

PRE-CIVIL WAR CAVE SURVEYS

by
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Europeans had been surveying caves since the 17th and 18th Centuries (Ellis, 1987, p. 52). Up until the late 18th Century, none of the caves in America are known to have been surveyed. Cave mapping was not considered a viable part of land ownership. The need or especially the desire to map a cave apparently never occurred to early cave explorers. The pioneers had more important things on their mind, the settlement and taming of an otherwise virgin country side.

Not all of the early collected cave surveys are profiled in this review. Only those cave maps which seem to set a precedent are included. Or, when a cave map acted as the impetus for further cave surveying. Spelean history research on the evolution of cave mapping has been restricted in part to Mammoth Cave (Call, 1896; Guinlan, 1964; Meloy, 1968 and 1973). What was lacking was to bring the Mammoth Cave maps into context with cave maps in the rest of North America.

Curiosity and the pursuit of scientific knowledge seems to have been the prime motivation of then Governor of Virginia and future President, Thomas Jefferson, in the exploration and mapping of Madison's Cave, Virginia. This earliest of cave surveys was made in 1782 and published in Jefferson's Notes on the State of Virginia (Anon., 1889, in Halliday, 1981). The map is highly generalized by today's cartographic standards and I would catalog it as a simple cave map. Madison's Cave map first appeared in America in 1787. The original manuscript for Notes, was written for the French government under the direction of Francois, the Marquis de Barbe-Marbois, Secretary of the French Legation in America (Schachner, 1957, p. 224). The map, like everything else in Notes came from Jefferson's pre-existing files and correspondences.

Jefferson's sketch map of Madison's Cave shows about 650 feet of passage and uses arrow symbols to indicate the direction of floor slope (Shaw, 1979, p. 65). Trevor R. Shaw said the use of slope arrows on this cave map was the first of its kind ever used anywhere. The arrows point in a down slope direction. The eye draught map is drawn at a scale of 1 inch equals 50 feet; and suggest a sketch and pace survey. The map shows multiple entrances and when a cave passage ends, the cave wall line are closed around that area. And if the passage continues beyond exploration, the wall lines remain open. This drafting device is still used today.

Since the early 1800s, there had been political talk of war with England, France and Spain. The infra-structure of the gunpowder factories grew from 1802 on ward and relied on imports of India saltpeter from Bombay and Calcutta; sulphur from Italy; and charcoal from domestic sources. It was within the 1805-1806 time frame that the domestic saltpeter industry renewed its self from the hay day of Revolutionary era America. As war cries bantered about in Congress and local newspapers called for action; some enterprising businessmen went into the production of

saltpeter from caves and rock shelters. When war finally erupted against England in 1812, the domestic saltpeter mines, powder factories, and private and government material contracts were well established. During these tumultuous times, a few caves were mapped by persons associated with the saltpeter industry. Mapping was done to show: the extent of the cave; location of economic mineral resources; distribution of engineering constructions; spatial relationship between adjoining caves; as an advertising tool to sell stock in a saltpeter company or to act as an illustration to scientific research.

The map of Great Saltpetre Cave, Kentucky, is a paramount achievement in cave cartography by the first American viticulturist, John James DuFour. DuFour was contracted by Samuel Brown, M.D. and Thomas Hart, Jr., of Lexington, Kentucky, to act as saltpeter maker and to conduct a physical survey of the cave and surrounding topography (DuFour, 1805a, P. 307; 1805b; N.D.). Two maps were produced, each a specialty in their own right. One of the maps is the first transit and chain survey of a cave in America (George, 1988, p. 33); and was completed by early April of 1805 (Brown, 1805). DuFour was a skilled land surveyor and his tools would have been a transit on a Jacobs staff and a four rod chain (sixty-six feet) of one hundred links. No information is available to suggest he used a tripod.

DuFour's map is a high quality pin and ink drafted survey showing cave walls, location of saltpeter vats (both rectangular and V-vats), water sources and place names. Place names commemorate prior owners and descriptive physical features in the cave. The map has a long north arrow affixed to a bar scale in poles. Use of the long north arrow is typical of European land surveys. The other map is a pencil sketch showing cave passages, surrounding geography and the industrial saltpeter refining complex outside the cave (DuFour, n.d.). The American Philosophical Society erroneously attributes this map to Samuel Brown. Comparison of hand writing clearly indicates DuFour as the cartographer. Both maps accompanied Brown's monograph on the manufacture of saltpeter published in 1809. The maps were never published. One of Jefferson's associates, E. I. du Pont made a hand drawn copy of the DuFour transit survey (du Pont, 1805).

In October 1805, a Transit and chain survey was made of Madison's and Amens (Weyer's, Weir's, or Grand Caverns) caves, Virginia, by J. Peck (Cornelius, 1818, p. 317; Halliday, 1981, p. 18). An engraver error list the cartographer as J. Peck. A manuscript copy (in color) is in possession of William R. Halliday, M.D., and an engraved copy of both caves appeared in the 1853 edition of Jefferson's Notes. The undated Halliday copy contains less text, variation in place names, number locations of place names different, more internal detail and no longitudinal cross sections. Halliday copy probably is an earlier rendering of the 1805 survey. Another Amen's-Madison caves map of a later annotated vintage served as the base map from which the 1853 engraving was made.

The map is significant because the two caves are: specially placed against one another, surface geography is indicated; a level survey with longitudinal cross section of both caves; bar scale in feet and a north arrow. Place names and cave symbols are

affixed and keyed by numbers to a table for Amen's Cave. The maps are simple in cartographic style and uses slope arrows as in Jefferson's map of Madison's Cave. These slope arrows point in an up gradient direction. The preferred trail and longitudinal section through each cave is indicated by a dotted line. Generally, the Pack map follows the style used by Jefferson on his early cave map.

It is curious to conjecture the purpose of the Pack map. Amen's Cave would not be open for tourist until 1808 (Green and Lotz, n.d.). Stair casings are indicated on this map and there is a note that says, "to visit all parts of this wonderful cavern will take up (in going & returning) a distance of 2000 Yards." And that suggest an earlier tourist cave. Even Jefferson (1767) says Madison's Cave is located near the intersection of two major wagon roads and is frequently visited. The cave was owned by Matthias Ament (Amen, Amon, Amend or Amendt) from 1788 to 1810 (Green and Lotz, n.d.). He then deeded the cave "to his daughter Mary and her husband, Henry V. Bingham." Madison's Cave would be mined for saltpeter during the War of 1812, under Bingham's ownership.

Since 1810, more than one hundred maps have been prepared for Mammoth Cave, Kentucky (Meloy, 1977, p. 42). The earliest maps were used to promote and manage the saltpeter factory while later generations maps were employed to illustrated travelogues.

The first Mammoth Cave maps were of a utilitarian nature. These were sketch (eye draught) maps, apparently drawn from memory and showed where the mineral resources (saltpeter, glauber salts and springs) and saltpeter hoppers were located. The first maps are believed to have been used as a prospectus to entice possible investors (Meloy, 1968, p. 49; Hill and DePaepe, 1979, p. 249). Without standardized cave map symbols, these early maps relied on written text next to or in the interior of the illustrated cave passages. The earliest map was made prior to March 11, 1811, and one was sent to Benjamin Rush, M.D. by his prior medical student, Frederick Ridgely, M.D. He announces the map to his friend as a curiosity "for your amusement." Dr. Rush, in keeping with the American Philosophical Societies precepts of applied technology; sent a partial copy of Ridgely's letter and hand colored map to the American Philosophical Society. He had hopes they would publish it in their Transactions.

Ridgely (1811) excuses the rough sketch quality of his Mammoth Cave map by saying there were several compass surveys initiated in the cave, and all failed because "in whatever position of the cave the compass may be placed, the needle directly points to the mouth or entrance - can this be owing a magnet about the entrance or not - no metallic substances or ores of any kind have been noticed in or about it." The American Philosophical Societies Review Committee rejected the Ridgely map for publication. Because the map made no mention of this magnetic anomaly, the compass was not field tested above the cave on the surface, nor did the map indicate the cartographer. There was the possibility that the purported cave length could be an exaggeration if not a hoax. The cartographer of the Ridgely (1811) and the du Font (1811) map copy is unknown. The hand writing is different on each map and is not the penmanship of

Ridgely nor Charles Wilkins (part owner of the cave). Additional hand written corrections on the du Pont map is in the same script as on the Ridgely map. At present, no hand writing examples for Fleming Gatewood (the other part owner and saltpeter maker) nor Archibald Miller (cave manager) or their brothers is known.

The Ridgely map would be engraved and published in Jefferson's Notes in 1833; and the manuscript copy was published by Hill and DePaepe (1979, p. 250). The powder maker, E. I. du Pont received another copy of the map in mid year of 1811. The map is essentially the same as the Ridgely map except there is more descriptive text. The du Pont manuscript copy was published by Burton Faust in 1967 (p. 231).

Daniel Drake, M.D., had in his possession a copy of another early Mammoth Cave map. This was a specialty map with the briefest of economic mineral notations. The map shows the saltpeter engineered constructions in the cave and a cartoon likeness of Fawn Hoof, the mummy from Short Cave. Cartographically, the map is still of simple draftsmanship showing four rectangular saltpeter hoppers at Both's Amphitheatre, hollow log pipe line and three pump towers in the cave. From the Ridgely (1811) and du Pont (1811) maps, a late 1811 date seem adequate. The map is believed to pre date the December 16, 1811 earthquake and post dates the discovery of Fawn Hoof (the mummy) in September 1811 (George, in press).

The first published map of Mammoth Cave was similar to one supplied by John Bogert a New York attorney to Samuel L. Mitchill, editor of the Medical Repository (Gratz, 1815, p. 393). The cave is still depicted in sketch map form with numbers (for physical features and place names) keyed to a reference identification table. Harold Meloy (1975, p. 26) has located three different copies of this map. Prior to the publication era of the Mammoth Cave maps, only Jefferson's map of Madison's Cave had been published during the intervening 28 years.

After Nahum Ward's October 1815 visit to Mammoth Cave (Meloy, 1979, p. 29); he published a description and map of the cave. Mammoth Cave became the cave of caves on both sides of the Atlantic. Ward's map is the prototype of the fantasy cave maps. He was given a compass by Archibald Miller to aid in his underground survey. He only used the compass to survey trends of room length (Call, 1896, p. 49-50). The map was reprinted numerous times and often touted by the cave guides as an exaggeration if not a fabrication of length and passage sizes (Blane, 1824, p. 276-277). The map contains: a north arrow; passages which presently don't exist; and other passages cross under the Green River in the wrong direction of the actual location of the river. He use a dotted line between cave passage walls to indicate a cave passage crossing under another passage. The map sets the stage for future Mammoth Cave maps where secrecy of the true extent of the cave was needed and where fantasy was used to illustrate complex cave systems of long extent.

In August 1817, Elias Cornelius (1818) and the Reverend Huson produced a quadrant and chain survey of the Natural Bridge, Virginia. A physical description, survey notes and map were published a year later in Benjamin Silliman's American Journal of Science. This is the first accurate survey of a big room or

passage; and the first map to employ dashed line to signify the entrance drip line. Ceiling heights were triangulated and wall trends were fixed by surveying along their flank. Survey stations, drip line distances, channel of Cedar Creek and north arrow were affixed on the map. One had to refer to a table for azimuth and distance readings between stations.

A sketch map of one of the Plymouth Caves, Vermont, appeared in the Vermont Journal, probably in July or August 1818 (reprinted in Anon. 1832). This is a somewhat amorphous multi room map with room numbers keyed to a published physical description. Nahum Ward had used the same technique in several map editions of Mammoth Cave.

Sometime prior to 1820, the Russell Cave north of Lexington, Kentucky, was "accurately surveyed for three quarters of a mile" (Anon. 1820, p. 163). No information has been discovered as to who or why the cave was surveyed. It is not a known saltpeter site.

The Surveyor General of Canada, Colonel Joseph Bouchette sketch mapped a cave near Kildare, Quebec, Canada. The cave appeared in a book of his Official Tour of 1824 (Gibb, 1861). The father of Canadian speleology, George D. Gibb, christens this cave as Bouchette's Cavern. The sketch map has a north arrow and no bar scale. Distances, passage widths and physical passage descriptions are written out adjacent to the cave passage.

Robert L. Cooke in 1833 explored Weyers (Amens, Grand Caverns), Virginia (Green and Lotz, n.d.). On subsequent trips he made a very accurate survey of the cave. The map was published in 1835 (Douglas, 1964, p. 111); and contains an abundant amount of cave wall detail. A dashed line (as in the 1805 Peck survey) traversed along the main tourist trail. And that line is latter keyed to a longitudinal cross section placed at the lower edge of the map. The cross section indicates ceiling height along each passage reach. The map contains a north arrow, bar scale in feet and I think the numbers are keyed to a text description (I have not seen the two Cooke guidebooks). Vignette scenes of The Ball Room, and the Shell Room appear to the right of the map and help to artistically balance the drafting weight of the plan view.

The first transit and chain survey of Mammoth Cave was made by Edmund F. Lee, a civil engineer from Cincinnati, Ohio. He spent the winter of 1834-1835 undertaking this survey (Meloy, 1969a, p. 26). George S. Gatewood served as guide and chain man during the four month survey (Meloy, 1969b, p. 57-58). Eight miles of a purported twenty mile cave was actually surveyed. The 1835 Lee map was a high order transit survey with level control on the vertical distribution of all cave passages. The map was color printed, bar scale in feet, no north arrow and there was one vignette of the cave in the upper left hand corner of the map, showing the view from inside the entrance looking out. The exact reasons for why the survey was conducted is still unknown. The Weyer's Cave map may have been the prototype model to the Mammoth Cave map. The cartographic design of the Cooke and Lee surveys are similar as well as time frame of preparation. Both produced guidebooks to their respective caves. Call (1896, p. 51-52) said the Lee map would serve as a base map for the cartography conducted by Stephen Bishop (1845) and Horace C.

Hovey (1882). But, Hovey (1899, p. 19708) disclaims Call's statement on his having used the Lee cartography as a base map from which to work.

Despite Hovey's criticism of the Lee map; it is still a masterpiece in cartographic art. There are at least 24 longitudinal cross sections with place names of major passages and features indicated. The plan cartography shows an abundant amount of cave wall detail, breakdown piles and line squiggles for features in the ceiling. He adopts the use of a place name opposite the feature location in the cave. Light weight lines were employed to indicate cross under passages; squares for saltpeter hoppers; and the L shape of Fleming Gatewood's house and path to the cave is shown on the plan view. No map with this amount of passage detail would be produced in America until a decade after the Civil War. It ranks as one of the truly great cave maps along side Jefferson's map of Harrison's Cave or DuFour's map of Great Saltpetre Cave. Future cave cartographers failed to appreciate the detail quality inherent with the Lee map. They did not take the lead by copying from example the technical style presented at this early date. Most every over cave map is a jumble of seemingly confused cave passages placed with out regard to style or balance in the design of their finished cartography.

With the crossing of the Bottomless Pit in Mammoth Cave (October 1838), the Lee map and guidebook became obsolete (Metcalf, 1975, p. 28). A tourist compass and pace survey was made of the Main Cave, across the Bottomless Pit, down to River Hall and points beyond (Anon. n.d.). Comparison of similar vintage place names from Mammoth Cave maps and guidebooks is enough to narrow the time frame of preparation for this early survey to the tourist season of 1838 or 1839 (George, research in progress). Prior to the 20th Century, these are the only manuscript survey notes known for the cave.

Bear Cave in southwestern Pennsylvania is a delightful maze cave of exceptional complexity. The cave was surveyed on September 2, 1839, in the company of 18 dignitaries of the Philosophical Committee of the Westmoreland County Lyceum (MacLeod, 1839). The entrance elevation and the deepest position in the cave was fixed using a barometer. First use of a barometer for establishing elevations in a cave. Frederick J. Cope was in charge of the instrument survey and cartography. The map shows about 2250 feet of maze cave. No mention is made as to the kind of surveying instrument nor if they used a chain. Semicircular skewing of passage orientation of the Cope map when compared to the Schmidt et al. (1960) map suggest in part a compass and pace survey. It is almost as if the northern half of the cave is just a sketch map, because the orientation of the passages it in no way consistent with contemporary surveys. The map does not have a north arrow nor bar scale. There is a N.E. type script along the free face of the hill side containing the four entrances. This is the only way the map can be orientated.

Stephen Bishop (1845) the legendary guide and explorer of Mammoth Cave produced one of the best maps of the cave. It is a fantasy map of the mind, because it looks like a bowl full of spaghetti with twenty five miles of sketched in passage. It is a simple map with no internal detail except shading for stream

passages or deep pits. Using the Lee (1835) map as a base map, numerous new passages and place names were added in pencil by Bishop from memory. John Croghan (the cave's owner) inked in over Bishop's sketch for the lithographers (Thomas, et al., 1970, p. 336). The map is an excellent guide to little traveled portions in Mammoth Cave and became the standard map for the next forty years.

Lewis C. Beck surveyed two caves in New York State in 1842. Knox Cave is another amorphous looking bifurcating cave with no indicated entrance, interior detail, north arrow or scale. Distances for passage length appeared in the center of each segment. His map of Balls (Sage) Cave is nothing more than a longitudinal passage cross section with waterfalls, lakes, large rooms and a row boat with three men for scale. Distances are written out along each reach of the cave. Entrances to Knox and Balls caves is by way of deep pits and as such makes these caves the first pit caves surveyed in America. Descriptions of formations and room attributes is written out in the interior of the cave cross section. William M. Mather (1943) redrafted the Beck (1842) map for his geological report. The background rocks encompassing the cross section cave passage is less obstructive to the eye than that of the Beck map. Another survey of Ball's Cave was made in 1853 by W. H. Knoepfel (I have not seen this map).

Horace C. Hovey (1882, p. 127) gives a chronicle on the mapping in Wyandotte Cave, Indiana (I have only seen the Hovey map). The first map was made by H. C. Grosvenor in 1852. This was a compass and tape map. In 1853, D. L. Talbot, M.D. produced another map of the cave. These maps were combined and annotated by Horace C. Hovey in 1854, and was published in 1860 by David Dale Owen's in his Geological Reconnaissance of Indiana. Ash (1985, p. 57) though Hovey made extensive use of the Grosvenor map for a base line to sketch map newly discovered passages in the New Cave. Use of cave symbols is still used sparingly. For the big breakout domes, Hovey uses a difference in shading to signify rock piles in the cave.

Within a week, the Reverend G. S. Bailey (1863), explored and sketch mapped three caves in Kentucky. Diamond Cave (Cavern) was mapped on January 17, 1860, Mammoth Cave the following day and Hundred Domes the day after and on January 23. These are sketch maps and show a departure from prior maps. Bailey uses new symbols that are number keyed to a table. Before this time, stair casing, saltpeter vats, breakdown and streams were generally the only detail on a cave map. Here he shows stalactites, stalagmites, rimstone dams, pools, pits, cascades and Tuberculosis Huts. Incorrect placement of major passages in Mammoth Cave suggest at least that map was drawn after his return from the cave.

CONCLUSION

Most of the pre-Civil War cave maps were of very simple detail. Although a very few were transit and chain surveys. The maps consisted of walls, occasional cave streams, stair casings,

saltpeter vats, place names and little interior detail. Longitudinal cave sections were used to indicate uneven topography and only Thomas Jefferson (1782) and J. Pack (1805) map of Madison's Cave used arrows to indicate a change in floor topography. The map of Mammoth Cave by Edmund F. Lee (1835) is of exceptional cartographic detail. It would have been a watershed map if only his predecessors had copied the style of preparation. We had to wait for John Collett's (1878) cartography of Wyandotte Cave for a map showing a rebirth in artistic realism. The cartographic quality toward a visual representation of interior detail never matched that of the Europeans at the same time period. The Europeans were producing cave maps of exceptional accuracy and detail, for example the 1822 Grotto de Han map, by Jean Kickx and Adolphe Quetelet (Bastin, 1987, p. 20). Even the Pen Park Hole in England, showed more passage detail in 1682 than any of the American cave maps (Shaw, 1979, Fig. 4).

Without readily available cave map models to copy from, all of the early maps are classified by their simplicity and non standardized use of cave symbols. The early cave mappers were not artist or skilled cave surveyors. They had little idea of perspective in placing a three dimensional cave object on flat paper. The use of longitudinal passage cross sections solved part of that problem. The over reliance of word script used to describe a cave passage or feature often appeared on these early map. Chinese art used a similar device on paintings and illustrations.

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REFERENCES

- Anonymous n.d. Fingals [Mammoth] Cave. Manuscript Collection, The Filson Club, Louisville, Kentucky.
- 1820 A Letter, Touching Russell's Cave, from a Tourist in Kentucky to his Friend in Philadelphia. Western Review, 3: 160-164.
- 1832 Plymouth Caves. The Green Mountain Repository [Burlington], 1: June 1832, p. 135-137. Reprinted in Jour. Spelean Hist., 19 (3): 76-77.
- 1889 The Grottoes of the Shenandoah. Consisting of Weyer and the Fountain Caves ... Augusta County, Virginia. Valley Virginia Press, Staunton, Va. Reprinted in Jour. Spelean Hist., 1 (2): 23-26.
- Ash, Donald W. 1987 Geomorphic Development in the Mitchell Plain and Adjacent Crawford Upland in Harrison and Crawford Counties, Indiana. Angelo I. George, editor, Guidebook to the Kentucky Speleofest, Meade County Fair Grounds, Kentucky, 42-59.
- Bailey, G. S. 1863 The Great Caverns of Kentucky. Church & Goodman, Chicago.
- Bastin, Bruno 1989 L'Aventure des Explorations. in Man et Ses Grottes. Didier Hatier.
- Beaupre', Michel and Daniel Caron 1986 De'couvrez le Que'bec Souterrain. Que'bec Science E'diteur, Presses de l'Universite' du Que'bec.
- Beck, Lewis C. 1842 Mineralogy of New York. White and Visscher, New York.
- Bishop, Stephen 1845 Map of the Explored Parts of the Mammoth Cave of Ky. in Alexander Bullitt, 1845 Rambles in the Mammoth Cave. Morton & Griswold, Louisville, Ky.
- Blane, William Newnham 1824 An Excursion Through the United States and Canada During the Years 1822-23. Baldwin Gradock & Co.
- Brown, Samuel 1805 Unpublished letter to John Vaughan, dated April 9, 1805. Manuscript Collection, American Philosophical Society.
- 1809 A Description of a Cave on Crooked Creek, with Remarks and Observations on Nitre and Gunpowder. Trans. Am. Philo. Soc., 6: 235-247.
- Call, R. Ellsworth 1896 The Evolution of the Map of Mammoth Cave, Kentucky. Proc. Ind. Acad. Sci., p. 46-53.
- Collett, John 1878 Map of Wyandotte Cave, in Crawford County, Indiana. Ind. Geol. Sur., 8th, 9th & 10th Annual Rpts. of 1879.
- Cooke, Robert L. 1835 A Ground Plan and Section of Weyer's

- Cave, Augusta Co. Va. Bloomfield, N.J. Map collection of Gordon L. Smith.
- Cornelius, Elias 1818 On the Geology, Mineralogy, Scenery, and Curiosities of Parts of Virginia, Tennessee, and of the Alabama and Mississippi Territories, etc., with Miscellaneous Remarks, etc. in a Letter to the Editor. Am. Jour. Sci., 1: 317-331.
- Douglas, Henry H. 1964 Caves of Virginia. Virginia Cave Survey, Falls Church, VR.
- Drake, Daniel n.d. Map of a Salt Petre Cave in Green River Kentucky. Draper Manuscripts, 2080, Manuscript Collections, State Historical Society of Wisconsin, Madison, Wisconsin.
- DuFour, John James 1805a Day Book of Jean Jacques DuFour of Sales of Nentreux, Balliwick of Vevey, on his Travels. in Perret DuFour 1925 The Swiss Settlement of Switzerland County, Indiana. Indiana Historical Commission, Indianapolis.
- 1805b A Survey of the Great Salt Petre Cave on Crooked Creek in Madison County, Ky. Unpublished, Manuscript Collection, American Philosophical Society, Philadelphia, Pennsylvania.
- n.d. Unpublished map of the nitre caves of Kentucky. Manuscript Collection, American Philosophical Society, Philadelphia, Pennsylvania. Formerly attributed to Samuel Brown.
- du Roi, E. I. 1805 Map of Great Salt Petre Cave. Manuscript Collection, Hagley Museum and Library, Wilmington, Delaware.
- 1811 Eye Draught Map of Mammoth Cave. Manuscript Collection, Hagley Museum and Library, Wilmington, Delaware.
- Ellis, Brian 1987 Cave Surveying in Britain - An Historical Review. Trans. British Cave Res. Assoc. 14 (2): 52-55.
- Faust, Burton 1967 The History of Saltpetre Mining in Mammoth Cave, Kentucky. The Filson Club Hist. Quarterly, 41 (3): 227-262.
- George, Angelo I. 1988 abs. Saltpeter Activity of John James DuFour. The NSS Bull., 50 (1): 33.
- In press V-Vats and Rectangular Hoppers in Mammoth Cave. Cave Research Foundation Annual Report, 1988.
- Gibb, George D. 1861 On Canadian Caverns. The Geologist, London.
- Gratz, Hyman 1815 Green River, or Mammoth Cave, Henderson County, Kentucky. Medical Repository, 17: 391-393.
- Green, John and John Lotz n.d. The Story of Cave Hill. Upper Valley Regional Park Authority.
- Halliday, William R. 1968 Two Centuries of History at the Grottoes of the Shenandoah: Grand Caverns and its Neighbors. Jour. Spelean Hist., 1 (2).
- 1981 America's Second Cave Map. Jour. Spelean Hist., 15 (2): 18.
- Hill, Carol A.; and Duane DePaese 1979 Saltpeter Mining in Kentucky Caves. Reg. Ky. Hist. Soc., 77 (4): 247-262.
- Hovey, Horace C. 1882 Celebrate American Caverns. Robert Clarke & Co., Cincinnati.
- 1899 Mapping the Mammoth Cave. Scientific American Supplement, No. 1229: 19707-19708.
- Jefferson, Thomas 1789 Notes on the State of Virginia. John

- Stockdale, London. Reprinted 1984 in Merrill D. Peterson, ed., Thomas Jefferson, The Library of America, p. 123-325.
- 1853 Notes on the State of Virginia. J. W. Randolph, Richmond, Virginia.
- Lee, Edmund F. 1835 Notes on the Mammoth Cave. James and Gazlay, Cincinnati.
- Macleod, W. Norman 1839 Exploration of the Lyceum Cave. The Pennsylvanian Arque, and Farmers' and Mechanics' Advocate, n.s. 8 (19): 1, October 4, 1839.
- Mather, William M. 1843 Geology of New York. Casrol and Cook, New York.
- Meloy, Harold 1968 Early Maps of Mammoth Cave. Jour. Spelean Hist., 1 (3): 49-57.
- 1969a Lee's Notes on the Mammoth Cave. Jour. Spelean Hist., 2 (2): 26.
- 1969b The Gatewoods at Mammoth Cave. Jour. Spelean Hist., 2 (3): 51-62.
- 1975 Historic Maps of Mammoth Cave. Jour. Spelean Hist., 8 (3 & 4): 26-31.
- 1977 abs. Historic Maps of Mammoth Cave. Jour. Spelean Hist., 10 (3 & 4): 42.
- 1979 Outline of Mammoth Cave History. Jour. Spelean Hist., 13 (1 & 2): 26-33.
- Park, J. 1805 Plan of Madison & Ocala Caverns. in Thomas Jefferson 1853 Notes on the State of Virginia. J. W. Randolph, Richmond, Virginia.
- Quinlan, James F., Jr. 1964 The History and Evolution of the Map of Mammoth Cave. Type written, 5 p., Mammoth Cave National Park Headquarters.
- Ridgely, Frederick 1811 Unpublished letter to Dr. Benjamin Rush, dated March 11, 1811. Manuscript Collection, Historical Society of Pennsylvania. Extract in Manuscript Collection, American Philosophical Society, Philadelphia, Pennsylvania.
- Schachner, Nathan 1957 Thomas Jefferson. A Biography. Thomas Yoseloff, New York, 4th Printing.
- Schmidt, V.; A. Ellisher and J. Dunn 1960 Bear Cave, Westmoreland County, in William B. White, Caves of Western Pennsylvania. Penn. Geol. Sur., General Geol. Rpt. 67.
- Shaw, Trevor R. 1979 History of Cave Science. 2 vols., Crymych.
- Thomas, Samuel W.; Eugene H. Conner and Harold Meloy 1970 A History of Mammoth Cave, Emphasizing Tourist Development and Medical Experimentation Under Dr. John Croghan. Register, Ky. Hist. Soc., 68 (4): 319-340.