by Charles E. Mohr. *Penn. Geological Survey*. Fourth Series, Bulletin G 3.

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Caves of Pennsylvania Attract Attention. 1942. *Commonwealth of Penn., Dept. of Internal Affairs, Monthly Bulletin*, March 1942, Vol. 10, No. 4., 15-16.

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A Classification of the Genus Pseudanophthalmus Jeannel (Fam. Carabidae) with Descriptions of New Species and Notes on Distribution. *Jour. Elisha Mitchell Soc.*, 47(2): 261-280. 2 pls.

Valentine, J. M.
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Webb, William S.
An Archaeological Survey of the Norris Basin in Eastern Tennessee. 1938. *Bureau of Amer. Ethnology, Bull. 118.*

Wedel, Waldo R.
Archeological Remains in Central Kansas and Their Possible Bearing on the Location of Quivira. 1942. *Smithsonian Misc. Coll.*, Vol. 101, No. 7.

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Geologic Map of West Virginia. 1932. Morgantown, W. Va.

White, George W.
The Limestone Caves and Caverns of Ohio. *Ohio Jour. of Sci.*, Vol. 26, No. 2. (reprint)

Woodward, Herbert P.
Geology and Mineral Resources of the Roanoke Area, Virginia. 1932. *Bulletin 34, Virginia Geological Survey.*

Very soon after the catalog above was submitted to the editor five cartons of books were received. These were the gift of Dr. Paul Price of the West Virginia Geological Survey, and his gesture is typical of his long interest in the Society.

The collection consists of the following county reports of his organization:

1. Greenbrier County, 1939. Maps, 1936-37. Five copies.
2. Hampshire and Hardy Counties, 1927. Maps, 1926. Five copies.
3. Jefferson, Berkeley and Morgan Counties, 1916. Maps, 1916. Five copies.
4. Mineral and Grant Counties, 1924. Maps, 1923. Five copies.
5. Pendleton County, 1927. Maps, 1927. Five copies.
6. Pocahontas County, 1929. Maps, 1929. Five copies.
7. Preston County, 1914. Maps, 1914. Five copies.
8. Randolph County, 1931. Maps, 1931. Five copies.
9. Tucker County, 1923. Maps, 1921.

Each report contains numerous illustrations and is accompanied by a folio of maps of the area under consideration, one topographical and one geological. The reports for Greenbriar, Pendleton, and Pocahontas are rich in cave references. The shortest report is over 300 pages, while there is one of over 900. In short it is a fine collection to add to our Library. We hope other "cave States" will try to keep Dr. Price from getting ahead of them!

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News-Letter No. 1

of the Committee on Exploration and Location

January, 1943.

The Chairman plans to send out this news-letter once each month to members of the committee. It is hoped that members will contribute items whenever they have them. Inasmuch as liaison has not yet been established between the Chairman and members of his committee in the Eastern part of the country, the contents of this news-letter are concerned only with the work in the Far West.

News on Washington Caves at Last!!

Information on caves within the State of Washington has at last been received and is being prepared for speleological listing. This information was secured from Mr. Harold E. Culver, supervisor of the Division of

Geology of the State of Washington. While the notations of cave occurrences were brief, Mr. Culver's material filled a big hole in our list of western caves. He points out, however, that this information does not "do justice to occurrences of caves in Washington, and I am going to ask one of the geologists on the staff here to secure all the additional information possible."

The caves mentioned include a small "ice" cave located in an erosional remnant of the Columbia River lavas just north of Spokane. This has an old shaft lined with tea matting, which indicates an association with the early Hudson Bay Company factories. Other information on limestone and lava caves in various parts of the state is included, and should prove very useful to any members contemplating exploration in Washington.

Exploring Opportunities in the South-West

We are accustomed to think only of the Carlsbad Caverns when we refer to the American southwest, but indications are that it is one of the most interesting fields in the country for speleological exploration. The geologist, Willis T. Lee, states that "Carlsbad may be excelled by some unexplored caverns in the Guadalupe Mountains." Near to Carlsbad are several other large caves, particularly Bighorn Cave (in west branch of Slaughter Canyon) and McKitterick Cave (20 miles north of Carlsbad).

Unexplored caves are also reported to be in Last Chance Canyon, near Queen, New Mexico. Speleological data is also desired of the "Cerro de la Bandera" Ice Cave located 50 miles southeast of Gallup. This was last reported as having an ice wall 50 feet long and 14 feet high.

Lava tunnels, with ice formations all year round, have been reported near Winona, Arizona. The Chevalon canyon, near Winslow, Arizona, remains unexplored, but aerial observations have indicated the presence of some enormous caverns.

Information Wanted on Unique Texas Cave

A condensation of information on the exploration of a limestone cave near Boerne, Texas, about 1932 by a party headed by Dr. Frank E. Nicholson, indicates that it is perhaps the most unusual phenomenon in our science. The information is from an old reference, and anyone having further information on this cave please contact this committee.

Five hundred feet within the cave is a subterranean lake overhung by stalactites which reach to the surface of the water, requiring swimming under water for 200 feet. Occasional "pockets" permit breathing. This expedition penetrated beyond the lake to a great vaulted tunnel, which contained a "bottomless pit," subterranean spring, and stream. Progress was possible to a point one mile from the entrance and 600 feet below the surface.

The most unusual feature of the cave is that in it were found white blind crawfish, pheletrodroid salamanders, and blind, white translucent frogs. Most unbelievable is the report that at the cave's lowest level (one mile from entrance and 600 feet underground), 50 Spanish oak and Hackberry trees were found growing. That trees can grow in complete darkness with a complete absence of light and sunshine is a phenomenon that demands further investigation by speleologists.

Information Desired on an Eastern Cave

Cave in question lies 1 mile southeast of Sloan's Valley Station in northeast part of map of the Burnside Quadrangle (Geological Survey), located near the west margin of the Cumberland Plateau. A Mr. W. M. Davis, in a paper on limestone caverns, states that this cave seems to give evidence at least of the possibility of active solution below the water table. (Most caverns are opened by solution below the ground water table and later exposed and subjected to corrasion by the lowering of the ground water). Anyone knowing of this cave, or further information, is requested to contact this committee.

Curtailed Travel Hits Exploration Work

Gas rationing, and the necessary saving of rubber, have reduced the amount of active exploration that can be done by the committee in 1943. However, there is much needed research and classification work to be done, and the war years provide the best opportunity for it. Members who are looking forward to active exploration, are advised to determine now what caves or areas they mean to visit, and then spend as much time as possible in research and reading about this cave or area. In that way, a much more intelligent exploration can be made when the opportunities for real field work again open up.

ERWIN W. BISCHOFF, *Chairman*.
567 33 St., Oakland, Calif.

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Cave Fauna

. . . *By* J. A. FOWLER

The present Fauna Committee report includes a new feature which will henceforth be made a permanent part of these occasional cave fauna lists. This report, as well as subsequent ones, thus will consist not only of the usual new additions to the list of cave fauna, but will also include an annotated list of the current literature on North American cave fauna.

So far as the new additions to the cave fauna list are concerned, these are compiled from two principal

sources. One of these is the communications received from the United States National Museum regarding the specimens sent to them for identification. The other is the irregular faunal lists forwarded to the Fauna Committee by individual members describing material collected by them personally. These latter are frequently restricted to the specific group that is the specialty of the person sending them in. In this connection, the Fauna Committee would like to call the attention of the members to the fact that we have in the Society (and on the Fauna Committee) specialists in several groups of animals. These persons are qualified to identify any material representative of their group which is sent to them for identification. In order to expedite the identification of cave-collected faunal specimens, it is suggested that whenever possible such specimens be sent to the proper authority. A partial list of these authorities and their specialities follows: Dr. J. M. Valentine—beetles; Dr. J. P. E. Morrison—snails; Dr. Martin Muma—spiders; Dr. Leslie Hubricht—isopods and amphipods; Mr. Charles E. Mohr—bats; and Mr. J. A. Fowler—amphibians and reptiles.

New Additions to the Cave Fauna List

Mollusca

Goniobasis ebenum Lea—Wonder Cave, Grundy Co., Tenn. At the mouth of the cave in the "twilight zone."

Myriopoda

Polydesmus serratus Say—Boyer's Cave, Liverpool, Perry Co., Pa.

[1]*Arachnida*

Order Phalangida

Suborder Plagiostethi

Family Phalangiidae

Leiobunum bicolor Wood—3 sub-adults collected in zone of partial darkness (PD), John Friend's Saltpeter Cave, Oakland, Garrett Co., Md.; one adult collected Big Springs Cave, W. Va. in zone of total darkness (TD).

Order Araneida

Superfamily Argiopoidea

Family Gnaphosidae

Drassylus depressus Emerton—1 male collected in cave entrance (CE), Indian Caves, W. Va.

Family Theridiidae

Theridion tepidariorum Koch—1 female collected CE, Indian Caves, W. Va.

Family Linyphiidae

Anthrobia mammouthia TellKamf—1 young female collected by Ed Gage, TD, Big Springs Cave, W. Va.

[1]The spider (Arachnida) list was compiled by Martin Muma.

Family Argiopidae

Cyclosa turbinata Walckenaer—1 female collected CE, John Friend's Saltpeter Cave, Oakland, Garrett Co., Md.

Meta menardi Latreille—1 young female collected TD, Big Springs Cave, W. Va.

Family Agelenidae

Coras sp.—1 young female collected CE, John Friend's Saltpeter Cave, Oakland, Garrett Co., Md.

Family Lycosidae

Lycosa rabida Walckenaer—1 male collected CE, Toney's Cave, Blacksburg, Va. by Bill Stephenson.

Family Salticidae

Habrocestum pulex Hentz—1 female collected CE, Indian Caves, W. Va.

Coleoptera

Pseudanophthalmus hubbardi (Ground beetle)—Luray Caverns, Va. in zone of total darkness (TD).

Quedius sp.—a scavenger beetle also collected from Luray Caverns, Va. (TD).

Orthoptera

Ceuthophilus sp.—a male nymph of the cave cricket. Collected in Dulany's Cave, Uniontown, Pa.

Siphonaptera

Myodopsylla insignis (Roth)—a male flea from Dulany's Cave, Uniontown, Pa. It is probable that this flea came from one of the bats inhabiting the cave, since this same species of flea was reported from certain Minnesota cave bats by Rysgaard[2].

Pisces

Cottus bairdii carolinae—this fish, one of the freshwater sculpins—Miller's Thumb, was collected in Toney's Cave, Blacksburg, Va.

Mammalia

Order Chiroptera

Suborder Microchiroptera

Family Vespertilionidae

Myotis lucifugus lucifugus (LeConte)—several new records include Dulany's Cave, Uniontown, Pa.; Five Quarry Cave, Martinsburg, W. Va.; John Friend's Saltpeter Cave, Oakland, Garrett Co., Md.; Porter's Cave, W. Va.; Trout Rock Cave, W. Va.; and Toney's Cave, Blacksburg, Va.

Myotis grisescens—Painted Bluffs Cave, Knoxville, Tenn.

[2]Rysgaard, G. N. A study of the cave bats of Minnesota with especial reference to the Large Brown Bat, *Eptesicus fuscus fuscus* (Beauvois). *Amer. Midl. Nat.* 28(1): 245-267, 1942.

Myotis sodalis—John Friend's Saltpeter Cave, Oakland, Garrett Co., Md.

Pipistrellus subflavus subflavus (Cuvier)—Painted Bluffs Cave, Knoxville, Tenn.

Recent Additions to the Literature on North American Cave Fauna (1938-1942)

This list of literature dealing with North American cave fauna for the period 1938-1942 is by no means exhaustive but is merely intended to call attention to certain pertinent papers which have come to the attention of the Fauna Committee, and which have not been previously listed in the cave bibliography. An asterisk (*) indicates that a copy of the paper is on file with the Fauna Committee chairman. Some of the others not so asterisked, however, may be obtained through the National Speleological Society Library c/o Robert S. Bray, Librarian, R. F. D. 2, Herndon, Va.

Allin, A. E. 1942. Bats hibernating in the district of Thunder Bay, Ontario. *Canadian Field-Nat.* 56(6): 90-91.

*Bishop, Sherman C. 1941. Notes on salamanders with descriptions of several new forms. *Occ. Papers Mus. Zool. Univ. Mich. No. 451*, p. 14.

A new subspecies of salamander, *Pseudotriton montanus diastictus*, is described, the type locality being Cascade Caverns, Carter Co., Kentucky.

Blair, Albert. 1939. Records of the salamander *Typhlotriton*. *Copeia*, No. 2, pp. 108-109.

Typhlotriton spelaeus, which has been reported from south-western Missouri, northern Arkansas, and extreme southeastern Kansas, has not been previously reported from Oklahoma. This article cites four locality records, two from caves and two from springs, in Oklahoma.

Breder, C. M. Jr. and E. B. Gresser. 1941. Further studies on the light sensitivity and behavior of the Mexican blind characin. *Zoologica* 26(4): 289-296.

Experiments with the fully blind, cave-dwelling *Anoptichthys*.

*Carr, A. F. Jr. 1939. *Haideotriton wallacei*, a new subterranean salamander from Georgia. *Occ. Papers Boston Soc. Nat. Hist.* 8:333-336.

A small, blind, white, perennibranch salamander with long legs brought up by an air-lift pump from a 200 foot artesian well at Albany, Doughtery Co., Georgia.

Chamberlain, Ralph V. 1942. On centipeds and millipeds from Mexican caves. *Bull. Univ. Utah Biol. Ser.* 7(2): 1-20, 22 figs.

Report on myriapods taken in caves in San Luis Potosi, Nuevo Leon, Vera Cruz, and Guerrero.

Cooley, R. A. and Glen M. Kohls. 1941. Three new species of Ornithodoros (Acarina: Ixodoidea). *Publ. Health Rep.* 56(12): 587-594, 1 pl., 3 figs.

Mites associated with bats in California, Arizona, Texas, and Oklahoma.

————. 1941. Further new species of Ornithodoros from bats (Acarina: (Argasidae). *Publ. Health Rep.* 56(17): 910-914, 3 figs.

Mites from a bat cave in Texas and a bat-inhabited mine-tunnel in Arizona; also from *Pipistrellus* sp. in Utah and Colorado.

Cowan, I. McT. 1942. Notes on the winter occurrence of bats in British Columbia. *Murrelet* 23(2): 61.

Lasionycteris noctivagans and *Myotis californicus caurinus* at Vancouver. October records of 4 spp. of Myotis.

*Dearolf, Kenneth. 1941. The invertebrates of 37 Pennsylvania Caves. *Proc. Pa. Acad. Sci.* 15: 170-180.

One hundred and twenty-six invertebrate species recorded from 37 Pennsylvania caves, an increase of 5½ times over the 23 invertebrates reported by Mohr (1932) from Pennsylvania caves.

Folk, G. Edgar Jr. 1940. Shifts of populations among hibernating bats. *Jour. Mammal.* 21(3): 306-315.

Records for *Myotis lucifugus* and other bats banded in New England, as well as frequent and detailed winter observations on hibernating *M. lucifugus* in Indian Oven Cave, Acram, New York.

Gates, William H. 1940-41. The bat—one of our most interesting mammals. *Louisiana Conserv. Rev.* 9(4): 40, 60.

————. 1941. A few notes on the Evening Bat, *Nycticeius humeralis* (Rafinesque). *Jour. Mammal.* 22(1): 53-56.

Thirty-one Evening Bats collected from a colony in Robeline, Louisiana, in May 1940 were all found to be pregnant, each carrying 2 young.

*Green, N. Bayard. 1942. Representatives of the genus *Gyrinophilus* in West Virginia. *Proc. W. Va. Acad. Sci.* 15: 179-183.

Cave habitat of Purple Salamander, *Gyrinophilus porphyriticus porphyriticus* mentioned. Reese's (1934) list of caves inhabited by this salamander is included. These caves were as follows: Mingo and Sinks, Randolph Co.; Snedegar's, Cave Creek, and Raine's Cave, Pocahontas Co.; Coffman's, Greenbrier Co.; and Steele's, Monroe Co. Specimens also collected from small cave near Aggregates, Randolph Co. This species is indicated as being more common in West Virginia caves than any

other salamander, including even the cave Salamander, *Eurycea lucifuga*.

Griffin, Donald R. 1939. Bats migrate too. *New Eng. Nat.* 5: 1-4, 4 figs.

Bats banded at Cape Cod in summer found following winter in Vermont and Connecticut. Move from cave to cave in winter when little insect food is available.

———. 1940. Notes on the life histories of New England cave bats. *Jour. Mammal.* 21(2): 181-187.

Notes on the seasonal distribution, social habits, and breeding habits of New England cave bats, especially *Myotis lucifugus*.

Hardy, Ross. 1941. Notes on Utah bats. *Jour. Mammal.* 22(3): 289-295.

Locality records for Utah bats with notes on habitat, habits, and distribution. Among 23 races, a number, such as *Myotis lucifugus phasma* and *Antrozous pallidus cantwelli*, not previously listed from Utah.

Hitchcock, Harold B. 1940. Keeping track of bats. *Canadian Field-Nat.* 54: 55-56.

Report of 738 *Myotis* and 11 *Eptesicus* banded in Ontario and Quebec. Species included *M. l. lucifugus*, *M. keenii septentrionalis; Eptesicus f. fuscus;* and *Pipistrellus subflavus obscurus*. Caves visited were: Lafleche Cave, Wilson's Corner, Quebec; caves on Flowerpot Island, Bruce Peninsula, Ontario; caves near Wiarton, Bruce Co., Ontario; and Crystal Rock Cave, as well as several caverns on South Bass Island, Sandusky Bay, Ohio.

———. 1941. *Myotis subulatus leibii* and other bats hibernating in Ontario and Quebec. *Canadian Field-Nat.* 55: 46.

Myotis subulatus leibii and *Pipistrellus subflavus obscurus* from two caves in Tyendinaga Township, Hastings Co., Ontario and St. Pierre de Wakefield, Gatineau Co., Quebec; *M. keenii septentrionalis* also from Wakefield Cave, *M. l. lucifugus* and *Eptesicus f. fuscus* from both caves.

——— and Keith Reynolds. 1940. *Pipistrellus* hibernating in Ontario. *Canadian Field-Nat.* 54: 89.

Pipistrellus subflavus obscurus hibernating in a small limestone cave at Rockwood, Wellington Co., Ontario. This subspecies reported but twice previously from Ontario—at Ottawa, and at Niagara-on-the-Lake.

———. 1942. Homing experiments with the Little Brown Bat, *Myotis lucifugus lucifugus* (LeConte). *Jour. Mammal.* 23(3): 258-267.

(to be continued)

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VANCE

This cave is owned by Mr. M. K. Vance. The cave is on the base of the hill on the east side of Roaring Springs Road, 2 miles north of Roaring Springs Mill or 1 mile up Roaring Springs Creek road from its junction with U. S. 11 just west of Orego.

The cave is just back of a spring behind the 2nd house past Roaring Springs Mill, just before the road leaves Roaring Springs Creek.

Cave visited and entered but not explored by W. J. S. 10/17/42. Cave appears to be a water course, with cave life (not collected). This cave is not known to be of any great extent but it has never been thoroughly explored.

Cave lies in the Greenbrier Limestone.

W. J. STEPHENSON.

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A Note on Some Banded Bats

J. A. FOWLER

Big Brown Bats, *Eptesicus f. fuscus,* collected in Whitings Neck Cave, Scrabble, Berkeley Co., W. Va., December 12, 1941, were found to be banded with metal bands attached to the wings of each of the bats. The Fish and Wildlife Service, United States Department of the Interior, through the courtesy of Dr. H. H. T. Jackson, has informed the writer that these bats were banded by Mr. H. Ison Shreve of Brushy Run, W. Va. at Whitings Neck Cave on March 16 and 30, 1941. Thus these same bats, which were banded in the spring in Whitings Neck Cave, were hibernating there in December.

Cave Log of the Society

Preliminary Speleological Reconnaissance May 17 to 24, 1942

By ERWIN BISCHOFF and FRED R. PRESLEY

What was intended to be a complete survey of the caves located within Sequoia National Park, Cal., had to be changed to a preliminary reconnaissance due to several factors that were unforeseen. In the first place, our photographer was unable to go along, so our plans to take interior flashlight photographs had to be abandoned. In the second place, because of the tire situation we decided to leave automobiles at home and travel to the park by public transportation. This proved a serious handicap. In the third place, we had under estimated the rugged nature of the terrain.

The park proved a difficult place even to reach. We finally arrived there by taking the Santa Fe train to Fresno (from Oakland, our starting point), then by gasoline interurban train to Visalia. From Visalia we proceeded to Giant Forest Lodge (in Sequoia Park) by means of a private sedan service which we contracted for in Visalia. We then made Giant Forest Lodge our base, from which we hiked to the cave areas.

Our preliminary letters to the Park Service, to the Park Superintendent, and to other officials proved to be of great value, as we were expected at the park and were very cordially received by the rangers. We telephoned Col. White, park superintendent, who made the trip up from his Ash Mountain headquarters to see us at the lodge two hours after our arrival. Col. White provided us with many excellent tips concerning the caves, and gave us a fine picture of the historical background and previous explorations. Other park officials, particularly Mr. Fry, the Wild Life Commissioner, and Ranger Blanks, gave us much assistance and information. They both assisted us greatly by taking us to vantage points in the park in Park Service trucks and giving us on-the-spot directions on cave locations and prospects.

We remained in the park for a week. Our daily activities and findings are outlined below:

MONDAY: Hiked to Crystal Cave: along Generals highway 2 miles to Colony Mill Road, thence 6.4 miles to end of park road, thence 3000 feet by trail to the cave. The cave entrance is protected by an iron grill which has been designed to give the appearance of a spider web, with a huge spider in the center. The spider revolves and acts as gate handle and lock. The Park Service sent a foreman down to unlock the gate for us. We remained in the cave from 10:30 A. M. to 3 P. M. A complete exploration was made, and all negotiable side passages investigated. Lacking a tape-line, however, we paced the main channel of the cave to give an estimated measurement. (See separate report on this cave). We returned by hiking the same road to the Lodge, arriving at 7:30 P. M. There is an available short-cut by trail, which leads from the Lodge 2:5 miles to Marble Fork Bridge, eliminating considerable road distance. This should be noted for future trips.

TUESDAY: Today we investigated two prospects which were pointed out to us by Ranger Blanks. From a point on the General's highway just north of Deer Ridge, a dark opening can be discerned on the south slope of Eleven Range Point (in the Marble Fork Canyon of the Kaweah). This had long been considered a possible cave entrance by park rangers, but its exploration had been deferred due to the difficulty of reaching it. These prospects lie half-way up an almost perpendicular slope in a limestone outcropping. At this location, our 50 foot length of rope proved a great asset. The climb down to the opening proved to be more physically exhausting than dangerous. We found the prospect disappointing speleologically. It was really two openings about 50 feet apart. Both were about 20 feet deep, and appeared to be the result of large boulders having become dislodged and falling down the slope, leaving a cave-like hole in the canyon wall. A two-foot stalactite had formed in one hole, however, and a group of tiny thin stalactites were found in the other.

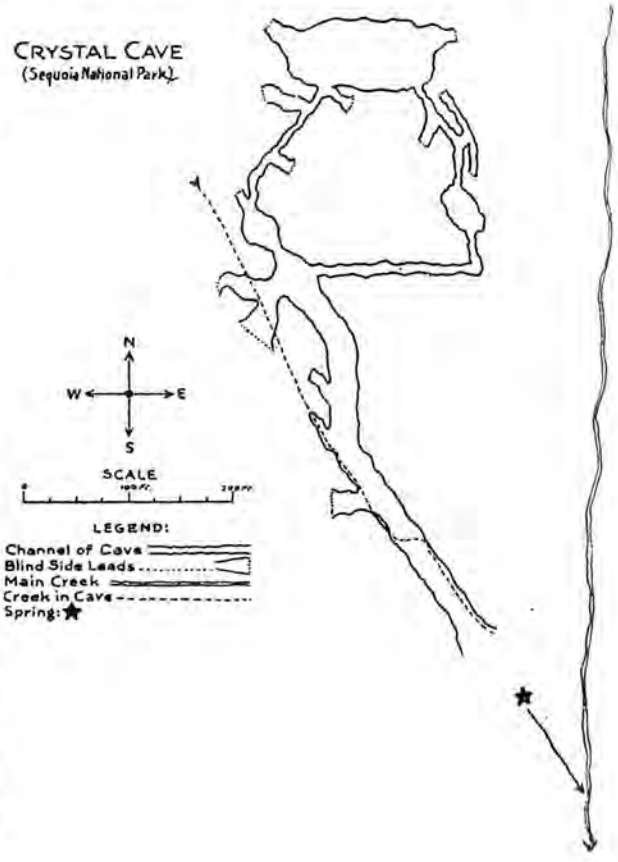
WEDNESDAY: The unaccustomed exertion of the previous day, to say nothing of numerous bruises and scratches acquired, made us decide to use this day for relaxation. We did, however, hike out to the summit of Moro Rock, elevation 6,719 ft., for a comprehensive view of the area. This afforded us a view of the areas in which Paradise, Palmer, and Clough caves were located. The apparent great distance and extremely steep nature of these areas decided us against attempting to reach them on foot from the Lodge.

THURSDAY: Our first attempt to reach Marble Cave. This cave is the closest to our lodge (1 mile), but strangely, is the most difficult cave in the park to reach. It has never been explored, even by rangers. Ranger Blanks is the only man who has descended to it within the last fifteen years. The cave lies at the bottom of the deep gorge of the Marble fork of the Kaweah. The canyon walls are almost perpendicular, and it is 2000 feet down from the highway. On this day we attempted to reach it from upstream, our plan being to work down along the river. We separated, Fred going up the Marble Fork Bridge and attempting to work down from there. I cut straight down the canyon wall about a half-mile above the cave. This proved to be the most gruelling and hazardous climb in my experience. I was able to reach a point about 500 yards above the cave, but no farther. The river was also running too high and too fast to cross, and the cave is on the opposite (west) bank. Fred encountered an impassable section farther upstream and also had to turn back. The presence of millions of lady-bugs made the going difficult. Every rock, tree, and twig was covered with them. As it was necessary to hold on to these rocks and trees in climbing along the river canyon, the bugs would crush under one's hands and render only a very slippery support. The bugs also flew into one's eyes and mouth, and down the inside of one's collar. Despite the picturesque beauty of the canyon, we were glad to get out as soon as we could.

FRIDAY: Our second attempt to reach Marble Cave. This time we made an effort to negotiate the ravine just south of Eleven Range Point, but this proved too difficult in the lower sections for the quick progress required if we expected to return by dark. We made several other unsuccessful attempts on the north and south slopes of Deep Ridge. I did succeed in climbing out to a point just south of Deer Ridge, from which the Marble Falls were visible. (the only such point on this side of the canyon). We did locate two places where the climb down to the cave appeared feasible, but due to the arduous nature of the descent and ascent it will be necessary for the explorer to come to the "jumping-off" place by automobile so as to be fresh for this work. The preliminary road hiking tired us too much.

SATURDAY AND SUNDAY: These two days spent wandering about the higher altitudes to the east. No speleological prospects in that area. Spent a great deal of time chatting with the rangers about the other caves which we were required to postpone. We learned of "Boyden's" cave located in Kings Canyon National Park, and which was not on our Western caves list. Also of "Soldier's" cave, presumed to be in the vicinity of Palmer cave—but while well known some thirty or forty years ago, has since disappeared and no one has been able to locate it since. The story is that while the Park was under the Army's administration, some soldiers went out to explore it and never returned. Clough Cave has been much vandalized, the formations having turned brown from the torches used in exploration. It is said to be a quarter-mile long. Putnam cave, also a new one to us, is said by rangers to be located just below a ridge on a mountain known as Homer's Nose. Paradise cave has an entrance hole that has a sixty-foot perpendicular drop, and formerly there was a windlass over the cave opening but it is not known if it is still there. A closer approach may be made to the cave by a road known as the "oil road." (See rangers for information on this road).

CONCLUSION: The caves and cave prospects of Sequoia National Park are all located along the line of a limestone outcropping, which comes to the surface intermittently in the form of a dike. This line runs north and south near the western boundary of the park. No caves have been discovered in the eastern half of the park. All of the caves are in limestone, and are solution cavities (with exception of Marble-cave which is partly river-formed), and Crystal Cave is perhaps the best in



the region. Those who attempt to do cave work in this region are advised to take an automobile, wear sturdy shoes and clothes, and include a 75 foot rope in their equipment. Large knapsacks are a necessity to transport speleological equipment and lunches, as the hands must be kept free for climbing.

(Trip made May 18 from base camp at Giant Forest Village in Sequoia National Park, by hiking two miles south on General's Highway to junction with Colony Mill Road, then 6.4 miles northwest to end of road, then 3000 feet by trail to cave.)

The entrance to this limestone cavern is on the northwest wall of a creek canyon. The general course of the canyon is north and south, the creek flowing toward the south. The cave opening faces toward the southeast. The region surrounding the cave is a very mountainous type, the creek canyon is heavily timbered, and the cave entrance is located in a vertical bluff of limestone. The entrance is located near the bottom of the hillside, about 15 feet above the creek level. Looking toward the interior, the direction of the entrance tunnel is northwest. The entrance itself is 12 feet high by 27 feet wide, and is dry.

The cave exists in thick bedded limestone, the general course of the cave being along the joints and seams in a gradual upward slope, except where interrupted by huge horizontal boulders. There are three levels in the cavern which correspond to three channels hollowed out by the creek which originates from drip waters in the cave. The upper level is not negotiable, consisting at present principally of chambers which form the vaulted ceilings of the middle chambers. It is accessible only by rope and piton method, and has no continuous floor. The middle level is the main negotiable channel.

The up-slope of the middle level is about 25 degrees. A parallel smaller channel exists about 25 feet above and to the north of the main channel of the middle level, which has an up-slope of from 20 to 25 degrees. The return trip is made via the secondary channel, which joins the main channel near the entrance by means of a park service constructed path. The lower level is accessible only by rope down narrow crevices and exists as the lowest level of the cave stream. At its deepest portion it is only 30 feet below the middle level. It consists of very tiny rooms and long non-negotiable crevices containing the stream.

A trip from the entrance down the main channel takes one to the "main room" and returning via the secondary channel, representing a distance of 1200 feet (paced). The distance from the entrance to the main room is 626 feet (paced).

The direction of the main passage is northwest, and that of the secondary channel northwest to northeast. Minor leads go to the upper and lower levels at right angles to the main passage. The longest leads occur near the main room, one going down 40 feet (estimated) and another reaching up 50 feet (estimated).

The main passage has an average width of 25 feet, with a maximum of 70 feet and a minimum of 3 feet. Average height of the tunnels are 15 feet. Average ceiling of chambers 55 feet, with a maximum of 65 feet.

There are two chambers which can be called "rooms." The "Main Room", located at the inner end of the main passage, is oval shaped, running east to west, is 120 feet long, 70 feet wide, and 60 feet high (estimated). The other smaller room is located on the secondary passage of the main level, is oblong, running north to south, is 60 feet long, 30 feet high, 50 feet wide (paced and estimated).

There is an average amount of decoration, some large quantities existing in the blind leads. Dripstone is abundant in the form of stalactites, stalagmites, columns, ribbons. No helictites were found. There were some small pools and pool-formations similar to the oolite-formation ponds. One stalactite found was 7 feet long, 3 feet wide (measured). One column was 12 feet high, 4 feet wide (measured). About 80% of the formation was grey and buff colored, the other 20% white.

The floor of the main and secondary passage is of mud and sand, with patches of broken rock debris and bedrock.

The cave contains a stream which follows the course of the main passage, but is usually down in a deep crevice. It reaches passage level about 120 feet (paced) from the cave entrance where it crosses the passage. From this point it continues in a 6 foot deep crevice about 2 feet wide (water about a half-foot deep) to within 50 feet of the cave entrance where it disappears into a hole and reappears as a spring just outside the cave. There are 3 ponds in the cave, each approximately 10 feet by 10 feet, all of which contain ridged separations.

At this time of the year (May), the cave was fairly wet, with considerable drip in the interior regions.

Photographic opportunities are poor, due to the twisting nature of the passage and the small number of rooms. The exploring conditions of the cave are good, there being no opportunity to become lost. The cave is clean and easily negotiable, except for climbs in minor leads to upper and lower levels.

There was no plant life found. No fauna noticed,

with the exception of many black millipedes (all found were dead, but in good condition).

The main passage has a strong air circulation, the cold wind undoubtedly being responsible for the low temperatures throughout the cave, as the stream water did not feel particularly cold. Thermometers placed in various parts of the cave all indicated 45 degrees Fahrenheit. An outside thermometer (placed in shade just outside cave entrance) indicated 49 degrees at 10 A. M., and 53 degrees at 2 P. M.

The cave has been considerably developed during the past two years by the Park Service. Concrete rest-rooms have been installed in a lead just inside the entrance. The cave entrance is protected by a wire grill representing a spider web, with the spider in the center acting as handle and lock. The main passage path has been improved to some extent, and the connection between the secondary channel and the main channel on the return trip is a park construction. An ingenious electric lighting system has been installed throughout the main level. None of the lights or wires are visible from the path, and the indirect lighting is intelligently planned. Guide-conducted trips are made several times a day during the tourist season, which begins about May 28th. Those visiting the cave out of season should apply for permission and key at Park Headquarters.

If any serious exploration of the minor leads is contemplated, the following equipment will prove useful. A gasoline pressure lantern (preferably the 2-mantle type). A 50 foot length of strong rope. A compass. A head-lamp which will leave both arms free for climbing (we used an electric type, which was wired to a battery case clamped to our belts).

We are satisfied that we investigated every negotiable lead and crevice in the cavern, and that there are no large passages or rooms existing off the main passage. The only possible extension of the cave may lie in openings near the ceiling of some minor leads and the main room. These, however, cannot be reached without a long ladder.

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Additional Reports of Previous Trips

SHOSHONE

Preliminary Reconnaissance: June, 1941.
Trip made by auto from Oakland, Calif.

This is an ice-filled lava tube located about 14 miles north of Shoshone, Idaho. It has been partly developed by a private caretaker who lives near the cave, and who guides parties through the cave and furnishes lanterns. There is no interior lighting, but a wooden board-walk has been constructed which runs the length of the cave.

It is a fairly large tube with considerable ice throughout. The cave occurs in a lava formation area, and the cave entrance presents a cross section clearly indicating several distinct flows of lava subsequent to that which formed the cave. The lava is a black basalt.

The caretaker stated that originally an ice wall blocked the interior only a few feet from the entrance, but when a hole was chopped through this and warm air currents admitted, much of the ice in the tube melted. However, an ice "river" of undetermined depth still covers the entire length of the tube floor. About 150 feet from the end of the tube the last remaining ice wall still stands. It is now about 10 feet high, a hole having been chopped on top to permit further exploration. The ice in the wall is stratified, indicating a variation in quantity of periodic freezes. The ice on the floor and walls is very clear, and shows few fractures. Rocks can be seen several feet down through the ice. The caretaker stated that an analysis of the water showed an unusual purity, and that chemical action or minerals do not affect it.

The caretaker was questioned concerning seasonal variations, but he stated that the weather did not affect the interior, and that the drip was consant during all seasons. This is attributed to the lava layers over the tube roof acting as reservoirs for water. There is a theory that another tube filled with ice lies directly beneath, acting as an "ice box" or refrigerator for the upper tunnel. The free water, which does not immediately freeze, collects in a low portion of the floor near the center of the tunnel. Here there is a crack in the side wall, which the caretaker states opens occasionally to drain off the water.

Work is now being done on the tunnel entrance in an attempt to partially seal the opening to prevent warm air currents from melting the ice. The caretaker is confident that the cave can rehabilitate itself once this is done.

There is said to be another large cave half-way toward Shoshone, and that information concerning it could be had in that town. Another road junction just north of the Shoshone Ice Cave leads to the Chalk Mine. Here there is said to be a "Chalk" cave.

VOLCANO HILL

Preliminary Reconnaissance: June, 1941.
Trip made by automobile from Oakland, Calif.

This lava tube is located near Grace, Idaho, across the highway from a small hill of volcanic origin known as Volcano Hill. The cave is known locally as an "Ice Cave", although the ice found at this time (June) was neglibible

and there is probably none at all by mid-summer. The cave is about a half-mile long. Entrance is effected at a point where a portion of the roof collapsed. Half way to the end is another smaller opening in the roof which admits sunlight. The tunnel has an average width of 25 feet, and an average height of 30 feet. Shape is generally that of half-circle. The roof sections are of stratified igneous rock, and the floor is hidden by washed-in silt and mud. The walls and ceiling are smooth throughout. There is no evidence of dripstone or other deposits. Some sections of the tube are swampy floored, and some of this mud and water is frozen (which constitutes the ice previously mentioned). Tiny beads of water seeping through the walls and roof reflect the light and give the interior a "silvery" appearance.

The roof of the cave at no place appears to be more than 20 feet below the ground surface. A country road crosses over it near the entrance, and vibrations due to its use by farm trucks and equipment may have caused or contributed to the collapse of the roof sections by which entry is effected. The country in vicinity is rolling farmland, and the cave is about a mile from the base of hills to the east. There is no stream consequent or adjacent, but interior conditions of the tube indicate that it must occasionally perform the function of carrying off run-off waters.

After passing the second roof opening, there is much evidence of roof collapse. This debris partially fills some sections, making the going rather difficult and dangerous. The far terminus results from a complete filling-in of the tunnel with roof debris. The logical continuation of the tube in a westerly direction from the first opening is also clogged with roof debris. No further exploration possible in either direction without digging.

CRATERS OF THE MOON CAVES

Preliminary Reconnaissance: June, 1941.
Trip made by auto from Oakland, Calif.
(Mr. Ed. Ericson, assistant to Park Ranger, accompanied Bischoff in much of the exploration here.)

These consist of a large group of lava tubes of varied sizes and shapes existing in the Craters of the Moon National Monument, Idaho. Many of these are newly formed, geologically speaking, and are very rough and jagged. The entire area consists of pahoehoe lava flows with interspersed aa. The cave floors and walls are covered with ripples with jagged edges that make exploration an uncomfortable operation.

10-c (Great Owl) is the largest in height and width, but very short in length. There were a few patches of ice on the floor at this time (June).

10-l (Indian Tunnel) is the longest of the large tubes, and due to the presence of several openings in the roof, can be explored without lanterns.

10-i (Surprise) is a small twisting tube, which has a "lava dam" about 20 feet high near its end.

10-s (Beauty), 10-j (Boy Scout), 10-(k) (Dewdrop), and several unnamed tubes nearby were explored. Several of these contained lava "stalactites", and even some of the rarer lava "stalagmites." Most of the tunnel walls were coated with a white desert "salt", which could be removed in flakes ¼ inch thick.

TWIN BUTTES

Preliminary Reconnaissance: June, 1941.
Trip made by auto from Oakland, Calif.

This lava tube is located in the middle of the lava plain between Blackfoot and Arco, Idaho. Half-way across the plain, in an undifferentiated basalt area east of the highway are two large buttes, Middle Butte and East Butte. The cave occurs on the ridge between the two buttes.

The cave extends about a half-mile in a northerly direction from the entrance, which was caused by roof collapse. It has a smooth tunnel averaging 6 feet in height, and 15 feet in width. Some sections measure about 30 x 20 feet. The tube ends in a meeting of the ceiling and floor with debris.

It is known locally as an "ice cave", although no ice was present at this time (June).

FORMATION

Preliminary Reconnaisance: June, 1941.
Trip made by auto from Oakland, Calif.

This small cave occurs on top of a small hill near Soda Springs, Idaho. It was evidently formed by the solvent and abrasive action of hard mineralized waters. The area in which the cave is found gives the appearance as though huge bubbles had formed and collapsed leaving crater-like cavities with overhanging rims. The cave itself is entered through a hole in the side of one of these rims. This exterior points to volcanic origin but interior calcareous deposits indicate presence of other than igneous rock. The area is at the edge of an undifferentiated basalt and pre-Miocene rock sector.

The greatest depth of the cave is about 50 feet, and is about 150 feet in length. It extends in each direction from the opening, and has one side passage which can be crawled for an undetermined length. The rock near the entrance is similar to the exterior, having a peculiar

pumice-like nature. There are no formations but ground water has depostited globular calcareous deposits on the ceiling. Some of these are small and thin resembling tiny stalactites. The whole ceiling has a brown bubbly or globular appearance.

MERCER

Preliminary Reconnaissance: January 11, 1942.

An automobile trip from Oakland to this cave was made on this date by a party consisting of: Ann McDonagh, Helen Salfaday, David Levin, and Erwin Bischoff.

This cave is a commercial development of a limestone cavern near Murphys, California. The property is now owned by the widow of its discoverer—Mrs. Mercer. A guide is stationed at the cave all year round. Entry fee with guide is 75 cents per person. The development consists of wooden stairways and electric lighting.

The cave occurs in the Calaveras limestone formation of Carboniferous era. It is located on the slope of a small hill near Murphys. The entrance is at an elevation of 2,260 feet. There was no snow present at this time. The caves reaches a perpendicular depth of 150 feet, and has an entrance to exit traveling distance of 1,230 feet. (Figures by cave management).

It is a fissure-fault cave, the limestone formation having a crack or fault running north and south. Ground water and spring thaw run-off draining into this fissure has enlarged it by solution and abrasion. The top of the fissure is covered with earth and collapsed sidewalls. There is considerable dripstone formation of small size in the upper part in the form of stalactites, stalagmites, and ribbons. Nearer the bottom, the flowstone predominates and wall assumes a white crystalline mass, sometimes brown tinted, in the form of globular or flaky and spiked white crystal clumps. There is much evidence of wall collapse, indicating that the cave was much deeper previously. At the 150 foot level, further progress is blocked by complete collapse of the side walls. Entrance to the cave is effected through a small opening 6' x 3', and the slope is so precipitous that the stair is the only path possible throughout the cave. Ropes and long ladders were used before the stairs were built. The stairs wind straight down and slightly southward until bottom is reached. The return trip is made by another vertical stairway about 40 feet north, the surface exit being by an artificial opening 50 feet north of the entrance. No true bottom can be reached. The management claims an continual temperature of 56 degrees F. There is considerable drip but no pools.

An unusual feature of the cave are the presence of quantities of lichens suspended from the cave roof and walls. It is said there were a great deal more formerly. A white fungus growth now clings to the wooden parts of the stairway in response to the presence of electric lights. No other flora or fauna observed. Remains of two Indian skeletons are said to have been found here. Since cave is impracticable for use as a shelter or home, these may have been victims of accident, or cave may have been used for burial purposes.

E. W. BISCHOFF.

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Arkansas' "Unsung" Wonder

After Ed Gage and I had planned to see this cave for almost a year, we managed to get a crew from Pittsburgh together on Aug. 22, 1942. We, Joe Jankowski, Doyle Fields, and myself made up the crew. Joe had had some cave experience, but Doyle was a lad from Kentucky with none, although he came from right around the big caves of that state. It was also his first camping trip.

We arrived at Harrison, Ark., on the 24th. We stopped at the postoffice and inquired about the cave with the same result we always get in the east: everybody knew of some other cave, but not the one we were hunting. We took route No. 7 out of Harrison to Jasper Road, and on to Marble City. A right turn onto a gravel road took us to the top of the mountain. At the first house we were told to stay on the well-traveled road down the other side to Ceicle creek. The road to Vallines Chapel was washed out, due to heavy rains, with the result that we landed at a farm owned by Wm. Martin on Gaither Creek, 5 miles from the cave. Martin gave us the general direction to the cave, but did not know the exact place. He told us of a Mr. Kalb who could show us to the cave. Since it was then rather late in the afternoon, we decided to make camp there and get an early start in the morning.

6 A. M. found us ready for the hike to Gaither Mt. With our caving equipment and enough food for three meals, we made our way up the first mountain to the home of "Granny" Briscoe. From there on it was a very faint trail. On our way we heard the sound of axes. We spread out to find who was using them, as our meager information as to the whereabout of the cave had us a little worried.

To our relief the man cutting timber was Adam Kalb with a lad who turned out to be Marshall Vallines. Both showed interest in our trip. After a short talk they agreed to go with us. A small cave just above where they were working ended in a rock fall about 30 ft.

from the entrance. The formations were massive but dry. Many cave crickets were seen. Our guides took us up a blind canyon cut out of limestone on the way up Ceicle creek. It was beautiful with a waterfall of about 75 ft. at the upper end. The trees above arched the opening at the top, and made it almost as dark as a cave. Young Vallines had never been in this canyon although he was born not 3 miles from it.

We came back to Ceicle creek and made our way up the dry bed to a small stream coming down from the right. The entrance is up this slope about 159 yds. from the junction of the two streams. In the face of an outcropping of limestone about 10 ft. from the ground, is an opening 3 ft. long by 1½ ft. high. The cave was found by Walter Kingsly about 15 yrs. ago while digging for groundhog.

We dropped through the opening to a mound of earth 6 ft. below, and walked down this mound 40 ft. into a room about 500 ft. by 250 ft., where massive formations were everywhere. The floor is covered with lakes, the largest of which is 20 ft. by 15 ft.

Along the left side is a corridor formed by a series of columns 50 ft. long. The colors behind these pillars are wonderful. The walls are terraced with small lakes. Farther along the left wall is a large column about 20 ft. at the base. We tryed this lead, but it was short, and housed a large, oversized cricket colony. We followed the wall keeping an eye out for the passage mentioned in the article by Mr. Connell.

At the rear of the main room is a hill covered with bat guano, 12 to 15 in. deep. The ceiling is covered with small stalactites, and the floor with very wet mud at the extreme end of this room. Along the right wall are large rocks, and behind one of these we found the lead we were looking for. Our guides had enough by this time so we made our way to the entrance. Two hours had been spent in exploring the one room.

After bidding our friends and guides goodbye, we had a bite to eat and reentered the cave to follow the lead to the river. In the main room just befote we entered this lead, we found large tracks. We decided they were made by timber wolf. Here we had a laugh furnished by the lad from Kentucky: the cave didn't seem large for Doyle and a timber wolf, too. He wanted to go out. We calmed him down by telling him the tracks were old ones. (But who are we to tell if they are old or new in a cave when they all look alike?)

We made our way through a crawl of 40 ft. to a passage 12 to 30 ft. wide with the ceiling ranging from 10 to 50 ft. Along this passage we came to a column about 12 ft. at the base. The top of it came through the ceiling and the bottom was in another passage 12 ft. under the main one. We took a look at the few leads going off from the base of this pillar, but didn't spend much time at it as we wanted to see the river. About 100 ft. from the end of the first passage is a hole just large enough to drop through: 20 ft. down, and we were in a second passage much larger than the first one..

Following this for some time, we heard the sound of running water. It was now 7:00 P. M. Two hours later we found the river. We dropped down into another level, then back under the rock for about 50 ft. to a crevice 5 ft. wide. At the bottom is the stream. The water is about 8 ft. deep at this point and very fast. We followed the stream up until we came to a large room. Our lights could just light up the ceiling. It must have been over 200 ft. or more to the top. The room was very dry; but we were forced to get wet if we were to see any more of this wonderful cave. At this point the water was up to our armpits; farther along, the walls widened out to make the stream only a little over our ankles. After an hour in this cold water, we heard a roar ahead. We assumed we were coming to the falls, but no such luck. We were at a series of chutes. We had to buck the water coming down through walls only 3 ft. wide in these chutes.

The air current and spray from the water made it hard to keep our lights burning. Water in these chutes was waist deep; it would have impossible to make it up through them if the walls were farther apart. It took another half hour to reach the falls, but it was well worth the effort we had spent. The falls are 65 ft. high, and the room in which they fall is full of mist. We couldn't make ourselves heard a foot away from each other. There is a large opening above the falls. Just how one could get up the face of this wall to explore farther is hard to conceive. We hope to visit this cave in the future, and find out what mysteries lie above the falls.

We were eating by the fire just below the entrance at 4:30 the following morning after a fast trip out. After a short rest we started our five-mile hike back to the car. We went to sleep for a few hours, then started on our return trip to Pittsburgh.

JAMES BEARD.

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CAVE OF THE DEAD COW

As told by Albert Bachand of 7 Potter Place, North Adams, who explored it in company with his father-in-law, Henry Champagne of 12 Potter Place and James Papa of 367 Houghton Street, North Adams, late in October, 1942. Mr. Bachand is a prospective member of New England Spelunkers' Grotto, No. 1, "N. S. S."

I heard about this cave in Hancock, Mass., from a brother-in-law, Pat Falbo, who works with me at the General Electric works, in Pittsfield. He told me of the man, Charles Skirkes, on whose farm the cave is situated. The way he told me, which was the same as I already

had heard, was that the cave was so deep that you could throw a stone in it and couldn't hear it land; that a cow had fallen into it; that nobody ever went down because there was so much loose stone; that it was too dangerous; that after you did go down to the point where the cow stopped, you could not go further, for the opening was too small.

We went to that farm last Monday morning, Columbus Day (Oct. 12) to investigate this cave. Only the wife was home and she hadn't been to the cave in five years and only knew its whereabouts within a mile. We went to the foot of the mountain and fanned out, my father-in-law, Henry Champagne, Jimmy Papa, and I. It was my father-in-law who found the cave and gave out a war-whoop to call us two other fellows.

The cave is surrounded by a pole fence, no doubt erected so no more cows could fall in; it is in a depression of about a 20-ft. diameter. Jimmy started down with a pole and poked around a hole of about a foot across. His pole suddenly went out of sight, and he came up that bank so fast I thought he would continue straight down the mountain. He wouldn't go back down there unless I went first.

We tied a heavy rope to a big tree just above the opening. I climbed down and kicked the leaves and stones until there was an opening plenty big enough to let anybody through easily. I went in, followed by Jimmy, and down about 25 feet to a sort of ledge, and there was the cow. It had been there about four years and all that was left was the skeleton. We broke off a jawbone and took a picture of it and of a bat that was hanging from the side of the cave at the same time.

We figured that people could not hear their stones land because they were landing on the cow, leaves, and debris that was piled there. This place seemed to be the bottom of the cave. We were almost disappointed because we expected to find an immensely deep cave from the reports we had heard. After a while we managed to open up a hole in the floor next to the very uncontented cow, who failed to become a troglodyte or whatever you call cave enthusiasts. This was the tightest opening I had ever had to squeeze through yet. It was straight down. Not knowing where I was going to land, it was quite an experience—not mentioning the loose stones that followed. After I got through the "squeezer", I saw such a slew of large spiders that I regretted coming down. I mean large: one says to the other, "Shall we eat 'm here or carry him inside?" I didn't tell the other fellow about them 'till he was down with me, and then he told me not to shine my flashlight on the beasts, he didn't want to see them.

This cave was formed in the same manner as the Williams Cave in Williamstown, and is composed of the same rock. It was formed a long time ago by an earthquake or landslide which opened up a crevice in the rock beneath the ground. This type of cave is a hundredfold more dangerous to enter than is one which was made by erosion action of water (such as the one at the bottom of Union Dam) one being loose rock, the other solid ledge. The cave was 55 feet deep, measured with a string.

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JOHN FRIEND'S SALTPETER CAVE

The following report on John Friend's Saltpeter Cave in Garrett County, Maryland, is to be considered a supplement to the report by William Stephenson in Bulletin No. 4, page 9, September 1942.

While on vacation in the late summer of 1942 at Deep Creek Lake in Garrett County, we decided not only to visit John Friend's Saltpeter Cave, but to find out as much about it as we could and report our findings in a complete form. Armed with bottles for water samples, a long laboratory thermometer, a protractor (the nearest thing that we could find to a compass in Garrett County) a tape measure, vials for collecting, we located the cave on the side of a rolling hill on the Friend farm and entered it by means of a crude ladder placed there by previous cavers.

On the first day we spent 3½ hours exploring the passages and getting as far through the cave as we comfortably could. The cave seemed to continue in crawling dimensions so we decided to get our temperature readings and water specimens on this trip and return for later exploration. Most of the going on this first trip was very easy, and at no time was it necessary to crawl. The atmosphere and walls were full of moisture. Initials and names covered most of the muddy walls. The readings made on this first trip are all given at the end of the article. This first trip was made in the daylight.

The next night we returned and took a group of others with us. John and Joe Mattingly and Paul and Bob Lewis, fellow vacationers and new cavers, and Paul Uphold a nearby farm boy were in the party. We quickly covered the distance of the cave that we had covered the day before, or to the spot where going was no longer easy, and the passage seemed blocked by a mud fill and a large stone known as the Saltpeter Rock from which the cave got its name.

We then divided into two groups of three and four. Bob Lewis, Joe Mattingly, Paul Uphold and Martin lay flat on their stomachs and wiggled through the small hole or what was left of the passage, determined to find any further cave if such was in existance. Kay, John Mattingly, and Paul Lewis started back out of the cave

making a chronological list of names and dates appearing on the cave walls and collecting any fauna overlooked on the previous trip. Bob Lewis, Joe Mattingly, Paul Dphold and Martin separated into two groups for chaining and mapping the cave beyond the mud fill. (Details of the mapping will be given later.) This second trip was completed in 2½ hours.

Physical Studies

This cave is almost lacking in cave formations. Some very small stalactites were found on the upper level of the cave near the entrance. As Stephenson stated in his report, the so-called "Saltpeter Rock" may be the remnants of a large stalagmite or column. Beyond the mudfill, one large mud-covered stalactite shaped much like a hornet's nest was the only formation noted. This stalactite incidentally is the only unmarred formation left in the cave.

The cave is negotiable 248′ beyond the mud fill. Most of the passages are low and narrow, and can be traveled only by sliding, crawling or crouching. One narrow room, 5′ to 6′ wide, 35′ to 40′ long and varying from 4′ to 9′ in height, lies at right angles to the passage 58′ southwest of the mudfill. The passage runs generally southwest with much twisting and turning.

The cave stream is fed from five different noticeable sources. It originates 15′ northeast of stadia B, (base of second ladder) is increased by a large drip pool 10′ southwest of stadia F. (about 190′ from base of second ladder), by the spring southeast of the junction mentioned by Mr. Stephenson, by a side stream 162 ′ S. W. of the mud fill, and a second side stream 216′ S. W. of the fill. Both of the streams beyond the fill entered the passage from the S. E.

Temperature readings of the water taken at the origin of the cave stream, the drip pool and the mud fill were 53°, 52° and 52° F. respectively. Air temperatures taken at the base of the second ladder, the junction and at the mud fill were 56°, 57° and 54° F. respectively. These temperatures can be considered valid only for the time of year at which they were taken.

Water samples taken at the origin of the cave stream, at the drip pool, and at the mud fill proved the water to be very pure chemically. The electrolytic constant of the water varied between 95 and 90 at 65° F. which is very little greater than that of distilled water.

Biological Studies

The fauna actually collected in the cave consisted of 4 spring tails, 3 flies, 1 mosquito, 1 cave cricket, 5 harvestment and two spiders. Identifications of these specimens will be found in the fauna committee report.

One young rat believed by the authors to be a young Allegany Wood Rat was observed about 150 feet from the entrance of the cave. The furred tail and extremely white hair on the stomach of the animal prompted the tentative identification. Several specimens of the solitary or dewy bat (P. s. subflavus) were also observed.

Flora noted consisted of long filamentous fruiting bodies of a fungus found in the numerous rat droppings and many flat lichens found near the entrance, in the zone of partial darkness and in several cases in the zone of total darkness.

Human Interest Studies

The earliest date that could be found on the cave walls was 1776—Mary Hinebaugh. Following is a list of dates and names, most outstanding from that date to the present.

1809—E. C. Woodrup
1816—L. Boer
1847—H. W. Stevens
1868—S. P. Friend
1870—Ed. Browning
1871—Newton Kemp
1872—Mr. and Mrs. Charles Kemp
1873—George Percy
1875—A. J. Dutton, July 19
1878—S. Browning, May 20
1879—Annie Savage
1880—E. Custer, July 3
1881—Friend, C. C.
1887—Eliz. Friend
1891—Oscar Shome
1892—A. Rodafer
1894—J. J. Thompson, Photographer
1900—J. H. Shank, Aug. 22
1903—Dollie Snlow
1913—Hattie Custer
1915—Carroll Friend
1924—Edw. Hinebaugh
1927—Owen Friend-C. R. Carr
1932—Fred Allen
1933—Mary E. Hoge
1941—R. T. Nordeck
1942—Mr. and Mrs. Muma

The above list proves first of all the constancy of the moisture of the cave to allow names to remain intact so long, secondly the length of time the cave has been known and thirdly that women have been spelunkers as long as men. The first date had a woman's name and they were sprinkled liberally through the years.

A deposit of used carbide was found beyond the mud fill proving that explorers had been beyond the Saltpeter Rock before and proving also that the stream never rises appreciably to wash the passages clear of such debris. Thus we may say that the moisture of walls and atmos-

phere and the flow of the stream are relatively constant. Friend's Cave is not large in comparison with many, but is very interesting from the human interest point of view.

KAY AND MARTIN MUMA.

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INDIAN CAVES— PENDLETON COUNTY, W. VA.

The weekend of May 30, 1942, a group of the Society members met in West Virginia for the purpose of exploring as many caves as possible in a short time. The night was to be spent in Davis, W. Va.; but the party, coming from various points, were instructed to meet at Jordan's Cave on a small country road running parallel to Route 28 from Petersburg to Franklin. Instructions said to take a road out of Moorefield to the left, and follow that road, the cave "couldn't be missed!" The road was very obvious on the map, but very hard on tires, car, and nerves, and the distance was much greater than had been expected. The cave turned out to be 26 miles from Moorefield and only 6 from Oak Flat which is on an excellent road from Franklin. The directions thus should read: go to Franklin and turn left to Oak Flat. At Oak Flat turn left six miles on a dirt road to the Trumbo farm, and the cave is on the left.

Those of us who came from Moorefield have little to complain about even though the road was not good. Those who really got into difficulties were the car loads who tried to find short cuts across the mountain from Petersburg on roads that existed, not on road maps, but only in farmers' minds. When the party had finally gathered, everyone was too exhausted from travel to go immediately to the caves; so, since the Moorefield river ran obligingly alongside the dirt road, we all, in various stages of dress and undress, refreshed ourselves with an early summer swim.

After our dip we found the Trumbo farm on the right hand side of the road going toward Oak Flat, donned our cave clothes, gathered together our equipment and started across the field behind the farm house with the guidance of Mr. Trumbo.

We were then heading toward Jordan's Cave. We started toward the gap behind the farm known as Trumbo's Gap, crossed a small stream and fence and followed N. E. along the stream on an old road that crossed the stream again. Picking up the old road across the stream we followed it past some old railroad ties and continued to follow the stream with Trumbo's Gap to our east. Then we crossed a large stream on old railroad ties laid on the stream bed. When we had crossed this last stream we stopped to reconnoiter. Mr. Trumbo informed us that Jordan's Cave was some two or two and a half miles on up the stream and up the side of the mountain, but that there were several small caves very close by, down stream.

Because we were all a little exhausted from our difficulties in finding the cave we decided on the small, close ones, known as Indian Caves. We cut back to the right or S. W. after crossing the stream on the railroad ties and followed back along the stream gradually climbing the steep hill on the left. We soon saw the mouth of one of the caves high on a ledge over our heads. Bill Stephenson and John Petrie, by climbing high around the entrance, were able to drop down on the ledge by a rope and drop a rope ladder to those of us below. The rest of the party then ascended by means of the rope ladder (a first experience on such a ladder for some of us) and entered the cave.

The passage into it was narrow and winding, ending in a very small room. The only thing we found that might have indicated Indians, were smoked niches in the floor and walls which might have served for fire containers. One large rat was noticed scampering into a hole and later a nest of baby rats was found. The atmosphere and walls of the cave were very dry. We soon returned to the ledge and descended the rope ladder to the somewhat level spot below.

By continuing a little further along the side of the hill and up another cliff by means of a shaky old ladder we found the entrance to another smaller cave. This cave, also, was very dry and much smaller than the first. Interesting fauna was noticed in both and will be listed below.

After thoroughly working both of these caves, we returned to the Trumbo farm by crossing the stream directly below the two caves instead of returning to the railroad ties to cross.

Biological Studies

Fauna collected in the cave consisted of one jumping spider, one comb-footed spider and one wandering spider, all collected at the entrance. See fauna Committee Report for identifications. The lack of moisture probably accounts for the low biota of the caves.

A large female rat and young were observed; the young were tame and could be induced to gnaw on small bits of wood.

The floors of these caves probably would have revealed Indian relics, but as no archeologist was present they were left intact. Enthusiasm plus a lack of knowledge may have destroyed valuable material.

MARTIN AND KAY MUMA.

LIMESTONE MT. CAVE

This cave was visited by the Society on Sunday, May 31, 1942. The party included Jack Preble, Dr. Paul Price, Bill Stephenson, George Reeves, Lew Klewer, Noble Smith, Mabel Sterns, Florence Whitley. At the time of this visit the cave entrance was entirely filled with wire, brush, junk, bottles, etc. The owner states that the last time anyone was known to have been in it was some 30 years previous. It took about ½ hour to remove the debris sufficiently to effect entrance. The entrance proved to be a sink about 8′ deep with a narrow vertically shaft about 3′ in diameter in the bottom droping directly into a small dome of about 8′ diameter and 10 ft. high. (A rope ladder was used but is not a necessary requirement). From this first dome which has been marred the "entrance chamber", the entrance changes to a small crack like opening about 2′ wide, leads on to the main cave 6′ below.

The floor of Entrance Chamber was formed of rocks and other rubbish which had been thrown in through the sink so that it was impossible to ascertain the position of the true floor. This debris had partially blocked the lead into the main cave forming, in fact, a wall of loose stone that appeared ready to move and fill the entire lead at the least provocation. From one to 2′ of this loose rock was removed before it was deemed safe to proceed further. It is quite probable that the true floor of this entrance chamber is actually on nearly the same level as the main cave as is those of the first and second dome rooms.

The main cave itself consists primarily of but a single passage, generally L shaped. One enters this passage at the joint of the L. The long leg of the cave extends about 300′, in a S. W. direction. The passage constituting this leg is about 5′ wide and 10′ high. It has a small stream which probably dries up in wet weather. About 50′ down the passage the stream drops 2½ to 3′ forming the beginning of a second level. The stream disappears after 30′ as does this level. 25′ on the right side is the first and largest dome room 6′ in diameter and 30′ or more higher with a wet weather lake, as previously described. 23′ on is a pit 3′ in diameter, approximately 10-15′ deep which probably penetrates into the underlying sandstone. 100′ on, still on the right, is the second dome room which is about ¼ the size of the first one. About 50′ on the passage becomes too small for further progress.

The small leg of the L constitutes a passage 3′ wide and 5′ high. This passage, after about 30′, branches into 3 passages, the righthand 2 of which are immediately blocked by mud and talus. The lefthand one bears slightly to the left, and continues for about 100′; whereupon it becomes too small for further traverses.

No fauna was observed in the main cave. In the entrance room crickets were seen and flies, spiders, mosquitoes, etc. are probably also present but were not actually observed.

The cave itself is small and quite young. As it is just below the surface of an exposed mountain side with good surface of drainage, it is obvious that soon (geologically) the ground will be cut down to it and it will thus cease to exist.

This cave is located on the property of Mr. Ernest Adams just south of Limestone, on the southeast side of Limestone Mt., Tucker County, West Va.

Specific directions to reach the cave are as follows: from Parson, W. Va., go 7 miles to St. George. From St. George take road to Limestone and go exactly 6 miles to Mr. ——— house. Park cars. Go up dirt road from house around south side of the Mt. for about 150′ till directly below lone tree in field above road (on hill). Cave entrance about 75′ below road (left side) in field. Entrances and an old sink which Mr. Adams has partially filled with wire and rubbish has the usual weeds and small trees and growth and is easily recognized from the work road.

This cave is in the Greenbriar limestone which lies just below the crest of Limestone Mt. The entrance of the cave is near the bottom of this limestone belt and the cave itself extends down into these porous sandstones which lie below the limestone. A small stream probably intermittently trickles through the main part of the cave to sink into a pit near the end of the cave and disappears in the underlying sandstone. There are 2 fairly large domes each estimated to be 30′-35′ higher just off of the main lead of the cave. The first is the larger and in wet weather supports a pool several inches deep in its bottom. Both domes probably extend to within a foot or two of the ground's surface and in time undoubtedly will develop into new sinks or even additional openings.

No formations or other items of interest of any kind were noted. No revisits are recommended unless one should wish to check on the progress of Mr. Adams' attempts to fill it up.

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LOST CREEK CAVE

This cave is situated about 10 miles northwest of Anaconda, Montana, and is also known as the Foster Creek Cave or the Garrity Cave.

It is reached best by driving up Foster Creek, west of Anaconda, taking the road which turns up the canyon to the right after having gone up a hill two miles up from the mouth and driving up this to the first large canyon to the right again. There is but one ridge in

this canyon, and it is about two-thirds of the way up and on the left-hand side. The cave is in the second large park, about 300 yards back on the top of this ridge, and about 250 yards south from a section cornerpost, very easily seen on the top of the main ridge. The opening is marked by a trench 10′ x 4′ with a pile of dirt on one side. If there is difficulty, query Horace Garrity at Garrity Grocery, in Anaconda.

Structure and Formations:

It has an original vertical drop of about 40′, which can be negotiated by a ladder there (which should be tested by a roped person, first), and consists of 6 rooms which can be explored; terminating with a blocked passage which may be openable. It has three pools of water, two about a foot in diameter, and one about 8′ in diameter and 4′ deep. Formations are still live and are flowstone, bacon, clusterites, and the stalactites, stalagmites, and pillars usually found.

Identification:

Should properly be called either Foster Creek or Garrity Cave, as it is in the Foster Creek drainage instead of the Lost Creek.

History:

This cave was discovered in 1886 by Garrity and Fish as a very small opening. They enlarged it and put in ladders. The present ladders have been in over 32 years and still show little signs of decay. A large number of people have autographed the cave, both men and women, from the year of its discovery to the present, but the formations are not badly damaged as one would expect.

Members of party: Leader, H. Seidemann, Jr.; and Mrs. Herman Seidemann, Anaconda, and Willis Nelson, Bozeman, Mont.

Willis arrived from Bozeman on Saturday night and gathered our equipement for an early start on Sunday morning. Lacking a car we caught an early bus. Of course our attire aroused great amusement and curiosity to the other passengers. We reverted to foot when our path diverged from that of the bus, and arrived at the cave after hiking about 7 miles through very scenic surroundings. As we reached the cave we were caught in a heavy rainstorm, so we took shelter under some Alpine pine (we were at an altitude of about 8000′) and broiled some steaks for lunch.

We entered the cave at 2:30, Willis and Betty providing an anchor for a rope about my waist while I tested the 30-year old ladder. It was still very solid, as my feet were sore from jumping on the rungs on the way down. Mrs. Seidemann and Willis then joined me in the main room. This room is about 70′ by 30′ with two large passages leading off, one to the north and one to the west. The room is fairly dry and has little formation and a rock floor.

We took the north passage down and, after about 20 feet of passage, came to another ladder about 6 feet over a smooth boulder face. This gave into a room about 60′ by 30′ with a broken rock floor and little formation.

The southwest corner of this room had a group of formation and two small pools, about a foot across and 6″ deep, with a passage going upward which looked as if it pinched out, and which we ignored in favor of the larger passage leaving the other end of the room at a downward slant.

This passage curved for about 20 feet and gave into a smaller room with a beautiful waterfall formation on the right hand side. The top of this formation looked somewhat like a Buddha to Nelson's eye, but I insisted it looked as if he had melted and run down the side, so we christened it the "Melted Buddha."

A short passage and another ladder brought us to the next room, which is as beautiful as I have ever seen. Flowstone and clusterites abound and there is a pool, about 8′ in diameter and 4′ deep, with formations all over its edge and down into it on its walls. We couldn't see if there was a passage in it under the back edge or not, and it was a little too cold to explore comfortably to find out.

The passage went on over a hump and into another small room with a fair amount of formation, and over another hump into the end room. Here the floor was broken rock and the passage led down to the left and was filled in with the rock. It looks as if this loose rock could be removed and might open a further passage, but our time was too short to admit of us attempting the job so we started back.

At the first room we now turned our attention to the west passage and, after about 40′ of small turning passage, we came into a large room through a small squeeze. We then recognized the second room. We had come out the passage we had before considered as no good, proving that no passage should be considered as a dead end until it has been proved by exploration to the very end.

We came back out at 4:30, to find the storm blown away and the sun shining. Willis and I completed our maps and checked them against each other. We found them in good agreement.

We talked over the various ways home and decided to go over the ridge and down Lost creek. On top of the ridge directly north of the cave about 250 yards is a section corner survey marker, which we looked over and then calmly left, without noting the section numbers! From an available Forest Service map we think that the

Corner is that of sections 32, 33 T6N,R12W, and 4, 5 T5N,R12W.

Equipment:

50′ of ½″ rope.
2 small miners carbide lamps. (5 hrs. capacity)
1 wrist flashlite.*
1 small first aid kit.
Notebooks.

HERMAN SEIDEMANN, JR.

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HELL'S HALF ACRE

For two years we had been dreaming of Hell's Half Acre, Willis Nelson and myself. We were two students at Montana State College with a common desire to explore caves. We had explored other caves, but Hell's Half Acre was our as yet unattained Mecca.

Hell's Half Acre is a portion of Morrison Cave Montana, a beautiful handiwork of nature in the picturesque Jefferson Canyon, is a deep gash in the 1300′ layer of Madisonian limestone which covers a large portion of west central Montana. Morrison Cave, now a State Park, was hewn by Nature in a great fold where this layer was bent 30°. The main portion of the cave has been well described and its fame has spread, especially since the Government installed a CCC camp further to develop the cave.

The CCC boys had done extensive work and the cave was considered practically mapped and known when one boy, on getting up in a small passage, found an opening emitting a draft. The enlarging of this hole unleashed a large-scale explorative effort; but after one boy was lost for a considerable time, and others narrowly escaped injury, those in charge deciding that its rough nature offered no commercial possibilities, and unable to curb the explorative tendencies of the boys, put up a concrete and rubble bulkhead in the opening and Hell's Half Acre was again closed except to the draft and the bats which went through the small remaining passage.

Armed with this knowledge and intimate acquaintance with the cave gained through several trips and conversation with the guides and those who had frequented the cave before its development, we went to Mr. Bruno Petsch, Geologist and Supt. of the cave. Mr. Petsch had aided us in cave work before, and knew of our experience and was himself anxious to know more about Hell's Half Acre than the meager information left by the CCC. When we offered to remove the bulkhead, he gave us permission to do so, and to explore such portions of Hell's Half Acre as we deemed safe, and especially to try to find the surface exit accounting for the draft. He placed all the extra facilities of the Park Service at our command—lights, maps left by the CCC, and the sleeping facilities at the Lodge. Also, he personally provided us with a compass and level for mapping purposes.

On May 9th Melvin Carlson, Keith Ripley, and Willis Nelson from Bozeman and I from Anaconda, all members of the National Speleological Society, met at the Lodge about 4:00 P. M. We had drills and a sledge for removing the bulkhead, as well as cameras and lights of various sorts. We held a conference with Mr. Petsch making final plans, and with lunches, electric lights furnished by Mr. Petsch, and the rest of our equipment we entered the cave about 5:30 P. M.

From 6:00 P. M. we worked on the bulkhead, aided by Jack Malone, a guide at the cave, who in spite of having to guide the next day, went on in to Hell's Half Acre with us.

The bulkhead had set exceptionally solid in the damp air of the cave, and in combination with the cramped working quarters we had a difficult time. But by 10 P. M. we had cleared the concrete work out and had a space large enough for even Mel Carlson who needed more clearance than the rest of us. We then ate our lunch, drank from the spring back of Pompey's Pillar and entered the point of interest.

The room we entered was 18′ x 10′ with a ceiling 4′ to 8′ high, similar in nature to the portion of the cave we had just left, and had three passageways large enough for travel. We chose the one with the draft leading upward and decided that we would at all times follow the draft or, not being able to detect it, the uppermost passage, since because of the nature of the formation the cave is in, the opening must be on or near the top ridge.

Upon leaving this room, we found we were definitely in a different type of cave structure. The main axis of the fold must be near this room, the developed portion of the cave being of a solution room type, the result of tremendous compression increasing the solubility. The portion we were now in had been torn apart and was, in the main, simple vast spaces and jumbled rock, left when the rocks had been torn apart. The path here rapidly steepened with few solution openings and, with two exceptions, clusterites as the only formations.

In a short distance, repeated measurements showed the inclination to be approximately 45°, varying from 40° to 50°. The going was very difficult and we began to realize that the belt lights (a battery about 4″ x 7″ and 2″ thick with a light on a 3′ cord) were not ideal for exploratory work, being bulky and awkward when carried in the hand, and enlarging the waist line unduly when carried on the belt. We explored numerous small

*I use and approve of this lite, as the extra hand freedom is very handy; but an emergency is a *must* with this, as the batteries last only 3-5 hrs. usually, and the case is of a breakable plastic.

passages, but found there was one passage leading up, which seemed the only route carrying on for any great distance. Finally, about 2 A. M., we decided to call a halt, having progressed inward about 600′ from the point of entrance of Hell's Half Acre and having gained about 300′ of altitude above this point. The room where we stopped was one of the largest we had seen in this part of the cave, being about 60′ x 40′ at its largest dimensions, with a total vertical development of about 50′. We made the return trip in about an hour, since we now had a marked trail and no side passages to intrigue us.

The next morning, the four of us (the guide being on duty) went back in at about 11 A. M. and resumed the upward trail. This time we left the unwieldy lights behind and used three small carbides, while I used a flashlight strapped to my wrist for more freedom of movement in difficult passages.

We reached our previous top in about an hour and commenced fresh progress. The cave soon seemed to flatten out and the progress became more difficult. The slant varies from 5° to 30° and the passageways were smaller and many blind alleys were encountered. The draft was still with us though, and spurred us on to more climbing and through many passages so small that we could barely work through. Finally at 4 P. M. we turned back, since we had to be out by 6:30 P. M. for bus connections. We still had clear passage visible ahead and the draft was still there. We had progressed 400′ past our stop of the day before and had gained 100′ to 150′ more altitude.

On the way back we stopped at one large side passage and Carlson went in to take a look at it. A shout brought us on the run and we beheld the "Snow Room." I cannot conceive of any scene more beautiful. The crystals here are a pure white and resemble nothing so much as they do a thick hoar frost. They have formed on the dog-tooth spar in layers 1″ to 6″ in depth and are on the floor to depths of over 18″.

The trip out took about 1¾ hours and, after emerging and reaching the Lodge, we held a conference with Mr. Petch. From final review of our data, we concluded from outside survey figures that we had been within 50′ to 150′ of the surface.

Future plans were discussed including plans for an attempt to be made to establish the outer exit by means of a small cylinder of gas released in the draft and smelled at from the surface.

Analysis of the "Snow" crystals made by myself, a chemist, proved them all to be carbonates, and mainly calcium, with traces of the other alkaline earths, excepting barium.

HERMAN J. SEIDEMANN, JR.

BLOWHOLE CAVE

On Sunday, April the 25th, Martin Muma, Walter Weed, Richard Scott, Roscoe Dwiggins and myself set out for Blowhole Cave. This cave, as previously reported, is located on the farm of Mr. Raines, in Teterton, W. Va. The cave extends for about two miles and has one very promising side passage which is not yet completely explored. I believe that the Society has visited this cave from the entrance upstream to the second duck-under.

The second duck-under is about 35 feet in length and at the end of the crawl, the formations have formed almost to the surface of the water making it necessary to stick your head completely under water to continue on. At the end of this crawl, there is a pretty group of formations. Formations are scattered all along the cave, but much of the cave is bare. There are several large flow-stones which are very beautiful. In the side passage there are also some very nice formations.

Continuing from the duck-under, the passage is fairly large and it is very easy traveling. The next obstacle is a waterfall about seven or eight feet high. The water in the pool under the fall is about waist deep, and the fall can be crossed by one person standing in the water and hoisting the others over, or by one person going over and throwing a rope back. The passage continues on to a fairly large room which contains another waterfall. Running from the left side of this room is a large side passage, which we followed for about ⅛ of a mile. Most of this side passage is almost as large as the main passage, except in a few places where it is necessary to draw in your stomach and squeeze through.

Going over the waterfall in the main passage, you come to a series of small falls or drops of about one foot, following this the passage becomes very large and the floor is quite smooth and composed of black rock. Further on there is a room to the side of the passage which contains an old ladder, and some initials. From here on, the main passage is a jumble of rocks. The water comes out from an impassable crack in the side, thus we believe this to be the end of the cave.

Martin Muma has previously reported on the fauna in this cave. Near the end of the cave (in the room containing the ladder), we observed many crickets and some spiders. We also observed a cave millipede. The conductivity of the water was 85 and the pH was 7.5.

The foregoing description of this cave is rather brief and certainly does not do justice to the cave. It is a very interesting cave, and well worth visiting.

EARL BEARDSLEY.

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SNIVELY'S CAVE

After filling my gas-tank with the remains of my meager "A" ration of gasoline, we set out one Sunday

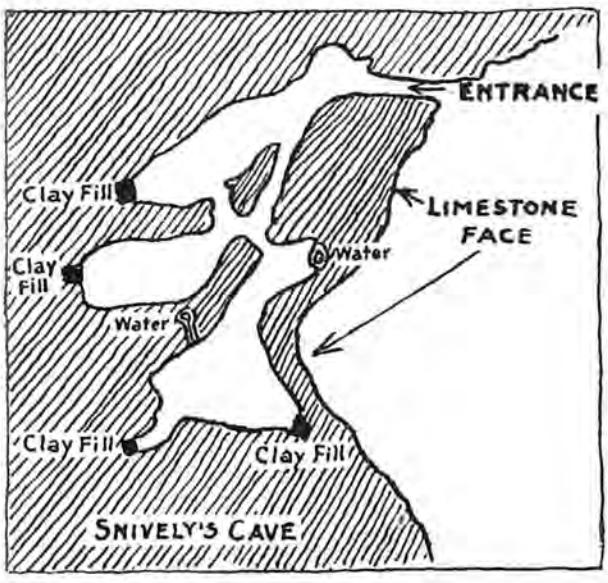
in search of a cave near Keedysville, Md. Besides Martin Muma and myself, two new cavers, Roscoe Dwiggins and Walter Weed, went along.

By nine o'clock we had reached Boonsboro. From Boonsboro to Keedysville we followed route 34. In Keedysville we turned east on the first road south of the railroad tracks. Here we luckily met a farmer who informed us that the first road to the right (south) would take us directly to Snively's farm.

Upon reaching the farm, we donned our cave apparel and set out in search of the cave, which was "over yonder a piece facing the crick." From previous directions we knew that the cave was located in a limestone face which was facing a creek. We followed the creek a short way and came to the projecting limestone strata.

For about two and one half hours we slid and crawled into the numerous little holes which were in the limestone face. Finally we located one hole in the north end of the hill which w efelt certain was the cave. Being the smallest, I squeezed through the narrow entrance, and sure enough, it was the cave. Much to our disappointment the cave was only about 200 feet in length, and consisted of three rooms, all of which were blocked off by clay. In the last room there were two pools of water. The cave was rather moist but there was no running water. The formations consisted of two or three columns, many small stalagmites, and one series of rimstone pools. A few formations were still in the process of being formed.

The temperature of the air in the last room of the cave was twelve degrees C., and the water in the pool in the same room was eleven degrees C. The conductivity of the water was 400, and the pH of the water was eight.



The fauna, which we collected, consisted of nine spiders, one fly, one mosquito and two crickets. Several bats (P.s. subflavus), one centipede, and one rat nest were observed. (See Muma's fauna report for fauna of this cave.)

After this somewhat disappointing visit we went to the remains of Bushy(?) cave at Cavetown, Md. As Stephenson had told Muma, this cave had been entirely dug away as a quarry.

Since it was still fairly early, we went to Needy's Cave, Pa., where we got quite muddy and very tired but our spirits were up to par when we headed for home.

Below is a rough map drawn up by Muma, of Snively's Cave. The compass points are correct, but the distances are estimated.

EARL BEARDSLEY.

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BEAR CAVE, NEAR BLAIRSVILLE, PA.

Accompanied by Ed. Gage and Katherine Gage, I visited this cave. It was visited by R. Stone about 1931 and mentioned in his book. Bear cave is traversed mostly by crawling. We managed to reach the stream at a very narrow passage about 800 ft. from the entrance. We could not go farther although Mr. H. Stitt, Editor of *Blairsville Gazette* claims to have passed this point. He is bigger than any one of us. He and Mr. W. Carney, Scoutmaster of troup No. 1, Blairsville were with us in the cave. Mr. Stitt's small dog stayed with us the whole way through. Some bats, crickets and spiders were seen.

We dropped down into the sink known as the rattlesnake's den on the way back to the car. The drop is about 35 ft. The right passage led 40 ft. to a drop of 8 ft., then 12 ft. to the end where we found the skeleton of a small deer. We took pictures of this find.

The best way to cave is Route No. 22 to Blairsville. Turn right at circle to town of Hillside. Take old log road to Sportsman's Farm. Follow road to old quarry at top of hill. The sinkhole is on a path leading up the hill about 100 ft. The cave is farther along the same path which crosses the top, then down to the stream about ½ mile.

JAMES BEARD.

★

THREE KENTUCKY CAVES

(September 13, 1942)

DEAD GOAT

Dead Goat Cave, named for the dead goat at the bottom of it is a small cave, with a few high, narrow passages, very water worn but at no time could we penetrate more than about 50 feet from the opening. Little Crappo is merely a dead end drop of about 50

feet with a small room at the bottom and apparently no further exit although one may be found with further exploration. Dynamite Cave is an opening in which considerable dynamiting has been done seeking another entrance to Diamond Caverns but none was found.

DOYLE

The large Doyle Cave has a lot of possibilities but we didn't have the equipment to really do it justice. Just got in to it as far as we could without building a lot of ladders and getting more lights, but one of these days we plan on going down again and spending the whole day and night if necessary, going through it. Some of the natives have been in it and looked around a little but none of them have really done a job of exploring so far as we could find out.

PASSENGER COACH

The Passenger Coach on the farm of an old native by the name of Vance, is about 150 yards long, around six feet wide and has a dome shaped ceiling like that of a passenger coach. It has a small entrance and a crawl way about 60 feet. Then it opens to standing room for about 30 feet, drops four feet for about 20 feet and then ends up in another shallow crawlway that just comes to an end after about 50 feet. It has cave crickets, salamanders, and some small insects.

LOU KLEWER.

THREE WEST VIRGINIA CAVES

ROARING SPRINGS

This cave is at Roaring Springs Mill, Pendleton County, West Va. Roaring Springs Mill is 8 miles up Roaring Springs Creek Road which comes into U. S. 33 just west of Orego, West Va.

The creek which flows through the cave is damned up just inside of the cave and is diverted in a flume to run to the mill.

The cave and stream come out of the face of a hill, a stream bank about 12′ above the stream bed. The cave itself parallels the surface stream for about ¼ mile.

In dry weather all of Roaring Springs Creek leaves the surface stream bed and flows through the cave but in wet spells most surface water flows in the stream bed. In one or two flows it is said water from the cave stream comes out of the hills in times of high water. Cave lies in the Greenbrier Limestone.

This cave was visited but not entered—10/17/42, due to high water conditions. Though much crawling is involved it is said that one can easily traverse this cave from one end to the other in dry weather.

FERRIS

This cave is in the hill side directly over the road or west side just before the road crosses Roaring Spring Creek at Roaring Springs Mill. Cave is 1 mile south of the mill or 7 miles up Roaring Springs Creek Road from its junction with U. S. 3 just west of Orego.

The cave lies about 50′ or 40′ above the road and its entrance can be plainly seen from the road. Cave was seen but not explored 10/17/42. Cave is said to be quite dry—a crawl for the major portion of its length.

Due to its dry and protected mouth it ought to be a good site for acheological exploration.

Cave is in the Greenbrier Limestone.

BIG SPRINGS CAVE ON ELK RIVER

The trip to Big Springs Cave on Elk River, near Parsons, W. Va. was not so bad. The cave is located near the stream; in fact the water from cave forms the head of the creek. The opening is large enough to walk into, and a short distance in, a brief climb brings one to a maze of passages. One of these we followed to what appeared to be the end.

I left John Petrie and crawled a little farther to find a small triangular opening in some fallen stone. After a little work with my axe I was able to go another 50′. Some formations are in this room, and all are covered with a coating of mud. There are two chimneys: one is about 12′ across and 35′ high, the other 5′ by 25′. In the other end of the room are many large stones that have fallen from the roof.

The route we took to the cave was No. 219 to Parsons over the Black fork of Cheat River; turn left at Lambert's store; cross railroad; turn left at Tucker co. school; then keep to right to dam. The gate there is locked. We walked up the road ½ mile to the first stream coming in from left; then ½ mile up path to cave, following stream all the way.

JAMES BEARD.

WYTHEVILLE CAVE, VIRGINIA

This cave is about 10 miles north of Wytheville in Wythe County, Virginia. Is said to be of considerable size and is known locally under the name of the family owning the cave. It is one of the oldest known caves in Virginia, being referred to in publications dating back to about 1810.

Data from M. M. Sutherland of the Va. State Planning Board. December 1, 1942.

The name "Wytheville" is used until proper name is determined.

From the Society's Records

The following detail reports of field trips and the report on "Practice Hole" have been taken from the files of the Society and reproduced herein in full. It is not the general editorial policy to print the detail report of all trips and caves that become part of our records as it is believed it would make the Bulletin as a whole too uninteresting. However, particularly well-done or interesting detail reports not prepared with view of publication will be reproduced from time to time with a view to supplying suggestions to members and groups for their own reporting. It is hoped that by this means the quality of our reports may thus be continually improved.

The practice of preparing a proposed program or schedule in advance of a trip is particularly worthy of note. It is interesting to see how the program of the second trip reported was altered in view of the experience gained on the first trip reported.—WM. J. STEPHENSON, *Associate Editor.*

REPORT OF N. S. S. FIELD TRIP JULY 10, 11, 1943

PROPOSED SCHEDULE

General Objects—Exploration and Training.

Composition of Party: Car 1, Stephenson, Mrs. Stephenson, Guttag, Vincent, Porter, Drysdale. Car 2, Brown, Petrie, Miss Connor, Miss Richardson, Turner, Daves.

Specific Objects: A. Clarke's Cave. 1. Check previous map. 2. Finish exploration of lower level. 3. Follow out all side passages if time permits. 4. Training in rope ladder and uses (on surface). Note: half of party check right hand lead and half left hand lead. Both parties work toward lower level when finished.

B. Withero's Cave. 1. Follow downstream course and find end. 2. Trainin cave. 3. Fauna collection. Note: Work alone by two parties. Stream exploration under leadership of Petrie, limited to 5.

C. Blowing Cave. 1. Complete general exploration if possible (a) course beyond stream (b) course of stream (up). 2. Training in muddy cave technique. Note: Exploration party under Petrie's leadership, training under Stephenson.

SCHEDULE

Leave Richmond 5 P. M. Saturday, July 10. Arrive Charlottesville 7 P. M.—Leave 7:30—Arrive Waynesboro 8:30—Eat at So. Grill—Leave Waynesboro 9:30—Arrive Staunton 10 P. M. for night. Sunday, July 11, rise 6 A. M.—Eat and start by 7:30 A. M.—Arrive Clarke's Cave 7 P. M.—Arrive Withero's Cave 1 P. M.—Arrive Blowing Cave 4 P. M.—Leave Blowing Cave 7 P. M.—Arrive Waynesboro 8:30 P. M.—Eat and leave by 9:30 P. M.—Arrive Richmond 12 midnight. Note: Schedule can be speeded by spending less time in each cave, or by sending parties to Withero's and Blowing Caves simultaneously. 5 P. M. best for leaving on return. Omission of Withero's?

General Summary:

This trip was successful in regard to most of its major objectives. The schedule proved to be ambitious and as a result only one cave (Clarke's) was visited instead of the two or three originally planned. A minor accident which might have proven disastrous served as an impressive example in instruction of the new members in safety practices:

Specific Report:

The make-up of the party was as planned. It was found that the traveling schedule had been planned alright and was maintained approximately as planned. New directions for reaching Clarke's Cave were recorded.

A slight accident to one of the party, which would not have happened had the individual been wearing a safety rope as was clearly indicated, served to emphasize the importance of always using a safety when climbing. Details of this accident are appended separately.

The map of this cave (see cut) previously prepared was checked along the main lead and found to be accurate in all major respects. It was found that greater detail as to formation or other distinctive features should be added to increase the map's usefulness.

Several hundred feet of new passageways leading west at the pits rear Section B-B and two new well-decorated rooms were discovered and sketched on the map. The entire new portions should be accurately mapped by a further party.

At least three new leads were discovered but not explored due to lack of time. One near Table Rock was particularly promising. A short rope ladder and two 50′ pieces of rope should be carried by any subsequent party. Lack of time prevented any work being done on the east or minor lead and the front or north portion of the cave.

The members of the party though relatively inexperienced all behaved well. The trip proved nearly ideal for breaking in new personnel. It is believed that a little better party organization would pay great dividends as to results accomplished. It is recommended that in future all personnel of field trips meet a few days prior to the trip to organize the party with duties of each member in detail.

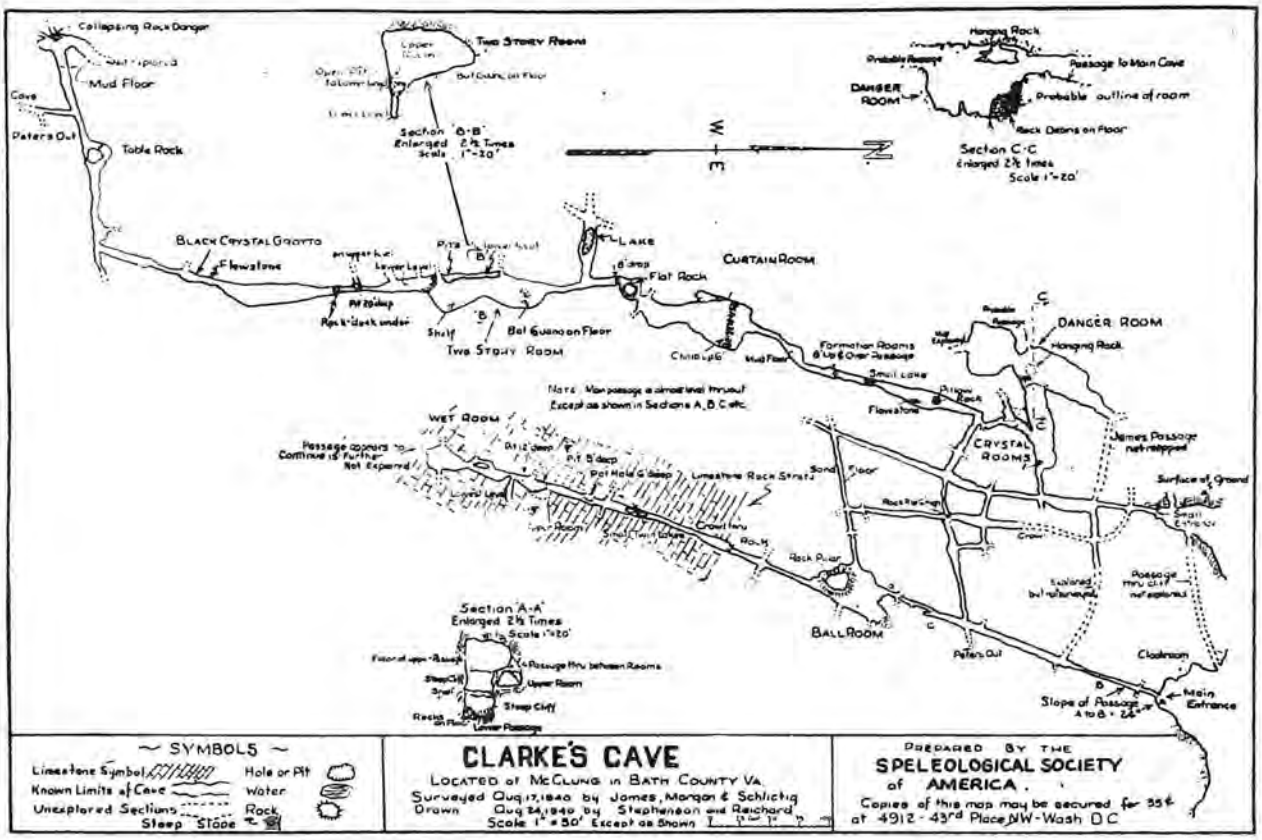
Several members of the party noticed the cold and a few complained of hunger. It is recommended that sufficient knapsacks be carried on subsequent trips to provide a few spare sweaters and some little nourishment.

Respectfully,

WM. J. STEPHENSON,
Party Leader.

APPENDIX 1. *Report of Accident.*

In attempting to reach the mouth of the cave it was decided to try to drop down over the cliff rather than make the arduous trip around its base. After dropping the rope ladder over the face of the cliff, Petrie attempted its descent without using a safety rope. He reported that the end of the ladder appeared to be a few feet short of the bottom, but that he was going to slide the remaining few feet using a rappeling rope that had also been thrown over. Thru an error in judgment his "few feet" turned out to be 15-20 feet directly below the end of the ladder to an approximately 45° slope bottom, so that he not only "burnt" three fingers on the rope but would have been severely jolted at the bottom had not the steepness of the floor caused him to decelerate slowly by rolling over and over for at least a dozen feet rather than stop suddenly. A rock snag projecting into his path of drop down the cliff face gashed his knee to the



bone for a diagonal 1½" cut over the kneecap, requiring five stitches. Fortunately the knee was merely deeply cut, not otherwise bruised nor any bone smashed, so he was able shortly thereafter to walk out alone on the roundabout path the rest of the party had meanwhile descended. Vincent kindly volunteered to drive him to a doctor. Dr. Hileman of Milboro was reached promptly, and he quickly and deftly did a good job of repair.

This incident serves well to illustrate the need for always using a safety rope. Had such a rope been used Petrie could easily have been eased down to the ground when his error in judgment of vertical distance became apparent. Some degree of skill and experience was definitely proved by this incident to be no substitute for a safety rope. It is requested that all of our members take this incident to heart and never make even the simplest dangerous climb or descent without a safety. There is an old saying to the effect "it is always the good swimmer that gets drowned." So in climbing it appears to be "always a good climber that gets injured."

APPENDIX 2. *Directions for Reaching Clarke's Cave.*

From Milboro Springs, Bath County, Va., proceed west on No. 39 (road toward Warm Springs) for approximately five miles to No. 625 (on right) marked to Fort Lewis. At McClung (only road crossing) cross No. 629 straight through and cross Cow Pasture River on concrete ford or bridge at 3.6 miles from No. 39. .3 mile on is home of Mr. Clarke on left, a total distance from No. 39 of 3.9 miles, where cars may be parked.

Cross stream back of Mr. Clarke's house and go straight up hill following old road through small gap with small wet-weather stream on left. After passing through gap (about ¼ mi. from house) head due north across field to the top of the cliffs of the Cow Pasture river. At this point one is directly over the cave entrance, which lies in a dark break in the cliff. The cave mouth can be reached with aid of a 50′ rope ladder, the minimum height of the cliff being nearly 40′. The right (east) side of the gorge is the best for climbing.

To reach the cave without scaling the cliff, follow the lower edge of the field (approx. northwest) to the cliffs of the Cow Pasture. Here there is a break that allows one to descend to the river's edge. Follow along the base of the cliff to the right (east to northeast) to a gorge or "canyon" in which is the cave entrance and climb to a dirt slide. A stationary rope to aid in hill climbing is desirable both at the hill to the cave entrance, and at the main hill down to the river. The true or main entrance to the cave is in the third gap in the cliff. The

second gap has the small cave entrance that requires crawling. The extent of cave back of the hole in the first gap is at present undetermined. In the base of the cliff just below (to the west and south) of the first gap is a small hole that emits a powerful stream of cold air in summer. This hole however is too small to permit entry.

REPORT OF N. S. S. FIELD TRIP JULY 31, AUGUST 1, 1943

PROPOSED PROGRAM

Purpose:
1. Locate and explore new caves.
2. Complete exploration of Showalter's Cave.
3. Training and experimenting in traversing underground lakes.

Party:
Car 1. Stephenson, driver; Petrie; P. Patrick; NacNab; Drysdale; Hill .
Car 2. Brown, driver; Mrs. Brown; Daves; Mrs. Daves; Turner; Miss Richardson.

Schedule:
Leave Richmond 5 P. M., July 31.
Arrive Lexington 9 P. M. (via U. S. 60) Locate housin.
Dinner 9-10 P. M. at Virginia or Southern Restaurant.
Retire 10:30 P. M.
Rise 6 A. M., Aug. 1.
Breakfast 6:30-7:30 A. M.
Arrive first cave 8 A. M.
Arrive Showalter's Cave 12 Noon.
Leave Showalter's Cave 4-5 P. M.
Swim and clean up 5-6 P. M.
Arrive Buena Vista and dinner 6-7 P. M.
Arrive Richmond 10:30 (earlier or later depending on exigencies).

Brief

This trip followed out the prearranged schedule in all details except as the composition of the party. Lena Conner, George Pritzker and Earl Porter were substituted at the last minute for Mr. Daves, Mrs. Daves and Raymond Turner. All travel was carried out nearly to the minute. All objects were fully accomplished.

Detailed Report

We arrived at Tolley's Cave shortly before 8 A. M. (a little ahead of schedule). This cave is formed by a stream cutting through the spur of a hill for a distance of about 800 or 900 feet. We followed the cave into the hill for nearly 400′ when we were stopped by a shallow lake reaching within 2″ of the ceiling. We retraced our steps to the cave entrance and back to the car which was parked at Mr. Tolley's Farm House. This north entrance of the cave proved very uninteresting. Itt contained the usual bunch of junk and cans and had no formations or other features of interest with the exception that it appeared to be distinctly warmer than the average cave throughout.

Mr. Tolley now offered to lead us to the lower of south mouth of the cave. The south cave appeared to be quite different from the north section. It had the usual cave temperature and was exceptionally well decorated. Mr. Tolley made the entire trip with us and it was the first time that he had ever been that far back in his cave. The south cave also ended in a shallow lake similar to that in the north cave and which in all probabilities was the same pond. On the exit trip from the south cave several specimens of fauna were collected. Both the north and south caves were mapped 70″ and a check line run between the two entrances.

After a quick lunch in Lexington the group separated into two parties—one to finish the exploration of Showalter's Cave and the other to look for new caves. Both parties were successful in their undertakings. The Showalter party crosses "Welches' Lake" and pushed on portaging their improvised boat to a second and then to a third lake. The third lake was of considerable size and quite shallow and probably constitutes the end of the cave. It is thought that passages lead on under the surface of the water but such passage would be so mud filled as to prevent trespass even if the lake was drained. The improvised rubber boat made of two innertubes and a board proved so successful that it is recommended for all such work.

The location party succeeded in getting leads on at least 5 new caves and actually located 2 of them.

Separate detailed reports are being prepared on Tolley's and Showalter's Caves and on the work done by the locating party. The preparation of a separate article on the construction and use of the innertube boat is recommended.

After a clean-up swim, dinner was had in Buena Vista and the return journey to Richmond completed without accident.

PRACTICE HOLE, HARRISONBURG, VA.

Lat. 38° 29′ 30″ ± 3″ W. Long. 78° 50′ 54″ ± 1″

Directions: From Jct. of U. S. 11 and State No. 260 at north end of Harrisonburg proceed 2.2 mi. to house of Mr. Fries (on right) just before reaching entrance to a little quarry on right (Amoco pump in front of store fifty yards back toward Harrisonburg on left). Cave is now in small clump of rock across road (from house and quarry) in field on south side of fence, 275° from Fries house, 235° from quarry entrance gate. Cave entrance is in center of the clump of rocks and near the top or crest.

Description of Cave: The cave consists primarily of

a single vertical hole 26′ deep from entrance to talus on floor. Talus is 3-4′ deep beneath the entrance. Entrance is a wedgeshaped hole about 2½′ long and not over 1′ wide at the base of the wedge. The apex of the wedge is at 350°. The walls of the hole open up, after a few feet, in every direction but that of the apex. The hole terminates in a passage 2-3′ wide and 10-15′ ceiling height. The body of the cave is in the form of a T, the stem of which is shorter than its head. Entrance hole lies about 10′ down the stem, the total length of which is probably not over 25′. Direction of stem passage is 0°.

The passage forming the head of the T runs from 70° to 250° with both sides extending for about 30′. All passages end in constrictions that bar further progress. At the end of the east branch a small hole in the floor shows where any water which enters the cave drains off. There is some little flowstone present in each passageway. All passages have varying ceiling from 10 to 20′ high. The main development of the cave appears to have been on a vertical plane along the joints and seams of the rock.

While this cave can no doubt be worked with a single rope, a rope ladder is advisable. The closeness of the walls especially near the top make ladder climbing difficult but quite safe. Hence the name "practice hole." Probably a skilled rock-climber could "do" the cave without resorting to the use of any rope at all. In fact the author found it easier to chimney the last 5′ than to use the rope ladder. For a cave offering opportunities for safe practice of rope work under restricted conditions it is hard to see how this cave could be surpassed.

This cave was visited Oct. 17, 1942 by a party from the Society consisting of Stephenson, Petrie, Emshwiller, Faust, Seltzer, Drysdale and Murray Seltzer. Emshwiller, with only one arm, was able to make the descent and ascent both practically unassisted. Though many caves in the neighborhood were filled with water due to the unusual floods of that week, this cave showed no sign of standing water, thus giving evidence of a large well-drained cave system somewhere below into which the flood water must have drained.

The cave is developed in so-called "Athens shale" (Butts' Geologic Map of the Appalachian Valley in Virginia). This formation in this area however, instead of being shale, consists primarily of limestone of the type which a few years ago might have been designated "chambersburg age."

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DYER'S CAVE LEGENDARY REPORT

[This article should be compared to the previous report of this cave in Bulletin No. 4.]

Dyer's Cave derives its name from the old "Dyer Homestead" upon which it is located. It lies about thirty miles south of the old town of Romney and five miles northwest of the spot where Lost River loses itself under the mountain. This cave is only two miles from the old Moorefield and Winchester Turnpike.

Dyer's Cave is situated in a hollow which is heavily timbered by oak, birch and maple trees. At first glance it looks like a limestone ledge about forty feet high, with an opening about twenty feet square. Around this opening the rock ledge is covered with long green ferns which are green all the year; and from this opening, the mouth of the cave, you will catch your first glimpse of this dark, silent cavern with its network of underground passages. Your admiration and wonder will increase as you enter either by the lower or upper passage. You will come to a room on your left which is about thirty feet high and about the same in length and width. The most interesting thing there is a natural shelf in the side of the wall, which looks like a marble slab. As you approach it, letting your light shine upon it, you see millions of sparkling reflections.

Pass on about fifty yards farther and you will come to what is known as the "Natural Ice Factory." Here the water drips from the rocks overhead and freezes into icicles, some of which have measured several feet in length and have weighed as much as two hundred pounds. Icicles have been gathered in July and August, the hottest months of the year.

The next point of interest you will find is a small room known as the "Wolf's Den." The Wolf's Den is off from the main passage and can be reached only as crawling through a small hole known as "Fat Man's Misery." Once inside this room, you can still see evidences of its once being inhabited by wild animals. When this no longer holds your interest, you can pass into the place known as "Saltpeter Room." Here saltpeter was mined before the Revolutionary War and the ancient pick marks can still be seen on its walls. From here you must climb down a narrow natural staircase to a lower level. Here the passage is very narrow and after traveling this for some distance you will come to a stream of water. This stream is only a few feet wide, but no man has yet plumbed its depth although many have tried with sounding lines to reach the bottom. Here, too, you will receive a very peculiar experience, for, if you are using lanterns or pine knots for torches either will suddenly go out as you cross the stream. After crossing it you can relight your lights and go on exploring.

Before turning back, you must see one more interesting sight. This is a very large room known as "Heckle Town." From the walls and ceiling of this room hang what looks like icicles of all sizes and colors. When the light flashes upon them they look like spears of heckles;

hence the name, "Heckle Town." Upon closer examination they are found to be of rock formation of many different colors. This phenomenon of nature is yet to be solved by some scientist.

The length of Dyer's Cavern is not now really known, but it has been explored by sightseers and adventurers for a distance of five miles. So you can see that there is much more to be seen than I have just told you about.

A great many stories or legends have been handed down from our forefathers concerning this place, some of which I will endeavor to write for you before I close my story.

During the Indian wars a great many settlers took refuge in this cave to keep from falling into the hands of the savages. At one time they were mining saltpeter and other chemicals used in making gunpowder and making it near the mouth of the cave when a pack of hungry wolves rushed from its black depthse and devoured the entire band of settlers leaving only a few remnants of clothing and their tools to teel the tale.

Some time after this a band of men was engaged in moulding money here while hiding from the Indians. At last the Indians caught them and burned them at stake.

Several years afterward a group of men who had heard of the making of money in the cave decided to search for it. After making full preparations for the adventure they drank a good bit of whiskey to give them courage and then, with hopes soaring high, they started on their way. After searching for some time they found the spot where the money was supposed to have been hidden. Here they set to work with spades and picks and, after working for quite a while unearthed the old money molds. Now they were sure of success and began working harder than ever. At last they struck a metal box and as one member of the band struck the lid a heavy blow with his pick, a black, hideous form approached them. They were spellbound for a few moments, until one braver then the rest sprang with an oath at the approaching phantom. Instantly, every light went out and all were in total darkness. What were they to do? They could not find their torches and all were badly frightened and confused. After a while they decided on a plan, the oldest man leading and the rest following on hands and knees they crawled along in what they thought was the right direction. Thus for several days they wandered until by chance a rescue party found them and brought them out to the welcome sunshine once more. Never since has this treasure been molested, and, if this legend be true, and a great part of it has been proven to be true, the treasure is still there for someone to find and claim. —*The Moorefield (W. Va.) Examiner,* April 15, 1942.

SENECA CAVERNS, OHIO

By L. E. WARD

It was a cold "early winter" morning on November 14th, 1942, when our party left Toledo to visit Seneca Caverns, South of Bellevue, Ohio—a little more than a month after our return from Diamond Caverns and other caves in Kentucky. Harland Wood had made arrangements for this trip by contacting his friend, the manager of Seneca Caverns, Mr. Don Bell, an attorney residing in Bellevue. Our group was composed of the following members of the National Speleological Society: George White, Lou Klewer, Harland Wood, George Parke, and the writer.

We arrived at the caverns shortly after twelve o'clock noon, and were greeted by Mr. Bell, who had promised Harland that he would personally conduct us through these underground passageways. The entrance building to the caverns is situated near the highway leading from State Route No. 269, and as we drove into the grounds, one of our members remarked that the presence of an "old cemetery," on the opposite side of the driveway, certainly gave the scenery a mysterious setting.

After changing into our "cave clothes," our party entered a lower room in the entrance building, at the further end of which we were facing a high, natural limestone wall that seemed to rise out of the earth, to form a part of the room itself; while immediately in front of and extending downward, adjacent to it, a series of descending concrete steps, leading to a lower avenue, presented an irresistible appeal to our speleological instincts. Before starting on our trip to the first level of the cave, Mr. Bell called our attention to a large, colored chart-map, showing the geological location and structure of these caverns, and there imparted much interesting data and information concerning the existence of this, the only "Earthquake Crack" or "Fault" open to the public.

Two outstanding features in connection with these "caverns," were immediately apparent, as we made our way over well graded walkways and steps, following the ever downward course of a great natural crack in the earth's structure. First, the temperature, unlike that in most caves, was 42°, or 12 degrees lower than that which we had become accustomed to during our many hours' experience in "Underground Kentucky," and, second, although we were walking through an earthquake crack or fault, these passageways and avenues continued to maintain most of the physical characteristics and appearance of a typical limestone cave.

In the dim days of creation when this old world of ours was undergoing much more rapid changes than today—geologists tell us that all the region from Wes-

tern Ohio to the Atlantic seaboard, from the Gulf of Mexico to Hudson Bay, was submerged beneath a great inland sea of which the Gulf is but a remnant. The western edge of this old sea washed the slopes of a great north and south mountain range passing just east of Cincinnati and extending from Northern Alabama beyond the Northern shore of Lake Erie. Its eastern shore lay high up on the slope of a second mountain range in the regions along the Atlantic shoreline of today.

Earlier, by earthquake action, these mountain ranges had been erected. Four times, by tremendous quakes, the floor of that sea was submerged and five times, heaved above the waters. Out of millions of years of earthquake action there developed from Gulf to Bay, deep down in the bed rock of the continent, along the eastern slope of the western range, a great series of earthquake faults or cracks. And so, through the strife and turmoil of earthquake and glacier, nature gave birth, in Northern Ohio, to one of her greatest wonders, the Subterranean Drainage System of the Bellevue Area, of which both Seneca Caverns and the "Blue Hole" are a part.

Our downward "penetration" to the side of Old Mist'ry River was made by "easy stages," in much the same manner as a winding road "zig-zags" back and forth down one side of a steep, mountainous hill. A number of large rooms were entered as we followed the course of the trail. In one of the lower avenues, Mr. Bell called our attention to a most interesting horizontal crack in the limestone wall, tapering from an 8 inch opening, back as far as the eye could follow and illuminated by several flood lights, which revealed the presence of innumerable dwarf stalactites; while beneath this sparkling formation, countless odd-shape pieces of shale rock were observed. The distant location of these rocks precluded the possibility of having been thrown there by human hands. One of the members of our party attempted to throw some flat "sailer" rocks into the crevice, but his efforts were in vain, as they would strike either the floor or roof and fall far short of their desired mark. A closer examination revealed no apparent "breaks" in the smooth, stalactite-studded roof of the crevice—all of which leaves the origin of these rocks and their present location entirely unexplainable.

Old Mist'ry River

We were now walking through the Grand Canyon Room, a great, long rock-bound avenue, the ceiling of which slanted downward at a 45° angle, thus passing over and connecting the 7th and 8th levels. By following the down-grade of a steep trail over great projecting limestone ledges, we soon found ourselves standing along a pathway at the top of a graded incline, leading downward and passing under the great earthquake wall that extended from a point, and at a sharp angle, 50 feet above our heads. As we stood there, taking in the sights, the silence of the cavern was broken when one of the boys suggested that Harland Wood lead the way "under" the ledge below us, but he was promptly rebuffed when Harland stated that due to "priority regulations" Mr. Bell was unable to furnish rubber diving suits for this purpose.

All eyes were now focused upon and looking into the depths of a most unusual subterranean river, flowing crystal clear, but colored a beautiful "blue," along the wall side, at the bottom of the 8th level of the caverns, 160 feet beneath the surface of the land. Flowing thru rocks riven by earthquakes millions of years ago, it courses deep beneath the limestone structure of the region and is reported to feed the famous "Blue Hole" of Castalia, 15 miles to the North. We were informed that on May 14th, 1930, three message bearing bottles were liberated in the flood waters of Old Mist'ry in the fifth level of Seneca Caverns by three Fremont, Ohio men; and that on June 17, 1934 one of these bottles was found floating in the Blue Hole. It has been claimed by some visitors that they have seen "blind fish" swimming in the stream. Little shrimp, crab-like creatures, with a tail like a rooster's spur, live in the waters. Blind and without sense of equilibrium, they shoot about head first, through the water, more often bottom-side up than in what to the human seems a normal traveling position. This "river" is subject to considerable variation in flood times, rising during spring rains as much as 60 feet in a week's time.

After further examining this mysterious river, several of our members ventured along a ledge at the far end of the long avenue, overlooking the blue waters below, and reported that an additional or "extension" avenue could be seen around a bend in the canyon wall. However, the ledge on which they were walking became so narrow that it was impossible for them to go further. A number of crawlways were explored on our return to the surface, several of which led into small water-carved rooms. Mr. Bell informed us that in 1936 an Indian Rug Needle or "shuttle" of stone was found in the 4th level, 80 feet under-ground, and that investigation revealed that it was from 1000 to 1500 years since a stone shuttle had been in use. Our trip into Seneca Caverns brought to a close, a most interesting and diversified series of "speleological experiences" for the year 1942, and it was agreed by all the members of the Toledo Group that should the opportunity arise during the summer of 1943, further "caving" expeditions would be undertaken.

RANDOM NOTES

(*Continued from page 30*)

itself to the lower portion of the outer rim of the stalactite. This is partly due to the accident of proximity and also due to the force which the already precipitated calcium carbonate at the extremity of the stalactite exerts in drawing more calcium carbonate to itself. It must be remembered that we have been talking only of the upper portion of the drop. The following seems theoretically possible and not only that but probable although the writer cannot remember that he has observed the same. He now asks the members of this organization to make observations for themselves and see if it is correct. The lower portion of the drop will not be in contact with any solid calcium carbonate and calcium carbonate will therefore not be assisted out of solution by pre-existing calcium carbonate. However, under favorable conditions of air flow around the drop and suitable flow of water from above carbon dioxide will evaporate from other portions of the drop and when formed will fall to the lower portion of the drop being retained within the drop by the surface tensions on the exterior. Now with more water coming from above the drop will be loosened from its support and fall down together with its contained calcium carbonate to the stalagmite. Stalagmites then may be formed by the precipitation of calcium carbonate produced by the loss of carbon dioxide from the solution coating it but also by calcium carbonate brought from its stalactite as indicated above.

Flowstone would be calcium carbonate precipitated on a sloping surface. When precipitation takes place on flat surface pans or the similar structures may be produced.

Often knobs are formed on stalactite and stalagmites and on the walls of caves. During the process of formation one may note that the exterior of the knob is coated with water. And this water is not moving under the influence of gravity but moves in consequence of capillarity and commonly against gravity. In such cases evaporation takes place more rapidly on the exposed portions of the knobs and the knobs are built up in horizontal, inclined or other positions without relation to gravity. Doubtless the attractive force of pre-existing carbonates helps to pull the material out of solution but the main factor is the concentration of solution is due to the loss of carbon dioxide.

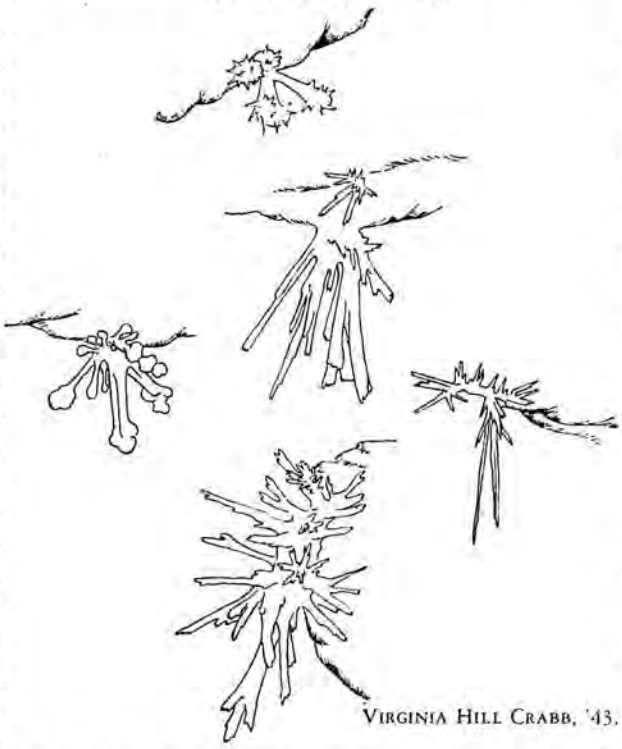
In response to the force of crystallization crystals form in caves regardless of gravity and independent of the conditions which produce the knobs. It is not quite clear how this can be the case but it is suggested than an atmosphere saturated with moisture may be an essential factor. It is more probable that this takes place only in situations in which there are no air currents and consequently little opportunity for a loss of carbon dioxide. The force of crystallization must here be the dominant and perhaps the only factor. We might even suggest that the pull of the precipitated material could take its chemical relative out of solution when the solution is quite saturated. Obviously then, the direction of the crystals so formed will be independent of gravity and independent of air circulation. It is a structure of this kind which constitutes most of our helictites. It is perhaps in order here to introduce a definition of helictite. The writer does not feel quite competent to do this but when such definition is formulated it should be so worded as to exclude knobs. We might suggest that maybe the force of crystallization should be considered as necessarily incorporated in such a definition. An essential feature of helictites is that they are independent of gravity and therefore stand at any angle whatever wih referenc to the force of gravity. Careful search in almost any cave where deposition has been going on may show minute structures which may be regarded as helictites. This would include the minute needles which sometimes form fuzzy surfaces and velvety covering. It is a far cry from such minute needles to the magnificent flower-like structures a foot or more in diameter, which sometimes flower in such profusion in most favored localities.

The mineralogy of cave deposits is not as simple as is generally supposed. Calcium carbonate of cave deposits is generally in the form of the mineral calcite. Less commonly it is aragonite. The only difference between these two minerals is in their crystal system. Calcite is hexagonal while aragonite is orthorhombic. For the most part calcite in cave deposits does not have its proper crystal form. Calcite has hundreds of crystal forms. It is one of the most prolific of minerals in matter of forms. Not only is it varied in form but the general shape or habit of its crystals is variable. Technically the most common forms are rhombohedrons and scalenohedrons. Rhombohedrons alone generally give short stubby crystals. Scalenohedrons give sharper pointed crystals. Usually crystals are combinations of various rhombohedrons and scalenohedrons with scalenohedrons predominating and giving a steep conical shape to the crystal. A common shape resulting from such a combination is known as dog tooth spar. Such crystals are not commonly met with in caves.

Aragonite is found in caves is generally needle shaped. It is quite safe to assume that any slender tapered crystals found in caves are aragonite. Such crystals may vary in size from so minute structures as to be distinguished with difficulty by the unaided eye to an inch to several inches long. Commonly they are minute and it is only under exceptionally favorable circumstances that long crystals form.

Since most carbonate materials in caves do not have crystal form other criteria for distinguishing between these two minerals are needed. Since they have the same chemical formula a quantitative chemical analysis will show no difference. There are however chemical tests which distinguish but they are not very certain in the hands of the inexperienced. There is a physical test which is better. Aragonite heated to a temperature below redness will fall to a powder. Since aragonite may alter to calcite with the retention of the form of the aragonite the matter is still more complicated. The cleavage of the two minerals is quite different. Calcite will break in three planes which meet at oblique angles. Aragonite has one cleavage parallel to the long axis of the crystal. Crystals of sufficient size to show cleavage can usually be distinguished on this basis by the use of a hand lens. Aragonite crystals are often grouped in radiating aggregates and such aggregates gates and such aggregates often show concentric banding.

HELICTITE (CRYSTALICTITE) FORMATIONS
SKETCHED FROM NATURE IN NEW RIVER FAULT CAVE
GOODWIN'S FERRY, VA.



VIRGINIA HILL CRABB, '43.

Since limestone is more soluble than dolomite, caves are more common in limestone than in dolomite. There are caves in dolomite but only under exceptional circumstances. The word dolomite is used for a mineral as well as for a rock. As used above the word dolomite refers to the rock. Since dolomite is a calcium-magnesium carbonate it is dissolved and precipitated in the same manner as calcite but not so readily. The white veins which one often sees in dolomite rocks are generally dolomite but often carry some associated calcite. Here they are not readily distinguished by appearance but since calcite is soluble in dilute cold acid while dolomite is not, this chemical test is a ready means of separation in limestone caves one would not look for dolomite deposits but in caves in dolomite they occur but are not common. Even in dolomite caves the deposits are chiefly calcium carbonate.

Next to calcite and dolomite gypsum is the most abundant rock forming mineral which is easily dissolved. Therefore we have gypsum caves. The solution of gypsum is quite different from that of the carbonate rocks. Here carbon dioxide does not play such a prominent part. Gypsum is soluble in 650 parts of non-carbonated water. It is not thrown in and out of solution by carbon dioxide as carbonate mineral. In eastern United States gypsum is not common and gypsum caves are almost unknown but in western part of the country gypsum and gypsum caves are more common. Gypsum is present in eastern caves but not usually in abundance. Where mud is washed into caves gypsum crystals are not uncommon in such mud.

Dripstone and flowstone are usually calcite but may be wholly or partly aragonite. Dolomite deposits in caves are not so common that generalizations can be satisfactorily made in regard to them. The writer has seen dolomite stalactites. Helictites are commonly aragonite but may be calcite. The curved and twisted pendants in caves are sometimes dolomite and are probably properly called helictites. Sometimes solutions ooze through walls of caves making deposits as they come and may even disrupt coatings previously formed. Such structures are apt to be curved. Indeed they sometimes resemble what soft putty would look like if squeezed through a small hole. Such structures should probably be called helictites.

Many caves are known as saltpeter caves, so called because they do not contain saltpeter. Yet the powder for several of our American wars was made in part from nitrate from caves. Probably many of the Virginia caves were scraped for the nitrate which they contained. Indeed old utensils are not uncommon in caves and one is probably not far wrong when it is assumed that such were used in the recovery of nitrate. The writer has never seen what he thought was nitrate mineral in caves but some Kentucky caves are said to have been once rich in such material. However the writer has leached dirt from Virginia caves and obtained calcium nitrate.

In the Comstock Lode, which is the world's hottest mine, aragonite is abundant and the cause of its formation is easy to guess. Since our Virginia caves have a temperature of approximately 50° F. it would seem that temperature was not the controlling factor.*

*A portion of this article has been omitted for lack of space.

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(This does not include caves listed in article of Robert Morgan)

Illustrations

Bulletin No. 6, featuring *A Glossary of Speleology*, by Martin H. and Katherine E. Muma; *The Netherland of Night*, by Jo Chamberlin; and *Underground Adventures at Diamond Cave, Kentucky*, by J. E. Ward, will be issued as soon as funds of the Society permit.