

AMERICAN MUSEUM NOVITATES

Published by
Number 1131 THE AMERICAN MUSEUM OF NATURAL HISTORY August 6, 1941
New York City

DISCOVERY OF JAGUAR BONES AND FOOTPRINTS IN A CAVE IN TENNESSEE

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The remarkable discoveries here recorded were made in the Craighead Caverns, about 5 1/2 miles southeast of the town of Sweetwater in Monroe County, eastern Tennessee. This cave, much the largest in this region, has been known for many years. Indian relics have been found near the entrance and the Indians certainly knew the cave and used it at least occasionally for shelter, but there is no evidence that they explored it extensively. The name Craighead is said to be that of a former owner, a Cherokee Indian. Saltpeter was mined here, as in many southern caves, to make gunpowder during the Civil War. The main rooms have been open to the public for some fifty years or more and the cave enjoys increasing fame as a tourist attraction. Cock fights and dances were formerly held in one of the rooms near the entrance, now used for mushroom growing. In spite of all this, parts of the cave were discovered only recently and some parts are still unexplored.

The discoveries to be discussed in this paper were made in 1939 and 1940 by two young men employed at the caverns, Jack Kyker and Clarence Hicks. Living in the vicinity and inveterate cave-crawlers, familiar with this cave from boyhood, they devoted their spare time to searching for new rooms and in the course of this pursuit they found some bones in a narrow fissure of extremely difficult access. In another part of

the cave, almost equally inaccessible at that time, they found footprints of some large animal.

These discoveries were brought to the attention of the present owners of the cave, Dr. W. J. Cameron and Mr. W. E. Michael of Sweetwater, who recognized their importance, investigated the occurrence, and removed some of the bones. They brought the latter to the American Museum for identification and Dr. Walter Granger and I found that the bones included parts of a very large jaguar and of an elk (or wapiti) fawn. In May, 1940, I visited Sweetwater and through the hospitality and cooperation of Dr. Cameron and Mr. Michael I was able to examine the sites and to obtain further remains of the big jaguar as well as a plaster mold of the footprints. These specimens, as well as those first found and some recovered at later dates, were generously presented to the Museum by Dr. Cameron and Mr. Michael.

I am also indebted to Dr. Berlen C. Moneymaker for a copy of his plane-table map of Craighead Caverns as known in 1929, here published with additions by Mr. Michael to show some of the later discoveries and the jaguar localities. Dr. Raymond Ditmars and his assistants at the New York Zoölogical Society permitted and assisted the obtaining of tracks of a living jaguar for comparison.

OCCURRENCE OF BONES

The Craighead Caverns are a large solution cave, in one of a series of knobs formed by outcrops of Paleozoic limestone. As shown in the accompanying map, the cave consists of an irregular series of large rooms, the lowest of which extends below ground-water level and contains a navigable under-

ground lake. (Through fluctuations in water level the entrance to the lake room was formerly completely under water and its discovery is recent.) The outside entrance to the cave is about 1100 to 1200 feet above sea level. The passages between the rooms are narrow in some cases

and in others are low and nearly or quite filled by fine red silt, so that some of the rooms remained unknown or unexplored until recently. There are also numerous fissures through which a man can barely or cannot squeeze. One of these, barely wide enough for a man and for the most part so low as to require crawling on face and abdomen, leaves the main cave at the point marked "C" on the map and winds for perhaps 300 feet to a point below "B" on the map, following approximately the dotted line. The passage here communicates with a vertical fissure (not shown on the map) of considerable height and depth but still very narrow, developed more or less along the northeast-southwest joint system that can be detected from the orientation of several of the cave's rooms and fissures. The small room shown at and below and to the left of "B" on the map is above this fissure, with which it communicates by a small hole in the floor.

The bottom of this fissure is filled with red cave earth and the first bones found were partly buried in and partly protruding from this earth at the lowest point in the floor of the fissure. These include a jaguar lower jaw and some twenty-five or thirty fragments apparently all of a single animal, a very young, probably newborn elk (or wapiti) fawn. This point is approximately 225 feet lower than the present entrance to the cave and about 250 feet below the old entrance shown on the map, now closed by fallen rock. It is only about 200 feet horizontally from the present entrance and about 250 from the old entrance, although by the shortest known passages it is at least 400 feet from the former and 650 from the latter.

To the left of this point (by the orientation of the map) the floor of the fissure rises rapidly and it becomes small and irregular, finally so small that we could find no further way by which a man or a jaguar could possibly continue along it. The impracticable opening above this probably communicates with the sloping room leading to

the old entrance, to the left of the new entrance, although we could not certainly prove this. At the highest accessible point, about fifty feet above the first discovery, in a deposit of very wet red clay part of the skull of a jaguar was found.

From these relationships, it would be just possible that the remains were washed down from the passage leading to the old entrance, or even from outside the cave through that entrance, but this seems unlikely. It is possible that the jaguar or jaguars wandered alive into the small room above the fissure, fell into the latter through the hole in the floor of the room, and were unable to get out. In this case the individual represented by the skull must have been trying to climb out and have become wedged or died of starvation at the highest point that it could reach. The fawn may similarly have wandered in and fallen or, more likely, may have been dragged into the cave by a jaguar. Its bones were broken when found and may have been broken by a jaguar, but this is uncertain. Some of the jaguar bones were gnawed by rodents after death.

On the wall of the fissure, within reach of the bottom, there are several parallel grooves, now lightly coated with travertine. The discoverers believed that these were claw-marks made by the jaguar in its endeavors to escape, a distinct possibility but one that I see no way of proving or disproving.

Although there is no duplication of parts and both are surely of the same kind of animal, the remains may represent two individual jaguars, since the skull appears to be of a somewhat younger individual than the lower jaw and not to articulate well with the latter. These bones will be figured and described in a following paper in which the occurrences and classification of all the larger Pleistocene felines of North America will be discussed. The elk bones evidently represent a single individual and do not appear to differ significantly from recent *Cervus canadensis*.

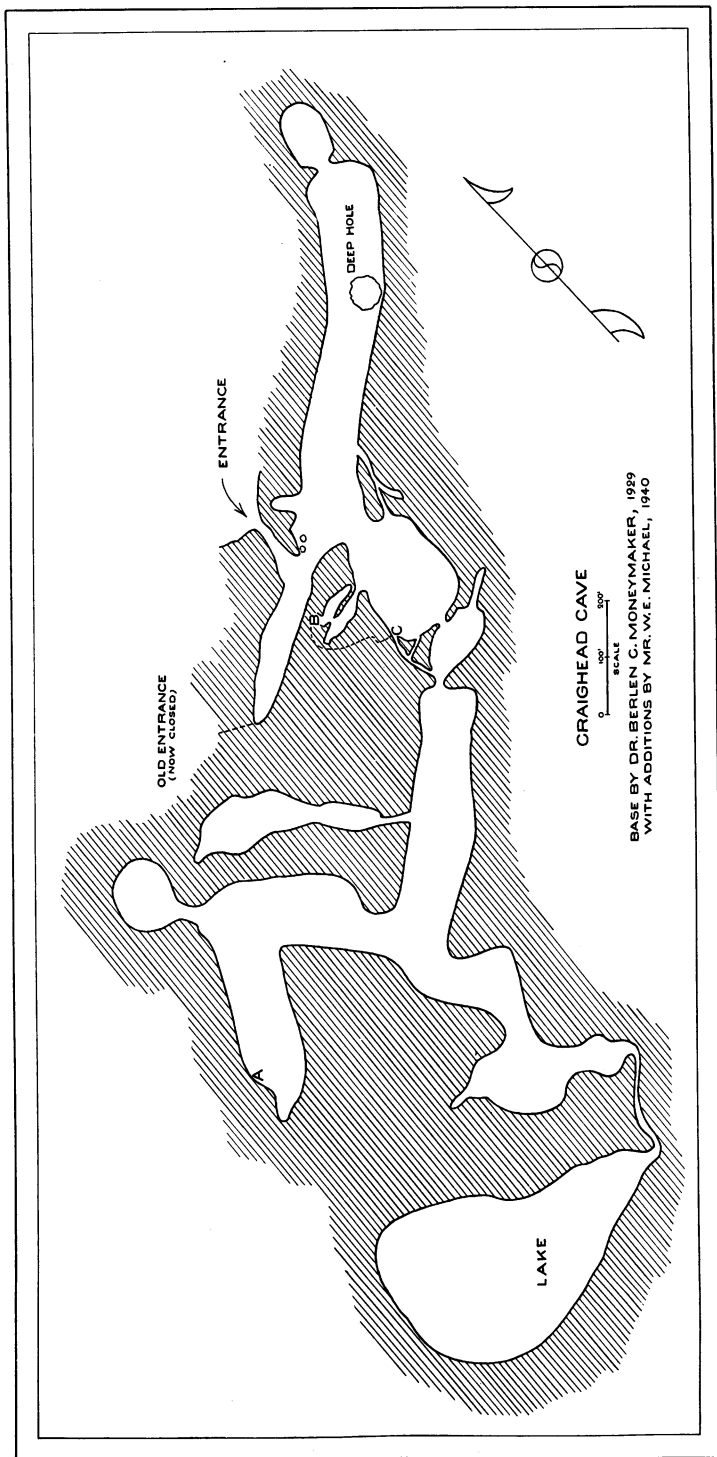


Fig. 1. Map of Craighead Caverns. A, approximate location of jaguar footprints. B, point above the first bone locality. C, entrance to winding passage to bone locality.

OCCURRENCE OF FOOTPRINTS

Besides the scratches on the wall near the bones, there are numerous other scratches in various parts of the cave. Some of these appear to have been made by claws and it is possible that a few of the larger ones were made by the jaguar, but this is not subject to proof. Such single scratch markings in the parts of the cave long explored and open to the public must in any case be subject to doubt. Two clear footprints were, however, found in such a position and of such a nature that they surely represent an animal and probably the jaguar. These occurred in a different part of the cave from the bones, at the point marked "A" on the map, some 800 feet distant in a straight line horizontally and about 1500 feet by a route practicable for a man or a jaguar. The distance by a practicable route from the present entrance to the cave is about 1600 feet and from the old entrance about 1800 feet. It is possible that a shorter route existed when the footprints were made but this is unlikely. Intensive exploration has revealed no trace of a shorter passage to the surface and the tracks are on a pile of fallen rock and cave clay suggesting that no extensive remodeling of the topography has occurred in this part of the cave since they were made.

The footprints are in a fissure opening into what is called the New Room. This was known before, but was difficult of access and seldom entered until 1940 when a trail was dug through the thick clay deposit that almost sealed the corridor leading into the room. The main floor and ceiling of the room are roughly horizontal but on one side the ceiling slopes upward rapidly and the floor of this fissure-like extension is also steeply sloping and formed by fallen blocks of limestone between and sometimes covering which is much red cave earth and clay. The fissure narrows at the top and finally is nearly closed by rock and by clay evidently washed down from above. It here becomes impassable for a man or any animal as large as a jaguar. Aside from vague markings that may or may not be footprints, two clear, partly superposed prints were found just below this highest

accessible point. The prints are those of an animal traveling straight up the slope. Before reaching this stretch of softer material the animal would have been traveling on rock or on harder earth where the prints would be less distinct. The elevation above the floor of the New Room is about thirty feet. The suggestion is that the animal was lost and climbed the slope in an endeavor, here vain, to find some way out. Darkness here is, of course, absolute and there is no place in the cave more than a few feet beyond the entrance where any glimmer of light penetrates.

The material in which the prints were made is not a pure, slick clay but a sort of earth, clay mixed with very fine sand, of the brick-red color of all the cave earth and most of the soil of the countryside overlying the limestone. The earth is still soft and moist and can have hardened little if any since the prints were made. They were clear and sharp and looked as if they might have been made only a few minutes before their discovery, except that a small amount of loose, almost dry earth and darker dust had drifted into them. In view of the complete absence of dust in the air, even this trivial accumulation might suggest considerable age or a marked change in conditions since the prints were made, but it seems very improbable that there has been any radical change. The presence of some dust in the tracks is consistent with relatively great age, but does not necessarily indicate this. Within historic times even these remote parts of the cave have been frequented both by rats and by bats, and their activities could produce such an effect relatively rapidly.

Since prints in such soft earth were sure to be damaged or destroyed soon, now that the New Room is being opened to tourists, their permanent preservation was assured by filling them carefully with plaster and removing this along with such loose dirt as adhered to it. This mold was carefully cleaned by Otto Falkenbach in our laboratory, a rubber cast made and reversed, and plaster replicas made that faithfully reproduce every detail of the originals.

DESCRIPTION AND IDENTIFICATION OF FOOTPRINTS

The two clear tracks of which replicas were made are partly superimposed, the toes of the posterior print cutting into the central pad print of the other. The prints are probably those of fore and hind feet, the latter impressed later and partly over the former. As would be expected from the steepness of the surface, the anterior ends of the prints are deeper and are very strongly impressed as if the animal were climbing hard, as it must have been, or possibly leaping. The posterior edge would not have shown at all were it not for a strong pressure ridge squeezed up behind it. The mud was also squeezed up to some extent between the toes and more strongly along the right, but not left, side of the tracks. The pressure was mainly backward and to the right and the left margin is relatively shallow and vague. The prints are probably those of left feet and it is also possible that the lateral pressure was increased by the animal's turning toward the left as it stepped out of the second print.

The two prints are alike except in details. Each shows a united central (intermediate, metapodial) pad preceded by three digital (apical) pads. The central pad is relatively small, with the posterior border rounded and the anterior tending to be angulate between the toes. Exact measurement is impossible but the greatest diameter, which is transverse, is approximately 70-75 mm. in diameter on the clearer posterior print. Except for the ridge between them on the impression, the large toe pads begin immediately anterior to this metapodial pad. Each toe pad is oval and elongate anteroposteriorly. Of the three clearly preserved on each print, the two to the left are of about equal size and the one to the right is equally broad, or very slightly broader, but shorter. The impressions of these pads are all longer on the posterior than on the anterior print. The left toe of the three of the posterior print has a clear claw-mark, indicating a large claw barely extending beyond the pad and elevated above the bottom of the latter. A similar claw may be vaguely indicated on the middle toe of this print but is not

visible on the right toe or on any of the anterior print.

There is no identifiable impression of a fourth toe on either print, but the dirt just to the left of the toe impressions was irregular and vaguely depressed. It is entirely possible that another toe here failed to make a clear impression, especially as this side of the prints is less clear in general and the pressure was to the right so that the toe farthest to the left was bearing less weight.

The two longer toe impressions on the posterior print are about 80 mm. in length and the shorter (right) toe impression about 70. On the anterior print the two subequal toe impressions are about 60 mm. in length and the other is about 50. The distance across the three clear toes of the posterior print is about 120 mm. and on the anterior print this dimension is about 130 mm.

The identification of these prints is not obvious and, as is likely to be true of tracks made accidentally under such unusual circumstances, they do not have the clear, diagnostic characters of prints made under ideal and normal conditions. The pressure was oblique, the animal's motion cannot have been a normal stride, the consistency of the medium was uneven, and the surface was steeply sloping. The occurrence of jaguar bones in a distant part of the same cave might have been purely coincidental, but it does show that jaguars did enter the cave, and after study of all reasonable possibilities, I conclude that these are jaguar tracks.

The major difficulties are that these are apparently three-toed prints and that one of them shows claws, whereas jaguar tracks, like those of all felids, normally show four toes and do not show the claws. I have searched the Pleistocene and Recent faunal lists for a three-toed, clawed animal that could have made these prints, and as far as I can learn no such animal is known or is at all likely to have occurred. By elimination, the only alternatives are either that these are not genuine animal tracks or that they were



Fig. 2 Plaster replica of the jaguar footprints, made by filling them with plaster and reversing.

made by an animal of a species normally four- or five-toed. The first alternative will be mentioned again, but it is unacceptable. Adopting the second alternative as a hypothesis, further elimination shows that the tracks can only have been made by a large felid. The apparent absence of the fourth toe (which would in fact be digit V) can be explained as the result of mutilation of the animal or of the imperfection of the print. The first of these possibilities is improbable, and the second is probable and adequate. The prints do not, in fact, prove that this toe was absent on the animal and it is quite possible that it simply failed to be impressed clearly.

For more positive identification, jaguar tracks were made in fine wet sand at the New York (Bronx) Zoo and compared

three-toed and is closely similar to the Craighead prints.

The apparently anomalous claw impression also proves on study rather to confirm than to contradict the identification. The mark is that of a claw that was strongly curved, barely in advance of the apical pad, and considerably above the latter, not showing except in an extraordinarily deep print. These are normal characters of feline claws, and with the living jaguar we found that the claws do show in the same way in a very deep print and especially if the toes sink in more deeply than the central pad. In short, the cave prints are really what would most probably be left by a large feline under the given conditions.

As will be shown elsewhere, the big fe-

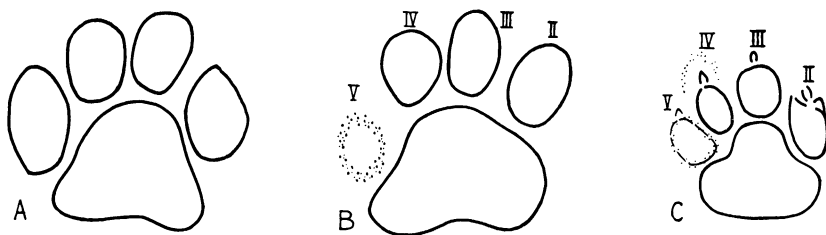


Fig. 3 Sketches of prints of a recent jaguar. A, an average normal print. B, deeper print made with strong, slightly oblique pressure by a swift-moving, leaping animal; the displaced print of the fifth digit is very vague and distinguishable only on close inspection. C, still deeper print, but posterior part relatively shallow; claws show on three of the toes; the print of the fifth digit is shallower and vaguer than the other three.

directly with a replica of the Craighead footprints. The available live jaguar was a rather small female with feet smaller than those of the Craighead cat, but the difference in size of the prints was approximately in the same ratio as the difference between skull and jaw of the living cat and those from Craighead Caverns. The form of the prints matched well except for the imperfections of those from the cave. It was also established that the fifth digit of the jaguar may fail to leave a clear print. The print sketched in Fig. 3B was fairly deep, made with hard, slightly oblique pressure while the animal was moving fast and leaping. The print of digit V is apparently displaced, out of symmetry, and is vague and shallow. Except on close scrutiny the track looked

lines of the North American Pleistocene and Recent can all be classed as pumas, jaguars, and members of the *atrox* group. These prints are small for *atrox* and there is little reason to refer them to that animal, remains of which have not been found closer than about five hundred miles from this locality. Since the tracks look so fresh the pumas living in this region into historic times must be considered. Puma and jaguar prints cannot always be distinguished. The puma has larger feet relative to the skull. The metapodials are longer than in the jaguar, but the foot is more slender, less heavy and stubby, and the plantar areas of the jaguar feet reach larger maximum dimensions than do those of pumas. Large recent male pumas of the *F. concolor oregonensis* or *hippolestes* group

may leave tracks as much as 90 mm. across the three middle toe pads, but probably never much exceed that size. Since this dimension is about 120 mm. in the cave prints, these certainly could not have been made by any recent puma. They could have been made by a jaguar of about the maximum size for males of the largest South American races, and this is about the size of the bones found in Craighead Caverns. Since the prints cannot belong to animals known in the recent fauna of the region, the probability that they do belong to a jaguar of this sort is so great as to amount almost to certainty. That they should have been made by one of the large extinct pumas would be an incredible coincidence.

This occurrence is so remarkable that the thought of a possible hoax is sure to arise, but I am convinced that neither intentional nor unintentional deception has been practiced. The good faith of the discoverers is beyond question, and it is almost impossible that they were them-

selves deceived. Until 1940, it was necessary to crawl to get into this part of the cave. A few persons did penetrate as far as the New Room in 1929, but it was not open to frequent or casual visits. The footprints were not in the room, proper, but up a steep slope that is difficult to climb and that apparently never had been climbed (by humans) until the discovery of the tracks. The nature of the tracks is still more convincing. To make cat tracks of the right size and kind for these jaguars before it was known that any such felines occurred in Tennessee would require quite impossible clairvoyance and technical skill. Moreover anyone desiring to perpetrate such a hoax would surely make normal four-toed tracks: the imperfection of the prints in this respect and their perfection in other respects make a combination readily produced naturally but incredible in an artifact. It is also impossible that the tracks are the result of any natural cause other than their being foot impressions.

TIME OF EXTINCTION OF EASTERN JAGUARS

The jaguar bones found in the cave are unmineralized and are very fresh in appearance in spite of having soaked in limy waters. The footprints looked almost as if made in the last few minutes. The great uniformity and slow change of cave conditions make it possible that the bones and prints are nevertheless old historically, but it is difficult to believe that they are old geologically. The question does not now seem capable of proof, but there are some suggestions, hardly worthy of the name "evidence," that jaguars did survive in eastern North America into the earliest historic times.

On Sebastian Cabot's map of America, 1544, a large spotted cat is shown in what is now eastern United States.¹ Its right hind foot happens to be almost on the spot where jaguar footprints were found in Craighead Caverns. Cabot's evidence, whatever it was, necessarily referred to

living animals. It is possible, as Seton suggested, that a spotted puma was meant. It is also possible that the spots were an error, that an ocelot was intended (but this would be equally difficult to explain), or that the animal was inserted here for decoration and not known or believed to live here. Nevertheless the obvious explanation is that Cabot had some reason for thinking that jaguars occurred in this region, as we now find that they did, at some time or other.

A search, not exhaustive, has been made for archaeological evidence of Indian acquaintance with the jaguar. There is abundant evidence for Mexico and various parts of South America where jaguars still live, but no clear evidence, positive or negative, was found for eastern United States. There are relatively few reliable identifications of animal remains from archaeological sites in the area here considered and many common species of the region are not reported in this context.

¹ A copy of the pertinent part, from the original in the New York Public Library, is given by Seton, 1925, Pl. II.

Zoomorphic art forms were fairly common in the Mississippi Valley and the Southeast, but especially as regards mammals they display more clumsy imagination than skilled observation. Relatively few can be identified, even as to family, in a way satisfactory to the zoologist. There are some that could—giving the imagination ample scope—be based on the jaguar. For instance, in Holmes, 1903, Plate L, there is a pottery vessel from Tennessee portraying a snub-nosed animal with blunt, erect ears and with designs of concentric circles painted on the body, and Plate XCVIa of the same work shows a very crude clay figurine from Florida remotely suggesting a cat with tail of medium length and with spots at least on the flanks and legs. These could represent jaguars or could represent any of a number of other animals.

On the other hand, the absence of indubitable evidence of Indian knowledge of jaguars in this region does not tend to show that these animals were really unknown to the Indians. As far as my cursory review of the literature shows, there is similar absence of certain archaeological evidence of the puma, which the Indians all certainly knew very well, as well as of numerous other common species surely present here in Indian times.

Miss J. M. Lucas has kindly searched much of the pertinent historical literature for references to the occurrence of jaguars east of the Mississippi in European travelers' accounts. No indubitable evidence was found and there are few remarks that could possibly apply to these animals. The most interesting of these vague legends were cited by Jefferson (1799) in his efforts to prove that a great cat was then living in the mountains of the "West"—which then included eastern Tennessee.¹ Some of

these accounts probably refer to the puma, magnified by terror and by repetition. It cannot be said that any necessarily had a factual basis other than the puma, but in at least one instance, that of "a person of the name of Draper" on the Kanhawa in 1790, Jefferson was insistent that the animal in question could not be that "mis-called the panther" (i.e., the puma). Spots are not mentioned in any of these tales, an omission that prevents accepting any as clearly referring to the jaguar but that does not exclude the possibility.

Jefferson said that these stories had become discredited in his day because no one produced remains of the reputed big cat. He proposed to substantiate the legends by equation with the "great-claw" bones in his possession. But this attempted substantiation was itself thoroughly discredited by Wistar's correct identification of these bones as belonging to a giant sloth, and not to a cat.² By a perversion of logic, which my colleagues have apparently shared with me, it has been felt that the error in identification disproved the belief in "great-claw," the cat, which turned out to be *Megalonyx*, the sloth. In fact the stories of the big cat came first. Jefferson believed that a great cat had existed in the region in historic times, and then attempted to identify the bones in hand as belonging to the cat. The error in identification certainly does not mean that no such cat existed.

Indeed a great cat, one larger and (no doubt) fiercer than the puma, did exist in this region, for here are the fairly fresh bones and very fresh footprints from Craighead Caverns. The equation of the

¹ Jefferson referred especially to western Virginia (which included Kentucky until 1792), but also to the West in general. Tennessee was still the frontier when Jefferson wrote, its first white settlements only thirty years old and statehood not granted until 1796. Eastern Tennessee, where the cave is, had successively been included in North Carolina, in the forgotten State of Frankland or Franklin, in North Carolina again, and in the "Territory South of the Ohio River." The border with North Carolina was not established until 1915, but the region of Craighead Caverns was known to belong to Tennessee even in Jefferson's day.

² While on the subject of legends, this may be an appropriate occasion to point out that the place in the history of our science usually given to Jefferson is also legendary. Jefferson did not found the science of vertebrate palaeontology in America and had, even for his day, only the most amateurish and casual of contacts with it. He was not the first to describe fossil bones from this country. He did not find the *Megalonyx* bones. He did not correctly identify them and his description—in contrast with that of Wistar in the same year—was poor and inaccurate. He coined the word "*megalonyx*" as a fancy vernacular equivalent of "great-claw" but he did not found the genus *Megalonyx*. Such as it was, Jefferson's interest in paleontology was a symptom of a wide-ranging mind, but the honor commonly done him by vertebrate paleontologists is rather a reflection of his extraordinary eminence in other fields than a just appraisal of his accomplishments in this. Its basis is sentimental rather than historical.

Craighead cat with Jefferson's cat, that of the legends and not of the sloth bones, is a different matter. It does seem possible that after all these years authentic remains have been found that belong to the cat in whose existence Jefferson believed so earnestly. This is purely speculative, however, and probably cannot now be proved, one way or the other.

As regards the possible historic occurrence of jaguars east of the Mississippi, there are two quite different problems: whether jaguars like the Craighead cat survived there and whether jaguars like those of Mexico and Texas strayed into this region. That jaguars have occurred widely in recent times in southern Texas, and probably still do occasionally in the most remote parts, is well established by the evidence of Audubon and Bachman, Baird, Bailey, and others. The most eastern definite records almost reach the Louisiana border, but I do not find any authentic and explicit record east of the Sabine River. Audubon and Bachman said that jaguars formerly occurred in Louisiana and northward, but they gave no circumstantial evidence for this. Baird, too, thought that jaguars had been killed in what is now Louisiana, but gave no reliable record. Jaguars are individually wide-ranging, cross large rivers without serious difficulty, and have been authentically reported as far north as Tennessee (but much farther west) and in still colder and drier climates. There is, then, no reason why jaguars should not have strayed from their positively known historic range as far as Tennessee. On the other hand, there is no worthy evidence that they have done so in historic times. In addition to

the Craighead cat, the direct evidence of jaguars north and east of their established historic range consists of scattered finds comparable to but less complete than that of Craighead Caverns. The Texas jaguars belong to the *Panthera onca hernandesii* group, and probably to *P. o. veraecrucis*, if that is a valid subspecies. The Craighead cat is comparable in size and some other characters with the largest individuals of the largest living races, in Matto Grosso and the Chaco, and significantly different from any recent jaguars of Mexico or the United States. This discovery and the others that have been made and become identifiable by comparison with this do not show strays from the recent jaguar range, but a separate subspecies now extinct, whenever its extinction occurred.

Some of these discoveries, to be reviewed in a separate paper, were made in old strata definitely Pleistocene in character and in associated fauna. None seems to be younger than the Craighead cat and the question of possible recent survival depends, at present, on the latter.

A curious parallel adds to the interest of this tenuous possibility of jaguar survival. There are similar, but somewhat more definite, legends of the presence of a great cat in Patagonia in early historic times, into the 18th century. Cabrera (1934) has shown that these accounts may be true and may refer to the extinct form that he has called *Panthera onca mesembrina*. It is thus barely possible that both the now extinct largest marginal races of jaguars, one in the extreme south and one in the north and northeast, did not become extinct until after the beginning of European settlement in America.

KYLE QUARRY

A few fossil bones were found in a limestone quarry about three-quarters of a mile south of the present entrance to Craighead Caverns on the property of Mr. George Kyle. Through Mr. Kyle, Dr. Cameron, and Mr. Michael, bones that had been picked up by workmen in the quarry were presented to the Museum and some others

were found in place during my visit. The known underground passages of the cave approach within perhaps a quarter of a mile of the quarry, and it is quite possible that small fissures in cave and quarry are in actual communication. Nevertheless the two bone occurrences have no probable relationship beyond the indirect relation

that both involve Pleistocene fissure formation in the limestone belt, as do other occurrences over a space of hundreds of miles. The proximity of these two discoveries is purely coincidental. The bones in the cave were certainly not derived from the quarry deposit or one like it, and there is no necessary or probable close equivalence in age beyond the fact that both are doubtless pre-historic and post-Pliocene. The bones in the cave are fresher in appearance, those in the quarry more heavily mineralized and there is a definite impression that the latter are older, but this cannot be established as a fact.

The bones found in the quarry are in old solution passages of variable diameter not exceeding a few feet. Where the bones were found, these cavities are completely filled with red clay, typical cave-earth of the region, with a few broken limestone fragments and some secondary deposition of calcite. The bones so far recovered were apparently not more than about ten feet from the surface as it was when the quarry was opened. Most of the bones were broken before burial and all the teeth so far recovered had fallen out of the jaws and scattered, although in two cases teeth found near each other in the matrix appeared to have been of the same animal. The fragments are distributed rather sparsely through the clay, with no rich accumulation. Apparently these are the remains of skeletons that disintegrated on the surface and were washed into open fissures from time to time.

The fossils found at this locality do not lend themselves to unequivocal identification of species. The following forms are indicated:

SNAKE—a group of associated but dislocated vertebrae. These seem to have been deposited in a secondary fissure in the clay, but are preserved as are the other bones and are probably nearly or quite as old.

TURTLE—one incomplete costal plate.

BEAR—P⁴ and M¹, found separately but probably of one individual, distal end of humerus, scapholunar, pisiform, distal end of tibia, metapodials, phalanges, etc. These bones show various small differences from recent specimens but are very close to *Ursus (Euarctos) americanus* and probably inseparable from that species. Most of the specimens represent an unusually robust individual.

OTTER—humerus, lacking both ends, proximal end of radius, and perhaps a few other fragments. These specimens are hardly identifiable, but they do agree closely with a large *Lutra canadensis*. Reference to some extinct species, like *Lutra rhoadsii*, is equally possible.

BOBCAT—upper canine and perhaps foot fragments. These, too, are not positively identifiable but agree well with *Lynx rufus*, as far as they go. Pertinence to some extinct form like *L. calcaratus* is not excluded.

TAPIR—mainly represented by four upper teeth, probably left P²⁻³, right P⁴, and left M². These were all isolated, as found, but the P²⁻³, at least, seem to belong to one individual. More exactly identifiable than anything else from the quarry, these teeth closely resemble *Tapirus veroensis* Sellards and can be closely matched by teeth of that species from the Seminole Field, Fla. I applied the name *T. veroensis sellardsi* to these latter specimens, but the subspecies was poorly founded and is probably invalid. The geographic occurrence is nearer *T. tennesseae* Hay, but size and morphology are probably nearer the Florida type. Hay's species was based on inadequate data and poorly defined. It is probably a synonym of *T. veroensis*, a probability somewhat enhanced by the present occurrence. *T. veroensis* was based on excellent diagnostic material and was well defined, even though its probable separation from *T. haysii* cannot be considered absolutely certain because of the less complete knowledge of the latter. The following measurements show the size relationship:

	P ²			P ³		P ⁴		M ²	
	Length	Width		Length	Width	Length	Width	Length	Width
		Ant.	Post.		Ant. Post.	Ant.	Post.	Ant.	Post.
Kyle Quarry	19.3	21.9	23.5	19.4	24.1 24.0	19.9	ca. 26 24.6	25.0	28.5 24.1
<i>T. veroensis</i> , Type	18.5	23	19	24	20	26	24	28	
<i>T. haysii</i> , ref.	20.5	26	22.5	26	26	28	26	31	

The comparative measurements are from Sellards (1918), the *T. haysii* teeth being from Port Kennedy, Pa. Hay's measurements of *T. tennesseae* are not compared because the dimensions that he gives for upper teeth are anomalous and those teeth may have been incorrectly placed in the series. The differences in size and structure from *T. veroensis* seem to me to be well within the probable range of individual variation.

PECCARY—broken lower canine. Probably peccary, but otherwise indeterminate.

DEER—two broken astragali and a proximal phalanx. These do not seem significantly unlike recent specimens of *Odocoileus virginianus*, but again there are supposedly extinct species like *O. laevis* to which the fossils could belong.

For what it is worth, this list suggests a typical Pleistocene fauna of this region. For instance, Hay's list of cave or fissure specimens from Whitesburg, Tenn. (Hay, 1920), includes bear, tapir, peccary, and deer, inseparable from the Sweetwater forms as far as comparison is possible. *Lutra* and *Lynx* do not appear to have been reported as fossils from Tennessee, but they are common enough in similar collections from nearby states. The Port Kennedy Cave, in Pennsylvania, contained animals

allied to all those found in the quarry near Craighead Caverns: snakes, turtles, black bear, otter, bobcat, tapir, peccary, and deer.

There is no proper basis for an age determination more exact than that the fauna is certainly post-Pliocene and pre-historic. It is in general of the type called "Pleistocene," and could even be old Pleistocene, but there is good evidence that all these sorts of animals also survived into the Recent in North America. The tapir and perhaps the peccary, however, probably became extinct in the early Recent, perhaps ten thousand years ago or more, and the degree of fossilization and geologic occurrence are also better consistent with an age greater rather than less than about ten thousand years.

As a locality record, this occurrence has sufficient interest to merit this brief note, but otherwise it is of little importance. Its chief value may be to direct attention to a region and to conditions where more abundant and more complete specimens may be found at any time.

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