THE ASSOCIATION

The American Spelean History Association is chartered as a non-profit corporation for the study, dissemination, and interpretation of spelean history and related purposes. All persons who are interested in those goals are cordially invited to become members. Annual membership is $5.00; family membership is $6.00; and library subscriptions are $4.00. ASHA is the official history section of the National Speleological Society.

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FRONT COVER:
Photographs by Ed Frank of wooden and stone mine posts in Sarah Furnace Cave, and a map of the surrounding area from Caldwell's Historical Atlas of Clarion County, Pennsylvania (1877).

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THE JOURNAL

The Association publishes the Journal of Spelean History on a quarterly basis. Pertinent articles or reprints are welcomed. Manuscripts should be typed and double-spaced. Submissions of rough drafts for preliminary editing is encouraged. Illustrations require special handling and arrangements should be made with the editor in advance. Photos and illustrations will be returned upon request.

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BACK ISSUES

All copies of back issues of the Journal are presently available. Early issues are photocopied. Send requests to Jack H. Speece (address given below, with officers). Indexes are also available for volumes 1, 2, 3, 4, and 5. All issues of volumes 1-7:2 are available on microfiche from Kraus Reprint Company, Route 100, Millwood, New York 10546.

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Journal Staff

Editor: Marion O. Smith, P. O. Box 8276, UT Station, Knoxville, Tennessee 37996

Printer: Byron's Graphic Arts, 712 E. Harper Ave., Maryville, Tennessee 37801 (Jim, Callie, & Mike Whidby)
The annual meeting of ASHA which was scheduled to be held in connection with the NSS Convention in Sheridan, Wyoming, the week of June 25-29, 1984, was canceled due to a lack of members in attendance. The history session of the society was also lacking in support. It was the decision of trustees Russel Gurnee, Harold Meloy, Jack Speece, and Cato Holler to continue serving until next year's annual meeting. They also appointed the same officers to serve another term: Joel M. Sneed, president, Larry O. Blair, 1st vice president, Gary Soule, 2nd vice president, Jack H. Speece, secretary/treasurer, and Marion O. Smith, editor. It was noted that Marion was doing an outstanding job in bringing the Journal up to date with quality material. A special thanks belongs to the membership who have contributed financially to ASHA in its need. The dues will need to be raised in the near future if we intend to continue with a quality Journal. The dues of $5.00 per year was established upon the organization of the association in 1968 and have not been raised since.

**FINANCIAL STATEMENT**

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**1984 PETER M. HAUER AWARD**

The 1984 recipient of the Peter M. Hauer Spelean History Award was Marion O. Smith, the current editor of the *Journal of Spelean History*. Since 1979 he has been actively collecting documentary material pertaining to saltpeter mining in American caves, with emphasis upon the Confederate Nitre Bureau. His writings include mining histories of Trinity, Daniel, Long Hollow, and Sauta caves, Alabama, and Renfro Cave, Tennessee. Future reports are planned by him on Big Bone and Nickajack caves, Tennessee, two caves in Bath County, Virginia, Manitou Cave, Alabama, and the "lesser" saltpeter caves of Jackson County, Alabama.

"The reason schoolboys delight to dig and explore caves is because of the recesses there." Nashville *Union and American*, January 24, 1871.

*Journal of Spelean History* -3-
Bransford family members guided visitors in Mammoth Cave from 1838 until 1939. Prior to the Bransfords, two generations of earlier guides had conducted travelers through the cave. One of the 1809 visitors had authored a descriptive narrative of his underground adventures which was published in 1810.

More travelers came and wrote more accounts of the cave. These were published on both sides of the Atlantic and brought more visitors. By 1835 at least four maps of the cave had been published. These with the two printed guidebooks (1818 and 1835) set the stage for coming events.

A new era began in 1838 when Franklin Gorin, an attorney of Glasgow, Kentucky, purchased the property from Hyman and Simon Gratz. Gorin brought his seventeen year old slave, Stephen, for a guide. He also hired from his Glasgow friend, Thomas Bransford, two slaves, Mat and Nick, brothers of about the same age as Stephen.

There were three young guides at the cave: Stephen Bishop, Materson Bransford, and Nicholas Bransford. Older guides Joe Shackelford and Archabald Miller, Jr., taught them the tourist routes in the cave, as they had been taught by earlier guides. The three young men were willing learners and were the principal guides during the next two decades.

Not content with the known cave, each of them entered the dark unknown and made new discoveries on his own. Mat was a member of the exploring team that first entered Mammoth Dome and found there a miner's lantern that had been dropped down Crevice Pit when the cave was worked for saltpeter. He also discovered at the end of Franklin Avenue a beautiful grotto later names Serena's Arbour.

The cave property changed hands again in 1839 when Dr. John Croghan of Louisville purchased the cave. Stephen was sold with the cave. Mat and Nick were leased as before. In the truest sense, the three belonged to the cave, and only secondarily to their legal owners. Croghan planned a tuberculosis hospital within the cave, and in 1841 the three were set to work building cabins in the cave to house future patients. Two were built in Audubon Avenue, some in the Main Cave, and one in Pensacola Avenue.

Invalids arrived in 1842. There were a total of eleven patients (not all at the same time) and four companions living within the cave. The guides carried their food from the hotel kitchen and did their errands. One patient left the cave, he thought much improved; another showed no improvement and left in January, 1843. Those with terminal illnesses died in the cave, and the experiment failed.

Croghan died in 1849 and Stephen in 1857. Now Mat and Nick were the most experienced guides. Dr. Charles W. Wright wrote in his 1858 guidebook: "Although a great deal has been said and written about Stephen, from the fact that he was the favorite of a former proprietor, he was in no respect superior to either Mat or Nicholas, nor was his acquaintance with the cave more thorough or extensive." Wright also mentioned that "Mat, as well as Nicholas, saved a party from drowning on Echo River, by his courage and self-possession."

Some of the visitors wanted to explore new cave. In 1863 F. J. Stevenson of
London, England, spent ten days doing just that. When he and Nick descended
to the bottom of Gorin's Dome, they found a pool of water in which he "observed
a slight current . . . which flowed into the pool from under a low arch of rock
at one side and passed out by a similar arch on the opposite side. The highest
point of these arches was about 8 inches above the surface of the water."

The following day a small boat was constructed and lowered by guides to the
bottom of the dome. He and Nick spent the next two days exploring the upstream
part of the river.

Stevenson later described his discoveries on what has since been known as
"Stevenson's Lost River." When a dam was built on Green River forty three years
later, the water level rose in the dome closing the only known entrance to that
river. Remains of the boat could still be seen at the bottom of the dome in 1900.

Stevenson also wrote that he and Nick explored Roaring River, and that he,
Nick, and Frank DeMonbrun each descended the Maelstrom, the deep pit at the end
of the long route.

Mat assisted Charles Waldack, a Cincinnati photographer, in taking the first
photographs in the cave. The equipment, large and awkward, included a stereo­
graphic camera, magnesium flare holders, and bulky reflectors, all of which Mat
helped transport from place to place within the cave. Forty-two wet-plate stereo­
scopic views were taken in 1866 and published by Anthony & Co. of New York in
1867. These are now at the Library of Congress. The one showing Mat at the cave
entrance is a favorite of collectors.

During his fifty years as a guide, Nick saw many famous people who came to the
cave. Ralph Waldo Emerson came in 1850. His impressions of the Star Chamber in­
spired one of his essays. The following year Jenny Lind sat in the devil's chair
in Gothic Avenue. It has since been known as Jenny Lind's arm chair. In 1872
Grand Duke Alexis of Russia toured the cave, as did Dom Pedro, Emperor of Brazil,
in 1876. That same year Shakespearean actor Edwin Booth recited Hamlet selections
from a high natural stage in the room since known as Booth's Amphitheater. One of
the 1867 visitors gave a colorful description of Nick:

We call him Ole Nick, considerably past middle age; wrinkled, a short,
broad, strongman . . . every one of the innumerable wrinkles in his
black face made more distinct, with his white beard and mustache, and
the whites of his eyes seeming to glow in the blue elfish light,—­
was a caricature, half grotesque, almost terrible, of Satan himself.

In 1886 W. F. Sessor photographed Nick. The original is in the archives of the
Filson Club, Louisville. A copy was published by Jim Quinlan on the cover of the

A second generation of Bransfords became guides at Mammoth Cave. Henry, son
of Mat, was born in 1849. Trained by his father, he began guiding about 1872. He
delighted in showing the saltpeter hoppers used during the War of 1812, and the
road through the main cave along which ox carts brought peter dirt to the hoppers.
Tracks of the cartwheels remained in the road, as did some of the corncobs at the
place where the oxen had been tethered and fed. One visitor observed that the
cobs appeared perfectly preserved by the pure cave air and asked to purchase one
as a keepsake. Henry obliged, and then said that he would carry in more cobs for
future visitors.

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Along the main cave is a large room where religious services had been held since 1834. In this bone-dry part of the cave, Henry would stop his party and announce "This is the Methodist Church" in such a way that one of the non-Metho­dists was sure to ask "Why do you call it the Methodist Church?" After just the right interval of pause, Henry would answer, "Because it is too dry for the Bap­tists."

One of Henry's chores in 1882 was helping with the mushroom farm in the cave. During the previous year natural beds of mushrooms were found in River Hall. Since there was a considerable demand for this delicacy in Louisville and Nashville, as well as at the cave hotel dining room, three of the Estate Trustees organized the Mammoth Cave Mushroom Company. Augustus A. Nicholson was president, and other trustees served as secretary and treasurer. They employed a Frenchman by the name of Mazeller to supervise the enterprise, and Major Francis Klett was the manager.

Beds were constructed and planted at the end of Audubon Avenue. The guides watered and tended them. Business was good until the treasurer absconded with all the cash, leaving Klett with no funds to pay the debts or for operating capital. The business failed.

Parades of visitors came with each passing year. Herman Zagel, a German visitor in 1887, described Henry as "a handsome young negro man built like Hercules, tall and broad shouldered. On Echo River, he sang with a full melodious voice . . . a three-tone sequence of notes . . . which came back a splendid chord."

Mat died in 1886. Henry died in 1894, leaving two young sons, Lewis and Matt, who would later serve as third generation guides. But in the meantime, William Bransford, of the second generation, was becoming a well known and respected guide at the cave.

William, born in 1866, began guiding in 1888, and continued for over forty years. Tall and dignified, he accompanied the cave exhibits to the Chicago World's Fair in 1893.

The management had stripped beautiful Charlotte's Grotto of its gypsum flowers for exhibition at the fair. The original "Mammoth Cave" mummy (Fawn Hoof) had been exhibited at the 1876 Philadelphia World's Fair, but it had not been at the cave since 1815. The role of the "Mammoth Cave" mummy was now being played at the cave by another mummy (Little Alice). Similar in appearance, few people knew the difference.

William exhibited the mummy and specimens of the gypsum flowers in White City at the Chicago fair. Thereafter, the area off Cleaveland Avenue from which the flowers had been taken was known by the guides as Specimen Avenue.

William was an exploring guide. In May, 1907, he and Edward Hawkins took Benjamin F. Einbigler of New York City through a maze of passages to the left of Boone Avenue. Beyond, they discovered the majestic Cathedral Domes. The following month author Horace C. Hovey was taken to their discovery. He placed it on his 1909 cave map as "Hovey's Cathedral." On the same map he remembered the two guides by naming one passage "Hawkins' Way" and another "Bransford Avenue." This is the only feature in the cave named for any of the Bransford guides.

A third generation of Bransford guides appeared with Lewis and Matt, sons of
Henry. Lewis began guiding in 1895. Matt began as a lunch carrier in 1897 and became a full guide in 1905. Like the guides before and after them, they saw hundreds of names and dates placed on the cave walls since 1801.

In 1907 a stone plaque was dedicated by Chancellor J. H. Kirkland of Vanderbilt University as a tribute to the students and alumni of the school. The ceremony was held in Sparks Avenue just beyond Bandit Hall. The polished granite plaque includes the quotation from Thomas Carlyle:

Out of the lowest depths, there
is a path to the loftiest heights.

Thereafter, the room with the plaque has been known as Vanderbilt University Hall, and the guides took pride in showing this literary gem on their cave tours.

Occasionally, large banqueting groups were served dinner in the cave. Lewis and Matt long remembered that time in 1915 when tables were set in Audubon Avenue for two hundred guests. They dined on hotel linens by candlelight, and then were taken on a cave tour.

By 1930 there were eight Bransfords on the guide roster. The fourth generation included Arthur, Clifton, Eddie, Elzie, and George, sons and nephews of Lewis. William died in 1934. The younger Bransfords left the guide service by 1935. Matt retired in 1937 and Lewis in 1939.

An era had ended. Four generations of the Bransford family had conducted travelers through Mammoth Cave for over a hundred years.

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JOURNAL OF SPELEAN HISTORY
TWO 1789 CAVE REPORTS

MIDDLETOWN, [Conn.], April 11.

Last Sunday a Cave was discovered in Chatham, in which was deposited a number of articles of stolen goods, among which were the articles taken from Capt. Benton's sloop last winter, (as mentioned in a former paper) and a considerable quantity of provisions, clothing, &c.---The cave is in a thick unfrequented wood, having a passage just large enough for a man to crawl in upon his hands and knees for some ways, when it opens to a convenient room, with a fire-place in it, &c. It is supposed to have been occupied for some time past by a gang of villains who infest the State.

Hartford American Mercury, April 13, 1789.

CURIOUS CAVE.

In the town of Tinmouth, in the State of Vermont, on the side of a small hill, is a very curious cave. The chasm, at its entrance, is about four feet in circumference. Entering this, you descend 104 feet, and then opens a spacious room 20 feet in breadth, and 100 feet in length. The angle of descent is about 45 degrees. The roof of this cavern is of rock, through which the water is continually percolating. The stalactites which hang from the roof appear like icicles on the eves of houses, and are continually increasing in number and magnitude. The bottom and sides are continually incrusted with spar and other mineral substances. On the sides of this subterraneous hall, are tables, chairs, benches, &c. which appear to be artificially carved.

This richly ornamented room when illuminated with the candles of the guides, has an enchanting effect upon the eye of the spectator. If we might be indulged in assigning the general causes of these astonishing appearances, we should conclude, from the various circumstances attending them, that they arise from water filtrating slowly through the incumbent strata, and taking up in its passage a variety of mineral substances, to unite according to their affinities.

At the end of this cave is a circular hole, 15 feet deep, apparently hewn out, in a conical form, enlarging gradually as you descend, in the form of a sugar-loaf. At the bottom is a spring of fresh water in continual motion, like the boiling of a pot. Its depth has never been founded.

Providence Gazette, May 16, 1789.
Mississippi is not known for its caves, but there are a few within its boundaries. The largest caves are to be found in Jasper and Wayne counties, and are formed in limestone. Smaller caves are to be found in Tishomingo, Union, and Atalanta counties, but are mostly formed in quartzite.

Civil War newspapers and books refer to the many "caves" in and around Vicksburg, which were used as shelters during the 1863 Union siege of that city.

Vicksburg is located on the Mississippi River/Louisiana border, and in between the Big Black River to the south and the Yazoo River to the north. It is a caveless geological area. The caves referred to in the literature were man made, dug in soft soil along hillsides and shallow ravines. Most were very small. Construction of larger networks was prohibited for fear of cave-ins. Naval bombardments did in fact cause some cave-ins and "cave" collapses with fatalities.

The following accounts give some insight to the use and size of the "caves," which are more accurately described as tunnels. The first is from the New York World, July 15, 1863, which described the surrender of Vicksburg:

When we consider that these people—men, women, and children—have, for a month and a half, been in daily terror of their lives, never being able to sleep a night at their homes, but crawling into caves, unable to move except in the few peaceful intervals in the heat of the day, we may appreciate what a life of horror was theirs.

These caves, indeed, are among the most curious features of this life in a besieged city. In several places the streets are cut through the bluff, and in the walls rows of caverns have been hewn, resembling somewhat the appearance of a burrow of rabbits. Most of these are shaped like the letter Y, the stem forming the main entrance, and branching out some seven feet. Into these subterranean pits the inhabitants would crawl so often as the guns and mortars opened out what promised to be a heavy one. As many as twenty-five have been crowded into one hole. The sight of these poor creatures flying...

"With blanket in the alarm of fear caught up," was both ludicrous and melancholy. The cry would go up from the irreverent soldiers, "Rats, to your holes," as women and children huddled into the bank. The men generally remained outside, or sought shelter in the bombproofs and magazines nearer the batteries.

At least one "cave" dwelling lady who lived through this time of trial by fire kept a diary throughout the forty-seven day siege. She was Mrs. James M. Loughborough, wife of one of the adjutants under General John C. Pemberton. Loughborough spent most of her time during the siege between two different "caves." The first was behind the home she spent time in while visiting friends. This cave received heavy shelling since the house itself was within view of the Mississippi River. Her second cave-home was on the eastern outskirts of the city, almost beneath the outer network of defenses. It too received a heavy bombardment from Union land forces.

Loughborough's journal was first published in 1864 under the title, My Cave
Life in Vicksburg. According to the preface of a later edition, she proceeded to St. Louis after the city fell:

There, one evening, in conversation with a friend who had been reading her little journal of the siege, the thought was suggested of publication. On writing to Appleton & Co. regarding the matter, a reply was received requesting the transmission of the manuscript journal; and the author was urged to dispatch the papers... while public interest in the siege life was still vivid...

The published book was reviewed by the New York Independent.

Of her first cave shelter she wrote:

The cave was an excavation in the earth the size of a large room, high enough for the tallest person to stand perfectly erect, provided with comfortable seats, and altogether quite a large and habitable abode (compared with some of the caves in the city), were it not for the dampness and the constant contact with the soft earthy wall. [page 17]

Upon moving to her "new" cave, Mrs. Loughborough related:

M [her husband] sent over and had a cave made in a hill near by...

Our new habitation was an excavation made in the earth, and branching six feet from the entrance, forming a cave in the shape of a T. In one of the wings my bed fitted; the other I used as a kind of a dressing room; in this the earth had been cut down a foot or two below the floor of the main cave; I could stand erect here. [pages 58 and 61]

Mrs. Loughborough's journal gave the following account of the construction of the dugouts:

Caves were the fashion—the rage—over besieged Vicksburg. Negroes, who understood their business, hired themselves out to dig them, at from thirty to fifty dollars, according to the size. Many persons, considering different localities unsafe, would sell them to others, who had been less fortunate, or less provident; and so great was the demand for cave workmen, that a new branch of industry sprung up and became popular—particularly as the personal safety of the workmen was secured, and money withheld. [page 72]

Although these hollow spaces referred to as "caves" were not in fact true or naturally formed caverns, their purpose and construction as related in the above references give a clear view of the life and times of the siege of Vicksburg, and has earned them a place in spelean history.

John L. Smyre and Ron Zawislak's long promised book on the history, exploration, and survey of Big Bone Cave and the caves of Bone Cave Mountain, Tennessee, will soon be published!

Vol. 19, No. 1 -10-
IRON ORE MINING AT SARAH FURNACE CAVE

Edward Forrest Frank

In the mid-nineteenth century iron ore was mined from the roof of Sarah Furnace (Porter's) Cave in Clarion County, Pennsylvania. The ore was used in small local iron furnaces to produce pig iron. This in turn was shipped by flatboat down the Allegheny River to Pittsburgh to be further processed.

The entrance to Sarah Furnace Cave is on a hillside about 380 feet above the Allegheny River near the village of Sarah Furnace. The cave is a network maze developed in the Pennsylvanian aged VanPort Limestone. The limestone at this locality is from twelve to fifteen feet thick. Immediately overlying the limestone is a one to two foot thick iron carbonate layer locally known as "buhrstone ore." This is the ore layer that had been mined from the cave roof. Natural passages in Sarah Furnace Cave are typically keyhole shaped and range in size from too-small-to-enter solution tubes to walking passages eight feet high and three feet wide. Mined passages were formed by enlarging the natural passages found in the cave. Mined passages are rectangular in cross-section and average four feet high and ten feet wide. The natural passages served the miners as ready made access tunnels to the ore body overlying the limestone.

The present investigation of the cave began upon reading a description of the cave written by W. B. White (1976) in Caves of Western Pennsylvania. He reported, "The cave is of special interest in that iron ore . . . was mined from the cave in colonial times. . . . In many places cave passages are indistinguishable from mine tunnels, and ancient roof timbers are still to be seen."

Subsequent visits to the cave by the author revealed potentially several miles of natural maze passage and over half a mile of mined enlarged passage. The mined passages are distinguishable from natural passages by cross-section shape, broken versus solutioned surfaces, and the presence or absence of drill holes, mine posts, and other indications of mining activity. The cave is presently being surveyed by members of the Northwestern Pennsylvania Cave Survey of the Na-
Ridgewalks in the area revealed four other small caves, specifically Catfish Creek Cave, "P" Cave, Porcupine Cave, and Somewhat Disappointing Cave, that also contained signs of iron ore mining or ore exploration. As it was not economical to ship the ore any distance from the mine, the ore removed from these caves was probably used in two nineteenth century iron ore furnaces, Sarah and Catfish, located nearby along the Allegheny River.

Sarah Furnace was located below and slightly downstream from the hillside entrance to Sarah Furnace Cave. Faint traces of what might have been a haulroad are still visible leading from the cave. Three of the small caves mentioned above were located along an old wagon trail leading from Kissinger Mills and the village of Catfish about one mile north of the location of Catfish Furnace. The fourth cave is located directly across Catfish Creek from the others. Catfish and Sarah furnaces were in blast respectively from 1846 to 1856 and from 1860 to 1867, and the mining or iron ore from the caves probably took place during these two time periods. The iron industry in Clarion County itself lasted only from 1801 to 1887, so the mining definitely took place in the nineteenth century.

In Sarah Furnace Cave two separate areas have been mined. One short section with less than 500 feet of mined passage is found off the present entrance to the cave. The second larger mined section is separated from the entrance area by a maze of crawlways. During the period of actual mining another entrance must have opened into this area. In fact several large mined passages now terminate abruptly at the hillside plugged by fill material from a more recent surface coal mine overlying the cave. One or more of these filled passages may have served as entrances to this section of the cave during the mining operations.

In addition to the mine-enlarged passages themselves, there are a number of other remnants of the mining operation left in the cave. These remnants include: mine posts, laid stone walls, artificially filled passages, holes made with a drill, and a broken shovel.

Both wooden and stone posts are scattered throughout the mined portions of the cave. The wooden posts are T-shaped with a round log section used for the stem and a heavy flat board used for the cross-piece. Many of these posts are still in place while others have fallen to the floor. Future plans include dating some of these posts using dendrochronology to provide a physical confirmation of the age of the mining operation. Stone posts consist of cairn-like stacks of flat limestone flags reaching from the floor to the ceiling. Sometimes these stone posts are used by themselves, while at other times they are used in conjunction with the wooden posts.

In several places in the cave there are stone walls that were constructed by the iron ore miners. These walls appear to serve two purposes, helping to support the roof and disposing of excess rock removed during mining. In the entrance section several large stone walls have been at the corners of intersections between two mined passages. At these intersections the roof strata must support a longer span of ceiling and these stone walls help give it support. In other areas shorter walls have been built along the sides of the mined passages. The areas behind these walls are typically filled with chunks of limestone removed during the mining process. Often side passages were filled with debris and walled off from active areas of the mine.
Throughout the mined areas are numerous broken short sections of drill holes. Where intact they are typically three-fourths inch in diameter and terminate in a single flat chisel-like point. These holes are found on the passage walls and ceilings primarily on the surface of the ore layer. They were made by hand drills commonly in use at that time for mining. Usually one worker would hold the rod-shaped bit while another miner drove it into the rock with a sledge hammer. The resulting holes were then filled with black powder or other explosives and the surrounding rock was blasted loose. The loose rock was then further broken up by hand and hauled away.

No drill bits, sledge hammers, carts, or similar items definitely dating from the mining days were found in the cave. However, a single flat-headed shovel blade was found in a mined area in an isolated back portion of the cave. This shovel head may or may not date from when the cave was mined. In addition, some unidentified pieces of iron and segments of wire of indeterminate age have also been found in the cave.

IRON INDUSTRY

The iron industry in Clarion County and the rest of northwestern Pennsylvania played an important role in the development of the great iron city of Pittsburgh and in turn the development of the country itself. In 1856 Pennsylvania produced 59,388 tons of iron. Of this amount 20,368 tons were produced in Northwestern Pennsylvania. The importance of caves to this iron production can not be fully determined. In the Geology of Clarion County (1880) H. M. Chance states, "There is hardly a mile along its [buhstone ore] four hundred and fifty miles of outcrop in this county, but shows some trace of old diggings or prospect holes." Where caves were present they provided ready-made low-cost access tunnels to the iron ore deposits. Further cave exploration in Clarion County is likely to reveal other caves in which mining took place.

The iron furnaces used in northwestern Pennsylvania were all of the same basic design. This design had been in general use in this country since the early 1700's with little change in the succeeding century. The typical furnace was a stone structure similar in shape to a truncated pyramid with a square base, tapering walls, and a flat top. The walls enclosed a similarly tapering chamber with a vent at the top called a bosh. Triangular openings at the base of the furnace walls allowed a bellows to pump air into the interior bosh of the furnace. The bellows were usually powered by a water wheel. Inside the bosh alternating layers of charcoal or coke, iron ore, and limestone were stacked. The charcoal or coke was then set afire and the bellows used to force air into the bosh to melt the iron ore. The limestone served as a flux. The melted iron was collected in a crucible in the bottom of the bosh and fed into molds. These molds were called pigs, hence the name pig iron. The hot gases produced in the process escaped through the vent at the top of the bosh.

Of the iron furnaces that once stood at Sarah Furnace and Catfish little remains. Of Sarah Furnace a circular depression with raised edges is all that remains. Of Catfish Furnace nothing at all remains. At nearby Brady's Bend the ruins of an iron furnace from the Great Western Iron Works that was in operation during this same time period can still be seen.

Most of the furnaces in Clarion County and the surrounding areas were originally constructed as cold blast furnaces which used charcoal. Some of these were later converted to use coke. According to Chance the production of the iron
A five foot high stone wall in the Porcupine Room near the entrance of Sarah Furnace Cave.

Two views of the mid-nineteenth century furnace of the Great Western Iron Works near Brady's Bend.
furnaces in northwestern Pennsylvania in 1856 averaged thirty and a half tons per week with some individual furnaces producing as much as fifty tons per week.

Very little written material is available on Sarah and Catfish furnaces, and no contemporary written material mentions mining ore from caves. Most of the information found on the furnaces is from A. J. Davis's History of Clarion County (1887), which is summarized below.

**SARAH AND CATFISH FURNACES**

Davis states that Sarah Furnace was completed in 1860 by S. F. Plummer after his retirement from Prospect Furnace. The name Sarah came from the wife of the proprietor. S. F. Plummer also owned an interest in Jefferson and Clinton furnaces prior to his construction of Sarah Furnace. This furnace was originally charcoal fired, but was later converted to coke. It continued to operate as such after many other charcoal furnaces were abandoned. The coke used at Sarah Furnace was mined in the hills overlooking Brady's Bend and coked in open hives at the coal pit's mouth. The furnace passed into the hands of Jennings, Morey, and Company and was abandoned in 1867.

Catfish Furnace was a steam cold blast furnace built in 1846 by Joseph Over, Reichart, and Labaugh along the Allegheny River at the mouth of Catfish Creek. The business failed in 1851 and the property was purchased by Alexander Miller. He leased the property to J. L. Miller and the furnace was reopened under the management of J. H. Kahl. In thirty-three weeks of 1856 the furnace produced 925 1/2 tons of pig iron from carbonate and red ores taken from within a mile to the north. It should be emphasized that all five of the caves mentioned as containing signs of mining are within a mile of Catfish Furnace, and all but Sarah Furnace are roughly north of Catfish Furnace.

Additional research into the history of Sarah Furnace and iron ore mining in it and other caves in the area is proceeding very slowly. All of the readily available materials have been checked. Additional source materials for historical information are still being sought. Other nearby caves are being examined for signs of mining activities, and people are looking for new caves. Plans to date some of the mine posts using dendrochronology are underway. The research efforts are continuing and any new significant findings will be reported in a later issue of this journal.

**BIBLIOGRAPHY**


IOWA'S GREAT CAVE ON THE VOLGA

James Hedges

Iowa has a scantly speleological literature, and it has virtually no graphic tales of nineteenth century exploration, such as those written by Hovey and others about caves in the eastern states. Recently, however, while reading an article on pioneer Iowa historians, my eye caught a reference, an aside, alluding to a report on a cave supposedly explored in 1835.

I say "supposedly," because the narrative in question, although from the pen of a nominal historian, is so artfully written that one suspects perjury. The author, while hunting, is playfully tricked by a demented young white man. He later enters an Indian camp and goes with the occupants to a large but obscure cave, where he finds the trickster to be preaching a sermon by torchlight. A warrior enters, waving a fresh scalp, and all leave. There is a great battle outside (in which the demented young man takes part); then, after some years, the author happens to be in the seat of government when the demented man is brought to court in chains. That night, while sitting on the river bank, he overheard another outdoorsman musing about the demented man when, suddenly, the demented man appeared in a canoe, and escaped by moonlight.

The locale of the tale is geologically suitable for a large cave, although none is now known in the area. The author obviously had seen some caves (or had read about them), because his cave description is realistic. There just might be, or may have been, such a cave on the Volga River near the mouth of Mink Creek. Or, maybe this is just literature. In either event, it is a thoroughly exciting tale by one of Iowa's best authors, Eliphalet Price. The complete article, "The Maniac of the Border," appeared in The Annals of Iowa (VIII, pp. 19-28) in 1870. The cave description, from page twenty-one, is reprinted below:

As the party approached the base of the hill, each suddenly disappeared through an aperture that opened beneath the entangled folds of a vinous arbor, that crept with a luxuriant appearance over a low undergrowth. Following the footsteps of our guide, we found that we were winding along a narrow but lofty subterranean passage, that led into the interior of the hill, and as we approached the brink of a broad, deep chasm, the party halted for a moment, and then one by one began to descend into the cavern by a natural flight of projecting rock steps, that wound with a spiral descent along the circular sides of the dark yawning pit, from whose depths arose the gurgling murmur of a distant waterfall, accompanied by a white column of spray, that sparkled and glittered as it reflected the glare of our torches. Our course at length diverging from the fearful chasm, we again found ourselves winding along a passage that widened occasion­ally into ample halls, then narrowing into a passage that admitted with difficulty a single person, until it opened into a stupendous amphitheater, from the center of which an ignited bundle of pine knots sent up a lofty column of blazing fire, that lit up the rock-bound sides of the cavern, giving to them the appearance of some 40 feet in height, while a deep blue arch of solid rock canopied the whole, festooned with innumerable columns of glittering spar, whose tapering extremities emitted a star-like sparkle, giving to the blue arched canopy a midnight ethereal aspect.
PRE-CIVIL WAR SALTPETER MINING IN OLD SALTPETER CAVE  
(MEBANE SALTPETER CAVE, PULASKI COUNTY, VIRGINIA)  

William R. Halliday, M. D.

A short but spacious saltpeter cave just outside the city limits of Dublin in Pulaski County, Virginia, is a well-known local landmark. In county and regional writings it is consistently termed Old Saltpeter Cave; in speleological writings it is consistently termed Mebane Saltpeter Cave, a name apparently given to it in 1951 by the Betty Sabatinos party which first reported it. Dr. Mebane was the owner at the time. Under that name it has appeared in several subsequent speleological references. Saltpeter mining in the cave was well documented by Hauer, who concluded that "most likely" the mining was during the Civil War.¹

Information brought to my attention in 1985 by Mrs. Harry J. Bugel of Nash­ville, however, indicates that saltpeter was mined here during the Revolutionary War. Most of this data is genealogical in nature. The story of the cave is an integral part of the tradition of the Trolinger family of the Piedmont country of North Carolina and its descendents.

A 1900 history of Alamance County, North Carolina, recounts how Cornwallis destroyed the grain in the mill of pioneer Jacob Henry Trolinger, upon which that worth expressed himself to the general incautiously enough that he ended up tied to a tree with a horse’s bridle bit in his mouth and abandoned until his wife came home hours later. "This treatment enraged Jacob Henry so much that he sent his oldest son, John, to a cave in Virginia (This cave he had found and explored when on his way to this State from Pennsylvania, in 1745) to make powder. . . . John entered and settled on 640 acres of land in Montgomery (now Pulaski) county, Va., including the cave." This information was provided by William Holt Trollinger, youngest son of John Trolinger, nephew of the John Trolinger who is referred to above.²

Collaborative information appears in another genealogical work:

Henry Trollinger, Sr. (also Trolinger, Drollinger, etc.) . . . located at a large spring east of the present town of Dublin, where the ruins of his cabin could be seen as late as 1890. There was a large saltpetre cave on the land and he was enticed to make gunpow­der during the Revolutionary War, beginning about 1776. His son Henry Jr. worked with him . . . until 1779 when he was drafted for a 3 month tour of duty. . . . He was required to find his own gun, horse, and ammunition . . . [and] was discharged about the last week of October. Henry Trollinger, Jr. resumed his business of manufacturing gunpowder for the army until the following spring, when he was again called to serve in April 1780 . . . the tour lasting a little more than three months. . . . Trollinger had been home only a few days from this tour when he was called into service again . . . then returned home, being discharged sometime in November. Trollinger again resumed the business of making gunpowder, but at this time sustained considerable loss because he had been paid in Continental money which turned out to be of little or no value.

The above is from pension records, and clearly was accepted as correct in the

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post Revolutionary War period. 3

Pictures of the cave appear in Colonial Days in the Land that Became Pulaski County, with a caption that states that the cave "was again worked during the Civil War—with Lieutenant James T. Trolinger CSA in charge of operations." Chapter twenty-four of this publication gives a slightly different version of the eighteenth century operations, stating that "Henry Jacob Trolinger" as well as his son Henry, settled, mined saltpeter and made powder:

Trolinger's product was much in demand during the Revolution. He prospered and acquired much land in the area. After the Revolution Henry Jacob Trolinger's older son Henry moved back to North Carolina. The old powder maker taught the craft to John Trolinger, his youngest son. John, following in his father's footsteps, continued to manufacture gunpowder at the old saltpeter cave for some years after the Revolution. 4

FOOTNOTES


4 Colonial Days in the Land that Became Pulaski County [author, publisher, and date undermined]. Photocopy of pages 134-37 in family records of Mrs. Harry J. Bugel, Nashville, Tennessee.

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Dr. Bill Halliday reports that the cave four miles south of Greaterville, Arizona, about which an 1881 newspaper article was reprinted in Vol. 18, Nos. 3-4 of this journal, is Onyx Cave.

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A cave has lately been discovered near Black Rock at the Southern extremity of Great Salt Lake, and about twenty-five miles from [Salt Lake City].

The entrance is about eleven feet wide, five feet high, and some seventy feet long. The walls are perpendicular and of solid rock. Passing through an aperture in the wall, you enter a grand hall, fifty feet long, thirty feet high, and six feet wide. You then descend and travel through a passage about two hundred and twenty feet long, four feet wide, and from fifteen to seventy feet in height.

A number of human skulls and other bones were found upon the floor of the cave, and some small bones on the ledges of the wall. The floor is soft and seems to consist of decomposed bones.

On the walls, near the entrance, are some hieroglyphics of spears and animals. The whole length of the cave is about 390 feet.

Chicago Tribune, July 4, 1863.
Quality control of the saltpeter-gunpowder product was one of the biggest problems associated with domestic gunpowder manufacture. Eleuthere Irenne Du Pont de Nemours realized this as early as 1800. In his native France, Du Pont was apprenticed under Antoine Lavoisier in the art of gunpowder manufacturing. Du Pont felt that French powder was greatly superior to that made elsewhere in the world, and he resolved to make American powder of equal character. Quality was insured by reprocessing incoming saltpeter, regardless of site of origin. He received his first government powder contract in 1801 from President Thomas Jefferson, who had suggested that Du Pont should build his powder factory near Washington City.¹

The Eleutherian Mills on Brandywine Creek, Wilmington, Delaware, were initiated on July 19, 1802. In the spring of 1804, Du Pont's first domestic powder was placed on public sale.

In 1802 F. Andre Michaux traveled through the western frontier recording botanical and geographical observations in his journal. His trip led him through Lexington, Kentucky, where for several weeks he frequently saw Dr. Samuel Brown. Michaux observed Brown's interest "in collecting fossils and other natural productions, which abound in this interesting country." I assume that Samuel Brown is probably the source to Michaux's references on saltpeter and gunpowder production in Kentucky and Tennessee. This is better established by reading the following statement by Michaux:

Independent to those manufactories which are established in Lexington, there are ... one or two powder-mills, the produce of which is consumed in the country or exported to Upper Carolina and Low Louisiana. The sulphur is obtained from Philadelphia and the saltpeter is manufactured in the country; the materials are extracted from the grottos, or caverns, that are found on the declivity of lofty hills in the most mountainous part of the state. The soil there is extremely rich in nitrous particles, which is evidently due to the chalky rock, at the expense of which all these excavations are formed, as well as for vegetable substances, which are casually thrust into their interior. This appears to demonstrate that the assimilation of animal matters is not absolutely necessary, even in the formation of artificial nitrous veins, to produce a higher degree of nitrification. Saltpetre of the first preparation is sold at about sixpence halfpenny per pound. Among the various samples I have seen, I never observed the least appearance of marine salt. The process that is used is as defective as their preparation of salt; I only speak relative to the extraction of the saltpetre, not having seen the powder-mills. I shall conclude by observing, that it is only in Kentucky and Tennessee that saltpetre is manufactured, and not in the Atlantic States.

In reading Michaux's Travels, it is clear he did not visit any saltpeter site or powder factory. Important observations by him included the defective methods of saltpeter extraction, his visual inspection of saltpeter rock samples, and the eastern Kentucky mountain saltpeter production centers.

¹ Reference or note missing.
Just under two years later, sometime around November 10, 1804, as Du Pont was making his business start in the east, Samuel Brown and Thomas Hart, Jr., of Lexington, Kentucky, went into the saltpeter-gunpowder business. It is evident from reading a letter of that date that Samuel Brown had earlier solicited the government for powder contracts. But I have not yet seen any evidence that any contracts were granted. None-the-less, their business was very prosperous and their product became renowned for its excellent quality. The Brown-Hart enterprise was brought to the attention of the Secretary of the Navy, Robert Smith, due to a great concern over the quality of powder aboard ships at sea. Accurate targeting of cannon was often not possible due to inconsistent powder burn. Other powder factories in the country were not as quality conscientious as was the Du Pont and Brown-Hart installations. If, as Michaux has stated that saltpeter production was restricted to Tennessee and Kentucky [This was not true—ed.], it would seem logical to select a natural scientist living in the territory where this kind of activity was taking place. Brown was then the only natural scientist living west of the Allegheny Mountains. Some of the reasons for Brown being chosen to investigate the saltpeter quality problem were his life long friendship with Thomas Jefferson (then president), his numerous publications on medical and natural history subjects, and his active membership in the American Philosophical Society. I have not been able to locate the Smith correspondence asking Brown to initiate an inquiry into the production of saltpeter on the new western frontier. I assume it was written sometime prior to November, 1805, and may even extend back to the time of Michaux's visit. After all, Brown was even then well versed in the poor quality of saltpeter manufacturing.  

By November 10, 1805, Brown had produced a "Memoir on Nitre and Gun Powder" and enclosed it with a letter to his friend, President Thomas Jefferson. Brown made two requests: to bring the copy to the attention of the Secretary of the Navy, and perhaps relay the Memoir to the attention of the American Philosophical Society in Philadelphia. Brown also made arrangements to give his paper before that society. I have not seen the correspondence to confirm this, but can only infer that some preparation was made by both parties. In the early part of January, 1806, Brown made his way, on horse back, along the Wilderness Road (State Road of 1798) to Washington City. He stopped momentarily at his Great Saltpetre Cave to collect additional information on the saltpeter resources from his caves and rockshelters. This probably consisted of the number of caves owned and operated for saltpeter production; their estimated production capabilities; number of rockshelters under production in the Cumberland Plateau region; and some notes on the amount of refined saltpeter from rockshelters and caves.  

Departing Saltpetre Cave, Brown continued his journey, arriving in Washington City sometime prior to January 19, 1806. Brown's reputation as a natural scientist through his publications, membership in the American Philosophical Society, and his saltpeter-gunpowder entrepreneurship had preceded him. Word spread of his presence in the city and reached E. I. Du Pont, who desired a meeting with Brown to secure saltpeter contracts. Apparently, a lot of saltpeter was still being purchased by Du Pont from European sources at a greater cost than the domestic product. Du Pont wanted to increase profits by decreasing expensive saltpeter shipments from Europe.  

During that day, gentlemen of worth or status would use an intermediary known to both parties to write a formal letter of introduction. Former Vice President Aaron Burr was known to both parties, and it was Burr who wrote the letter of introduction dated January 19, 1806. Du Pont delivered the letter to Brown on
the same date. The letter establishes once and for all that Brown was physically present in Washington, and logistically near enough to Philadelphia to deliver his famous saltpeter paper on February 7, 1806. At the present time, however, I have not seen any evidence of a saltpeter contract from Du Pont to the Brown-Hart enterprise.

Apparently, the Memoir sent to Secretary Smith by way of Jefferson did not have much impact on the mind of the President. But new information reported by Brown to the American Philosophical Society had a profound impact on Jefferson and Du Pont. Just five days later, February 12, 1806, Thomas Jefferson wrote to Pierre Samuel Du Pont, father of E. I. Part of the letter pertaining to saltpeter:

I am in hopes the Eleutherian mills go on well. It is lately ascertained that the supplies of saltpetre which the Western country can furnish are immensely beyond what had been expected. A single cave is known which could supply us for the whole term of a war. The caves are numerous. But a more important discovery has been made: that there are immense precipices of a soft sandy rock, which pulverised yields about 20 lb. of salt petre to the bushel, whereas the earth of the Caves yields 1 lb. to the bushel. Your son is setting out on a visit to that country to inform himself from his own view of the subject.

E. I. Du Pont never made this inland journey, although he planned it and several others during his lifetime. His growing business and debts prevented him from making this long anticipated quest. The cave mentioned above is Great Salt-petre Cave in Rockcastle County, Kentucky.

After returning to Lexington, Brown moved to New Orleans in April, 1806. The move was made partly for business (saltpeter and gunpowder contracts) and partly for personal (to be near his brother James) reasons. This is evident from reading Brown's extensive correspondence to his brother and his June 3, 1808, letter to Thomas Jefferson.

Later in Natchez, he became a gentleman farmer, got married, and raised a family. He gave up his medical practice, and only resumed it upon his return to Lexington years later.

By 1809, his Memoir had been published in the Transactions of the American Philosophical Society. Spelean historians from Hovey in 1896 to Faust in 1967, hail the Memoir as the first great treatise on the manufacturing of saltpeter and gunpowder in the United States. The scientific intelligencia at the time Brown published his paper were not very generous in assessing the worth of his research in their reviews of the 1809 Memoir. An anonymous reviewer for the Medical Repository in 1810 pans the Memoir, saying, "Already, on more occasions than one, have we mentioned the process of extracting salt petre from the limestone caverns—See our Hex. 1, Vol. VI. p. 364, and Hex. 2, Vol. III. p. 86; where an ample exhibition of the facts may been seen, as well as some speculations thereon." The Repository then reprinted a portion of the first section of the saltpeter Memoir. It is clear to me that the quantity of technical information in the Memoir is greatly superior to the two published articles in the Medical Repository. The rave and exhilaration expounded by Jefferson is missing from the review, but there may have been additional motives for the negative comments.

Years later, Samuel Brown resurfaces with another saltpeter related paper, actually a letter published in the American Journal of Science in 1818. This was
based upon a discussion between Brown and Benjamin Silliman, editor of the journal. The letter establishes Brown's continuing interest in the origin of saltpeter and his hope of coming out with a more definitive treatment on the subject. Brown moved back to Lexington, Kentucky, in 1819 and took a medical teaching position at Transylvania College and resumed his medical practice. At present, it is not known if he ever made good his saltpeter research desires.10

While I looked into the life and activities of Samuel Brown, there surfaced an indication of a national conspiracy. Samuel wrote his brother James of New Orleans on November 10, 1804. He mentioned his new venture into the saltpeter-gunpowder business, and solicited help in obtaining powder contracts. Then he says, "John Clay can sound the Spanish March!" I have in the past thought this quote was a gesture of exhilaration toward the prospects of his new found venture. Could it have meant something else?11

In September, 1805, Samuel Brown delivered a secret letter to Harman Blennerhassett. Blennerhassett was the chief financier in the Arron Burr conspiracy to invade Mexico and Florida, the remove the Louisiana Purchase and New York State from the Union. Blennerhassett along with Burr assembled arms, ammunition, powder, built boats, and outfitted a private army to carry out the plan. Burr was the advance firbrand and went on two western journeys to organize and recruit soldiers and generate the right political climate for the revolution to take place. Historians generally agree that Kentucky and Tennessee were pro-Burr.12

James and Samuel Brown were implemented in the Spanish Conspiracy by General James Wilkinson, but they were never brought to trial. Nevertheless, their public image became tarnished. Samuel Brown went into what seems to be a forced retirement in Natchez, Mississippi, and later, Huntsville, Alabama.

Burr and Blennerhassett were brought to trial in Richmond, Virginia, but were acquitted due to legal maneuvering and a lack of credible witnesses. After the trial there lay a whole arena of political corpses, among them Samuel Brown. His lifelong friendship with Jefferson was suspended several years. Only on June 3, 1808, did Brown write Jefferson in hope of exonerating his involvement with the conspiracy:

Some time ago I had written a letter of considerable length explanatory of my conduct during the disturbances which agitated this City in the Winter of 1806 & 7. But recollecting how disgusting such communications must have been to you I destroyed my letter & waited for the development of circumstances which I had no doubt would expose the guilty & do ample justice to injured innocence. The singular turn, however, given to the trial of Colo Burr at Richmond has left the public to lament, that the guilty were not punished—that the innocent were not exculpated--

Although General Wilkinson has, in a most malicious & wanton manner pretended to the grand jury at Richmond that he suspected Judge Hall Judge Mathews my brother & myself of a participation in the Conspiracy of Burr & although the substance of his affidavit has been published in most of the Gazettes of the Union none of use feel disposed to defend ourselves through the medium of the Press. As the General is our own accuser & as we have many reasons to believe that he will not long enjoy the public confidence, we would feel it degrading to attempt to convince him that what he calls his suspicions of our patriotism were unfounded. The desire, however, which I have always had of retaining your confidence & favorable opinion induces me to explain some circum-
stances mentioned by Wilkinson which might appear to you ambiguous—

Feeling the sting of public ridicule, Brown continues, "It is one of the evils attached to the inestimable blessings of liberty that any villain may injure through the Press the reputation of the most virtuous citizen—And it is not always in our power to remove the impressions which such calumnies may make on the public mind." Brown said he was in New Orleans for professional and private reasons. As earlier stated, these were to secure powder contracts and to be near his brother.13

Samuel Brown's business ventures in Kentucky probably collapsed by June, 1808. He was a ruined man. This is also the year that Charles Wilkins, also of Lexington, Kentucky, emerged into a full grown business undertaking of saltpeter and gunpowder production from Great Saltpetre and Mammoth caves.14

FOOTNOTES

7Du Pont . . . Autobiography.
8Padgett, pp. 100, 106-7.
11Ibid., p. 124.
13Padgett, pp. 106-10.
14George (1975).