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ROTHROCK'S CATHEDRAL, WYANDOT CAVE.

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Angelo I. George, *Editor*

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THE JOURNAL

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FRONT COVER

Engraving of Rothrock's Cathedral, Wyandotte Cave, Indiana. A. I. George collection.

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The Peter M. Hauer Spelean History Award is established to provide annually a certificate and cash award to be given to an individual or group of individuals engaged in an outstanding spelean history research project.

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THE LOST HOVEY DESCRIPTION OF WYANDOTTE CAVE

by

Angelo I. George

For more than two decades spelean historians have searched for Horace Carter Hovey's 1854 description of Wyandotte Cave. The original article was published in the *Indianapolis Journal* and reprinted in the *New York Tribune.* This was Hovey's first published cave description followed by a hiatus of 25 years until his next cave description appeared in the *American Journal of Science.*

There are enough published extracts in James Parish Stelle 1864 guidebook, *The Wyandotte Cave*, to target the authorship of the 1856 reprint in the *Living Age* to Hovey.

Reprinted from *The New York Tribune* in *Living Age*, **14** (664): 796-798, September 27, 1856. Collected by Gordon L. Smith, Floyds Knobs, Indiana.

THE WYANDOT CAVE OF INDIANA.

by

[Horace C. Hovey]

Southern Indiana is a land of subterranean palaces. Numerous caverns, varying in length from a few yards to many miles, are found in the counties of Harrison, Crawford, Orange, Lawrence and Washington. Some of these have been explored, but many still remain, with their mysteries unrevealed, sacred to silence and darkness.

The most remarkable one yet discovered is called the "Wyandot Cave." This has, in respect to beauty and size, but one superior in the world, the Mammoth Cave of Kentucky.

The appellation of "Wyandot" is given in honor of the tribe of Indians bearing the same name. I doubt if the Wyandots ever beheld the cave which is called after them. Their home lay further north. However this may be, it is certain that some tribe of Indians made this, in days of yore, their place of abode or retreat. There are spots far within the cavern where, evidently, large fires have been kindled, at some unknown time. Poles, cut from the white oak tree and the pawpaw, are found lying in piles here and there. Footprints, also, on the yielding yet enduring clay, are pointed out, which, from their peculiar shape and succession, are thought to mark the ancient visits of the Red Men. A few Indian implements of war, such as arrow-heads and spear-heads, have also been occasionally found.

The entrance to the cave is situated on the farm of Mr. Henry P. Rothrock, in Crawford County, five miles north-east from Leavenworth, a small town on the Ohio River. It is half a mile distant from Great Blue River (formerly called Wyandot River), and about 120 feet above its level. The mouth is reached after ascending a lofty hill by a steep winding path. The surrounding scenery is very picturesque, reminding one of some of the wild regions of New England.

The geological formation in which Wyandot Cave occurs is the mountain limestone, famous everywhere for its cavernous structure. It is in this formation also that we find the Mammoth Cave of Kentucky, Weir's Cave of Virginia, the Grotto of Adelsberg in Styria and the Grotto of Antiparos in Greece.

The party in whose company the writer visited the Wyandot Cave, in the month of September, consisted of three ladies and four gentlemen. Provided with candles and fireworks, we passed the outer door about 1 o'clock P.M. A light breeze blew out of the cave, but not sufficiently strong to extinguish our candles. On a very warm day, it is said, this breeze is increased almost to a gale, while in the Winter the wind blows into instead of out from the cave.

The contrast between the warm air of the upper world and the cold air of the subterranean affected us at first very strongly. But our systems soon accommodated themselves to the change. The uniform temperature of the cave is 53° Fahrenheit - 6° colder than Mammoth Cave. The atmosphere is remarkably pure and exhilarating. Our lights burned clearly and steadily everywhere. Carbonic acid and other noxious gases were entirely absent, even from the lowest points. This great purity of atmosphere is partly to be accounted for, I think, by the presence of extensive beds of nitre. The nitrogen, which is consumed in the formation of nitrate of lime, must have its proportion of free oxygen disengaged - thus charging the air with a larger supply of this exhilarating principle. It is said that nothing ever decays here. We were shown, indeed, the remains of an opossum which had been here ever since the cave was discovered, and perhaps a hundred years before.

A part of the cave has been known ever since 1820. This is called the "old" cave. The "new" cave was discovered in 1851. Of the former I shall say but little; to the latter I devoted most attention.

Much of the limestone, especially in the old cave, is highly magnesian. From this has been deposited vast quantities of the sulphate of magnesia (Epsom salt). Dr. Adams of Corydon, who was the former owner of the cave, once drove a thriving business here, in the manufacture of this salt and saltpetre. Lumps of the sulfate of magnesia are sometimes found, varying from one to ten pounds. The earth yields from four to twenty

pounds to the bushel, and the salt is of the best quality. The old cave has many fine halls and passages; but the most remarkable thing is "The Pillar of the Constitution." This is a splendid stalactitic column, fifteen feet in diameter, and twenty-five feet high. It is regularly reeded from top to bottom, and resembles a vast petrified fountain. This beautiful and stately pillar stands in the centre of the "Circle of the Union," as if to support its immense vaulted roof.

The extreme length of the old cave is three miles, and it extends generally in a northward direction. It is not much visited now. Most persons are impatient to behold the greater wonders and richer beauties which lie beyond the second door. Yet, were those still unknown, the scenes of the old cave would amply reward a visit.

There are two modes of entrance to the new cave; one is by the second door, three-fourths of a mile from the main entrance; the other is through an entrance known as "Rothrock's Straits," half a mile beyond. Passing through the second door, we entered "Bat's Lodge" - a low, smoke-stained apartment, where, in Winter, the bats assemble in vast numbers. Climbing "The Rugged Mount," we reached "Coon's Council Chamber," just beyond which the cave branches into two grand avenues - one leading southward three miles, and terminating in "Hovey's Point," the other northward four miles, and closing with "Butler's Point." Thus the entire length of the cave, from Point to Point, is precisely seven miles. But, including the various avenues, the discovered portion amounts to twenty miles. These distances, and all the others I shall mention, are from actual measurement.

Leaving the southern branch, we proceeded in a north-east direction, over "Hill [of] Difficulty," to the most sublime apartment in all this Temple of Silence, viz., "The Grand Dome and Monument Mountain." This dome has hardly its superior for size and beauty in the world. Standing on the summit of the mountain, which is 175 feet high, we looked upward; but the top was veiled in black darkness; we cast our glance around us, and the same unillumined night lay beyond the dim light of our lamps. It was only after we had ignited our fire-works that we could see, far above us, the bending arch of this majestic temple rising 245 feet from the base of the mountain; while around us extended a circular wall 1,000 feet in circumference. Within this rotunda the ancient Pantheon might be placed, or Saint Paul's of London find ample room. The dome is closed at the top by a smooth, elliptical slab beautifully fringed by broad, left-like, curling stalactites, bearing a close resemblance to the ornamental foliage of the acanthus. The summit of the mountain is a gigantic stalagmite 120 feet in circumference, rising in three points, respectively six, five, and three feet high. These, when viewed from the mountain's base, resemble three persons clad in pure white. Hence the name, "Monument Mountain."

At the further end of the Grand Dome is a most delicious spring. Here we left our basket of provisions, designing to take our evening repast beside these pure waters as we should return from our rambles.

It is often repeated that is but a step from the sublime to the ridiculous. Thus it was here but a step from the "Dome" to the "Auger-Hole." This last is a narrow, cylindrical passage, but twenty inches in diameter. Woe to the corpulent man who enters therein! Many a visitor has been compelled to make this the end of his journey. Kind Nature, however, had been merciful to the members of our party; and we all passed safely through, the difficulties of the way merely furnishing us food for merriment. We presently entered the "White Cloud Room" - a beautiful hall, the ceiling of which bears a fanciful resemblance to massive, snowy clouds. "The Bishop's Rostrum" lies a little beyond this, and is in the shape of a pulpit - being formed of a stalagmite of pure white gypsum. The "Cerulean Vault" is a high, arched room, the walls of which appear tinged with a delicate blue.

Passing many fine halls and avenues, christened with sounding names adapted to the tastes of all classes, we reached the "Crawfish Spring" - so named because in it are found very peculiar, white, *eyeless* crawfish. We were so fortunate as to secure some of its curious inhabitants, which we took with us for further examination.

Directly above this spring lay the entrance to the Wabash avenue. This extends further north than any other avenue. Three of us were ambitious to see the end of the cave. So, climbing with difficulty to the entrance, we passed for nearly a mile in a stooping posture. Beyond this the roof was much higher, and in a quarter of a mile the cave ends abruptly in a high and wide room called "Butler's Point." We probably stood where no mortal had stood before. We were discoverers. The floor of this room is composed of a very fine and solid clay. Here we obtained some beautiful acicular crystals of gypsum, and some of the sulphate of magnesia, fine as the softest hair; also we found some brilliant rosettes of curved crystals of gypsum, called by Dr. Locke of Cincinnati "Oulophilites," or curled-leaf stone.

Joining the rest of our party at the Crawfish Spring, we retraced our way, varying it by an occasional excursion into some winding avenue, or by passing around some cave-encircled island. Our path was diversified by rugged hills, rocky passes, dry beds of defunct streams, and by smooth plains covered thick with nitrous earth. Strangers not unfrequently lose their way amid these varied and novel passages. A curious anecdote is told about a man who was lost in the cave for just twenty hours. His light had expired; still he thought he would wind up his watch once every twenty-four hours. This he did five times during his wanderings in the dark, lengthening out his twenty hours into five days! Thus darkness, solitude, and terror lend

leaden wings to Time.

Re-threading the "Auger Hole," we reached the beautiful spring and Grand Dome. Here we dispatched our evening meal, seated on broad slabs of stone. Our exercise had given us keen appetite, and we feasted as heartily as though we were above ground instead of 400 feet below the surface.

It was about 7 1-2 o'clock when we emerged from the cave. The sun had just passed behind the western hills, and the stars were in the quiet skies. It seemed as though the Grecian fable were true, and we had actually been visiting another, a subterranean, world. The warm outer air, which at noon we had left with such reluctance, now seemed hot and suffocating. We as well as the face of Nature, appeared to have undergone a change.

Early in the morning of the following day we were again at the cave's mouth, prepared for further exploration. Having on the previous day seen most of the interesting points of the northern branch, we resolved to-day to explore the mysteries of that which led toward the south.

The first apartment we entered was "The Dining Room;" similar to and adjoining this was the "Drawing Room." These were plain, unornamented halls, of a large size, regular in shape, and having ceilings as flat and smooth as though finished by a plasterer. Beyond these the cave again divides and the two branches, having pursued separate courses for about a mile, unite again - thus encircling what is called "The Continent." Here we took the western branch, - designing to visit the eastern as we returned.

Soon we entered "The Wyandots' Grand Council-Room" - sufficiently ample, one would almost believe, to hold the whole tribe. This we illuminated with Roman candles. It is about 150 feet high and 250 in diameter. Many beautiful stalactites and stalagmites are here found. Ascending the rough and toilsome "Hill of Science," we passed within a sublime amphitheatre called the "Hall of Representatives." This approaches the size of the Grand Dome which excited our admiration so strongly yesterday. Passing the "Alligator" and "Hippopotamus" rocks so called from a fancied likeness to those creatures, we presented ourselves before "The Throne." This beautiful and singular *lusus naturae* is formed of stalactites, which shoot over in graceful curves, uniting their delicate, leafy points to form a splendid canopy, and stalagmites, which, rising from below in more solid masses, constitutes the body of the throne. The base is encircled with an ornate fringe of drooping leaves, while the sides are adorned with lilies and white roses. Victoria herself could desire no richer throne. The approach is rendered very slippery by the water which falls from the "Cascades" near by; yet we all gratified ourselves by a seat in the chair of royalty. We found it would hold two very comfortably.

About a mile beyond this is the "Diamond Avenue," where the eye is dazzled by a profusion of lustrous crystals, which shine upon the walls and lie scattered on the floor. These assume many curious shaped, to account for which has greatly troubled mineralogist. Some resemble gorgeous flowers of every kind; others look like rich clusters of grapes half-hidden among the graceful leaves. Beyond this room of wonderful forms we came to "The Flint Pit," where you see, lying far below, shinning black masses of hornstone. Near this is "The Sieve," through which, in rainy seasons, the water pours in great abundance.

Going a little farther, we came to "Hovey's Point" - the southern termination of the cave. In reaching this place, we must have passed under the Great Blue River, and approached very near to the Ohio itself. It has been suggested that this cave may continue, by some unknown passage, in a southern direction, until it connects with the extensive Mammoth Cave of Kentucky. To one who has travelled for many miles under ground, the idea does not seem unworthy of consideration. We soon acquire the feeling, having been checked at so many points, and yet having pursued our way for miles beyond, that there is no point at which we can safely say, "Lo! the end!"

On our way back, we passed to the east of the Continent, paying a flying visit to the Fairy Grotto, Neptune's Retreat, and Hermit's Cell. Then we entered the Sepulchre, where the great roof of rock hung in massive folds from a height of 30 or 40 feet to within a few inches of the floor. "Purgatory" lay beyond the Sepulchre. Here we were compelled to go through a long passage not more than two or three feet high. But we were amply repaid for all our toil when we entered the "Pillared Palace." This is a large hall, but only about fifteen feet high. It is, however, one of the most beautiful sights on which I ever feasted my vision. Here the stalactites of pure white stone lengthen their arms until they clasp the snowy stalagmites rising from below - thus forming solid but graceful pillars, which seem to yield support to the ponderous roof above. These pillars were ornamented with festoons of leaves and clusters of purple grapes.

We had now seen the most elegant halls, beautiful avenues, and stupendous domes of this immense subterranean palace, where Night holds her uninterrupted court. Yet, as we passed forth from the cool, exhilarating air of the cave and its pleasant and novel scenes, we could not repress a feeling of sorrow that we must forsake, perhaps forever, so much that is beautiful and sublime.

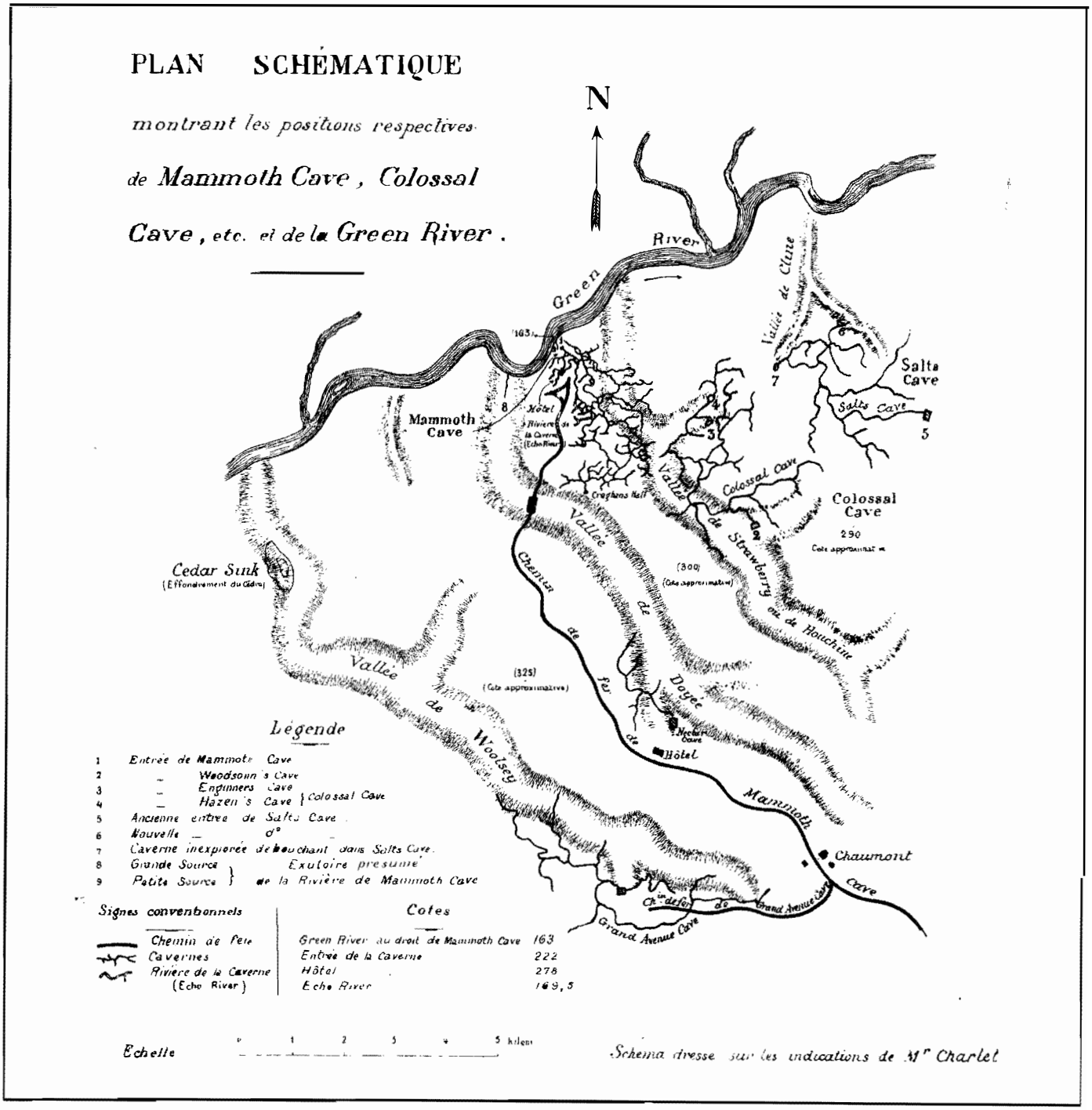
THE ALLIGATOR, WYANDOT CAVE.

Le COUPPEY de la FOREST AND THE MAPS OF MAMMOTH CAVE AND WYANDOTTE CAVE

by

Angelo I. George

The French speleologist Max Le Couppey de la Forest visited the United States in 1903. He was a contemporary of Édouard Alfred Martel and a frequent contributor to the cave journal *Spelunca*. During his stay, he visited Wyandotte Cave (September 1-2), Mammoth Cave (September 3-5), and the Manitou Caverns consisting of Wind Cave and Grand Cavern in Colorado (September 25). His cave descriptions were published in the November 1904 issue of *Spelunca*. The article contains an extensive description of Mammoth



Cave and its satellite caves. Followed by short descriptions of Wyandotte Cave and Manitou Caverns.

Le Couppey de la Forest presents a unique cave map of Mammoth Cave and Wyandotte Cave. Each has a north arrow and a bar scale. This is not the first map published of Mammoth Cave with a bar scale. The maps are in French.

The Mammoth Cave map is taken from the unpublished L. F. Charlet map. Because of small map scale, no passage detail could be shown. This map displays the geographic setting, cultural features, location of cave entrances and passages. The following caves are indicated: Mammoth Cave, Colossal Cave, Salts Cave, Nectar Cave (sic., Proctor Cave), and Grand Avenue Cave (Longs Cave).

Wyandotte Cave map displays an extensive amount of detail; and is redrafted from the John Collett map of 1878. Two caves are shown: Wyandotte and Little Wyandotte. Le Couppey de la Forest realized the cave length promoted by Wyandotte guides was an exaggeration. After seeing the cave, he compensated for distance hyperbole by using a proportion of 3.2/1.2. This lowered the cave length from 38 kilometers (23.61 miles) to 14.25 kilometers (8.85 miles). The 1966-1967 plane table/Brunton tripod survey conducted by Richard L. Powell of the Indiana Geological Survey and the Bloomington Indiana Grotto, produced only 5.2 miles of cave (Powell, 1970, p. 70). Le Couppey de la Forest comes within a few miles of the true distance from a map whose passage lengths were estimated by the cave guides. His bar scale is probably calibrated for passages he physically inspected in the cave. This is the first Wyandotte Cave map published with a bar scale. And would stand as such for 64 years until Richard L. Powell published his map of the cave.

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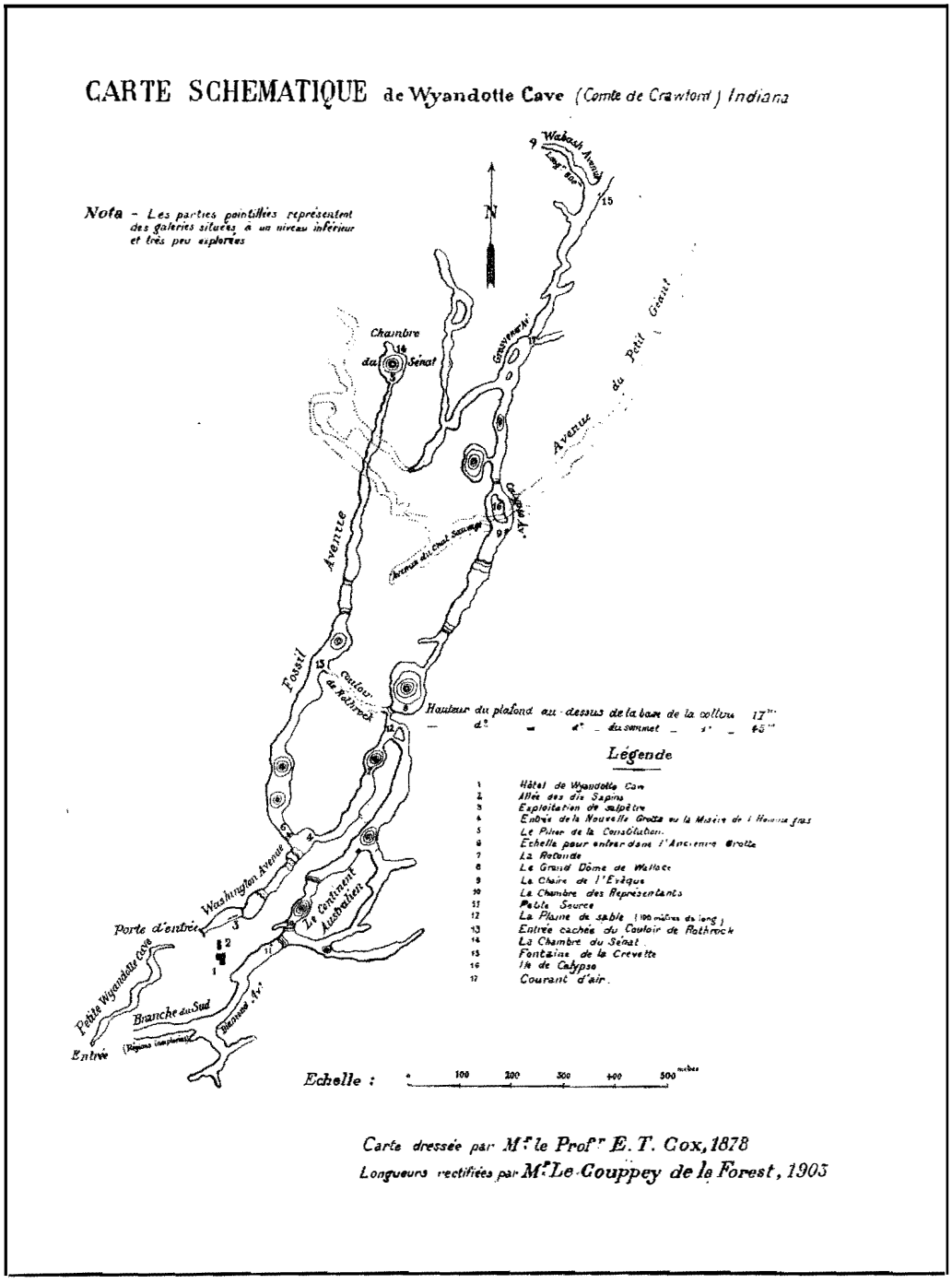

CHARLES J. ROTHROCK AND THE 1941 NEW DISCOVERY IN WYANDOTTE CAVE

by

John M. Benton

NSS 10689 and ASHA member

INTRODUCTION

January 1991 marks the 50th anniversary of the start of excavation of the Wyandotte New Discovery of 1941; it was completed and opened for tours in May of the same year. The Wyandotte Cave Company desired a connection to form a trail loop to save retracing steps. This was accomplished with the successful finding of the New Discovery, plus the added features of fantastic helictites and a beautiful room, the "Crater Room" were en route.

According to Charles J. Rothrock, their initial surveying methods were crude, but generally proved to be accurate within a few feet. The National Speleological Society was in its infancy and had not yet gained stature in the midwest. The Wyandotte Cave Company and the first explorers, to their tribute, got a qualified surveyor to pinpoint the final connection. The trio of Charles J. Rothrock, J. Robert Louden and Marion Sibert appear to have been hard core cavers for their time. Rothrock was 61 years old and although he did not do the hardest pushing, he negotiated long crawls and climbs in virgin or near virgin cave. Louden and Sibert pushed to their limits, and even used explosives (dynamite) to continue the search for new cave.

Alice McGrain was the first women to explore the New Discovery. She was either the wife or daughter of geologist Preston McGrain who wrote an article on the helictites in the *Proceedings of the Indiana Academy of Science* in 1942 (as per the April 13, 1941 picture in the Sunday Louisville *Courier-Journal*).

Prehistoric Indians were known to have frequented parts of Wyandotte and the diary mentions some items of interest on possible Indian use. The Grass Passage is talked about, and it connects to Pillared Palace, the start of the New Discovery. Supposedly George Jackson and some of the Rothrocks uncovered and then re-buried a grass bed in the 1920's or 30's. It has never been found but burying in damp soil may have destroyed all of it over the last 70 years or so. Strange indentations in the soft mud of the Crater Room are discussed as possible Indian knee print marks. Also a few pieces of shell bark hickory were found in the Crater Room. These may have been deposited by wood rats. Charles J. Rothrock says coon tracks were noticed which may have been mistaken for wood rat tracks. Any way in or out of the Crater Room by prehistoric Indians by known passages today would have been difficult indeed if not impossible. Perhaps a continuation of the work done by archaeologists Patrick and Cheryl Munson may answer some of these questions.

The strange air flow moving through Avenue 3, noticed by the explorers, was finally solved in the late 1980's. In 1941 the trio of explorers believed this passage led to a possible new cave system connected to the New Discovery. Several exhausting trips were fielded into Avenue 3, but all ended at the strange looking Pit Room at the "end". Due to time restraints and energy required to explore this passage, it was not pushed. The author, while working at Wyandotte in the early 1970's, made at least two trips out Avenue 3, but stopped at the same place Louden and Sibert did. The mystery was solved on October 3, 1987, by Danny Dible, Ted Wilson, and Joe Oliphant while working in Easter Pit. Easter Pit is located to the north of the Wyandotte historic entrance. Their efforts and others yielded 2.5 miles of new cave and connected near the Pit Room at the "end" of Avenue 3. Wyandotte had its second entrance and a lot of new cave. What the explorers of 1941 had suspected was true. There was a major side passage paralleling the New Discovery!

RECORD OF EXPLORATION AND IMPROVEMENT OF NEW DISCOVERY IN WYANDOTTE CAVE 1941 WRITTEN BY CHARLES J. ROTHROCK

(transcribed from diary of Charles J. Rothrock, Curry-Rothrock Wyandotte Cave Collection, Indiana State Museum, Indianapolis, Indiana).

Data covering discovery and exploration in Wyandotte Cave, season 1941.

At a meeting of the Directors of Wyandotte Cave Company, F. M. Rothrock[1] Pres. F. Wallace[2] Rothrock-vice president, Chas. J. Rothrock[3] Sec. & Treas., an appropriation of 200 dollars was made to cover expenses in excavation at a point in Wyandotte Cave known as the Grass Passage, located at Pillared Palace and crossing at right angles in front of P. Palace.

F. M. Rothrock Pres. made arrangements with Robt. L. Louden[4] that he should have charge of this work. Jan. 15 - 1941 this work was started. Robt. L. Louden in charge with Marion Sibert[5] & Chas. J. Rothrock as helpers. Work was started on the East Branch of the

crossing, a trench being driven for a distance of approximately 400 feet. No current of air was noticed until Jan. 24. At this time the trench had been driven until a breakdown of the ceiling was encountered, apparently closing the passageway. While resting and smoking, Louden noticed smoke from our cigarettes whipping thru cracks and crevices in the break. The smoke drifted to the left of our line of advance. After an hours work a very small passageway was opened up, ranging to the left and diagonally downward to a clay floor. To the right a small low avenue about 8 inches high led onward. Sibert - who is slender - was able to slip thru this opening, he reported extended for about 25 feet - emerging into an avenue about 30 inches high and 25 feet wide. He reported a profusion of Helictite formations as far as his flashlight would penetrate. Returning to the point of his entry the small opening was enlarged so that the three of us were able to get thru. We penetrated to a distance of 800 to a 1000 feet but it being rather late in the afternoon we decided to call any further exploration off for the day.

Jan. 26 - 1941 - Monday morning. Continuing our explorations we advanced in the passageway, discovered Saturday, for a long distance - still on our hands and knees part of the time - sometimes prone - inching our way N Eastward slowly (and painfully) but making progress, and still seeing plenty of helictites, stalactites, stalagmites and pillars of purest onyx.

Distances traveled in caves, especially hand and knee & belly work are apt to be misjudged. Any distances given in this record are merely approximations and are subject to correction. However, we traveled a long distance, finally reaching a huge breakdown, apparently blocking any further advance. This breakdown was composed of huge blocks and slabs of limestone. We could shine our lights up thru cracks and crevices between the huge stones but could find no opening large enough to admit us. Here the character of the floor had changed from damp clay to dry crumbly dirt and we found some few insignificant encrustations of gypsum. Finally working our way to the left at the base of the breakdown, crawling over huge limestone blocks, crawling under them, we reached a point where our time was limited if we wanted to get back so we again called the trip off until another day. However. Sibert wanted to go ahead for a short distance, so Louden and I waited for him. After an absence of about 15 minutes he returned and reported that he had reached a room about 30 ft. wide by 70 ft. long and perhaps 15 ft. high. Instead of there being a rising mass of rocks he had encountered a crater like room with a small pool of water in the center of the sink. He reported a great quantity of beautiful formations but for lack of time made no extensive observations.

Jan. 29th Wednesday. Returning to the large breakdown - we again negotiated the difficult route around the break - finally all three arriving at the Crater Room. This room far surpasses anything heretofore discovered in Wyandotte Cave in the beauty and variety of its onyx formations. Helictites in unbelievable quantities, shapes, and sizes. The whole room being a mass of every conceivable onyx formation. Huge formations of onyx were lying over on one side of it, broken off by their own weight. Colors of these formations ranging from milk white to deep orange - all of them extremely translucent. Electric lights properly installed would make this a Fairy Land. Raccoon tracks were numerous in the soft clay. These might indicate that this room was comparatively near the surface except that the onyx is of the pure-hard-uncrystallized nature. Our observations in many caves that we know to be near the surface are that formations are softer and are crystallized. Raccoons have been known to penetrate to the deeper caves, as in Washington Avenue and near the Cut Off.

Coming down out of the "Crater Room" there were two passageways, one of them we think, leading around the Breakdown back to the point where we first encountered the Break. We think that with not too much work or danger we may be able to get thru here and make an easy approach to the "Crater Room", instead of trying the dangerous & torturous way we first entered this room. Leaving this vicinity we entered another new low avenue. Here is where Sibert picked up one piece of shell bark hickory on the 1-25th. We examined the floors closely for indications of Indian signs but found none. Some curious indentations in the soft floor that could have been knee marks but they were not clear enough for identification. The walls and ceiling were not smoked so if the Indians visited this part of the cave they did it unfrequently.

Continuing on this avenue which was so low that our backs and belly were touching, we emerged into a higher hallway about 4 1/2 feet high. Louden continued on ahead of Sibert and myself until we could not hear him. Returning to us he reported that the cave continued on ahead and that indications were that it was larger than any we had yet found in the New Discovery. A good current of air was blowing into our faces and Louden reported this air was still blowing as far as he had gone.

Keeping in mind that air currents move from the outside of caves inward on horizontal passageways and upwards on vertical ones during the cold season, we have a condition here that we do not now understand; as we enter the New Discovery in an Eastward direction approaching the Big Break the air is moving inward; when we get to the Big Break, the current of air is of course checked by this obstruction, but after working around the Break and entering the low avenue just described the air is meeting us as we go in; i.e. the air from the passageway of the New Discovery and the new avenue leading away from the "Crater Room".

Illustration on next page merely attempts to show air flow and give an idea of the general conditions.

(Next page has illustration)

This peculiarity of air current we think indicates another avenue as yet undiscovered.

We believe that conditions indicate an entirely new system of caverns connected with the older known branches of Wyandotte by the New Discovery.

Our last Discovery may lead (and we have reason for this belief) to much larger avenues than any we have encountered as yet.

Jan 31 - 1941 Bob and Marion continuedexploration of #2 branch today - Reported #2 Break down at about 1000 ft. from Crater Room. This #2 Break entirely closes the #2 Branch and seems to be larger than #1 Break. However they were able to see thru a crevice between blocks of large stone and had the impression that they could finally get thru into a room.

Returning to #1 Break they reached the top of this rockfall and noticed cigarette smoke rising at one point of the Dome they were in and upon examination discovered #3 avenue about 20 ft. above and apparently paralleling # [?] Avenue.

This avenue has an eroded ceiling and a soft dry dirt floor affording easy crawling. Direction of air current inward from #1 Break, supporting our supposition of yesterday that there was another passageway taking care of the air flowing in from #1 and #2 avenues toward #1 Break. Reached no obstruction on #3 at the end of the days exploration.

To be continued

Saturday Feb. 1 - 1941 Bob and Marion made a rough survey of #1 passage to a distance of 500 feet. They said that instead of the avenue running due East, as we supposed, it runs for the first 500 feet approximately NorthEast - the last 50 feet turning directly North. If the avenue continues in this direction it will be in the proximity of Monument Mountain at the #2 Break. That - however is guesswork and will be determined by our next work with compass and line. To be continued.

Feb 3 - 1941 Bob, Marion and Chas. J. Rothrock. Finished survey to #1 Breakdown today and find that the distance from Beginning of New Discovery to #1 Break is 700 feet. Crawled up thru #1 Break and partly explored #3 avenue which runs nearly due south for several hundred feet which is as far as we explored this branch today. No. 3 Branch is a low avenue with a soft dry dirt floor and a very strong current of air moving south. At the end of the days exploration of this branch, the current of air was extremely strong, nearly extinguishing our candles. The expanse of ceiling at this point was at least 200 feet wide or wider at a guess - ceiling was very low - approximately 14 to 16 inches. There seemed to be more than one branch ahead of us but one of them that we investigated was practically closed by stalactite formations. Our time, however was too short for further investigation as we wanted to take a look at #2 branch.

Returning to #1 Break we found an easier way around this Break than we had previously. On our other trips we had gone thru a very difficult passage on the left of the Break. Today we tried around this Break to the right. After considerable work we succeeded in getting thru and found it much easier. This break is not so large as we first thought - the Break extending from the South to the Northwest with most of it bulk apparently from its south wall northward.

This right hand passage around the Break brings you to the Crater Room - this passageway can probably be excavated so that visitors may be taken to the Crater Room easily.

Taking #2 Branch which is quite low - about 15 ft. to 2 ft. wide, dry soft dirt floor- leading off in a Northeast direction for about 150 ft. then 50-60 ft. at 55°. NW then about 100 ft. exactly NW. From this point on the avenue leads onward in about the same general direction until reaching #2 Breakdown. The direction is directly North. We found no way of getting thru #2 Break after trying for an hour. This Break seems to be larger than #1 and cannot be very far from Monument Mtn.

Feb. 4, 1941 Tuesday morning I did not work as Billy Rothrock[6] had come from Evansville to visit us, as he had been drafted and was going to Indpls. to enter his years training. He wanted to see our New Discovery before leaving - so I worked in Marions' place while he and Billy visited the Crater Room.

Bob and I had decided to complete our trench back to #1 Breakdown before doing any more exploring. Doing this would hasten the time when we could show the Helictite gardens and would also remove the hard task of crawling the 700 ft. in order to reach #1 Break, where new explorations must be started. To be cont.
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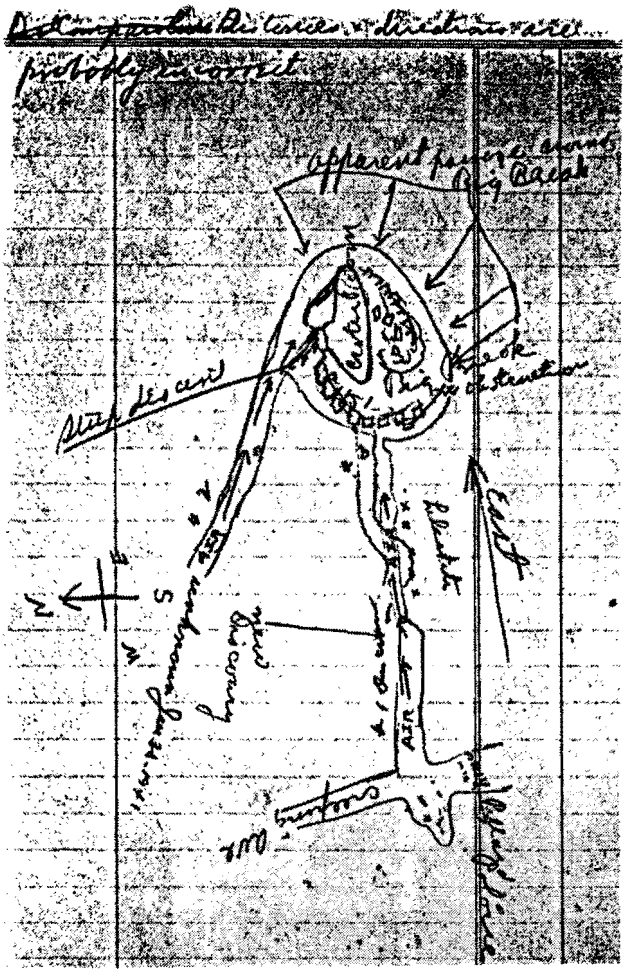
Feb. 5, 1941 Wednesday morning. Billy and I took some pictures (16 exposures) of the various helictite formations in #1 avenue. Photographing was very difficult as all our preparation as well as the actual exposures, had to be done lying in a prone position. However, we made the exposures and are hoping for good photos. Bob and Marion & Melvin McCutcheon[7] worked on the trench leading to #1 Discovery - To be cont.

Feb. 6 Today Bob decided to try using a small Jenny or burro hitched to a sled to haul the dirt out of the trench.[8] This mule belongs to Melvin McCutcheon. They have a long sled which they hitch the mule to. They had no trouble in getting this Burro in the cave. She walked along very calmly until she reached the cut-off. There she refused to climb several steps leading up and out of the cut-off. They coaxed and cudgeled her alternately several minutes. Bob decided to get a block and tackle hitched to he neck and come out of the cave and went home & got it. They tied a rope around her neck - the other end at the top of the stairway - and drew it taunt. The mule stood there with the strain on her neck - then came up one step and stopped - taking no interest in proceedings whatever. They tightened up on the rope the second time -



Courtesy Indiana State Museum

she came up the second step & stopped. They tightened up on the rope the third time - and the mule very calmly walked on up the rest of the steps and they had no further trouble with her. Don't know how successful this experiment with the Burro is going to be but it is worth trying as a lot more dirt can be moved this way - if it works - then by wheelbarrow. Anyhow it is entertaining and so far has not delayed the work.

Continued Feb 7, 1941 Continued trenching in the first part of New Discovery today. Bob, Marion, Melvin & his mule and myself. The mule is a time saver but we have a hard time getting her over the stairs in and out of the cave. Nellie (the mule) developed a sore shoulder today necessitating all of us laying off tomorrow -- Sat. Feb. 8. Were all tired and need the rest. Marion is working several hundred feet back in #1 Avenue - trenching out so that the more difficult crawls will be eliminated - hence saving travelling time in and out.

Riely[9] trying to get in touch with Paul Ellis[10] - who we all agree would be a good man on publicity of "New Find".

March 1, 1941 Mr. Jenkins[11] and wife drove 100 miles to see cave. Insulted & ordered off premises by Sam L. Riely.

March 4, 1941 Since Feb. 7 we have been excavating a trench thru #1 Avenue and have done very little exploring.

March 8, 1941 Marion and Bob, however made a trip into #3 finding a place too close to get thru, the floor being covered to a depth of 4-6 inches with a layer of very fine quality of clear "cave onyx" which they finally had to blow up with dynamite. Much to our surprise they found that this avenue instead of continuing in a Southerly direction switched around until the direction was NE as nearly as they could determine; i.e. that it was apparently was paralleling the other known branches of the cave. Very strong current of air still moving thru this #3 branch. So strong, in fact that the boys were very cold despite their strenuous exertions. Continued on this avenue until about 4 o'clock without coming to an end. Still a profusion of stalactites & helictites with a trace of gypsum here and there. Where it goes, how far, and whats ahead still a mystery.

March 5 Bob and Marion went in #2 Avenue today with intention of trying to find a way around thru or over #2 Break. Charlie went into Rothrock's Cathedral to see if he could hear Bob and Marion working at #2 Break. Went in at the bottom of the Mountain, at its base. Listened very closely for sound of voices or hammer. No sound reached thru. Came out, climbed the Mountain, went thru Auger Hole, crawled to the right in a small low opening - still no sound. Came back to Mountain skirting east side of it down near the base. Listened carefully - no sounds. Came over to south side around east edge of Mtn. until reaching a small ravine which runs diagonally across the Cathedral. Climbed down a crevice between the fallen rocks - sat down - listened; Suddenly - tap - tap tap! Could this be the sound of a hammer? Surely not! It must be the beating of my heart, which was pounding pretty heavily due to my climb over the Mountain. I'll be quite for a few minutes, until I get rested and my heart is quieter. Again a succession of sounds - tap - tap - tap - tap - tap - tap. Six beats. It can't be my heart - its too irregular. I'll tap on the wall and see if they can hear me. I picked up a small heavy stone and gave a succession of taps on the wall. After a pause I heard another succession of taps but could not be sure they were in reply to my signals. Finally decided to go back to where the men were working on #1 and get one of them to come and verify my suspicion.

Getting Frank Lynch[12] to accompany me - we returned to the Mountain and Frank being much slimmer than myself, he worked down thru this crevice to a lower level than I could get and both of us sat very quietly and listened. There it is! I whispered: rap - rap - rap - rap. There could be no question that we were hearing the boys working at #2 Break on #2 Avenue.

As we suspicioned - there is a connection at the Mtn. with #2 Avenue and #2 Break is the east side of the huge break known as Monument Mountain.

This break may be greater in extent than we think judging from the east wall of Rothrocks' Cathedral. The break (Monument Mt.) extends on the southwest side or left of the Mountain for a great distance thru what is known as Rothrock Secret Straits to Odd Fellows Hall in the Old Cave. One may make this trip from the Mtn: thru the Strait to Odd Fellows Hall by following a very rough crawlway over and under and between fallen blocks of limestone. This may be possible on the east side of the Mountain but to date no way has been found thru the Mtn. Break to #2 Avenue.

March 18, 1941 Tuesday. At the request of F. M. Rothrock, Robt. Louden and Marion Sibert continued exploration of #3 Avenue, starting on the trip at 8:30 AM and

returning at 5:10 PM. Traveling constantly during these hours thru crawlways, stoopways, and finally at the conclusion of the trip descending a pit into a large room from which several passageways led off. Only one of which they ran out, and which they found was blocked by stalagmititic formations. No final conclusion was reached and several side passageways were noticed. A profusion of formations of helictites - stalactites - stalagmites & pillar formations were found along most of the avenues. Time consumed in getting back to where Louden & Sibert ended this exploration is going to be a controlling factor in any further work of this kind. In order to go any further one must make up his mind to take along water, food, and a plentiful supply of candles & matches: and to spend an indefinite number of hours, more than 9 hours, the time spent by Louden & Sibert, who came out practically exhausted.

The trench from Pillared Palace to #1 Break is nearly completed, except for widening & deepening. The work from #1 Break to the Crater Room has barely been started and presents some rather difficult problems but no insurmountable ones.

The excavation in the Dry Branch at Foot of Hill of Difficulty is well underway and while the connection between #2 Avenue and the Dry Branch has not been definitely proven, we are, at least hopeful that a connection will be made, thus establishing a circuit trip which will be an ideal trip.

April 2, 1941. No "interesting" developments since last entry. Still trenching in #1 Avenue. Work progressing slowly but satisfactorily.

Dry Branch excavation rather disappointing to date. No connection established with #2 Avenue. Another survey of #1 & #2 Avenue; also a survey from Pillared Palace to & into Dry Branch by Marion Sibert & Chas. J. Rothrock. This survey shows that the Dry Branch excavation is paralleling #2 Avenue instead of getting close to it. However, we do not have a lot of confidence in our surveying abilities as none of us have had any previous surveying experience and the possibility is that while this survey may give us a general idea of the new 'caves' direction, it cannot be accurate enough to go by in driving a tunnel from one branch to another.

Louden reported tonight that they had driven the tunnel up against solid rock wall and would have to change direction if they continue with it. Two short lateral tunnels have been driven to the left of the main tunnel but in each case solid rock walls were reached.

April 3, 1941. Work on Dry Branch discontinued pending accurate survey. F. M. Rothrock recommended Frank Thornberry[13] - Thornberry unable to do work & recommenced Clarence Quebbeman[14] who started survey morning April 1941.

Survey completed in two weeks, shows definitely that #2 Break is the East side of Monument Mountain, as we had suspected. Our next step will be to complete the trench thru #2 Avenue to the Mountain & then drive a passageway thru the east side of this breakdown; thereby connecting Rothrocks Cathedral & the New Discovery. This will be a difficult & dangerous task.

April 11, 1941 All of Rielys left the hotel at 9:45 AM leaving Sam Rothrock[15] & Mac[16] in charge.

FOOT NOTES

1. Frank Miles Rothrock, President of Wyandotte Cave Company in 1941 and a principal owner.

2. Frank Wallace Rothrock, Vice President of Wyandotte Cave Company in 1941. He is Frank M. Rothrock's son.

3. Charles Julius Rothrock, was 61 years old in 1941. Died 1951. Son of Andrew Rothrock. Was Secretary-Treasurer of Wyandotte Cave Company in 1941. Cave manager from 1921 to 1926 and again from 1936 to 1939. Recorded a handwritten diary transcribed in previous pages. He was George F. Jackson's father-in-law. George's first wife was Lotys Rothrock who died of cancer, March 1954.

4. J. Robert (Bob) Louden was head guide in 1941 at age 47. Died in October 1972. He was associated with Wyandotte caves for 40 years; and was cave manager from 1956 to 1965.

5. Marion Sibert, guide and long time Wyandotte employee. Along with Louden and Charles J. Rothrock was a principal explorer in New Discovery 1941. Rumor has it he also found an extension off of Pillar of Constitution in Old Cave route and was said to have been gone for "hours".

6. William (Billy) G. Rothrock, son of Charles J. Rothrock, helped take first photos in New Discovery. Was brother-in-law to Wyandotte devotee George F. Jackson.

7. Melvin McCutcheon, helped on excavation of New Discovery. Owner of mule used in pulling rock and dirt on sled out of New Discovery.

8. Nellie, the mule. Copy of a *Courier-Journal*(?) clipping from May 1941 shows at least two mules were used. Surely, one of the world's few caving mules. Although, mules had been used in the commercial mining industry for years.

9. Samuel L. Riely, was cave manager in 1941.

10. Paul Ellis, mentioned in diary as one to get hold of for publicity of new find. He was responsible for the 1932 Ripley's Believe It Or Not feature on Wyandotte's underground Monument Mountain (Roger Gleitz, personal communication, n.d.).

11. Mr. Jenkins and wife, incident mentioned in diary about being ordered off premises. Not believed to have any connection with New Discovery work.

12. Frank Lynch, guide and helper; went with Charles J. Rothrock to Mountain Room and confirmed tapping from opposite side of connection Break.

13. Frank Thornberry (Thornbury), first choice to survey new find. Believed to be related to Rothrocks. Unable to do work, reason unknown.

14. Clarence Quebbeman, conducted survey in New Discovery, and located actual "connection" to Monument Mountain that was excavated. His map appears in George F. Jackson's 1953 book, *Wyandotte Cave*. A sketch map of this section with bar scale and north arrow appears in Preston McGrain's, Helictites in the New Discovery at Wyandotte Cave, Indiana; *Proc. Ind. Sci.*, (1942), 51: 201-206. Edward Haverstock, Toledo, Ohio, prepared a map of Avenue 3 in 1947.

15. Samuel Rothrock was helper, guide, and believed to have been cave manager for a short time, following Harrison Washington Rothrock's retirement. Fred W. Clemens, *Three Hundred Years Along the Rothrock Trail*, C. W. Hill Printing Co., Spokane, Washington, p. 240.

16. Howard McKinley "Mack" Beals, black cook at Wyandotte Lodge restaurant.

WYANDOTTE CAVE CHRONOLOGY OF HISTORIC EVENTS: A PRELIMINARY ASSESSMENT ©

by

Angelo I. George
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INTRODUCTION

Wyandotte Cave is one of the oldest commercial caves in North America. It is a stellar attraction and in olden days was often compared only to Mammoth Cave and Luray Caverns. Much has been written about the cave, yet little collective information is available on its historical beginnings, the people involved, or the results of their labor. What has been published is often fret with conflicting information that has fostered the development of traditions and myths. Yet during the commercial tenure of the Rothrock family (1851-1966), the stories show a relative consistency in subject matter, until the second managership of Samuel L. Riely (1939-1956). Some of these stories were manufactured to promote the cave as a tourist attraction. By the time the State of Indiana purchased the cave in late 1966, the accounts had become embellished to the point that they showed little association with earlier traditions or to actual events.

The goal of the Wyandotte chronology is to place historic events in context to the time period in which they occurred. The chronology is a guide map from which future research should be undertaken.

ACKNOWLEDGMENT

Mr. Roger Gleitz, Assistant Manager Wyandotte Cave, shared much of his personal knowledge on the history and management of the cave. He has long realized the need to develop a better understanding of the cave and its people for future generations to enjoy and benefit. To further this goal, he was instrumental in acquiring grants to study the history and myths of Wyandotte Cave of which this chronology is a natural out growth.

Many thanks are extended to Mr. Gordon L. Smith, owner of Marengo Cave, for permission to view and copy certain Wyandotte Cave books and articles. His help has saved countless hours in tracking down obscure references. William R. Halliday, M.D., provided many published articles by Horace C. Hovey. Mr. William Torode, librarian at the National Speleological Society Library, Huntsville, Alabama, provided a number of cave reference citations and opened their library to aid in this research. Mr. John M. Benton assisted in so many ways by providing direction to primary documentation to Wyandotte Cave, the Rothrocks, and contemporary cave explorers, especially George F. Jackson and Gordon Curry, M.D. Mr. Paul Ash, French Lick, Indiana, provided information on H. C. Grosvenor from the Donald W. Ash estate. Mrs. Catherine Summers, Corydon, Indiana, shared her collection on the genealogy of Benjamin Adams. Mrs. Emma K. Chanley, Leavenworth, Indiana, provided genealogical traditions of John M. Cummings and circumstances surrounding the discovery of the New Cave. Dr. Stuart S. Sprague, Mr. Marion O. Smith, Ms. Joan Marchand, and Mrs. Anna Frederick, for additional bibliographical information. The staff at the following libraries gave generously their time and assistance with this study: Indiana Room, New Albany Public Library, Indiana; Corydon Public Library, Indiana; Jeffersonville Township Library, Indiana; The Filson Club, Louisville, Kentucky; Louisville Free Public Library; University of Louisville libraries; Kentucky Historical Society, Frankfort, Kentucky; Indiana Historical Society, Indianapolis, Indiana; Ms. Laurence Hathaway, Reference Librarian, Indiana State Library, Indianapolis, Indiana; and Indiana State Museum, Indianapolis, Indiana. Ms. Diana Emerson George offered many suggestions for the improvement of this manuscript, and provided field and library support.

Indiana State Museum gave permission to quote from the Curry-Rothrock collection. Indiana Division, Indiana State Library gave permission to cite from their Rothrock manuscript collection.

Part of the research was supported by a matching grant from the Indiana Heritage Research Grants program and the Crawford County Historical and Genealogical Society, Inc.

This paper is dedicated to the memory of my friend and colleague, Dr. Donald W. Ash. He knew more about the early mapping of Wyandotte Cave and Horace Chipman Grosvenor than anyone else.

CHRONOLOGY

2200 B.C. to 800 A.D.: Archaic, Middle Woodland and Mississippian Indians utilized the cave of its natural resources, especially: chert, aragonite and epsomite (Munson and Munson, 1987, p. 10-11). No archaeological record of Wyandotte Indians ever using the cave.

October 10, 1782: Benjamin Adams born in Louisville, Kentucky.

September 8, 1792: Henry P. Rothrock born, Bucks County, Pennsylvania (Clemens, 1954, p. 229).

1798: Discovery of Wyandotte Cave. Date is contemporaneous with the discovery of Mammoth Cave and Great Saltpetre Cave in Kentucky. Unsupported contemporary documentation says F. I. Bentley discovered Wyandotte Cave (Riely, 1945, p. 12). McMurtrie (1819, p. 32) says the cave was well known at this early date.

May 7, 1800: U. S. Congress creates the Indiana Territory from the Northwest Territory.

1801: F. I. Bentley signature and one year date commemorate his visit to the cave. Signature date is questionable because the 01 could be a more probable 07. Style of lettering suggest Civil War era script. Signature of Francis Ignatius Bentley written on the back part of the Pillar of the Constitution (Roger Gleitz, personal communication, 17 August 1990).

1806: Territorial Governor of Indiana, William Henry Harrison visits the cave. Other visitors at the same time were Major Davis(?) Floyd and Major Warren. Harrison and Floyd signatures in the cave (Riely, 1945, p. 19). Tradition says Harrison wrote a description and published it. Other accounts refer to an entry he made in his diary. And Harrison made his visit in the summer of 1806 (Jackson, 1953, p. 11). No diary is known to exist nor are there written correspondence in Harrison's hand on his visit to the cave. At present, there are no primary documentation of Harrison's visit except his signature in the cave and secondary published documentation by Adams (1820) and McMurtrie (1819).

January 1, 1810: Fleming Gatewood of Louisville and Charles Wilkins of Lexington, Kentucky, purchase Mammoth Cave in Kentucky.

September 30, 1810: Levi Brashear of Nelson County, Kentucky, purchases Wyandotte Cave and Saltpetre Cave (Jeffersonville Land Office Register of Receipts and Land Entry Book, Receipt No. 00842). The Brashear family were salt brine producers in Kentucky. They have family ties with Charles Wilkins, co-owner of Mammoth Cave, Kentucky, and the William H. Harrison family.

December 16, 1811: The first of the New Madrid earthquakes strike the mid-west. This was followed by equally as strong or stronger earthquakes on January 23 and February 7, 1812. All of the saltpeter mines close in Kentucky. Geologic conditions are similar for southern Indiana, and I must presume those saltpeter sites then in operation must have also closed their doors.

1812-1815: War of 1812.

1812-1817: Tradition says Benjamin Adams, M.D. mined epsom salts and saltpeter from the cave.

1814: Unlocated published description of Wyandotte Cave (McMurtrie, 1819, p. 32).

November 4, 1814: Benjamin Adams marries Sarah Pottorff.

December 24, 1814: Treaty of Ghent, end of the War of 1812.

February 15, 1815: U. S. Senate ratified Treaty of Ghent. Saltpeter mines close or scale back to pre-war levels of production. Start of national economic recession.

December 27, 1815: Purchase of Wyandotte Cave property by Benjamin Adams. Prior to this date a lone hunter re-discovers Wyandotte Cave and its epsom salts (Anon. 1816). He takes specimens to Benjamin Adams, M.D., an apothecarius in Louisville, Kentucky. Adams offers $600.00 for two cart loads. Adams then visits cave, where he better realizes its true economic potential. He then goes to the U. S. land office in Jeffersonville and takes out a section of land (160 acres) for $320.00 at $2.00 per acre (Jeffersonville Land Office Register of Receipts and Land Entry Book, Receipt No. 06084). Saltpetre Cave is covered in the same land entry. Clearly, Adams did not own the cave during the War of 1812, and as a result could not have supplied saltpeter for gunpowder production during that time period.

February 14, 1816: First published record in *The Western Courier* of Adams' ownership. William E. Burrell, M.D. was probably a senior partner in the pharmaceutical exploitation of the cave. Burrell's association was short lived.

September 2, 1816: Adams and Burrell announce to the public the dissolution of their late firm.

August 19, 1816: William E. Burrell advertises to buy saltpeter for cash.

December 11, 1816: Formation of the State of Indiana.

February 27, 1818: Benjamin Adams' letter to a gentleman in Frankfort, Kentucky. Letter addressed to John Hay Farnham, President of the American Antiquarian Society. The letter is the result of Farnham's request for information on the cave. Letter reads as a prospectus to sell the cave. Adams' right to the U. S. Government land was about to expire because of failure to meet contract obligations of paying the remainder of the note owed to the Government; and it was for sale in Jeffersonville. He defaulted and lost the cave and adjoining property. The cave was then called the Epsom Salts Cave. Saltpetre Cave was also in this same parcel of land. The letter was reprinted in newspapers and journals numerous times until 1861. The description was almost as press popular as Nahum Ward's 1816 account of Mammoth Cave.

August 11, 1818: Prior to this date, W. B. Stilson describes the cave and publishes a short description. It is unclear if he actually went to the cave.

1818: Cave called Dr. Adam's Cave (Munsell, 1818).

1819(?): Henry McMurtrie, M.D., trip and published description of the cave. He establishes that Adams was the "present proprietor." And that suggest prior owners other than Adams. Cave called the Mammoth Cave of Indiana. It is not clear when McMurtrie made his visit to the cave. He moved to Louisville in 1816 (Conner, et al., 1969, p. 3).

1819-1820: Henry P. Rothrock, a German emigrant, moved from New York state. Over the ensuing years he purchased 4000 acres of land from the U. S. Govern-

ment Land Office in Jeffersonville for $1.25 per acre. This is $0.75 less than for then going second rate land. Cave slides into obscurity. Stelle (1864,p. 74) says the Rothrock's moved to the cave in 1818. They built a small cabin and mill on Blue River. The cabin's stone chimney was still standing in 1911 (Walsh, 1911, p. 1). The Rothrock family owned the cave to October 1966. Purchase of the cave by Rothrock is still under investigation, because it is not clear when they moved to the Blue River mill site nor when they purchased the property containing the cave.

1823: The General Assembly of the State of Indiana passes a new law requiring saltpeter and epsom salt caves be gated to keep live stock from eating waste products from the salt making process (Blatchley, 1916, p. 91; State of Indiana, 1831, p. 193). This is probably one of the first environmental laws enacted in the United States. Epsom salts is a diuretic, but "first run" saltpeter is not. The initial chemical conversion of calcium nitrate to potassium nitrate is very high in calcium hydroxide. Waste products (calcium hydroxide) from the processing of saltpeter is very dangerous and fatal to live stock if ingested. Calcium hydroxide in "first run" saltpeter causes massive internal bleeding (Brown, 1809). Secondary and tertiary processing is required to remove the remaining chemical impurity. Waste dumps of calcium hydroxide most likely would be found in the vicinity of the furnaces and ash hoppers. And these were usually near the cave entrance. All published references to the cave entrance gate cite the year as 1843. That date is just the published re-issuance of the State laws of Indiana.

June 1832: William B. Oaks visits the cave in the company of Henry P. Rothrock. At this time the cave was called The Great Cave. His description became very popular and was published many times.

August 9, 1833: Benjamin Adams dies of cholera during the epidemic in Louisville, Kentucky. He was buried in Cedar Hill Cemetery, Corydon, Indiana.

1843: Tradition recounts complaints raised by neighbors about live stock migrating to the un-gated cave entrance to lick the salts. Rothrock then fenced in his cave entrance to quiet complaints (Hovey, 1882, p. 126).

March 1, 1845-1848: Mexican-American War.

February 2, 1848: Treaty of Guadelupe Hidalgo.

pre 1850: On a winter Sunday, three brothers by the name of Kesner and another local boy by the name of Byerly explored the Old Cave. While there their candles went out and they waited for eighteen-hours to be rescued by George Sibert and "old man" Kesner (Rothrock, 1915).

1850: Tradition says Wyandotte Cave was opened to the public as a commercial cave.

late November 1850: Norman Jay Colman in company with Dr. E. Link, John Milton Cummings, O'-Bannon, Collingwood, and their guide discover the entrance to the New Cave (Anon., 1850; Colman, 1903, p. 2; Collett, 1879, p. 465; Chanley, 1990; and Emma Chanley, personal communication 23 June 1990). The identity of the cave guide is not known. I suspect it was Henry Andrew Rothrock. They discovered everything from Monument Mountain south to near Hovey Point. Cave called the Great Indiana Cave. Cave still more generally known as Adams Cave. Henry P. Rothrock considers it a hoax (Stelle, 1864, p. 75; Hovey, 1882, p. 126). Another visitor, C. Elliott inscribed his name on a large rock atop Monument Mountain in Rothrock's Cathedral (Gleitz, 1986, p. 107). It is not known if Elliott was in the initial party of early discovers.

late November - December 15, 1850: Auger Hole and north end of the cave discovered. Stelle (1864, p. 75) is in error when he says it was found in 1853. Collett (1879, p. 465) credits H. P. Rothrock as the discoverer in late 1850. Anonymous (1920, p. 15) and Pleasant (1926, p. 142) says Henry Andrew Rothrock (then about 11 years old) discovered the Auger Hole.

December 15-21, 1850: During this time frame, Henry P. Rothrock, S. Burnet, and others explore new section of the cave beyond the Auger Hole (Burnet, 1851, p. 1).

Late 1850: With the discovery of the Auger Hole, the Crawford County board of review raised Rothrock's land tax to $500.00 per year (Pleasant, 1926, p. 143).

1851?: Horace Chipman Grosvenor, a mining engineer from Cincinnati, Ohio, visits cave and makes first cave survey in Wyandotte Cave (Hovey, 1882, p. 147). Map and article published. All efforts by many spelean historians have failed to locate these items.

1851: Rothrock using his home on Blue River to care for infrequent cave visitors.

1851-1852: Ledger of cave visitor receipts in possession of Mrs. Jack Stephenson, Leavenworth, Indiana (Roger Gleitz, personal communication, August 1990).

August 28, 1852: First use of the name, *Wyandotte Cave* (note spelling) in the *Cincinnati Commercial* and republished on this date in the *New York Weekly Tribune*. Monument Mountain, Wallaces Dome, Concert Hall, Odd Fellows Lodge, Sulphur Spring, Auger Hole, Rothrock's Promenade (Morton's Marble Hall), Pluto's Chasm, Pillar of the Constitution are mentioned. No mention of the Counterfeiters Trench. A string and tape survey was conducted in portions of the cave. Thus establishing the long cave length as an over estimation. Cave was named by past Indiana Governor David Wallace for the antique name of Blue River (Hovey, 1911, p. 861). Wallace was also the father of the famous Indiana novelist, General Lew Wallace.

1853: D. L. Talbot, M.D., from Jeffersonville, Indiana, makes second map of the cave (Hovey, 1879, p. 2584; Owen, 1862, p. 149). The map was finished prior to July 16, 1853 (Anon. 1853, p. 3). David Dale Owen explores the cave (Owen, 1862, p. 157).

1854: Alleged and much quoted first use of the name Wyandotte Cave by R. T. Brown (1854, p. 310).

June 6, 1854: Story of the Counterfeiters' Trench and many place names (An Old Traveller, 1854). First really good description since Adams (1820) and McMurtrie (1819). Each major cave passage is given a arabic number.

September 1854: Horace C. Hovey, Butler(?) and scientific party visit the cave (Hovey, 1856; 1879, p.

2584; 1882, p. 125). Hovey annotates the Talbot map at the request of Rothrock. During the trip, they discover Butler Point and possibly Hovey Point. Rothrock's Straights is listed as a second negotiable entrance into the New Cave. Based on actual measurement, the cave is reported to be twenty miles long (Hovey, 1856, p. 797).

c. 1856: Discovery of Little Wyandotte Cave, then called Sibert's Cave (Jackson, 1953, p. 57). This is based on dates written on the wall in the cave.

July 31, 1857: Prior to this date, Andrew Jackson Rothrock was one of the guides.

late 1858: W. R. and J. G. McCollister enlarge passage leading from Easter Room and discovered the Unexplored Route (Blatchley, 1897, 151). Riely (1945, p. 12) says McAllister.

1858: Log cabin in use as a hotel down the hill from the cave (Hallock, 1858a). Clemens (1954, p. 49) says the year was 1860.

August 10, 1858: One of the first published reference that the cave was named for the Wyandot Indians (Hallock, 1858b). The Indians "were familiar with all its halls and passage. It is singular that they never revealed them to the first settlers." Cave reported to be 19 miles long.

1859: George I. Langsdale and Washington Rothrock finish exploration in Unexplored Route as far as Rothrock's Island (Blatchley, 1897, p. 151).

1859: George I. Langsdale surveys the Unexplored Route.

1860-1864: Civil War.

June 5, 1860: With continued success of cave discoveries, improvement for public visitation, the Crawford County board of review raised Rothrock's land tax to $5000.00 (Pleasant, 1926, p. 215). Rothrock appealed this tax increase, but the board saw fit to dismiss his petition.

1861: H. C. Grosvenor ambushed, killed and mutilated by Apache Indians in Arizona. He was at the time manager of the Santa Rita silver mines near Tubac, Arizona.

1861: Sibert's cave shown to the public (Anon. 1861, p. 7) The cave was found by Isaac P. Sibert in a sinkhole. He excavated the one entrance by digging and blasting rock from the small opening. Hovey (1882, p. 128) calls the cave, Little Wyandotte.

1862: Fourth map of Wyandotte Cave made from prior surveys. This is the second published map and is a composite map by Hovey of the Grosvenor, Talbot, and Langsdale surveys. Map is published without authorship (Owen, 1862). No bar scale, but does have a north designation at top of map page. Cave is called Wyandot Cave (note spelling).

1864: James Parish Stelle publishes first guidebook on Wyandotte Cave. During the winter time the cave becomes a potato cellar; apples do not keep very well (Stelle, p. 17). Story of the Counterfeiters Trench and how it got its name.

September 1865: Up on the hill the new hotel near the cave entrance is under construction (Anon. 1865, p. 2).

July 4, 1866: Large Fourth of July celebration and picnic at the cave. The Rothrock boys are near completion on the new Cave Hotel. They expect to have it finished in the fall (Andy, 1866; and Anon. 1866). It was generally thought the hotel was built in 1868 (Louden, 1967). The Rothrock "dog trot" house is still used to handle guest.

1867: Washington Rothrock was the cave guide (Smith, 1867).

September 4, 1867: Hope Lodge No. 1, New Albany, host regional Odd Fellows convention at Leavenworth. In the evening, a portion of the delegation make a quick exploration in the cave.

November 19, 1870: Future Governor of the State of Indiana, Albert G. Porter and Orley Colwell, walk from Indianapolis to Wyandotte Cave (Wolfe, 1929, p. 5).

February 22, 1871: Henry P. Rothrock dies in his seventy-ninth year. Left cave to his son Henry W. Rothrock and in trust for his grandson, Frank (Hovey, 1882, p. 128).

mid 1871: H. W. Conrad had already leased the Cave Hotel. Willis Sibert was the guide (Cope, 1871, p. 4). Rothrock manages the cave.

1872: First published reference by name to Saltpetre Cave (Cox, 1872, p. 152).

1877: The Sundial is the oldest rock monument built in the cave (Roger Gleitz, personal communication, 7 June 1990).

1878: Henry W. Rothrock is the chief guide and proprietor of the cave.

1878: H. C. Hovey and J. Barton Smith go to the cave. Barton makes renderings in the cave for *Scribner's* magazine to accompany Hovey's article. Illustrations would be used in Hovey's *Celebrated American Caverns*, published in 1882. Hovey also makes a map of the cave. Shows more passage extent than prior maps. He also discovers the Wolf's Lair. During the same year, John Collett (1879, p. 467) visits the cave and renders a new map of Wyandotte and Little Wyandotte caves.

Spring 1878: David Starr Jordan is lost on the Short Route for three or four hours (Rothrock, 1915). This place is now called Jordan's Wait. Jordan became president of Indiana University (1884-1891) followed by Stanford University, California (1891-1913).

April 2, 1878: Dr. Charles E. Milroy, and students from Wabash College, consisting of: A. J. Brown, L. B. Kuhn and C. R. Bailey discover Milroy's Temple in the New Cave (Rothrock, 1915).

May 3, 1878: C. R. Bailey and George T. Dodge are accidently crushed to death by a rail road train (Anon. 1876, p. 1).

pre-1879: Mr. Peddle makes a pedometer survey from the Pillar of the Constitution to the cave entrance, giving a distance of "one and one-sixth mile" (Blatchley, 1897, p. 157). He also used a 50-foot tape.

1879: First published record of three additional discoverers of the New Cave (Collett, 1879, p. 465).

These are Cummins, Collingwood, and O'Bannon. No mention is made of Norman J. Colman. H. P. Rothrock is credited with discovery of the Auger Hole connection in late 1850. First published record that Wyandotte Cave was once called the Indiana Saltpetre Cave (Collett, 1879, p. 464).

1880-1903: Andrew and Washington Rothrock are managers of the cave and hotel (Louden, 1967).

January 9, 1880: Steamboat America of Louisville, Kentucky, ascends Blue River as far as Wyandotte Cave (Wolfe, 1929, p. 5). This was achieved under the direction of Captain H. N. Adams, first mate R. P. Hunter, and piloted by J. M. Barbour.

September 18, 1883: Champion boxer, John L. Sullivan visits cave (Wolfe, 1929, p. 5).

1884: Two men from Evansville Indiana, "attempted to corner the onion industry of southern Indiana." They rented warehouse space in the cave (Blatchley, 1897, p. 154). Onion beds were constructed in Washington Avenue, Counterfeiters Trench, Sandy Plains, and entrance to the Old Cave Route. Stenciled inscription on onion barrels reads either G. H. S. or is it G. H. C. Company White Onion Sets (Roger Gleitz, personal communication, 17 August 1990).

mid 1884: William Thornbury (prior guide and general manager) becomes proprietor of the hotel and lease on the cave (Anon. 1884a).

August 21, 1884: George Trunk and Rush Thornbury acquired the lease to the cave and hotel for 5 years (Anon. 1884b, p. 4).

1884-1890: Second guidebook published, *Wyandotte Cave. What it is and Where it is.*

1887: Ben Hains makes black and white stereo photographs in Wyandotte and Little Wyandotte caves (Howes, 1989, p. 120).

c. 1890: Third guidebook published, *Twenty-Three Miles Underground.*

1893: Speleothems collected from the Unexplored Regions for display in the Chicago Worlds Fair (Blatchley, 1897, p. 164).

circa 1900: Rothrock unable to show Little Wyandotte Cave because of boundary dispute with the Siberts (Anon. 1983, p. 1). Although, the 1906 Wyandotte Cave Guidebook advertises Little Wyandotte Cave.

1903-1907: Joseph Sibert becomes manager of the cave and hotel (Louden, 1967).

1903: Fourth guidebook published, *Wyandotte Cave, Crawford County, Indiana, Greatest Natural Attraction of its Kind in the World.* This is an edited anthology of prior publications without authorship or publication source. For a brief moment, Norman J. Colman (without explanation) is co-elevated as the discover of the New Cave.

September 1-2, 1903: Wyandotte Cave explored by the famous French speleologist, Max Le Couppey De La Forest (1904, p. 129).

1904: First publication of the Collett Wyandotte Cave map with bar scale and north arrow by Le Couppey de la Forest (1904) in the French speleological journal *Spelunca.*

1904: Samuel L. Rothrock and A. K. Sears discover the Double Pit connection into the Long Route Air Torrent crawlway (Jackson, 1977, p. 107).

1906: Reprint and expanded edition of the 1903 guidebook, now called, *Wyandotte Cave, Greatest Natural Wonder in the World. What it is! Where it is! How to Reach it!* This is the fifth guidebook to be published.

1907-1908: Joseph Wiseman becomes manager to the hotel and cave. His tenure was to 1908. Another source says 1908 to 1913 (Louden, 1967).

July 13, 1907: First visitors arrive by automobile from Natchez, Mississippi. This consisted of Mr. and Mrs. George, M. D. Kelley, Pearl Moritz, and their black chauffeur Robert Gordon (Curry, n.d.).

1911: Samuel L. Rothrock is manager of the cave (Walsh, 1911). Louden (1967) said Rothrock became the manager in 1913.

1914-1918: World War One.

1915-1917: William Bennett is proprietor of the cave lease (Rothrock, 1915; Louden, 1967).

1915: Wyandotte Cave also known as: Old Indiana Saltpetre Cave, Sibert's Cave, Rothrock's Cave, and Corydon Cave (Rothrock, 1915, p. 2).

1916: During the year, 600 people visit the cave (Wallace, 1916).

1917-1921: Walter Sibert becomes the manager of the cave and hotel (Louden. 1967). Conflicting information from Alvay Cline (Roger Gleitz, personal communication, 15 August 1990) says Russell Rothrock was manager of the cave and hotel from 1917-1919.

June 1919: Treaty of Versailles, end of World War I.

c. 1920: Land dispute closes Little Wyandotte Cave to tourist (Powell, n.d., p. 79).

1921-1926: Charles J. Rothrock becomes manager of the cave and hotel (Louden, 1967).

Early 1923: Charles Rothrock, James Robert Louden, Samuel Rothrock, and Lelah Austin experience wind storm in the Grand Council Chamber (Jackson, 1975, p. 71). The wind came from the Wolf's Lair. Samuel L. Rothrock experienced a similar storm many years prior to this event. Even before that, George F. Jackson's father encountered one of these wind storms. Both early storms occurred midway in the Old Cave.

1923: George F. Jackson makes first visit to Wyandotte Cave when he was a Boy Scout (Jackson, 1972, p. 55). Later he becomes one of the guides and marries into the Rothrock family. He published many articles on the cave and its history. He became affectionally known as George "Wyandotte" Jackson.

June 1927: Russell Trall Neville films *In the Cellars of the World*, in part in Wyandotte Cave (Howes, 1989, p. 250). This is an early North American 35 mm film.

1926: Radio reception of WHAS broadcast in Throne and Canopy. Jackson (1970, p. 6; 1975, p. 26) said it was the first radio broadcast received in a cave. The

first known radio reception occurred in Mammoth Cave on August 19, 1922 (George, 1988).

1926: Conflicting information says "Charles Julius [Rothrock] was manager of the Wyandotte properties until 1926" (Rothrock, 1979, p. 253; Louden, 1967).

November 27, 1926: Formation of the Wyandotte Cave Company (Clemens, 1954, p. 52).

December 4, 1926-1936: Samuel L. Riely becomes manager of hotel and cave. Riely's business partner was Ruskin F. Rowe of Corydon, Indiana (Louden, 1976; Anon. 1926, p. 1).

1927: Cave Hotel on the hill is remodeled (Clemens, 1954, p. 54). Herbert C. Samms survey of Wyandotte Cave (Powell, n.d.).

August or September 1927: First exploration of Jone's Discovery by George Jones, Gordon L. Curry, M.D., and George F. Jackson (Anon. 1927).

1928: Map of Wyandotte Cave and Salt Peter (Saltpetre) Cave by Dr. Gordon L. Curry (Riely, 1945, p. 31). Map has north arrow and no bar scale.

July 13, 1933: Hotel, tavern, and restaurant burns down. Many records lost in the fire (Anon. 1933). The fire occurred in a woman's dressing room at 2 A.M. The fire caused $15,000 to $20,000 in damage. The blaze started from a candle left burning in the room.

1934: New lodge built by Wyandotte Cave Company (Louden, 1967).

1936-1939: Charles J. Rothrock becomes manager of the cave and hotel (Louden, 1967). Clemens (1954, p. 56) says the year was 1935.

1939-1956: Samuel L. Riely becomes manager of the cave and hotel (Louden, 1967).

1941: First published reference to William H. Harrison signature in Wyandotte Cave (Jackson, 1942, p. 42). About this same time, Jackson discovers the F. I. Bentley, 1801 (sic.) signature and date in the cave.

January 1941: New Discovery found by Charles J. Rothrock, James Robert Louden, and Marion Sibert (Reily, 1945, p. 14).

December 8, 1941: Congress declares war on Japan.

December 11, 1941: Congress declares war on Germany.

April 15, 1944: Cave Men of America formed for commercial cave operators. Wyandotte Cave personnel took the lead in forming the association (Riely, 1945, p. 29). Later, this organization matures as the National Caves Association.

1945: Samuel L. Riely publishes his *Wyandotte Cave*, a guidebook on the cave. This is the sixth guidebook on the cave. Several contemporary myths are fabricated in order to promote the cave. Especially, F. I. Bentley's 1798 discovery of Wyandotte Cave and the wounded Indian story. Story is a manufactured tradition lifted from an 1908 children adventure novel, called *Uncle Tom Andy Bill*, by Charles Major.

1945: First reference to Major Floyd's signature in Wyandotte Cave (Riely, 1945, p. 19).

May 8, 1945: V-E Day, end of war with Germany.

September 2, 1945: V-J Day, end of war with Japan.

1945?-May 1947: Little Wyandotte Cave and adjoining property was purchased by the Rothrocks (Jackson, 1953, p. 57). A new entrance is constructed. Powell (n.d., p. 79) says the cave was purchased in 1945. The cave opened to the public in 1947.

July 1947: A black top road is constructed from State Highway 62 to the cave (John Benton, personal communication, 25 August 1990).

Early 1950(?): Property improvement and family cabins constructed. During the year, Wyandotte Lodge is expanded (Clemens, 1954, p. 58).

1951: Over 40,000 tourist visit cave this year (Powers, 1951).

c. 1953: Map of Wyandotte Cave by Clarence A. Quebbeman, a registered engineer from New Salisbury, Indiana (Jackson, 1953). Contains north arrow and no scale.

1953: George F. Jackson publishes his guidebook, *Wyandotte Cave*. This is the seventh guidebook on the cave.

1953: A dam is constructed for a pay fishing lake (Clemens, 1954, p. 58).

1954: Wyandotte Cave attracts 30,000 tourist this year (Salzarulo, 1954, p. 17).

August 14, 1955: Hotel, restaurant, and manager's cabin destroyed by fire (Anon. 1955). The fire was caused by faulty electrical wiring in an unoccupied hotel room. Loss estimated at $75,000.00.

1956: The present lodge is constructed.

1956-1964: James Robert Louden becomes manager of the cave (Louden, 1967).

August 1960: Heavy equipment is used to excavate an exit to Little Wyandotte Cave.

1965-1966: Lowell and Maxine Archibald becomes manager of the cave (Louden, 1967).

1966-1969: Carl Breeden becomes manager of the cave (Louden, 1967).

Late October 1966: State of Indiana signs contract to purchases Wyandotte Cave and property from the Rothrock family for $350,000 (Carroll, 1966).

Late December: State of Indiana approves the purchase of Wyandotte Cave and property for $350,000 (Egler, 1966).

December 12, 1966: Wyandotte Cave promoted by the State as Big Wyandotte Cave (Egler, 1966).

1966: Dr. Richard L. Powell of the Indiana Geological Survey begins plane table survey of Wyandotte Cave. Over 5.359 miles of a purported 23 mile long cave is established (Courbon, et al., 1989, p. 116). They discovered some new cave passages during the course of their survey, but nothing of any extent or magnitude (Powell, n.d.). Small scale map published in numerous scientific reports. Large scale blue line copies for sale in gift shop in 1989-1990.

June 30, 1967: Little Wyandotte Cave opened to public after new renovation (Smith, 1967).

August 5 1967: Big Wyandotte Cave opened to the

public after new renovation (Anon. 1967, p. 22).

1968: Attendance to Wyandotte Cave is 23,000 (Tilford, 1969, p. 26).

March 1969-April 1987: Herdis Conder becomes manager of the cave (John Benton, notes, n.d. *in* Louden, 1967).

November 1969-January 1970: Electric lights installed in Wyandotte Cave (Sculley, 1969, p. B2).

December 29, 1969: Cave guides: Jim Pease, Tom Crecelius and others discover small room to the left of Fairy Palace (John Benton, personnel communication, 25 August 1990).

September 1970: Between Memorial Day and Labor Day, 17,000 paid admissions to Wyandotte Cave (Tilford, 1970, p. 22).

December 29, 1971: Cave guides John Benton and Doug Ray discover a new passage off of Cleopatra's Palace in Little Wyandotte Cave (John Benton, personal communication, 25 August 1990).

1972: Wyandotte Cave designated a Natural National Landmark by the United States Department of the Interior.

1975: George F. Jackson publishes another guidebook, *The Story of Wyandotte Cave*. This is the eighth book on the cave.

1981: Discovery of the Gauntlet past the Air Torrent on Long Route by John P. King and others (Roger Gleitz, personal communication, August 1990).

August 1982: Discovery of Neal Hall and lower passage below Pillar of the Constitution by Roger W. Gleitz and others (Roger Gleitz, personal communication, August 1990).

1987: Gary Kopp becomes manager of the cave.

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GRAND CAVERNS (?) IN 1866

by

Trevor R. Shaw

In 1866 a Scottish marquess and future Governor-General of Canada visited a cave in the Shenandoah Valley while touring the United States as a young man.

The Man

John Douglas Sutherland Campbell was born in London on 6 August 1845. As the eldest son of the 8th Duke of Argyll he was the Marquess of Lorne until, in 1900, his father died and he became the 9th Duke. He married Princess Louise, fourth daughter of Queen Victoria, in 1871 and from 1878 to 1883 he was Governor-General of Canada. He died on 2 May 1914.

Many portraits exist of him in late life. The photograph reproduced in Figure 1, shows him as a young man aged about twenty or a little more. He was twenty when he made his American tour. The photographers, Elliott and Fry, operated in London from 1865 for many years so it is not possible to date the picture any more closely.

Although a member of the British parliament he did not make a career of politics, precluded perhaps by his close association with the Royal Family. He wrote many books including a biography, reminiscences, books on Canada, fiction, and verse, besides the account of his 1866 travels.

The American Tour

The 1866 travels were described in a book of 355 pages published in the following year (Figure 2). The Marquees of Lorne was accompanied by one Arthur Strutt about whom nothing is known for certain. He is likely to have been a friend of similar age, so a probable person is the Honorable Arthur Strutt, born three years before Lorne, who was with him at Trinity College, Cambridge.

They sailed from Southampton in January 1866 and the whole tour was completed before the end of the year. Their first sight of America was the island of St. Thomas (in the Virgin Islands) on 2 February. Thence they went to Haiti (5 February), made quite a long stay in Jamaica beginning on 14 February, visited Cuba, and proceeded to New York, Boston (arriving 10 April), Washington (about 20 April), Richmond, Virginia (where they were on 1 May), and Charlottesville (about 12 May). That is the last place for which the date of visit is given. From there they went to Lexington and up the Shenandoah Valley to Harrisonburg. So the Shenandoah visit would have been towards the end of May. Then they went to Niagara, Toronto, and Ottawa before returning to England.

Figure 1. The Marquess of Lorne, from a photograph of about 1865 to 1870.

Besides descriptions of places, and meetings with Henry Wadsworth Longfellow and Ralph Waldo Emerson, the book shows interest in politics, employment, slavery, the recent riots in Jamaica, and American feelings in the aftermath of the Civil War.

The Cave

The visit to the cave in the Shenandoah Valley is described as follows (pp. 331-332):

> We drove down the valley eastwards towards Harrisonburg to see a very remarkable cavern, or series of caverns, in the limestone rock of a spur of the Blue Ridge. The air was very clear, and from the rising grounds one could see far over the rolling woodlands and broad fields that once made the Shenandoah Valley famous for its beauty and fertility. The mountain range stretched away on our right till lost to view in the direction of Winchester. All the mills have been burnt by Sheridan's forces. This was a purely military measure, as the corn from the valley supplied Lee's army. The houses of the people were burned when the owners fled, but were unmolested when they

remained. The man on whose farm the cave is showed us through it. The entrance is very narrow, and in the side of a hill. A series of halls are passed through, till one has gone for half a mile underground. The stalactites are most wonderful and beautiful, though their effect is rather spoilt by a coating of yellow that has formed where the drip has not been enough to prevent it. The forms are those taken by icicles, but are often far more grotesque and extraordinary.

The following is a bill that was presented to us after our visit to the cave, from which it will be seen that the people still talk of shillings and pence, though the sums understood by those terms are not what they used to be; a shilling with them being the sixth part of a dollar. The way in which they put down the sums in both coinage is curious.

2 Visits to Cave, each 9s.	$3 00
2 Dinners, each 4s. 6d.	1 50
	$4 50
Coloured Man Visit Cave, 9s.	1 50
" " 2 horses, 2s. 3d.	0 75
" " Dinner, 4s. 6d.	0 75
	$3 00

Which Cave?

The only tourist cave known between Lexington and Harrisonburg in 1866 was Weyer's Cave (now Grand Caverns), Massanutten Caverns being not yet discovered. Melrose (or Virginia) Caverns were indeed known at the time but they are north of Harrisonburg and very much further away from the Blue Ridge.

Lorne's description of the interior of the cave is consistent with Grand Caverns, but so little detail is given that it would probably match any other cave equally well. The location, "in the limestone rock of a spur of the Blue Ridge," is a problem, for Grand Caverns is not in such a spur. It is in a low hillside not far from the Blue Ridge, and Lorne's memory or his notes may have been confused on this point.

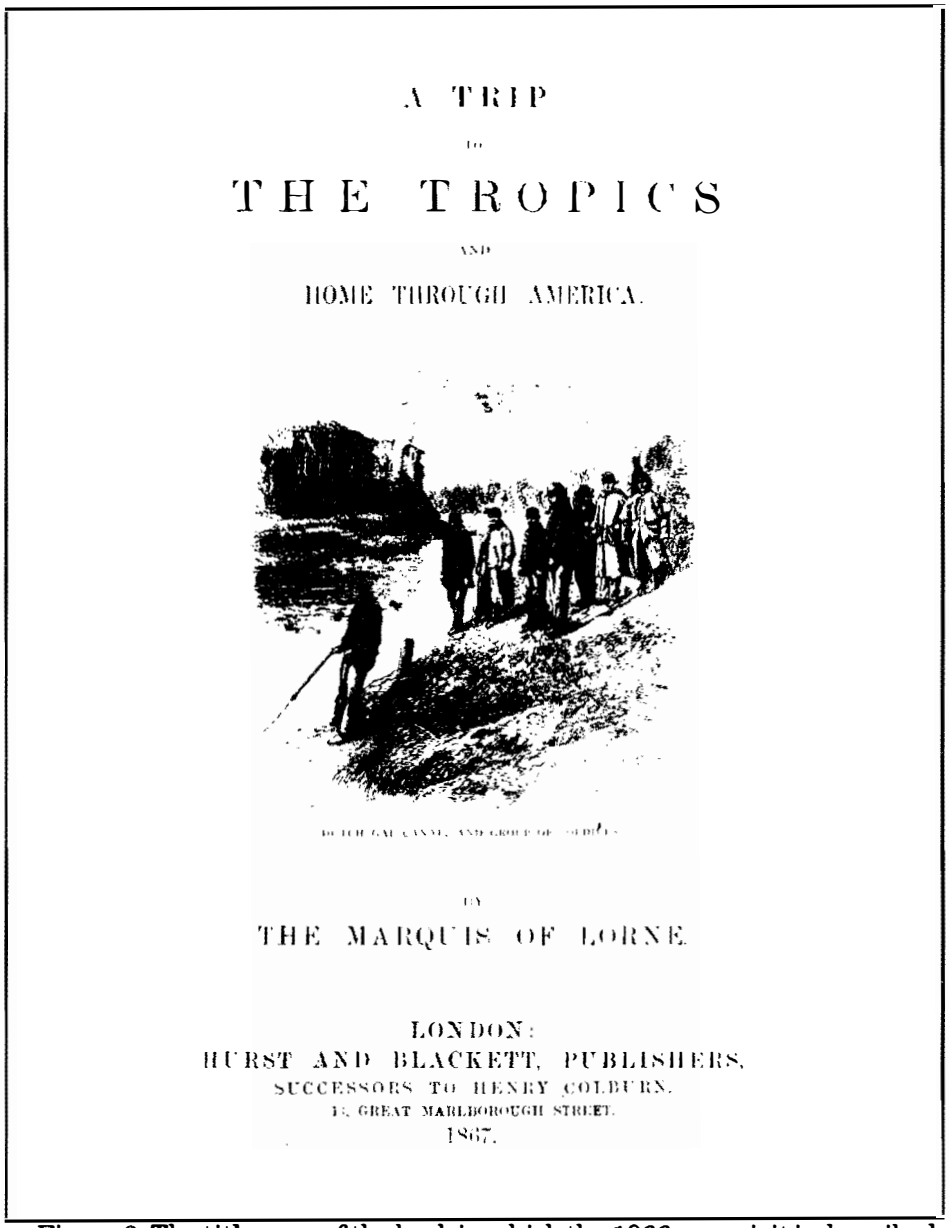
A TRIP
TO
THE TROPICS
AND
HOME THROUGH AMERICA.
BY
THE MARQUIS OF LORNE.
LONDON:
HURST AND BLACKETT, PUBLISHERS,
SUCCESSORS TO HENRY COLBURN,
13, GREAT MARLBOROUGH STREET.
1867.

Figure 2. The title page of the book in which the 1866 cave visit is described.

Acknowledgements

I thank William R. Halliday, M.D., for discussing the identity of the cave. Biographical information is taken from *The Dictionary of National Biography*[1] and *Alumni Cantabrigiensis*[2,3].

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A SKETCH OF THE SALTPETER MANUFACTURING MILLENNIUM IN WORLD HISTORY

by

Gary A. O'Dell

War, unfortunately, has long been a favored occupation of the human species. Consequently, the articles by which warfare may be conducted have been important items of commerce through the history of the world. As military technology developed over the centuries, from stone axes to satellite killers, the acquisition and regulation of contemporary ordnance supplies has usually been of paramount importance. For nearly one thousand years, gunpowder and its major constituent, saltpeter, were critical items.

Saltpeter, or niter, is a nitrate mineral that was known to the Chinese as early as the 1st century B.C., and long used for medicinal purposes and in chemical processes. Although Chinese science was far in advance of the western world, nearly a thousand years would pass before the deflagatory properties of this chemical led to the first development of gunpowder in China, and its adaptation to the ways and means of warfare. Saltpeter was readily available in many parts of China, reported by Sogdian Buddhist monks in the +6th century as an encrustation on certain soils. The incendiary nature of saltpeter was known by the 7th century A.D., as recorded in the Taoist book *Explanation of the Inventory of Metals and Minerals according to the Numbers Five and Nine*. According to this account, the monk Chih Fa-Lin traveled to the Ling-Shih district in Fên-chou about the year 664, and there declared:

"This place must be full of saltpetre, why isn't it collected and put to use?" At that time he was in the company of twelve persons, and together they collected some of the substance but found it unsuitable for use, and not comparable with that produced in Wu-Ch'ang. Later they came to Tsê-chou and the monk said again that saltpetre must also occur in this region... Whereupon they collected the substance, and on burning it emitted copious purple flames.[1]

Rather than the transmutation of base metals to gold as sought by their later counterparts of medieval Europe, Chinese alchemists often pursued elixirs of eternal life. Also in the +6th century, one of the earliest accounts of the mixing of saltpeter and sulfur comes from a related Taoist volume titled *Methods of the Various Schools of Magical Elixer Preparations*, in a formula attributed to the alchemist Sun Szu-Mo, The first proto-gunpowders were made accidentally in China in the +9th century as results of such experimentations, when mixtures of saltpeter, sulfur, and carbon sources such as dried honey or herbs were heated in crucibles. The result of instant deflagration must have been quite startling to these scholars; some suffered scorched hands and faces, and even had their houses burnt down.[2]

The technology of gunpowder, known as *Huo yao*, swiftly developed. Early mixtures of Chinese gunpowder had relatively low proportions of saltpeter to other ingredients and thus were not explosive. The first published formula for gunpowder appeared in Chinese writings in +1044, and over the next three centuries military uses diversified. Among the first applications was the invention of chemical warfare. Chinese trebuchets lobbed poison smoke bombs that contained toxic and odious mixtures of saltpeter, sulfur and such ingredients as powdered human excrement, arsenic, antimony and tung oil. Metal-cased shrapnel bombs followed, and with increased saltpeter content, high-explosive bombs and mines. The first weapon resembling a gun came early, beginning about +950; this was the fire-lance, a barrel-gun that shot rocket-propelled arrows or spears. Development of metal bombards or cannon occurred at about the same time in China and Europe, during the 14th century, in probability originating in China and quickly adopted in the west. Smaller, personal arms were developed as gunpowder composition was perfected.[3]

Knowledge of gunpowder had spread to Europe by the twelfth century, though its exact composition remained unknown for at least another century. Saltpeter was evidently known to ancient western civilization, as mention of "nitrum" is made in the writings of Pliny and others, referring to several sorts of nitrate salts obtained from surface soils. They failed, however, to discover its properties as an explosive component. It was the Arabs, late in the 12th century, who first learned that saltpeter was the primary ingredient. The Arabs called saltpeter, *bauraekh* and were reported to have obtained it from Armenia and Africa.

Another Arabic term for saltpeter, "Thelg as Sin," translates as "Snow of China" and is an indication of export of this material from the east. The first known mention of gunpowder in Europe was by Roger Bacon in his *De Mirabili Potestate Artis et Naturae* written in 1242; in this text he mentions *sal petrae* though no description of its manufacture is given. Mention of saltpeter was also made at about this time by Albertus Magnus of Germany, a Dominican monk and alchemist. An apocryphal account is that of *der schwartze Berthold*, or Berthold the Black, a Franciscan friar and alchemist who was said to have invented

the gun circa 1380 after heating in his laboratory an enclosed mixture of saltpeter, sulfur, and charcoal with explosive results. A history of saltpeter manufacture written in the mid-17th century discredits this, however, and correctly reports that "Brass Ordnance have been used by the Chinoies many ages ago."[4]

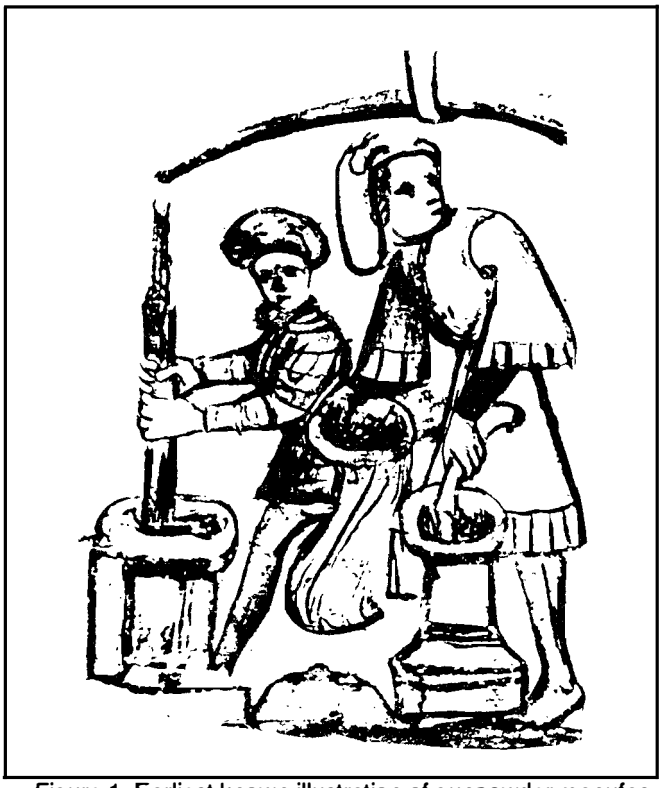

Figure 1. Earliest known illustration of gunpowder manufacture, circa 1350, cited from the *Codex Germanicus #600* and published in Oscar Guttman, *Monumenta Pulveris Pyrii* (privately printed, 270 copies, 1906). Accompanying text, translated: "If thou wouldst make a simple powder of three parts, only then take four pounds of saltpeter, which must be good and well refined and one pound of sulfur and one of charcoal and pound it in good wine in which camphor has been boiled and dry it in the sun. If no camphor is in it, the powder easily falls to dust but the camphor holds all together and is powerful and quick in all powder into which it be put." (Illustration courtesy of Hagley Museum and Library, Wilmington, Delaware).

Two centuries after Berthold purportedly won the battle of Fossa Claudia for the Venetians over the Genoese by his introduction of guns, Georgius Agricola described saltpeter manufacture in his *De Re Metallica* (1556), "made from a dry, slightly fatty earth, which, if it be retained for a while in the mouth, has an acrid and salty taste." Pietro Sardi, writing in 1629, states that "*Sal nitri* is Extracted from the Earth in great quantities, and from Walls in small...but not in all places, but such as are Proper, as those are, that are obscure and Cavernous, where the rain falls not." Sardi reported three tests for niter: "putting a little on the tongue, if there be sense of a biting taste"; thrusting a hot iron into suspect earth, allowing it to cool and examining it for a whitish color; and sprinkling over burning coals, "...if there be perceived any crackling noise, and any sparkles issues forth speedily, it shall be a sign of Saltpetre-Earth." Henry Stubbe in 1670 observed that saltpeter-earth might be found in English cellars and vaults, and even on the stone walls of his room at Oxford, which were below ground level. Stubbe also relates several accounts of discoveries of saltpeter occurrence in caves. Near a certain town, "there was a deep and close Grott under the Appenine, in which Millions of Owles did lodge themselves, their dung had been accumulated there for many centuries of years; out of this the Salt-Petre-men extracted so much of Nitre as amounted to an inestimable summe of money." Another account is quite grisly: "And not long ago, whereas in the Warrs betwixt the Crim Tartar and Polovians towards Muscovy [Moscow], great numbers of people being slain in battails were buryed for hast together in great cavernes in the Mountains, & so rotted there; out of that Earth in the Cavernes there was extracted a great quantity of Salt-Petre."[5]

Nathaniel Nye, also writing in 1670, traces the development of gunpowder in Europe in his text on the *Art of Gunnery*, and reports that though various persons had experimented with additional components, the essential ingredients of gunpowder were "Saltpeter, Brimstone, and Charcole." The proportions, however, had varied considerably (Table 1).

COMPONENT	PROPORTION/YEAR A.D.				
	1380	1410	1480	1520	1670
Saltpeter	1	3	8	4	6
Sulfur	1	2	3	1	1
Charcoal	1	2	3	1	1

Table 1. Composition of Gunpowder 1380-1670 A.D.

Note that the proportion of saltpeter in the mix was gradually increased and, correspondingly, the explosive force of the final product. The intended use, whether for cannon or for small arms, also influenced the proportions.[6]

As saltpeter was a relatively scarce commodity in Europe, until the development of the saltpeter trade in India by the British in the eighteenth century, the manufacture of gunpowder in Europe was greatly limited prior to this time. When the British began to dominate the trade of India, they found themselves in control of the world's major source of the most important ingredient, saltpeter. In the Bengal region, rich deposits of nitrate salts occurred naturally in the soils.

During the earlier period of Moghul rule, a lucrative trade in this item had been developed by British and other shippers. An entire caste arose, the Nuniah, their labor based upon the simple extraction of saltpeter from these soils. Due to the widespread occurrence of the mineral, the trade was never very highly organized, but control of international shipment remained almost exclusively in the hands of the British East India Company during the period of British political domination. It was this control of the world saltpeter market, and thus largely of the commercial manufacture of gunpowder, that led to the development of domestic saltpeter supplies in the United States during the American Revolution and later during the War of 1812.[7]

The exact origin of saltpeter is still unknown, though subject to wide speculation. It apparently is a mineral of organic derivation, due to the various circumstances under which it is found. Saltpeter has been extracted or produced by several methods. In ancient China and in India, nitrate-rich soil could be simply scraped up off the ground and concentrated through a simple procedure. This purification process involved leaching of the nitrates with water and boiling the liquid collected to crystallize the niter; a procedure essentially the same regardless of the original source of nitrate. Saltpeter could also be found in the soils under old houses, in barns, privies, and similar locations. The British Parliament in 1641 passed an ordinance allowing saltpetermen to dig for this substance wherever they pleased throughout the kingdom, provided that any damage was repaired. Similar laws were passed in eighteenth- century France, giving the saltpetermen *droit de fouille*, or right of entry and search, permitting them to ransack entire provinces for the mineral. Any who refused assistance to them were subject to heavy fines. In the early 19th century in Sweden, a form of rural property tax known as *salpetergärd* was instituted, requiring farmers to pay the tax with refined niter.[8]

In the United States, the outbreak of the Revolution in 1776 embroiled a country in desperate need of ordnance supplies. With the British controlling the major international source of saltpeter, and blockading the coast with an unchallengeable navy, a fledgling nation found itself without the means of waging war. The production of saltpeter had begun in the American colonies as early as 1642, with orders that every plantation should erect a house "to make saltpetere from urine of man, goates, henns, and horses' dung, etc." Niter production by these methods remained very limited even more than a century later on the eve of the Revolution. As the conflict loomed, Committees of Safety began hastily to promote manufacture of saltpeter by every means possible. At this time, the numerous niter-rich caverns of the land west of the Appalachians were still virtually unknown, and thus extraction of saltpeter from cavern soils was of relatively minor significance during this period.[9]

As the writings of Sardi and Stubbe indicate, it was commonly known that saltpeter could be obtained from certain caverns. Nye, in his 1670 gunner's handbook, also had observed that saltpeter might be found "loose within Vaults, Tombs, or desolate Caves, where rain can not come in," though he thought that the very best was made from animal manure. Suitable caves, however, were generally lacking in the New England colonies. About the only region of the colonies where niter might be found in caves was in western Virginia. In June of 1775, the *Virginia Gazette* published a short notice that Thomas Lynch of Bedford County had erected a gunpowder mill, and was making his own saltpeter. A few months later, Lynch wrote to the Virginia delegates at the Continental Congress in Philadelphia that he had purchased Reed Island on the New River (present Wythe County), where he had found niter interbedded in the rock layers and on the surface of the earth. Some few caves of this region were utilized.[10]

As caves were not yet the niter supply they would become during the second war with Britain forty years later, only the traditional means of production were generally available to the country; meaning of course that every household was encouraged to begin the scraping of their cellar walls and the overturn of their manure heaps. Many of the newspapers of the day published recipes for saltpeter production, so that the technology would be widespread. In the *Boston Gazette* for New Years' Day, 1776, the "Committee for propagating the manufacturing of SALT PETRE" published a typical discourse:

(T)ake earth from under any old building (whether meeting house, dwelling house, barn, stable, or other building), where the earth has been long covered from the weather; dig not above six or eight inches deep, and a little experience will teach you to chusz [sic] that which is loose, light, and crumbly, and has a bitterish or sourish ailum like salte upon the tongue; light sandy or loomy earth, such as water easily penetrates, works the kindest. Fill your leech-tubs with those earths...

As spring advanced in 1776, the country's leaders were becoming almost panicky regarding the impoverishment of ordnance. In a letter to Thomas Jefferson on April 26, John Page of Virginia complained that only one powder mill had been set up at the public expense, and that what little saltpeter was being made was of poor quality. "Could you believe it," he wrote, "the Salt petre Works are but little attended to. Some Money it is true has been advanced to different People but I kn[ow] of no grand Work..."[11]

Within a few months, following the Declaration of Independence, the situation had greatly improved. Every colony but Georgia enacted legislation to promote saltpeter and gunpowder production, and several of the works established were highly successful. In addition, gunpowder and saltpeter were then being brought into the country from France, Spain and

Figure 2. The saltpeter works of the City of Paris, 1697. Bags of partly refined saltpeter stacked at upper left, leach tubs to the right. Workers at "A" are pulverizing the raw material with hammers, while man at "B" is sieving it to remove rough impurities. (From M. Denis Diderot, *Encyclopédia ou Dictionnaire des Artes et Métiers*, multivolume, Paris Briasson, 1751-[?]. Illustration courtesy of Hagley Museum and Library, Wilmington, Delaware).

the West Indies, so that the situation was no longer as critical as it had been in 1775.[12]

In France, beginning at about at this time, the technology of gunpowder manufacture was far advanced under the astute guidance of Antoine-Laurent Lavoisier, directing the operations and experiments of the *Regie des poudres*. Among those working with Lavoisier was Claude-Louis Berthollet, who attempted to develop chemicals such as potassium chlorate and various fulminates as substitutes for saltpeter. In this he was unsuccessful, though in 1807 Alexander John Forsyth, a Scott, patented the percussion lock firearm using fulminates to ignite gunpowder charges and constituting a major advance over the flintlock mechanism. The need for a saltpeter substitute was felt keenly by countries such as France who did not have access, as did the British, to the India trade. In 1792, the British East India Company, at the request of Prime Minister William Pitt, tried to corner the available supply of saltpeter in Europe, to keep it out of the hands of rival France. France was at the time having difficulty procuring sufficient saltpeter to safeguard national interests, and attempted to develop methods of artificial production such as used in Sweden. This would have to be on a huge scale to provide all the national requirement of France. The scale was too large for the government, and carried too much risk for entrepreneurs; consequently the program never got much beyond the trial stage. Though Lavoisier was guillotined during the excesses of the French Revolution, it was from this fertile atmosphere that new technology spread to the United States, typified in the persons of Eleuthère Irénée du Pont and John James DuFour.[13]

Du Pont came to America in 1800, and soon established the Eleutherian Mills on Delaware's Brandywine River, destined to become the largest manufacturer of gunpowder in the country and the largest single consumer of domestic saltpeter manufactured from cavern soils. Du Pont had been apprenticed to Lavoisier as a young man and had learned both scientific method and the craft of explosives manufacture.[14]

John James DuFour had arrived in the United States in 1796, just a few years before du Pont, and traveled to Kentucky to take up residence and subsequently establish American viticulture in what was essential a frontier state. It was in Kentucky that DuFour met Dr. Samuel Brown of Lexington and developed an efficient system of extraction of niter from Kentucky caves.[15]

As explorers had moved westward across the mountains into the frontier regions that would become Kentucky and Tennessee, they could not fail to take note of the abundance of caverns and rockshelters, many of which possessed rich deposits of nitrates. As gunpowder was needed for defense and hunting in the wilder-

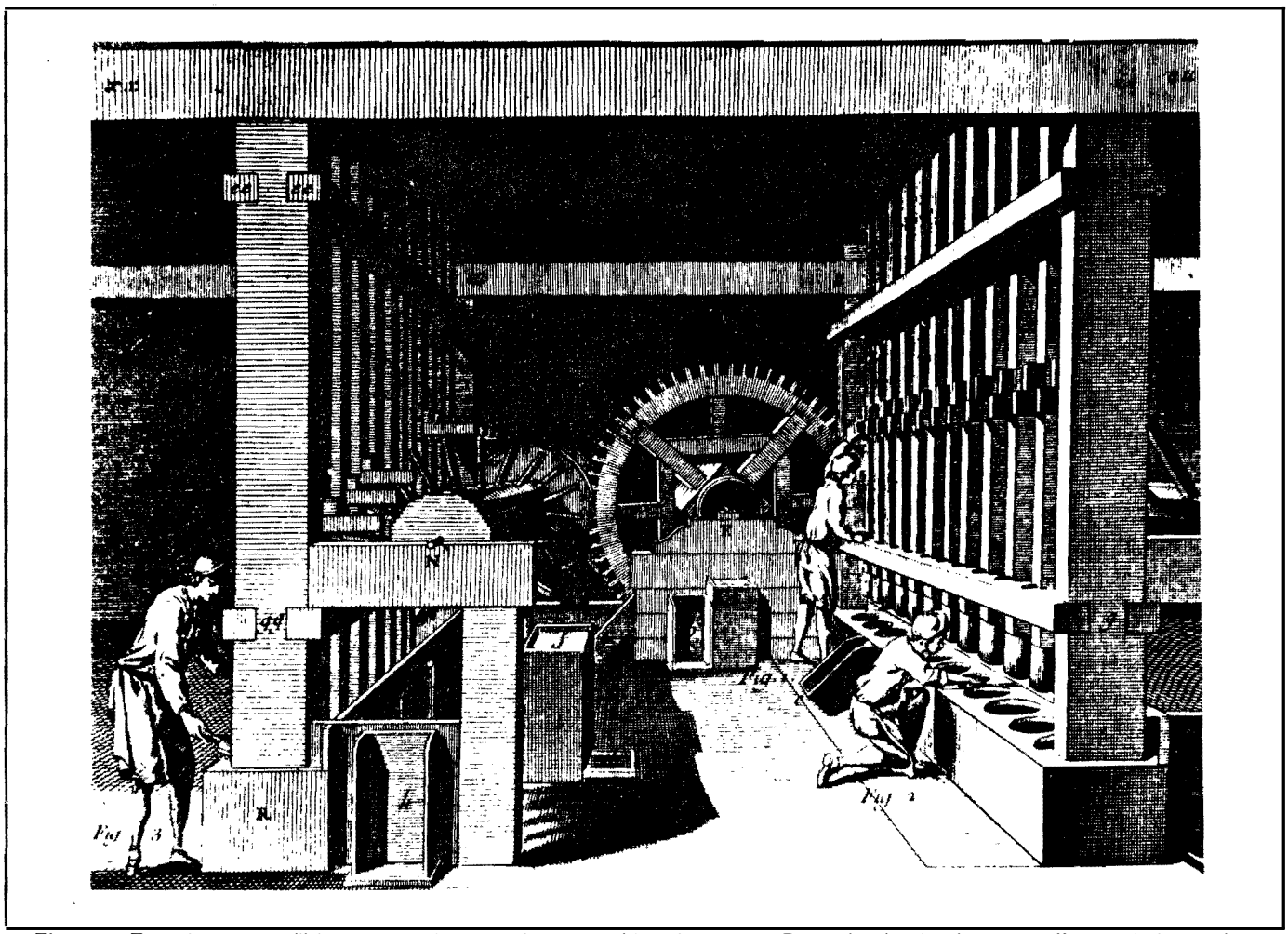

Figure 3. French stamp mill for gunpowder manufacture, mid-18th century. Pre-pulverized saltpeter, sulfur, and charcoal were incorporated with a small amount of water in this camshaft-operated mortar and pestle arrangement. The mechanism was probably water-powered. This was the standard manufacturing technology for nearly 500 years. (From M. Denis Diderot, *Encyclopédia ou Dictionnaire des Artes et Métiers,* multivolume, Paris Briasson, 1751-[?]. Illustration courtesy of Hagley Museum and Library, Wilmington, Delaware).

ness, the early pioneers were soon making saltpeter from the dry caves of the region. As the area become more settled, commercial powder mills became an important early complementary industry. Centrally located Lexington, Kentucky became the western market focus for both industries, and shipped large quantities of niter to the larger eastern powder makers.[16]

The domestic saltpeter industry reached its zenith shortly after the nineteenth century began, with the greatest production occurring in Kentucky and Tennessee. Two Kentucky caves were particularly dominant in production, Great Saltpetre Cave in present Rockcastle County and Mammoth Cave in present Edmonson. Great Saltpetre had been discovered in 1798 and over the next three years was exploited on small scale for its large nitrate reserves, operations greatly expanded thereafter. Mammoth Cave, well-known today as central attraction of a national park, was brought into major production about 1810. The operations at these two caves represented state-of-the-art technology in saltpeter manufacture.[17]

The extraction of saltpeter from cave soils was largely a cottage industry, produced in small quantities on a sporadic basis by the rural hill-dwellers and taken to market as convenient, there to be traded for cash or supplies. Major production, however, would require dedicated effort. Dr. Brown of Lexington formed a partnership to purchase Great Saltpetre Cave in 1804 and soon hired DuFour as his engineer to construct a saltpeter works. DuFour proved his merit and provided Brown with a highly efficient system after the labor of three months. Saltpeter earth was mined in the cave and placed within large rectangular vats for leaching. The style of these vats were one of many DuFour-Brown refinements, with a large capacity and an effective piping system to transport the leachate or "liquor" to the exterior for concentration. The leachate was boiled in kettles, and then run through the vats again, this time with wood ashes included for a necessary chemical conversion, as the first extraction had

produced calcium nitrate. Potassium nitrate was needed, and was thus provided in a substitution reaction.[18]

A cruder version of this process was used by less ambitious operations; less efficient, but with a similar advantage of using materials at hand (timber) for construction and fuel. In addition, caves were not the only source of saltpeter on the frontier. A large number of sandstone rockshelters provided conditions suitable for nitrate formation, and not being formed in calcium carbonate, these deposits were already predominantly potassium nitrate and needed no further chemical conversion. Thomas Jefferson wrote to Pierre Samuel du Pont (father of Irénée) in 1806 that

It has lately been ascertained that the supplies of saltpeter which the Western country can furnish are immensely beyond what had been expected... The caves are numerous. But an important discovery has been made: that there are immense precipices of sandy rock, which pulverized yields about 20 lbs. of salt petre to the bushel, whereas the earth of the Caves yields but 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.

The discovery to which Jefferson alluded was the consequence of researches by Dr. Brown, who had sent Jefferson a memoir on niter production from such sites. The saltpeter mining industry in the "west" therefore had two aspects, extraction from caves and also from rockshelters; so productive were these sites that traditional sources such as animal waste and from beneath the flooring of houses were seldom utilized in the region.[19]

Brown is credited in part with promoting that cavern soils would renitrify if replaced after processing, and thus being a naturally renewable resource, but this aspect of saltpeter manufacture was well known long before. Nearly two centuries before, Sardi, in describing methods of saltpeter manufacture, had instructed that:

Having taken out the Earth from the Vessels, after that the water hath extracted the Nitrous substance therefrom, let it be spread on the face of the Earth, but not exceeding a foot thick, and in some covered place, that it be subject to neither Rain nor the sight of the Sun...at two years end, that Earth will be impregnated, with as much Nitre as ever...[20]

As the first decade of the new century drew to a close, a second war with Great Britain appeared inevitable. Saltpeter manufacture, in ordinary times an important commodity, suddenly became invaluable and was seen by many men as a means to quick wealth. Importation of saltpeter and gunpowder from abroad was again cut off, requiring hasty development of domestic sources on large scale. Speculation, particularly in saltpeter, was rampant, and saltpeter caves suddenly became valuable properties. Saltpeter works and gunpowder mills were quickly established in numerous locations, primarily in Virginia, Kentucky and Tennessee. Mammoth Cave was among the most important niter mines of this era, and the technology earlier developed by Brown and DuFour was duplicated there on large scale. Most of the saltpeter processed at Mammoth was contracted to eastern powder manufactories, primarily to du Pont's Eleutherian Mills. Saltpeter brokers congregated in Lexington and purchased the commodity as quickly as it could be brought in. A significant proportion of Kentucky saltpeter production was manufactured into gunpowder in the Bluegrass, and used to supply United States Ordnance depots along the Ohio River. Kentucky gunpowder was used in several important battles of the Northwest Territory, and was also shipped to New Orleans and used in the famous concluding battle of the war there on 8 January, 1815.[21]

The wholesale middlemen and eastern manufacturers typified by du Pont made an error potentially fatal to the country; in an effort to keep manufacturing costs at minimum, saltpeter brokers in the west were instructed to maintain a price ceiling on saltpeter. This artificial limit bypassed the normal workings of supply and demand, so that even as niter became scarcer during the course of the war, the price paid to the miners was reduced to the point where saltpeter extraction became unprofitable and the miners refused to work at an unrewarding profession. Additionally, failure of miners to practice conservation of a normally renewable resource had resulted in exhaustion of the richest cave deposits, so that the niter industry had moved from Kentucky and Virginia to west Tennessee and Missouri. Had the war continued yet another year, it seems certain that the ceiling would have been overturned and the price of niter jump dramatically, as it had done during the earliest part of the conflict.[22]

With the end of the 1812 war and the renewal of importation of foreign gunpowder and saltpeter, an ailing industry in the interior of America collapsed. Saltpeter from British India was received in eastern ports at a total cost less than the cost of transportation alone for western saltpeter. Foreign powder, particularly that from Britain, was also available at low cost and of high quality. Large domestic manufacturers such as the Du Pont company, with established markets, were able to cope with gunpowder competition from abroad,and the availability of saltpeter at very low cost was all to their advantage. Interior powdermakers, such as the industry that had sprung up during wartime in the Bluegrass, could no longer obtain locally produced saltpeter and would be forced to import foreign supplies with shipping costs tacked on that doubled their costs over their eastern competition. The powder mill industry lingered in the interior states a few more decades, but it was moribund and eventually vanished.[23]

Though the war with Mexican in 1849 did little to stimulate saltpeter mining in the United States, the

Civil War served to temporarily revitalize a defunct industry. The industrial North possessed the capacity to produce gunpowder and arms in great quantity. The DuPont firm was located in Delaware, firmly in the North in both situation and commitment. The North also possessed several other major powder mill manufactories. In the South at the beginning of the war, there existed only two small powder mills of relatively low production. A fairly effective blockade of Southern ports by the North interfered with ordnance shipments to the Confederacy. Of the states containing substantial cavern saltpeter reserves, Kentucky and Missouri were border states not completely dedicated to the Southern cause, Strong Unionist sentiments in western Virginia led that region, with numerous saltpeter caves, to separate in 1863 and thus remove a source of great capacity. Although blockade runners would manage to bring in a fairly substantial amount of both gunpowder and saltpeter to southern ports, it was an uncertain method of supply. The South was left with cavernous Tennessee and the remaining portion of Virginia, and a scattering of saltpeter caves in northern Alabama and Georgia, to secure domestic saltpeter.[24]

These latter states together contained substantial reserves, and the South, out of dire necessity, turned to exploit it on large-scale. President Jefferson Davis addressed the Confederate Congress in January, 1862, stating that "Our present necessity is not for an increase of powder mills, but for a supply of the material for the manufacture of gunpowder. The mills now in existence, and which could readily be put to work, far exceed in their capacity to manufacture our ability to supply the requisite material." Two months later, he again spoke on the subject: "In addition to the mills now established a very extensive one has been constructed in Georgia, which we have not started because the supply of saltpeter did not justify it." Bills were quickly passed by the Congress to encourage the manufacture of saltpeter and small arms, and to organize a corps of officers to "work nitre caves and establish nitre beds." The Secretary of War directed that the highest transportation priority would be given to saltpeter and gunpowder. In April, 1863, an overworked Confederate Ordinance Department relinquished control of the industry to the newly established Nitre and Mining Bureau.[25]

The production of saltpeter continued to increase throughout the duration of the war, being considered a vital industry, and in fact exceeded that of the 1812 boom. Workers in the saltpeter and gunpowder industries were exempted from military service. An exemption issued by Captain W. M. Deitrich at Knoxville, Superintendent of the Seventh District for the Nitre and Mining Bureau, for G. W. McGee, stated that McGee, a resident of Eagles Nest on the Holston River in Tennessee, was "authorized to engage in the Manufacture of Nitre and while so engaged cannot be interfered with by Enrolling or Recruiting Officers." The saltpeter caves were generally in rather isolated areas, and often continued to operate even when Union advances placed them behind enemy lines. In Kentucky, a border state with mixed sympathies that had remained within the Union, a number of saltpeter caves in the Cumberland region near Tennessee were actively if surreptitiously mined at various periods during the war, and numerous others were subject to sporadic utilization by clandestine operations.[26]

The Civil War was the last gasp of the domestic saltpeter industry in the United States, and had then only been stimulated (as in earlier wars) by the disruption of international saltpeter and gunpowder commerce through blockade and adversarial political negotiation. The death blow was about to fall, as the Industrial Revolution swept the country late in the 19th Century and rapid advances were made in chemical technology.

On the west coast of South America was a region where, for countless generations, millions of seabirds had deposited thick layers of droppings. This deposition had resulted in a rich layer of sodium nitrate; unfortunately, gunpowder made from this form of saltpeter contained numerous impurities and was of poor quality. In 1857, Lammot du Pont, a grandson of Irénée, discovered a way to process this Chilean nitrate to produce a high grade saltpeter at very low cost. The new explosive was known as "soda powder" and quickly replaced black powder made with saltpeter from British India. This new blasting powder found widespread use in the fever of iron ore and coal mining then beginning to sweep the nation. Saltpeter lost still more ground as an industrial commodity when, in 1866, Alfred Nobel discovered that nitroglycerin could be rendered stable and useful by saturating a porous material with this formerly precarious chemical. The resulting product, dynamite, was the most powerful explosive yet invented and was soon in great demand.[27]

Rifle and cannon powder, however, still required the use of potassium nitrate, and although Indian saltpeter was still plentiful and relatively inexpensive, national security required a source of ordnance that was not subject to embargo or blockade. The Swiss chemist Christian Friedrich Schöenbein had saturated cotton with nitric and sulfuric acids in 1845 and invented "guncotton," but it had proved too violent to use in weapons. By the 1880's, European chemical laboratories had found ways to use guncotton in powdermaking, and researchers in the United States hastened to duplicate this effort. The Du Pont Company succeeded in producing this new "smokeless powder," which by 1900 had become the standard charge for large and small weapons throughout the world. The Mannlicher rifle model 1886 was the last of the bigbore military rifles designed for the use of black powder. The smoke-filled battlefield now belonged to a past era.[28]

Saltpeter had occupied an important place in the commerce of the world for almost exactly one thousand years, but was relegated to an historic perspective by modern developments in chemical technology.

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