

ANTHROPOLOGICAL PAPERS
OF
THE AMERICAN MUSEUM
OF NATURAL HISTORY

VOL. XXII, PART I

CONTRIBUTIONS TO THE ARCHAEOLOGY OF MAMMOTH CAVE
AND VICINITY, KENTUCKY

BY

N. C. NELSON



NEW YORK
PUBLISHED BY ORDER OF THE TRUSTEES
1917

American Museum of Natural History.

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PREFACE.

Cave archaeology has many incentives in America. In the first place, this line of research has yielded unprecedented results in Europe and some of the Old World investigators still persist in arguing that application on our part would duplicate their own achievements. In the second place, we possess an abundance of caverns and rock-shelters scattered over widely differing sections of our continent and there is sufficient evidence also that the aborigines have commonly made use of them. In the third place, caverns furnish exceptional conditions for the preservation of artifacts of all kinds. Consequently, one is strongly inclined to the opinion that here, if anywhere, we may hope to find solutions for some of our archaeological puzzles — the use, for example, of such problematic objects as banner stones, bird-stones, etc. Not only that but cave investigation may reasonably be expected to yield many perishable artifacts that would serve to verify and supplement our present notion, especially of the aboriginal cultures of the eastern United States. In the fourth and last place, the caves appear to hold the key to the archaeological problem — i. e., the chronology — for several large and important continental areas. The reason for this is that nowhere else can we be quite so sure of the validity of stratigraphic results as in cave-floor deposits. Shell-heaps may be almost equally satisfactory for certain coastal regions — and it may not be untimely to remark that shell-heaps have not yet been adequately investigated. The ordinary earthmound, however, or the ordinary village site, while it may furnish clues regarding the time sequence of particular traits of culture, does not appear to be suitable for speedy and precise results. Likewise our finds in drift deposits as, for instance, in the Delaware and Ohio valleys — so promising and yet so baffling; if the effort devoted to these had been expended on caves and rock-shelters we should doubtless long ago have had cleared up the issue involved.

Most of these incentives have been apparent for a long time. There can be no doubt, for example, that the remarkable European discoveries directly prompted cave investigations in this country by such men as Professors F. W. Putnam, J. C. Merriam, Charles Peabody, W. K. Moorehead, W. C. Mills, and others. At present a really considerable amount of cave work has been done in America, extending from one extreme of the continent to the other and ranging over a period of time dating back at least to 1835. Various centers such as Patagonia, Brazil, Yucatan, our own Southwest, Kentucky with adjacent states, California, and even

Alaska have been tried out more or less thoroughly, but with what have hitherto been regarded as essentially negative results. It might be profitable in this place to consider at length the history of American cave archaeology and to cite a bibliography; but time forbids. Men and institutions, one after another, appear to have taken up the work with enthusiasm and after a few years to have given it up again. The difficulty, it seems to the writer, has been that they have all expected too much. But while our work has been sporadic it has not been altogether superficial nor without value. We have learned enough perhaps to warn us against the sanguine expectations of our European colleagues and, whether or not this may account for the apparent neglect of the field, some of us are still convinced that cave work should be continued.

It was thoughts such as these that prompted the American Museum to make a preliminary examination of some of the Kentucky caverns last summer. The Mammoth Cave happened to be one of the sites chiefly because the cave management some four or five years ago made us a generous gift of archaeological material, including several choice textile specimens, found in the Mammoth and Salts caves on their estate. Our desire was to learn something of the conditions under which such perishable objects occurred, whether there might not be more, etc. There was no real expectation of finding any essentially new data here because the cave had been frequented for more than a century and in fact had been studied by no less an authority than the late Professor F. W. Putnam himself. Indeed, it is probably not far from the truth to say that it was here that Professor Putnam received the inspiration which turned him from natural to anthropological science — making him the sponsor for archaeological research all over the American continent.

The Kentucky region was deliberately chosen. For one thing it lies south of the limits of glaciation. If the Indian was in fact present on the American continent during the ice age he might as easily have inhabited Kentucky and Tennessee as his contemporaries of the Old World did the borders of the Pyrenean uplift. Geologically and topographically the two regions are in many respects similar. In both cases we have limestone formations deeply eroded and consequently abounding in caverns and rock-shelters of great age. Moreover, this very limestone was the repository of raw material of which people everywhere during the stone age stood in great need, viz., flint. But aside from this attraction the country as a whole in point of natural food resources seems to have been well suited to a primitive non-agricultural mode of life. It was well stocked with fish and game, to say nothing of vegetal products such as nuts, berries, and roots. The primeval forest of the eastern section of the state may have been heavier

than in the lower Pyrenean country; still, from all reports, it was less impenetrable than the half-despoiled timber lands of today. At any rate, the problem of getting about was not so difficult as might be imagined. The same geologic forces that provided caves and shelters to accommodate the primitive pioneers had also blazed avenues of communication for them, because no equivalent section in the world is better served by navigable waterways than is the commonwealth of Kentucky. Besides, the buffalo began to roam the state in late prehistoric times, his deeply worn trails connecting river-fords, salt-licks, springs, and open grasslands, following usually the easiest grade or, in other words, the lines of least resistance, thus giving rise no doubt to some of the local modern highways. Under these circumstances one may readily believe that whatever the date of arrival of aboriginal man in these parts and whatever events transpired during his occupancy, the main facts are preserved for us, at least in part, in the cave deposits.

In securing the data to be considered I am under obligation first of all to Judge Albert C. Janin of Washington, D. C., who as trustee of the Mammoth Cave Estate not only presented some of the material directly, but also encouraged my own excavations. I am likewise indebted for helpful assistance to Manager H. M. Pinson and to Miss Helen Randolph. In working up the material I have to acknowledge assistance on several points. Thus the shell species have been identified jointly by Curator L. P. Gratacap of the Museum staff and by Dr. Bryant Walker of Detroit. The animal bones were identified by Mr. H. E. Anthony and Miss Mary C. Dickerson, also of the Museum staff. The text figures were drawn by Mr. W. Baake and the plan by Mr. S. Ichikawa. Lastly I am indebted to my wife for assistance in preparation of the manuscript.

N. C. NELSON.

August, 1917.

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CONTENTS.

	PAGE.
PREFACE	3
INTRODUCTION	9
SURFACE SITES, MAINLY AROUND CAVE ENTRANCES	14
GENERAL DESCRIPTION OF SITES	14
Mammoth Cave Field	14
Moonshiners' Cave Field	14
Curtis Cave Field	15
Salts Cave Field	15
CHERT ARTIFACTS DISCOVERED	16
Miscellaneous Forms	16
End-Scrapers	19
Side-Scrapers	21
Geometric Form	21
CONCLUSIONS	22
INTERIORS OF THE MAMMOTH AND NEIGHBORING CAVES	23
EARLIEST DISCOVERIES, 1810-1820	23
KENTUCKY GEOLOGICAL SURVEY DISCOVERIES, 1870-1875	27
RECENT DISCOVERIES	28
PRESENT DISCOVERIES	30
ARTIFACTS	30
Summary List	30
Woven Moccasins	31
Worked Chert	33
GENERAL OBSERVATIONS	35
SUMMARY AND CONCLUSION	38
ROCK-SHELTER NEAR BONE CAVE	40
SITUATION	40
GENERAL DESCRIPTION	40
EXCAVATIONS AND RESULTS	41
Relic-Bearing Débris and Contents	41
Stone Grave and Contents	42
GENERAL CONCLUSIONS REGARDING LOCAL CAVE AND ROCK-SHELTER	
REMAINS	43
MAMMOTH CAVE VESTIBULE	45
SITUATION	45
ORIGIN AND NATURE OF ENTRANCE	45
AGE OF ENTRANCE	46
DESCRIPTION OF THE VESTIBULE	46
EXCAVATIONS IN THE VESTIBULE	47
THE EAST SIDE TRENCHES: I-V	48
THE WEST SIDE TRENCHES: I-V	51
COMPOSITION OF CAMP REFUSE	53
Animal Bones	54
Fresh-water Shells	55

	PAGE.
HUMAN REMAINS DISCOVERED	56
ARTIFACTS DISCOVERED	56
OBJECTS OF BONE	57
Awls	57
Chipping Tools	57
Projectile Points	57
Tubes	58
OBJECTS OF SHELL	58
Spoons or Scrapers	58
Pendants	61
Unknown Form	61
OBJECTS OF STONE	61
Chipped Arrow Points, Spear Points, and Knives	61
Scrapers	62
Pestles	63
ABSENT TRAITS OF CULTURE	64
SUMMARY AND CONCLUSIONS	68
GENERAL CONCLUSIONS	70
BIBLIOGRAPHY	71

ILLUSTRATIONS.

TEXT FIGURES.

1. Chipped Implements from Surface Sites	18
2. Typical Chipped End-Scraper from Surface Site	20
3. Chipped Side-Scraper from Surface Site	21
4. Chipped Geometric Implement from Surface Site	21
5. Principle of Wicker Technique employed in Kentucky Cave Moccasins	32
6. Principle of Twined Technique employed in Kentucky Cave Moccasins	32
7. Roughly Blocked Out Implement from Flint Dome, Mammoth Cave	33
8. Scraper-like Implement from Flint Dome, Mammoth Cave	34
9. Stone Grave in Rock-Shelter on Green River near Bone Cave	42
10. Floorplan and A-B Section of Mammoth Cave Vestibule showing Extent of Camp Refuse and of Excavations	49
11. C-D Section across Mammoth Cave Vestibule at about One Hundred Feet from the Entrance showing Order and Nature of Floor Deposits	50
12. E-F Section of Mammoth Cave Floor Deposits at about Thirty-Two Feet from the Entrance	52
13. Projectile Point of Antler from the Mammoth Cave Vestibule	57
14. Artifacts of Bone from the Mammoth Cave Vestibule	59
15. Artifacts of Shell and Chert from the Mammoth Cave Vestibule	60
16. Small Side-Scraper from the Mammoth Cave Vestibule	62
17. End-Scraper from the Mammoth Cave Vestibule	63
18. Pestles from the Mammoth Cave Vestibule	65

INTRODUCTION.

Most of the original data embodied in the following report were collected by the writer in May and November, 1916. The additional items were abstracted from a series of miscellaneous cave specimens presented to the American Museum in 1913 by the Mammoth Cave Estate. The latter collection comprises catalogue numbers 20.0-5763-5778, the former numbers 20.1-136-216 and 99-7326-7331.

A preliminary visit was made to Kentucky in the month of May. At that time the writer held consultation with Professor Arthur M. Miller of the State University at Lexington regarding suitable localities for investigation. Professor Miller suggested among other places the Kentucky River, or that section of it to the south of Lexington lying between Valley View and Highbridge. He took the trouble personally to accompany me to a small cave at the upper terminal, and I later went alone to verify conditions at the lower end. This stretch of the Kentucky, like the middle courses of the other rivers of the state, is cut deeply into a limestone formation underlying the gently sloping tableland. The gorge at Highbridge is a little over three hundred feet deep and the towering palisades on either side of the river have been so far eroded as to afford numerous ledges and overhangs. A number of caves are also present, some of them, according to reports, showing indubitable evidence of Indian occupation. Village sites are likewise reported along the river, both on the plateau proper and on the narrow strips of bottom land occasionally wedged in between the river channel and one of the gorge walls. In such a locality the problem of secure and comfortable shelter was easily solved. But whether the Indian occupied the region, in particular the natural shelters, for any great length of time can, of course, be determined only by excavation, and this I found no opportunity to undertake.

The second locality to be inspected and the one in which excavations were later commenced, was a short stretch of the Green River in the vicinity of Mammoth Cave in Edmonson County. Although nearly one hundred miles southwest of the Kentucky River segment described above, the general conditions are very similar excepting that caverns are here far more numerous. Green River is a stately current running through a deep winding gorge and locally peculiar in that it is fed almost entirely from underground sources — a fact intimately connected with the production of caverns. The border country is again a plateau, forested and somewhat undulating, but averaging about three hundred feet above the river level.

This plateau is characterized in the first place by occasional outstanding "knobs" and in the second place by numerous sink-hole basins.

The knobs are eminences of a pyramidal character, sometimes several hundred feet high and usually capped with sandstone, which register for us in a rough way the amount of erosion to which the country has been subjected. They are of special interest to the archaeologist chiefly because many of them are natural strongholds and as such were occupied by the Indians at least in relatively late times. As good local examples of these knobs there might be cited Indian Hill ¹ and Somerset Hill, the former about twelve miles down the Green River and the latter about eighteen miles up the same stream from Mammoth Cave.

The sink-hole basins, on the other hand, are depressions in the plateau surface resulting from the collapse of cavern roofs beneath. These basins act the part of funnels in catching up all the rain waters which usually drain through a vent in the bottom of each one and finally reach the river by devious underground channels. The waters in passage dissolve and wear away the limestone, thus gradually weakening the formation until new collapses and consequent sink-holes are added. This process of subterranean erosion has been calculated to have been going on for one or two million years ² until the whole formation from the top of the plateau to the river level has been literally honeycombed with caverns. The Mammoth Cave, for example, is said to exhibit no less than five levels of galleries, the lowest of which is near enough to the river level to be flooded by the back-waters of the spring rise and therefore still in process of formation, while the upper is little more than fifty feet below the plateau surface and in process of refilling.

Without professing to deal with the geology in a technical way, it must be obvious from the foregoing facts that the upper levels of these caverns are exceedingly old. They are in the majority of cases both dry and comfortable, with a constant temperature of about 54 degrees Fahrenheit; in short, peculiarly suitable for the accommodation of early man. Here he could find protection from the elements as well as from pursuing enemies; here he could store his provisions indefinitely and preserve the remains of his dead; and here, finally, he was able to secure, in workable condition, one of his greatest necessities, namely, flint. It should therefore be no cause for wonder that many of the caverns and rock-shelters in the vicinity of Mammoth Cave, including that cave itself, give visible evidence of having been frequented by the aborigines.

The specific localities investigated in the Green River country embrace caverns, rock-shelters and "flint sites," i. e., spots in the cultivated fields

¹ Putnam, (e), Vol. III, 62; Moore, 439, 487.

² Shaler, 8.

where worked and reject flints (strictly speaking, chert or hornstone), etc., occur in quantity. For the sake of brevity, as well as clearness, the principal stations and the nature of the archaeological material obtained from them are presented in tabular form as follows:—

No.	Name or Locality	Ashes	Shell refuse	Animal bones	Human bones	Chipped flints, etc.	Ground stone implements	Bone implements	Shell artifacts	Potsherds	Textiles, gourds, etc.
† 1	Mammoth Cave vestibule	*	*	*	*	*	*	*	*		
† 2	Mammoth Cave interior	*			(*)	*					*
† 3	Flint site in clearing above Mammoth Cave					*					
† 4	Flint site in valley bottom below Mammoth Cave					*					
† 5	Dixon's Cave, near Mammoth Cave										
† 6	Cave adjoining White Onyx Cave, near Mammoth Cave				(*)	(*)					
† 7	Moonshiners' Cave, $\frac{1}{2}$ mile below Mammoth Cave landing										
† 8	Flint site on valley bottom opposite Moonshiners' Cave					*					
† 9	Bone Cave, ca. 5 miles below Mammoth Cave landing, right bank				*	(*)					
† 10	Rock-shelter, ca. 200 yards below Bone Cave, right bank	*		*	*	*				*	
11	Haunted Cave, ca. 6 miles below Mammoth Cave landing, right bank										
12	Cedar Sink, 5-6 miles southwest of Mammoth Cave					*					
† 13	Rock-shelters (2) on the Napa farm, ca. 2 miles above Mammoth Cave landing, right bank			*		*					
14	Flint site on the Napa farm, ca. 2 miles above Mammoth Cave landing, right bank					*					
15	Flint site in Eden Valley, south of Three Springs					*					
16	Flint site and rock-shelter near Preacher Brown's house					*					
17	Flint site around Curtis Cave entrance, Eden Valley, ca. 2 miles east of Mammoth Cave					*	(*)				
18	Flint sites above and below Bedquilt Cave					*					
† 19	Salts Cave entrance and vestibule	*	*	*	*	*					
20	Salts Cave interior	*									*
21	Flint site in field surrounding Salts Cave					*					
22	Lard Cave and field, 15 miles up river, near Rowletts				(*)	(*)					

† Sites tested by investigation.
 (*) Reported finds.

All but the last-named situation are within a radius of six miles of the Mammoth Cave. Within this area many additional but mostly nameless places were indeed superficially examined with negative results, the sites listed above being merely such as were either tried out by excavation or on which positive data were obtained without prospecting. Yet the search was by no means exhaustive, as was made apparent during the last few days of my stay when reports began to come from various quarters about "Indian caves," etc., though evidently some of these were outside the six-mile limit.

As may be observed in the table, the majority of the real archaeological stations are characterized by the presence of flint artifacts and by little else. The three or four principal exceptions are numbers 1 and 2, 10 and 19. Of these the last-mentioned, viz., the Salts Cave, may properly be omitted from detailed discussion. Several days were in fact devoted to work in and around the entrance to this great cavern but no refuse deposits could be located which had not already been turned over by previous investigators. Consequently, there is nothing of importance to add to the published observations on this site and the present new developments in the local archaeological problem are based on data obtained at sites 1, 3, 8, 10, 17, and 21, in fact almost altogether on sites 1 and 10, i. e., the Mammoth Cave vestibule and the small rock-shelter near Bone Cave.

Before proceeding to the subject it seems necessary to call special attention to the fact that the archaeological material to be presented comes mainly from three different sources, namely: (1) the open fields around the cave entrances, (2) the cave entrances proper, and (3) the cave interiors. Unfortunately, these three groups of data are somewhat disparate phenomena; that is to say, our understanding of their connections, culturally and chronologically, is incomplete. The relation of the cave vestibule material to that of the cave interiors is reasonably clear; but there is no telling where the surface material from around the cave entrances belongs. In other words, the inner logic of our theme does not show where we should begin or where end. Any one of several possible mechanical arrangements is open to objections. Up to the present time nothing trenchant has been published except on data from the cave interiors and it would seem most natural perhaps to begin with that division of our subject already made partially familiar. The historical perspective of the local archaeological investigations is, however, deemed of secondary importance in a disquisition of this kind and it will therefore be ignored. The troublesome division of our subject, i. e., the data from the surface around the cave entrances, will be taken up first and disposed of very briefly by descriptions and comparisons. Next we shall pass in review all the published and newly

gathered data from the interior of the caves and point out their close relation to the moundbuilder culture and their comparatively modern origin. And finally, we shall turn to a more intensive study of the new line of data discovered in the Mammoth Cave vestibule, which data seem to the writer to be indicative of an older and more primitive stage of culture than has yet been recorded in this section of the country.

SURFACE SITES, MAINLY AROUND CAVE ENTRANCES.

Among the "curiosities" offered for sale to the Mammoth Cave visitors in 1916 were several arrow points and similar objects of chert. Inquiry disclosed that the disposal of such things was once a fairly thriving business and that certain individuals of the neighborhood have scoured the surrounding country to keep up the supply. The places where the relics occurred were spoken of as *flint sites*; and subsequent visits to some of the nearest of these revealed them to be probably either village sites or workshops. Naturally, after being hunted over for two or three generations, these places yield very few of the well finished and easily recognizable types of artifacts; but the less specialized types, such as scrapers or the unfinished forms of chipped blades, are still quite common. The most productive sites discovered were numbers 3, 8, 17, and 21 of the table in the introduction (p. 11) and all the specimens presently to be described were obtained at one or the other of these four places.

GENERAL DESCRIPTION OF SITES.

Mammoth Cave Field. Site number 3 denotes the wooded slope and the adjacent plateau directly above and east of the Mammoth Cave entrance. Owing perhaps to a partial reforestation of the locality since aboriginal days and possibly also to the more intensive searching on the part of relic hunters, comparatively little archaeological material was to be seen here. If the place was a village site, as would seem probable, there were no distinct indications of any kind to prove it either in the way of house sites, black camp dirt, broken pottery, or abraded stone objects. Only about sixty worked and unworked pieces of chert were brought away, but the fact that they occurred so close to the cave entrance seemed very suggestive.

Moonshiners' Cave Field. The locality given as number 8 (p. 11) is a small semicircular flat partly enclosed by the first bend of the Green River below Mammoth Cave Landing and situated directly opposite Moonshiners' Cave. There is, however, no apparent relation between the flint site and the cave other than that of juxtaposition, and the name has been applied merely as a convenient designation. The situation seems strongly sugges-

tive of a village site but the field has been under cultivation for a long time and it may also have been flooded repeatedly so that no aboriginal traces except chert fragments remain. At the time of the visit the field was in grass and a workman and myself in the course of a half hour picked up only eighteen more or less distinctly worked specimens; but, according to common report, it was formerly a very rich site.

Curtis Cave Field. Site number 17 indicates the little-known Curtis Cave, located in the Eden Valley, roughly two miles east of Mammoth Cave. The entrance to the cave is situated in an open cultivated field close to the base of a low wooded hill and is choked up with alluvium so that it cannot be traversed without a good deal of preliminary excavation. The surrounding field for some two hundred yards in certain directions is liberally strewn with fractured chert and apparently nothing else. To be sure, reports were current that "pestles" and other things had been found here; but while in the course of an hour's search we picked up over one hundred pieces of worked chert we did not observe a single indication of abraded stone work. This site is also known as one formerly rich in fine chipped stone specimens and a large fairly exquisite but typical spear point, said to have come from the place, was seen in the possession of a neighboring farmer.

Salts Cave Field. The last surface site to be specifically mentioned is number 21 of the preceding table, viz., the field surrounding the entrance to Salts Cave. This archaeologically well-known underground den is located some three miles in a northeasterly direction from Mammoth Cave and in surroundings that might be characterized as gently rolling country. In the midst of an open field there is to be seen a clump of trees standing apparently on a low hillock. Going up the incline and stepping in among the trees one is unexpectedly confronted by a sink-hole measuring something over 100 by 150 feet on the horizontal and perhaps 50 or 60 feet in depth. The north slope of the bowl is particularly steep, being in fact partly broken by vertical rock exposures. From a gouged out seam in the rock, some 25 feet below the rim of the bowl, there issues a small stream of water which pours over the remainder of the escarpment below and falls directly into the small entrance to the cave. In all probability the stream produced the entrance, though that is a suggestion of no particular concern to us. The local conditions have been outlined merely to show that we have here in close proximity all the elemental necessities conducive to permanent settlement, such as wood, water, soil for cultivation, and even shelter, if desired. Accordingly, the evidences of aboriginal frequentation in and around the entrance to this great cavern are no cause for surprise.

As has already been stated, there are indications that the entrance to

the cave was used for camping purposes¹; although, in reality, only to a very slight extent. The reason for this was doubtless that the vestibule contained scarcely any level floor space and, what was more important, daylight could not reach even what little suitable camping space there was. Nevertheless, chert fragments were found both in the vestibule and on the slope of the sink-hole outside; though their frequency here was nothing compared to what was observed in the cultivated field surrounding the sink-hole. Repeated searches were made here and forty-two worked chert pieces out of over two hundred odd finds were brought away; but, as in the case of the preceding sites, nothing else was found to indicate that there had ever been a village in the vicinity.

Citations of similar additional archaeological stations might be given on hearsay but the above will suffice. Whatever these places are, whether village sites or workshops, the conviction was inescapable from the start that they bore some intimate relation to their respectively adjoining caves. That the chert was quarried in the caves, as now seems most probable, did not occur to the writer at the time. Instead it seemed that the Indian perhaps chose to build his village near some cave entrance so that in time of trouble he might have a place of safety. If not that, then, inasmuch as he could hardly have lived permanently in the cave interiors, he must have lived in the entrances. Was it not already shown that he had lived in the Salts Cave entrance, even if the evidence was incommensurate with the amount of chert scattered in the surrounding field? It was reasoning of this sort that later resulted in excavations in the Mammoth Cave vestibule.

CHERT ARTIFACTS DISCOVERED.

The investigation of the Green River surface sites having been both local and desultory it seems useless at this time to attempt detailed textual descriptions of all the items discovered. Several writers such as Carr, Fowke, Young, Moorehead, and others have already familiarized us with the general nature of Kentucky's chipped implements. A rough analysis of the recognizable forms, with some illustrations, is needed, however, for purposes of comparison with the chipped artifacts from the Mammoth Cave vestibule to be described later. In addition, there are three forms which appear to merit special attention because of marked resemblances they bear to certain well-recognized European palaeoliths.

Miscellaneous Forms. The miscellaneous surface collections, partially illustrated in Fig. 1, appear to include:—

¹ Young, 305.

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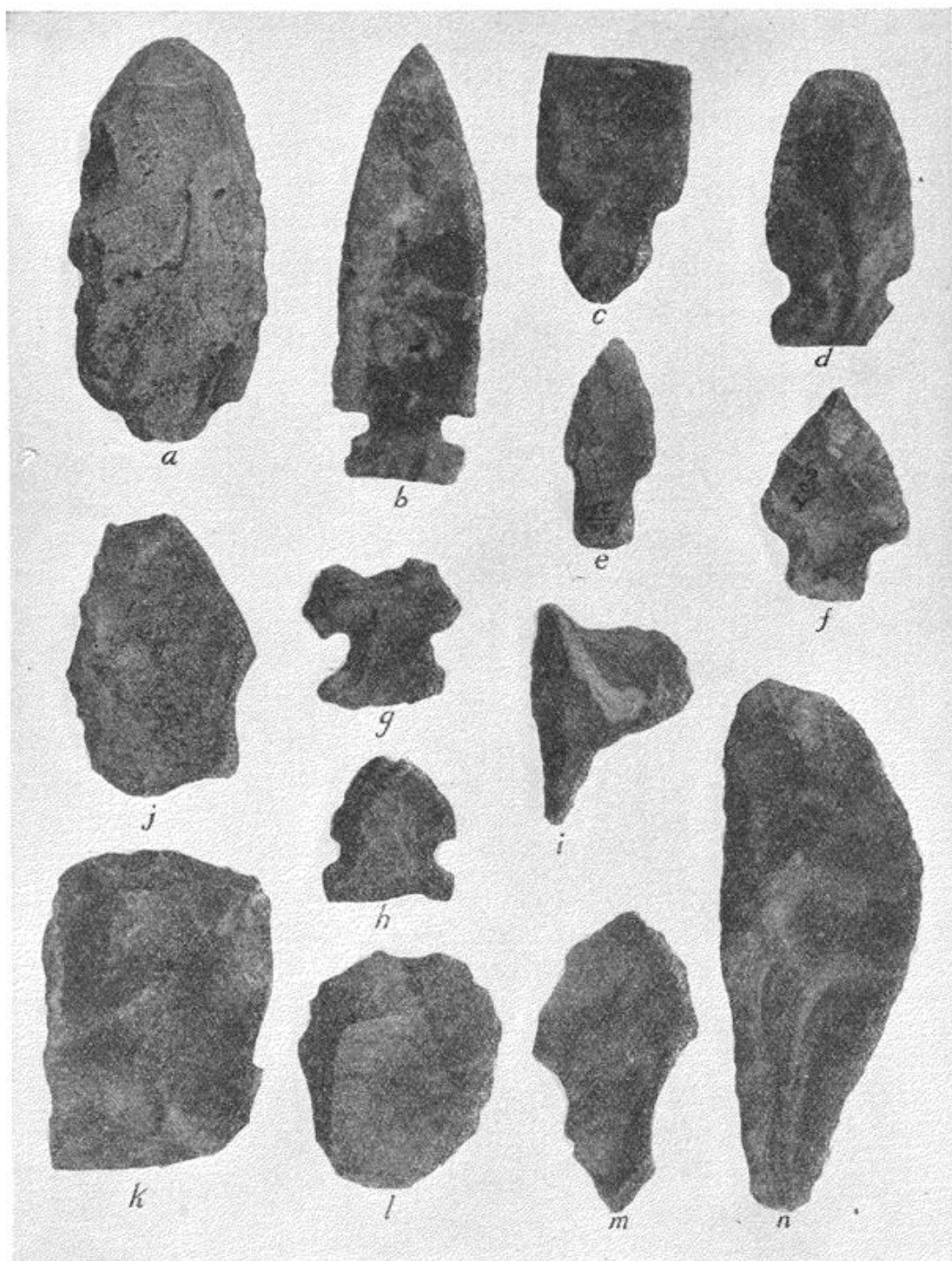


Fig. 1 *a* (20.1-212a), *b* (20.1-209a) *c* (20.1-212b), *d* (20.1-203a), *e* (20.1-209b), *f* (20.1-205), *g* (20.1-212c), *h* (20.1-203b), *i* (20.1-203c), *j* (20.1-212d), *k* (20.1-203d), *l* (20.1-213a), *m* (20.1-203e), *n* (20.1-209c). Chipped Implements from Surface Sites. $\frac{2}{3}$ Nat. size.

- I. *Core Forms — Flaked and Chipped All Over*
 1. Unfinished Blades
 - a Oblong (Fig. 1a)
 - b Nearly disk-shaped
 2. Spear Points
 - a Notched for attachment (Fig. 1b)
 - b Stemmed for attachment (Fig. 1c)
 3. Arrow Points
 - a Notched (?)
 - b Stemmed (Figs. 1e, f)
 4. Knives or Scrapers (Fig. 1d)
 5. Scrapers
 - a Notched edge (Fig. 1g)
 - b Rounded edge (Fig. 1h)
 6. Perforators (Fig. 1i)
- II. *Flake Forms — Chipped on Convex Side Only*
 1. Scrapers — more or less thick
 - a Side-scraper (?), i. e., *racloir* (Fig. 1j)
 - b End-scraper or planing tool (?), i. e., *grattoir* (Fig. 1k)
 - c Notched scraper (Fig. 1m)
 2. Knives or thin scrapers
 - a Oblong (Fig. 1n)
 - b Disk-shaped (Fig. 1l)
 - c Irregular forms

The "flake form" division of the preceding list contains several specimens which are suggestive of European palaeoliths, particularly those illustrated by Fig. 1k, l, n. Roughly speaking, they consist of concavo-convex flakes which have been retouched by chipping along the edge, the chipping having invariably been done from the concave side. Fig. 1k might pass for a Mousterian scraper and Fig. 1n is a blade of the sort that is very common in Aurignacian and later deposits. But with only a few specimens in hand it would be unprofitable to dwell at length on the suggested similarities.

End-Scrapers. A rather more interesting type of tool, of which several examples were found in the Curtis Cave Field, is shown in Fig. 2. The type is well known and has been figured and described before.¹ It appears to occur practically all over the Mississippi Basin, including western Texas, New Mexico, and Wyoming. Moorehead classifies the type as a "spoon-shaped" scraper and the labels in the National Museum identify it as a "duck-billed" scraper. The different names suggested by these terminologies correspond in a measure to an actual difference in form between the specimens from the eastern and western borders of the range of distribution. Those of the west, say from North Dakota or from the Staked Plain of Texas,

¹ Fowke, 170; Moorehead, (c), 198-209.

are generally rather short and rounded or oval in outline, while those from the states east of the Mississippi are more often oblong, as in the case of the given illustration. Essentially, the particular specimens with which we are here concerned are more or less prismatic flakes, of somewhat triangular outline, the broader, thicker ends of which have been dressed by chipping to a very high or abrupt angle. Often the chipping has been carried along one of the sides, occasionally even both sides; but in some specimens it is confined entirely to the end. Evidently the end retouch was for purposes of utilization while the side retouch was probably for accommodation.

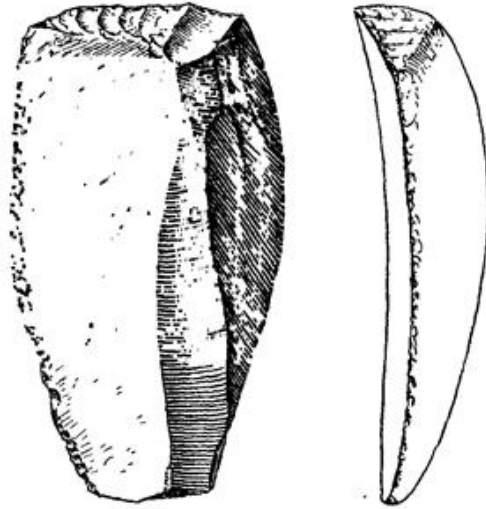


Fig. 2 (20.1-212e). Typical Chipped End-Scraper from Surface Site.

From the fact that this type of implement seems to belong to the Plains Area it has generally been regarded as a skin scraper; and the majority of the specimens being too short and stubby to be held effectively by the fingers it has been inferred that they were set in handles of wood or bone. Whether hafted specimens have ever been found I have not been able to ascertain, but in any case there seems to be no reason for promulgating a new theory about them. The western forms being little more than an inch in length they must undoubtedly have been hafted, but it seems quite possible for the specimen here illustrated to have been held directly in the hand, although it is only of medium length. Whether their use was entirely confined to skin-dressing may be questioned; some might conceivably have been used also for scraping wood or bone. The abrupt and somewhat dulled edge was no doubt deliberately devised for purposes of control. By this is meant that whereas a thin cutting edge might take too large a bite and thus ruin the object on which it is being used, a dull abrupt edge like the one here adopted could not do so. This difference is in a measure comparable to that existing between the spoke-shave and the plane.

But the point of chief interest about this tool is that in general form and in mode of production it is almost identical with the European *grattoir* of the middle and upper palaeolithic industries. The European type to be sure is usually longer and the retouched end is more often rounded than straight, as in the illustration. Besides, the French forms at least are made with superior skill and precision owing probably to the greater tractability of the raw material employed. Now, as is well known, the European

archaeologists have long regarded their *grattoir* as a sort of primitive planing tool; and while this explanation need not be entirely discredited it would seem possible that we might in time convince them that some of these planing tools were skin-dressing implements.

Side-Scrapers. In addition to the roughly crescentic side-scraper

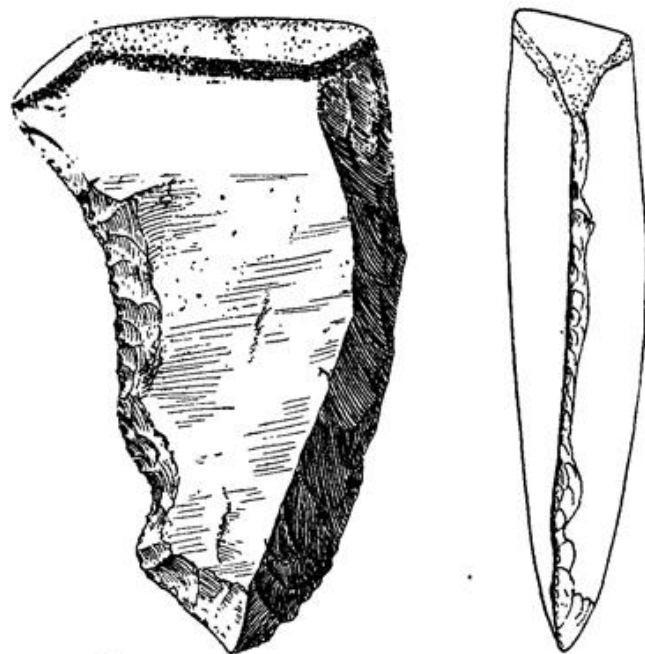


Fig. 3 (20.1-213b). Chipped Side-Scraper from Surface Site. Nat. size.

illustrated by Fig. 1 j, two or three others were found in the Curtis Cave Field. The most interesting of these is shown in Fig. 3. It is an oblong, slightly curved flake of triangular cross-section. The one thin incurving edge has been slightly retouched on one side, presumably for scraping purposes, while the thick edge, or back, has been chipped it would seem for purposes of accommodating the hand. It is an implement which would delight Professor Rutot. But without going into further details, we may conclude simply by stating that this tool and the similar ones mentioned might very easily pass for Mousterian scrapers.

Geometric Form. The last specimen to be singled out from the surface collections is shown in Fig. 4. Unfortunately it is the only one of its kind available and perhaps apology is due for presenting it. I have no desire to classify it or even to describe it in detail.

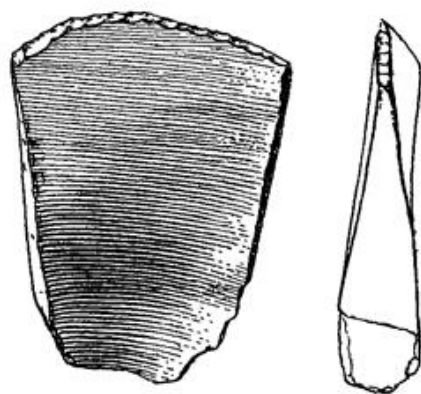


Fig. 4 (20.1-212f). Chipped Geometric Implement from Surface Site. Nat. size.

Possibly it is nothing more than an odd form of the previously described end-scraper; but it looks very much like the geometric flints of late palaeolithic times. At least it is not a fragment of a larger tool: it was deliberately made into its present form.

CONCLUSIONS.

Perhaps before leaving the subject it may be well to state that there is no attempt to mislead anybody regarding the Green River flint industries. The liberties taken with terminology and the comparisons made with European palaeoliths have been resorted to only for purposes of precision. Our Kentucky specimens might be of historic date so far as evidence to the contrary is concerned; but their resemblance to palaeolithic forms is not fancied. It is my personal opinion that were a well-selected series of these specimens handed over in an unlabelled condition to an European archaeologist the chances are more than even that he would recognize them as palaeoliths and would proceed to distribute them over the whole range of that culture. But of course no sound inferences can be drawn from this fact regarding American chronology. For the present at least our specimens are merely proofs that in the elementary stages of tool-making the Indian and the palaeolithic man of Europe hit on the same processes, simply because they were the right processes.

As to the nature of the sites themselves at which the specimens were picked up, no positive conclusion can be reached. They may have been village sites in spite of the fact that no evidence exists to that effect; but, inasmuch as we shall show later on that the chert in question was probably quarried in the respectively adjacent caves, it seems at least reasonably certain that our surface sites are essentially workshops, if nothing more.

INTERIORS OF THE MAMMOTH AND NEIGHBORING CAVES.

The present investigation was not extended in any protracted or systematic way to the interior of the caverns in the Green River country, for the reason mainly that this line of work seemed already well in hand. To have accomplished anything further of prime importance would have required more time than was at my disposal. A hasty examination was made in the forward part of Salts Cave, but only a very few notes and collections were secured. In the Mammoth Cave, besides two or three preliminary visits, one entire day was devoted to a special examination of the main cave and a few of its secondary passages lying between the entrance and the dome known as Chief City. Some of the resulting data are new and worth recording, but before doing so it seems desirable to detail in a summary way the essential facts already placed on record by prior investigators.

EARLIEST DISCOVERIES, 1810-1820.

The date of discovery and the history of early exploration, not only of the Mammoth Cave but of many other caverns in the vicinity, are shrouded in uncertainty.¹ As a natural result, there is some confusion regarding the origin of many of the archaeological specimens recorded in the early writings. The late Professor F. W. Putnam while a member of the Kentucky Geological Survey, from 1870 to 1875 or thereabouts, was probably the first to approach the subject in a scientific manner. He made explorations of his own in several of the caves in question and he also reviewed the origin and nature of the earlier finds, some of which date back to about the year 1810.

One find in particular, that of a richly furnished mummy, is of interest because it was minutely described as early as 1813, when it was exhibited in the Mammoth Cave. This description is quoted by Lewis Collins in his *History of Kentucky*,² from which the following relevant excerpts are taken:—

On my first visit to Mammoth Cave in 1813, I saw a relic of ancient times, which requires a minute description. This description is from a memorandum made in

¹ For the discovery of Mammoth Cave various dates ranging from 1797 to 1809 are given. See, e. g., Hovey, 15.

² Collins, Vol. II, 159-160.

the cave at the time. In the digging of the saltpetre earth in the short cave [supposed by some to be Gothic Avenue in the Mammoth Cave], a flat rock was met with by the workmen, a little below the surface of the earth, in the cave; this stone was raised and was about four feet wide and as many long; beneath it was a square excavation about three feet deep and as many in length and width. In this small nether subterranean chamber sat in solemn silence one of the human species, a female with her wardrobe and ornaments placed at her side. The body was in a state of perfect preservation, and sitting erect. The arms were folded up, and the hands were laid across the bosom; around the two wrists was wound a small cord, designed, probably, to keep them in the posture in which they were first placed; around the body and next thereto were wrapped two deerskins. These skins appeared to have been dressed in some mode different from what is now practised by any people of whom I have any knowledge. The hair of the skins were cut off very near the surface. The skins were ornamented with the imprints of vines and leaves, which were sketched with a substance perfectly white. Outside of these two skins was a large square sheet, which was either wove or knit. The fabric was inner bark of a tree which I judge from appearance to be that of the linn tree. In its texture and appearance it resembled the south sea island cloth or matting; this sheet enveloped the whole body or [and?] head. The hair on the head was cut off within an eighth of an inch of the skin, except near the neck, where it was an inch long. The color of the hair was a dark red; the teeth were white and perfect. . . . The features of this ancient member of the human family much resembled those of a tall, handsome American woman. The forehead was high, and the head well formed. . . . I discovered no blemish upon the body, except a wound between two ribs, near the backbone; and one of the eyes had also been injured. The finger and toe nails were perfect and quite long. The features were regular. I measured the length of one of the bones of the arm with a string, from the elbow to the wrist joint, and they equalled my own in length, viz., ten and a-half inches. From the examination of the whole frame, I judged the figure to be that of a very tall female, say five feet ten inches in height. The body, at the time it was discovered, weighed but fourteen pounds, and was perfectly dry; on exposure to the atmosphere, it gained in weight, by absorbing dampness, four pounds. . . . The color of the skin was dark, not black; the flesh was hard and dry upon the bones.

At the side of the body lay a pair of moccasins, a knapsack, and an indispensable, or reticule. . . . The moccasins were made of wove or knit bark, like the wrapper I have described. Around the top was a border to add strength, and perhaps as an ornament. These were of middling size, denoting feet of a small size. The shape of the moccasins differs but little from the deerskin moccasins worn by the northern Indians. The knapsack was of a wove or knit bark, with a deep strong border around the top, and was about the size of the knapsack used by soldiers. The workmanship of it was neat, and such as would do credit, as a fabric, to a manufacturer of the present day. The reticule was also made of knit or wove bark. The shape was much like a horseman's valise, opening its whole length on the top. On the side of the opening, and a few inches from it, were two rows of loops, one row on each side. Two cords were fastened to one end of the reticule at the top, which passed through the loop on one side, and then on the other, the whole length, by which it was laced up and secured. The edges of the top of the reticule were strengthened with deep fancy borders. The articles contained in the knapsack and reticule were quite numerous, and were as follows: one head-cap, made of wove or knit

bark, without any border, and of the shape of the plainest night-cap; seven head-dresses, made of quills of large birds, and put together somewhat in the way that feather fans are made except that the pipes of the quills are not drawn to a point, but are spread out in straight lines with the top. This was done by perforating the pipe of the quill in two places, and running two cords through the holes, and then winding round the quills and the cord fine thread, to fasten each quill in the place designed for it. These cords extended some length beyond the quills on each side, so that on placing the feathers erect, the feathers could be tied together at the back of the head. This would enable the wearer to present a beautiful display of feathers standing erect, and extending a distance above the head, and entirely surrounding it. These were most splendid head-dresses, and would be a magnificent ornament to the head of a female at the present day. Several hundred strings of beads; these consisted of very hard, brown seeds, smaller than hemp seed, in each of which a small hole had been made, and through the whole a small three-corded thread, similar in appearance and texture to seine twine; these were tied up in bunches, as a merchant ties up coral beads when he exposes them for sale. The red hoofs of fawns, on a string supposed to be worn around the neck as a necklace. These hoofs were about twenty in number, and may have been emblematic of innocence. The claw of an eagle, with a hole in it, through which a cord was passed, so that it could be worn pendant from the neck. The jaw of a bear designed to be worn in the same manner as the eagle's claw, and supplied with a cord to suspend it around the neck. Two rattle-snake skins; one of these had fourteen rattles; these skins were mostly folded up. Some vegetable colors done up in leaves. A small bunch of deer sinews, resembling cat-gut in appearance. Several bunches of thread and twine, two and three threaded, some of which were nearly white. Several needles some of which were of horn and some of bone; they were smooth, and appeared to have been much used. These needles had each a knob or whorl at the top, and at the other end were brought to a point like a large sail needle. They had no eyelets to receive a thread. The top of one of these needles was handsomely scalloped. A hand-piece made of deer skin, with a hole through it for the thumb, and designed probably to protect the hand in the use of the needle, the same as thimbles are now used. Two whistles, about eight inches long, made of cane, with a joint about one-third the length; over the joint is an opening, extending to each side of the tube of the whistle; these openings were about three-quarters of an inch long, and an inch wide, and each had a flat reed placed in the opening. These whistles were tied together with a cord wound around them.

The author of the description, whose identity is uncertain,¹ has been held by some to ascribe the origin of his specimens to the Mammoth Cave. An uncritical reading of his text might perhaps yield such an interpretation, but in any case it is contradicted by at least two contemporary writers.² Professor Putnam probably discovered this for himself because in 1875 we find him referring the mummy to Short Cave,³ some eight miles away, while

¹ Collins, writing prior to 1847, in Vol. II, 159, refers to him as "a highly scientific gentleman of New York," while Professor Putnam, who quotes this same passage in full about 1875, (see *b*, 314) refers to it as probably written by one Mr. Merriam of Brooklyn.

² Farnham, 360; Wilkins, 361-363.

³ Putnam, e. g., (c), 413; (d), 8.

Dr. Hovey in his Mammoth Cave guidebook (1912) credits the same find to Salts Cave.¹ The actual facts of the case do not appeal to me as of any great importance. The writings of the day make it perfectly evident that several desiccated bodies were found at about the same time (1810-20), some in the caverns and rock-shelters of Kentucky² and others in similar places in Tennessee;³ and there is no inherent reason why one or more of these should not have come from the Mammoth Cave, especially as both Collins and Hovey state that skeletal material was uncovered here, presumably by the saltpetre workers, in the front part of the cavern.⁴ The Salts Cave finds alone seem to be entirely authentic, perhaps because of relatively late date, and Mr. H. C. Ganter of Glasgow Junction still possesses a mummy said to have been found here. A number of mummy discoveries, evidently belonging to one and the same culture level being thus confused, I can do no better in this place than to list the objects found with them, regardless of the cave from which they may have been derived. The important items are as follows:—

1. Cords, two, three and five stranded.
2. Fishing nets, fragments of.
3. Matting.
4. Baskets, fragments of.
5. Basket-coffins made of cane.
6. Cloth, two different kinds, woven or knitted of bark.
7. Bags, different sizes, woven or knitted of bark.
8. Moccasins, different sizes, woven or knitted of bark or flags.
9. Head-cap, woven or knitted of bark.
10. Belts.
11. Dressed deerskins, ornamented with imprints of vines and leaves.
12. Dressed deerskins with hair shaved off.
13. Headdresses of feathers.
14. Mantle covered with feathers — apparently attached shingle-roof fashion.
15. Blanket woven of feathers — same principle as the feather blankets from the Cliff Dwellings of the Southwest.
16. Fan of turkey tail-feathers.
17. Strings of beads made of perforated seeds.
18. Indian beads, two — presumably of stone but not found with mummy.
19. Necklace of fawn hoofs.
20. Pendant of eagle claw with suspension cord.
21. Pendant of bear jaw with suspension cord.
22. Needles, or awls, of bone and antler.
23. Whistles of cane reeds.
24. Wooden bowl, $\frac{1}{2}$ pint capacity — not found with mummy.

¹ Hovey, 33.

² Mitchill, 319.

³ Jones, 1-6.

⁴ Collins, II, 158; Hovey, 34.

25. Bows and arrows.
26. Poles cut with flint stones.
27. Rattlesnake skins.
28. Vegetable colors done up in leaves.
29. Deer sinews — and other minor objects.
30. Pottery vessels and fragments ¹.

This diversified list of cultural data speaks for itself and it is necessary merely in this place to point out to the reader two important facts concerning it. The first is that all but two or three of the above items were the accompaniments of so-called mummies; and the second is that while it is impossible now to find out how these mummies were disposed of in the caves, some at least were secreted in stone graves ² of the identical type commonly met with in the aboriginal cemeteries of both Kentucky and Tennessee and beyond.

KENTUCKY GEOLOGICAL SURVEY DISCOVERIES, 1870-1875.

The comprehensive State Surveys of Kentucky, begun about 1870 under the direction of Professor N. S. Shaler, resulted in a new body of archaeological data being gathered from the Green River caves. On the scientific staff was the late Professor F. W. Putnam, serving in the capacity of naturalist. His work, as it happened, included a study of the cave fauna and while collecting this material his attention was forcibly drawn to the evidence of aboriginal visitation in the caves. Precisely what and how much of strictly archaeological work Professor Putnam really did is not quite clear; but Shaler, in his preface to the first memoir of the survey, especially announces a monograph by Putnam entitled: "On the Cavern Dwelling Races of Kentucky," with six plates. This paper unfortunately

¹ The above items are abstracted mostly from notes and letters written under dates ranging from about 1813 to 1820, i. e., shortly after the discovery of several mummies in the Green River country. See bibliography under:

Fiske, 303-304; Mitchill, 319-320, 321-323, 329-330; Putnam, (b), 323-328; Wilkins, 362-363; see also Collins and Jones.

The history of the collection is partly known. Prior to 1815 most of it fell into the hands of the American Antiquarian Society, Worcester, Massachusetts, where it remained in 1875 when Professor Putnam reviewed it. Since then the mummy and probably all of its accompaniments are said to have been turned over to the National Museum, Washington, D. C., where some of the material appears to be on exhibit, as I have recently seen fragments corresponding to items 8, 13, 17 and also item 24, i. e., the wooden bowl. This last is possibly the hitherto mythical specimen which gave rise to the name Wooden Bowl Room for one of the chambers in the Mammoth Cave. The National Museum acquired a collection of textiles said to have been found (about 1877) with a mummy in a cave eight miles from Mammoth Cave and which has been described and partly figured. See Holmes, (b), 34.

² Wilkins, 362; Mitchill, 318; Putnam, (e), I, 5: 21.

was not issued, and Putnam's discoveries are set forth only in a limited way in the Peabody Museum reports and in several of the scientific periodicals of the day, already cited. In these abstracts it appears that Putnam collected most of his archaeological data in the Salts Cave, although he evidently also visited the Mammoth Cave and found similar if not as many specimens in that place. The list of specimens extracted from Professor Putnam's writing¹ includes:—

1. Bundles of raw textile materials.
2. Cords, different sizes.
3. Tassel or fringe of neatly braided fiber.
4. Cloth, finely woven, dyed black stripes, darned.
5. Moccasins of different sizes and materials.
6. Feathers, of turkey?
7. Reed torches tied with strips of bark.
8. Burnt sticks showing choppings of stone ax.
9. Gourds, fragments of large.
10. Wooden platter, fragment of a.
11. Pendant of perforated *unio* shell.
12. Arrow point of flint.
13. Fresh-water shells.
14. Animal bones.
15. Human excrement.
16. Skeletal remains, a considerable amount of.
17. Fireplaces and faggot stations.
18. Imprints of sandalled feet.²

As Professor Putnam has himself observed,³ his list of data corresponds in many points with those associated with the mummies and it is hardly to be questioned that the two series of artifacts belong to one and the same type of culture. In other words, we seem warranted in concluding that the people who buried their dead in the caves were the same who left their effects scattered about on the cavern floors.

RECENT DISCOVERIES.

The archaeological cave investigations begun by the Kentucky State Survey came to an abrupt end apparently about 1875 and since then nothing seems to have been done until a few years ago when Colonel Bennett H. Young of Louisville took a hand. As a man of wide interests and broad

¹ Putnam, (b), (c), (d).

² This series of specimens is still extant at the Peabody Museum, Cambridge, Massachusetts.

³ Putnam, (d), 8; (e), I. 8: 50.

sympathies Colonel Young for many years has been an enthusiastic collector of things relating to the prehistory of his state. His lectures on archaeological subjects have excited much interest in his own section of the country and in 1910, at the invitation of the Filson Club of his city, he prepared a sumptuous volume on the "Prehistoric Men of Kentucky," cited in the bibliography. The author expressly disclaims all effort at scientific presentation; nevertheless, the volume, in addition to its fine illustrations of rare and valuable specimens, sets forth not a few facts of importance.

Commencing in 1894 as a field explorer, Colonel Young gave particular attention to the Mammoth, the Salts, and the Colossal caverns; but like his predecessor, Professor Putnam, he seems to have found most of his specimens in the Salts Cave. In this last-mentioned place he made several new observations. Thus he located and worked a refuse deposit directly inside the entrance; he observed — as did the writer — that the salts efflorescing on the cave walls had in many places been carefully scraped away, though whether by the aborigines or not is uncertain; and he found places in the cave where an ocher-like clay had been dug. He also made note of the fact that worked and reject flints, etc., are strewn over the cultivated fields for a hundred yards or more around the entrance to the cave, indicating, probably, the former presence of a village or a workshop. Of movable cave artifacts he secured a long and interesting list, and I will cite those things not already included among Professor Putnam's finds. The list follows:—

1. Cords, two, three, four and five stranded, twisted, plaited, spliced.
2. Cloth, different weaves, some white striped.
3. Matting — reported found.
4. Moccasins, braided of cattail, of inner bark, of wild hemp; mended.
5. Reticule or bag, 8 by 12 inches, woven, with two handles of plaited cord.
6. Headdress of basket work of split cane.
7. Turkey feathers with perforation.
8. Cup made from squash shell or rind.
9. Bottle of gourd, half-gallon capacity.
10. Vessels of gourd, one showing evidence of boiling by means of hot stones.
11. Platters made from gourd and mended, with string.
12. Bowl or platter of sassafras wood, fragment of.
13. Digging or planting sticks.
14. Ladders of oak sapling and cedar, with branches.
15. Scrapers of mussel shell.
16. Bone awl.
17. Notched flint ax.
18. Chisel-like celt.
19. Pestle of stone.
20. Pottery vessel.
21. Bundles of firewood and faggot reeds.

22. Gourds and gourd seeds, some of which have been germinated.
23. Squash and squash seeds.
24. Watermelon rind and seeds.
25. Corncobs, apparently of three different varieties.
26. Sunflower head.
27. Wild grape stems.
28. Human excrement, indicating that sunflower and watermelon seeds, also hickory nuts, formed part of diet.
29. Tobacco leaves and seed pods.

This series of specimens, and others not mentioned—being simply duplicates of Professor Putnam's list,—were either found by Colonel Young or came under his direct observation and are nearly all illustrated in his book. I have not had opportunity personally to examine either this or any of the preceding collections, though probably even the oldest are still in part extant; and I have cited these lists merely for what they may be worth without comment and without accepting any responsibility for their absolute correctness.

There is one critical observation to be made in reference to Colonel Young's collection, and that is that he failed to keep separate his finds from the interiors of the caverns and those from the camp refuse worked over by him in the entrance to Salts Cave. This is unfortunate because, as will be made clear later on, it is possible that the two groups of data did not belong to the same culture level and were therefore very likely not contemporary. When at Salts Cave I personally devoted some hours to searching in the entrance for refuse beds which had not already been overturned and the meager traces that I found yielded data of a character identical with the findings in the Mammoth Cave vestibule.

PRESENT DISCOVERIES.

ARTIFACTS.

Summary List. We come finally to a brief consideration of the Museum's own data, obtained in part as a gift and in part by the writer while at the caves.

Referring to the specimens donated in 1913 by the Mammoth Cave Estate, it should be stated first that they appear to have been found, all of them, in the Salts Cave. A few articles are not strictly of archaeological value but eliminating these we may itemize the remainder as follows:—

1. Bundles of raw textile materials: flags, grasses, etc.
2. Cords, twisted and braided.

3. Cloth, a small fragment of — probably part of a moccasin.
4. Moccasins, two, adult size, with cord lacings (?).
5. Child's moccasin.
6. Deerskin, fragment of.
7. Torch of cane reeds tied together.
8. Knitted bands of grass and bark — probably from torches.
9. Bundle of ordinary sticks.
10. Two sticks spliced or tied together with cord.
11. Charred poles with marks of stone ax.
12. Gourds and squashes, large fragments of.
13. Sunflower head, portion of.
14. Tobacco leaf.¹

In addition to the above I collected personally in the interior of the Salts Cave the following:—

1. Corncob, portion of.
2. Human excrement.²

While from the interior of the Mammoth Cave were obtained:—

1. Knotted torch wrappings of bark.
2. Strings of different kinds.
3. Torch of reeds tied with bark.
4. Poles hammered and cut with stone tools.
5. Gourd fragments.
6. Human excrement.
7. Worked and reject flints.³

A desirable completeness might be attained perhaps by figuring and describing in this place each of the listed items. However, I venture to refrain partly because of the relatively limited range of the data and partly also because most of the items have been described more or less satisfactorily a number of times already in the cited bibliography. A few additional observations seem to be in place nevertheless with reference to the textiles; while the last item in the list, the worked flints, forms an entirely new lead which calls for special consideration.

Woven Moccasins. The shapely, slipper-like moccasins described and figured by Col. Young and others⁴ are represented in the American Museum collection by three very frail and fragmentary examples. Two are of adult size, their extreme lengths being about $8\frac{1}{2}$ inches; the third is of child size or barely 6 inches long, measured externally. In addition, there is a small textile fragment which, though of different technique, resembles the style

¹ Cat. nos. 20.0-5763-5778.

² Cat. nos. 20.1-215-216.

³ Cat. nos. 20.1-136-143.

⁴ Young, 301-2, 306-7; Moorehead, (c), 236; Holmes, (a), Figs. 67, 101; (b), Fig. 9.

of weave employed in most of the specimens illustrated by Col. Young and is probably part of a fourth moccasin.

Each of the four specimens appears to have been woven of some kind of grass, the blades alone having been used. Neither the warp nor the woof element is appreciably twisted on itself. The warp strands (18 in one specimen and 20 in another) run lengthwise, i. e., from heel to toe, and the woof element (or elements) crosses these for the most part at a right angle. The crossing is effected in one of two ways — either in plain wicker-work fashion or in simple twined fashion, but each technique with a special modification imposed perhaps by the uniqueness of the task in hand. The variation from the normal wicker technique lies in the fact that two woof

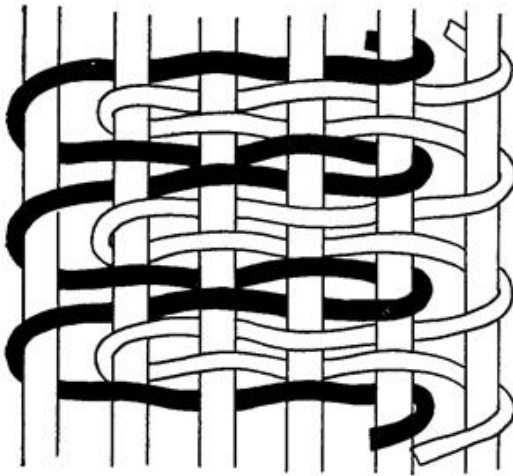


Fig. 5.

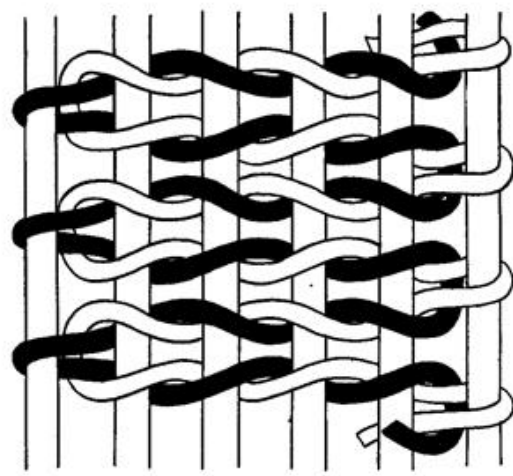


Fig. 6.

Fig. 5. Principle of Wicker Technique employed in Kentucky Cave Moccasins.

Fig. 6. Principle of Twined Technique employed in Kentucky Cave Moccasins.

elements are used under circumstances where only one would seem to be necessary and that one of these woof elements always passes around the right marginal warp but never the left, while the other woof element always passes around the left marginal warp but never the right. An examination of Fig. 5 should make the facts clear. The variation from the normal twining technique consists simply in the fact that the successive courses of the twined woof elements are twisted in opposite directions (see Fig. 6). Why this should be so can only be conjectured. Perhaps the resulting pattern was more pleasing; but, more likely, it was another scheme by which to avoid passing both woof elements over the marginal warp strands. To be sure, as may be found by experimentation, it is possible to turn the margin by only one woof strand and still keep the usual direction of twist, as in ordinary basketry, but it would leave the margin of the moccasin

somewhat weaker. In other words, it seems probable that the manner employed was a studied technical requirement. The next question to arise is: why should the marginal warp strands never be turned by more than one of the two woof elements? Again, though there is not enough material at hand by which to prove the case, I am strongly inclined to the opinion that it was a purely technical requirement. The weaving process began at the heel and ended at the toe, or rather in a median line above the toes. By omitting to pass one of the two woof elements over the marginal

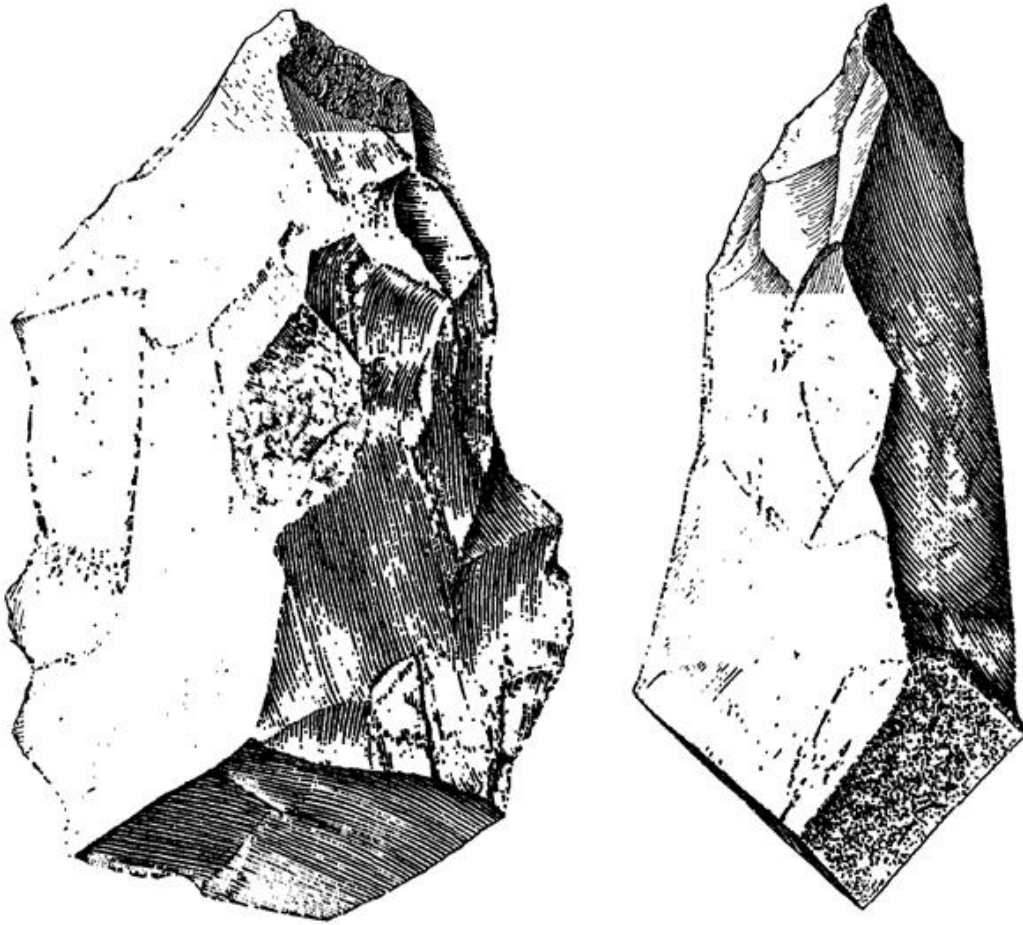


Fig. 7 (20.1-145). Roughly Blocked Out Implement from Flint Dome, Mammoth Cave. Nat. size.

warp strands the woven portion of the moccasin advanced somewhat faster in the middle than along the margins and this enabled the artisan to swing the two edges together over the toes in a perfectly natural way.

Without elaborating the facts any further in this place, we may close the subject by observing that the manufacture of moccasins of this type involves an extremely curious combination of basket-making and weaving principles, well worth further study.

Worked Chert. In looking over the published map of the Mammoth

Cave a place called Flint Dome was noticed. Later, when in the cave, I inquired about the place and the reason for its name. The answer was that flint occurred here and also in the neighboring passages. Mr. Louis Bransford, who was guiding, had not visited the gallery for many years and we experienced some difficulty in locating it. The floor of the narrow passages leading to our destination showed traces of both ancient fires and scattered torch reeds. But what was still more interesting was the fact that the flanking walls presented a slightly differentiated seam of rock, about two feet thick, studded with nodules of chert or hornstone. These nodules were of different sizes and projected varying distances from the wall. The projecting portions had in a great many instances been struck off, leaving exposed in the dull-colored matrix the bright blue-gray interiors of the nodules.

Here and there on the floor lay numerous incomplete nodules and frag-

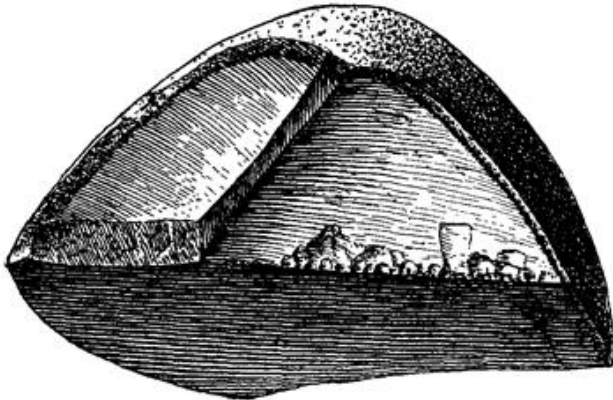


Fig. 8 (20.1-144). Scraper-like Implement from Flint Dome, Mammoth Cave. Nat. size.

ments, some with and some without incrustations. Handling a few of these I soon found two which appear to have been worked. One (Fig. 7) is a roughly flaked core of the *coup-de-poing* type, the beginning probably of a knife or a projectile point of some sort. The other (Fig. 8) is a partly incrustated flake with unmistakable evidence of chipping or re-touching along one edge. This

latter is strongly suggestive of the *grattoir caréné* or keel scraper so typical of the Aurignacian culture horizon in Europe. But while such a resemblance exists and there is probability also of the specimen having been used after the manner of the Aurignacian planing-tool, the particular form here shown is no doubt purely accidental. The point to be urged here is not that this or that type of flaked or chipped stone implement was made but rather the fact that raw material for such things was obtained in the cave.

The excursion to Flint Dome was made at the end of a long exhaustive day's work and the examination given the locality was consequently far from thorough. Nevertheless, the sum of the evidence establishes beyond reasonable doubt that the Indian quarried chert in the recesses of the Mammoth Cave. Very likely most of the chert fragments discovered in the vestibule excavations and also those found in the field about the entrance were obtained from outcrops in the cave similar to the one above described.

If then, as we have seen, worked as well as reject flakes of chert are likewise strewn in quantity around the entrances to the Salts and Curtis caverns — not to mention others — is it not a reasonable inference that the aborigines have also quarried in these caves? My own conclusion is, therefore, that whatever other purposes the Indian may have had in exploring the caverns, the search for raw material for tools and weapons was one.

GENERAL OBSERVATIONS.

Besides the collected specimens — identical in nature with those of preceding citations — independent notice was taken also of many collateral facts observed over and over again by prior visitors and investigators.

In Salts Cave particular interest attaches to the so-called Mummy Valley chamber. There seems to be a considerable amount of ashes here, but whether the powdery material is really camp refuse I found no opportunity to determine. If camp refuse, then it must be that there was, in aboriginal times, an entrance to the cave near this place, for it is altogether improbable that anybody should have carried firewood, torch material, and all the other necessities of life by way of the present entrance and a mile and a half or so beyond it into the interior.

In the Mammoth Cave the commonest evidences of aboriginal visitations — scattered reeds, fireplaces, etc., — are most frequent in the main cave passage. They begin immediately beyond the century-old saltpetre works and continue to the Black Chamber; then there is an apparent cessation until Chief City (about three thousand yards from the entrance) is reached and beyond which the guides said very little was to be seen. But some of the side galleries were also explored by the Indian. Thus, a large gourd fragment and other things were turned up a considerable distance out Blue Spring Avenue; reeds occurred in the passage connecting Cataract Hall and Fairy Grotto; and lastly, as we have just seen, worked chert fragments were found in the passages leading off to Flint Dome. There can hardly be a doubt that a thorough archaeological exploration would show the Indian to have visited all the readily accessible parts of the cave.

Having considered the general nature of the cave artifacts, it seems well to record also a few observations as to their principal modes of occurrence and the possible significance attaching thereto. Ordinarily, the cave floor is piled unevenly with rocks and boulders, but in some places it is covered with a deposit of fine yellow sand — the same sort of sand as was found in the vestibule excavation and presumably of fluvial origin. This material is today being used for dressing the tourist paths so that here and there pits

have been dug into it and examination is possible. The formation is normally dry as dust and, what is more strange, often conspicuously loose and structureless in the upper horizons, as if it had been handled. We dug into it in many places and found sections of charred cane, sticks, bits of string, pieces of gourd, etc., at various depths, but no human bones as we had hoped. The buried artifacts were commented upon by the Mammoth Cave personnel as normal occurrences. Mr. Edward Bishop, a reliable old guide, related that among other things a moccasin had been found some years ago in the vicinity of Snowcloud at a depth of more than two feet in this sand and beneath a boulder too large for one man to move. Whether this be literally true or not is of no particular moment; the topsyturvy condition of the upper level of the sand formation is a fact, and a fact rather difficult to explain. It seems plausible, however, that prior investigators, like ourselves, may have regarded these sandbeds as desirable burial places and in their hunt for skeletons they may have overturned the material. If the disturbance is due to the Indian, as it may well be, he would seem to have handled the sand for other purposes than interment or else he must have removed his dead on departing from the locality — a rather unlikely supposition.

But so far as reports and appearances go, the evidences of aboriginal frequentation are most common in the rocky portions of the cave. Naturally, after more than a century of tourist traffic through the main avenues of the Mammoth Cave little of importance is to be found except by painstaking search. In the Salts Cave, however, conditions must until recently have been quite different for neither Professor Putnam nor Colonel Young experienced difficulty in getting their respective collections, the items of which were found lying sometimes on the rock blocks but more often in crevices between them. In the Mammoth Cave today all that can be found on the surface in the way of strictly aboriginal artifacts are occasional bits of cord, knotted strips of bark from some torch bundle, chopped sticks and such like. On the other hand, broken sections of partly burnt cane¹ are exceedingly common, at least in certain localities; and we may perhaps elucidate the subject to best advantage by considering in detail what seems at present to be the most important of these centers of intensification, known in cave geography as Chief City.

Chief City is an immense dome situated in what is generally referred to

¹ A species of cane seemingly smaller but probably identical with that found in the cave still grows along the banks of the Green River, and a specimen brought away has been identified by Dr. Barrington Moore of the Museum Staff as *Arundinaria tecta*. Experimentation has not yet been carried out under proper conditions, but the indications are that a bundle of cane with a slight amount of nursing will yield a fairly steady flame without the application of oils or fats as some have thought essential.

as the Main Cave passage and fully three thousand yards from the entrance. It is the result of a tremendous tumble-down of rock which now rises from the normal floor level like a great heap of talus and over which the traveler has to climb. By inference from the published dimensions of the dome itself, this small mountain of débris measures about 300 by 550 feet on the horizontal and the height may be anywhere from 60 to 100 feet — I neglected to estimate it. In other words, the floor space within the limits of the great dome is unevenly heaped with a confused mass of broken, sharp-edged boulders, affording hardly a solitary spot sufficiently smooth and level for a man to lie down in. Nevertheless, reports (Hovey, 65-66) have been handed down to the effect that this place was a special rendezvous of the aborigines. Thus, the first white explorers are said to have found here implements and pottery as well as blankets of woven bark; and a certain Dr. Bird is quoted as having discovered in 1837 "astonishing unaccountable quantities" of cane, woven moccasins, and other remains. The combustible materials, according to the early cave managers and visitors, were sufficiently plentiful to be used in kindling bonfires with which to illumine the dome. Today no artifacts are to be found, but short sections of partly burnt cane are still thickly scattered and fireplaces are also noticeable in different places, though none with any considerable heaps of ashes.

Granting that all the above reports are substantially true, we have still to look for other convincing evidences that the place was in reality a selected retreat or camp. The Indian brought the combustibles and he no doubt also lighted most of the fires; but I searched his fireplaces in vain for a single trace of bone or shell, or anything else to indicate that he had eaten a meal here. I was told that shells had been found in the interior of the cave, but mere traces will hardly prove the existence of a permanent camp. Man in a state of nature is not a creature of nocturnal habits and we have no archaeological evidence to show that he ever resorted to anything so impractical and detrimental as to make his home in the inner depths of caverns. The idea is absurd! Yet primitive man seems to have explored caves the world over and his reasons for so doing are in most instances not at all clear. It is easy to give way to romancing on the subject and to say, e. g., that the Indian explored Mammoth Cave out of simple curiosity; but when the dangers and difficulties are soberly considered the explanation is not plausible. Neither does he appear to have used the cave as a "picture gallery" as was ostensibly the case with some of the early peoples of the Old World. With somewhat more show of reason it might be urged that the cave visitors interred their dead in the far interior as well as near the entrance; still, even if concrete evidence were present, such a custom could hardly have been general, involving as it did unnecessary practical difficulties. Chief City,

at any rate, does not readily lend itself to any of these explanations. The great dome, as has often been suggested, might have served for "secret council" meetings though hardly for ceremonies including dances; but why resort should have been had to this far-off place when there were others better adapted and just as secure much nearer to the entrance is hard to understand. It is thinkable also that the Indian brought hither great quantities of combustibles for purposes of lighting up the dome merely to satisfy his awe of its dimensions or perhaps to light his way across the chaotic mass of débris, but the size and situation of the fireplaces rather belie any such theory.

Shall we then conclude that the archaeological facts related in connection with Chief City are unexplainable? The answer must be both yes and no. Any one or all of the offered suggestions may be correct but the facts of the case do not prove them to be so. The facts, in short, do not furnish their own solution and our only recourse is to impose one, so to speak. Whether we shall hit upon the right explanation or not there can be little doubt that it is in reality very simple. Primitive man performs many acts which from our point of view are absurd and unnecessary yet he himself has usually a thoroughly practical end in view. The longer one deals with the mute evidences of early human intelligence the more one is impressed with the soundness of judgment exhibited in practical matters. In the present case the immediate purpose of bringing cane into the Mammoth Cave was of course to furnish material for illumination; but precisely why stationary fires should ever have been built in certain localities we cannot tell — if indeed these fireplaces are anything more than the remains of planted torches. As to the final purpose of lighting up the cave galleries, we have thus far only two or three suggestions. The first is that the Indian entered the forward part of the cave to dispose of his dead, the second that he explored somewhat farther into the interior for chert, and the third (as is suggested by the Salts Cave) that he scraped salt from the walls perhaps for medicinal purposes. If he had other reasons for venturing as far as Chief City and beyond they are not apparent. My personal opinion is therefore that Chief City was nothing more than an advance post in the Indian's cave exploration — a place where he collected quantities of torch material to be used for further exploration in all directions.

SUMMARY AND CONCLUSION.

We have considered somewhat more at length than was originally intended the archaeological data derived from the Mammoth and neighboring caverns off and on during the past century. The earlier discoveries

consisted of mummies or desiccated bodies some of them secreted in stone graves and accompanied by artifacts of a particular stamp. The later discoveries, including those made by the writer, embrace mainly artifacts of the same nature as those associated with the mummies but which were found scattered loosely about on the cave floors, proving incidentally that the Indian besides burying his dead in the caves also explored their interiors for purposes of quarrying chert. The identity and nature of the two groups of archaeological cave remains are accepted to mean that they belong to one and the same people or culture group and we shall try to show in the following pages what has already been suggested, namely, that this culture group is one with the so-called stone-grave people who were mound-builders and who maintained their chief traits down into historic time.

ROCK-SHELTER NEAR BONE CAVE.

SITUATION.

The one rock-shelter singled out for special consideration in this report is located some five or six miles down the Green River from Mammoth Cave Landing. The intervening course of the stream is, however, so excessively winding that the airline distance in question is probably less than three miles. So far as could be learned from local residents the place has no special name but its identity is easily fixed. It occurs in the right-hand limestone escarpment, opposite the lower end of Boardcut Island and about two hundred yards, or less, down stream from the locally well-known Bone Cave. Below it, perhaps three quarters of a mile, is another cavern known as Haunted Cave. A sort of gulch runs up the steep rocky bank from the water's edge to the shelter, which is easily caught sight of, at least when foliage is absent from the trees and bushes which screen the bluff.

Our discovery of the shelter was incidental to a search for the much talked of "Bone Cave." My guide and workman had not visited the locality for nearly twenty-five years, at which time he obtained "whole baskets full of human bones" in the cave.¹ On the present occasion, he at first mistook the shelter for the Bone Cave and on seeing his error left me at the former while he looked around for the real object of our investigation. During his absence I dug a test pit in the floor, made some interesting discoveries, and took a few rough notes and photographs, hoping some time to return and clear out the place. The prompt arrival of the already belated winter prevented this return, and in consequence the data to be reviewed are of a very rough and fragmentary character.

GENERAL DESCRIPTION.

The floor of the shelter was judged to be fully forty feet above the normal river level yet it had at some time been flooded to a depth of two or three feet, as was shown by mud adhering to the rock wall and other indications

¹ Unless there is some other Haunted Cave in this section of Kentucky, the present Haunted and Bone caves must have exchanged names since Lucien Carr collected skeletal material in the former (see Putnam, (e), Vol. II, 15, 209) because the Haunted Cave shown to me is unsuitable for sepulchral purposes.

of the high water mark. Semi-oval in outline, this "rock-house," as such places are called in local parlance, stretches about thirty feet along the cliff and the overhang measures as much as fifteen feet from front to rear. The place faces the sun and is a convenient and comfortable shelter, at least for summer use. The floor was strewn with slabs of rock dropped from the ceiling some four to six feet above.

EXCAVATIONS AND RESULTS.

The downstream half of the shelter floor appeared to contain some earth as well as rock and in about the middle of it a small pit was opened which ultimately expanded into a cavity something like 5 feet wide, 7 feet long, and $2\frac{1}{2}$ feet deep.

Relic-Bearing Débris and Contents. After removing a thin covering of earth there were encountered two layers of closely fitted pieces of limestone each about three inches thick and evidently broken remains of large slabs which had fallen *en masse* from the ceiling. Beneath was another stratum of earth and then again a bed of rock, which later turned out to be a stone grave. The earth referred to averaged five inches in thickness and in about the middle of it there was a thin streak of ashes and charcoal. Special examination of these ashes brought to light several bits of animal bone, four small flint flakes, one fragmentary blade chipped from the same material, and four very small fragments of pottery. There can therefore be no question as to the *débris* being genuine aboriginal camp refuse, even were it not true that pottery had before been reported from rock-shelters in this general region.¹

The potsherds alone may deserve a few words of comment, though very little can be said about them, as the largest fragment at hand is less than one inch square and no more than three-sixteenths of an inch thick. On closer scrutiny the sherd appears striated as if "wiped" in finishing. Its color on the outside is faintly reddish but the inner surface is black and crackled. The paste is heavily tempered by coarse crystalline rock particles — a fact of some interest because the large collection of pottery fragments recovered many years ago by the American Museum Expedition to the Fox Farm, in Mason County, northeastern Kentucky, appear invariably to be tempered with crushed shell.² In general, however, the ware seems to conform to that typical of the region at large and which, as far as I have observed, is of only ordinary excellence.

¹ Putnam, (b), 316; (e), 209, 491.

² Smith, (a), 190.

Stone Grave and Contents. The second deposition of rock encountered in the excavation exhibited relations indicating the presence of a grave, which was ultimately laid bare as shown in Fig. 9. It is, of course, an example of a mode of burial with which we are already familiar not only in Kentucky but in surrounding states. The cist in this instance is roughly oval in outline, measuring about 2 feet 6 inches by 3 feet 8 inches on the inside. It was constructed of twelve or thirteen slabs, of medium and small sizes, set up on edge and covered with two large slabs suspended about



Fig. 9. Stone Grave in Rock-Shelter on Green River near Bone Cave.

one foot above the bottom of the chamber, which was itself paved with small thin fragments of rock. Of the upright slabs there was one at the head (up-stream) and one at the foot which were exactly opposed and which in other respects appeared to be the principal rocks. The grave chamber was run practically full of solid earth, which when removed revealed the flexed remains of an adult female lying on the left side, head southeast, face southwest. The recovered parts of the skeleton are fairly well preserved; but, strange to relate, the lower jaw is missing. Probably no special significance attaches to this fact, however, because some of the larger bones show much evidence of having been gnawed and it is entirely possible that some rodent

carried off the mandible. The individual appears to be of slight build, with a skull bordering on brachycephaly, the index being about 79.29.

Not a single artifact was found to accompany the remains, but this also, according to Professor Putnam and others, appears to be nothing unusual.¹

GENERAL CONCLUSIONS REGARDING LOCAL CAVE AND ROCK-SHELTER REMAINS.

It is to be regretted that the entire shelter was not cleared out although in reality little is to be expected from it. The meager finds in and of themselves prove very little more than that the site was used first as a burial place and at some later time as a temporary abode, unless perhaps the ashes and fragmentary artifacts were burnt offerings of things properly belonging to the grave. In either case, however, both the nature of the grave and the presence of pottery above it links the rock-shelter find on the one hand to the previously considered discoveries in the interiors of the Kentucky and Tennessee caverns and, on the other hand, to the vanished "stone-grave" culture centering in the Cumberland Valley, but extending over the entire east-central portion of the Mississippi Basin.

Stone graves have been found before in rock-shelters² and sometimes with all the buried remains preserved intact, precisely as in the case of the previously described cave mummy finds. But, as is well known, most of the stone graves occur in the open, i. e., in cemeteries,³ in village sites,⁴ in earthwork enclosures,⁵ and in mounds⁶; and it is at first somewhat startling to learn that even here, under far from favorable circumstances, associated perishable artifacts, such as textiles, have occasionally been preserved. There is, however, little room for astonishment on this point, for one cannot read the French and Spanish exploration narratives covering the southeastern states without recognizing some of the archaeological specimens cited from the Kentucky and Tennessee caves. The inevitable conclusion is, therefore, that the cave data are representative of the mound-builder culture, which culture we know to have persisted down into historic times. Cyrus Thomas did not hesitate to pronounce some of the stone graves to be of even recent date⁷ and with equal assurance he ascribed the

¹ Putnam, (e), Vol. III, 164; Moorehead, (a), 120; Moore, 485; Thomas, 452.

² Fiske, 303-4; Thruston, 47-48.

³ Jones, 7; Thomas, 134-140.

⁴ Smith, 229, 232.

⁵ Thomas, 452.

⁶ Jones, 37; Mills, (g), 124; Putnam, (e), Vol. II, 342; Thomas, 302.

⁷ Thomas, 136, 690-701.

majority of them to Shawnee and Delaware Indians.¹ But we are not for the moment interested in ethnic associations. The wide range of interrelated cultural traits has been brought up merely to indicate that there are several independent lines of concrete evidence (aside from the somatic possibilities) by which the Green River people can be shown to have been members of the mound-building tribes and that the archaeological material collected, say in Mammoth Cave, need not necessarily be regarded as more than three or four hundred years old.

With this conclusion fixed in mind let us now proceed to an examination of the archaeological data discovered in the Mammoth Cave vestibule, data which it seems to the writer belong to a different stage of culture.

¹ Thomas, 692, 697, 698, 700.

MAMMOTH CAVE VESTIBULE.

SITUATION.

The entrance to the world-famous Mammoth Cave is located in the bottom of a deep forested ravine which drains into the Green River from the left side, directly above the head of steamboat navigation.¹ The distance down the ravine to the river is about six hundred yards and the distance to the head of the ravine, i. e., to the top of the plateau, is something less than two hundred yards. The elevation of the entrance is a little over one hundred and ninety feet above the normal river level and about sixty-five feet below the surface of the immediately surrounding country. The general trend of the vestibule and forward end of the main cave passage is from the southeast to northwest, the entrance facing in the latter direction, down the ravine.

ORIGIN AND NATURE OF ENTRANCE.

Whether there is any causal connection between the cave and the ravine does not particularly concern us, but the fact that the axes of the two practically coincide suggests the possibility that the ravine is in part due to the collapse of the forward end of the cave. In any case the present entrance is of secondary origin, having resulted from the collapse of the cavern roof due to the weakening by surface erosion in the bottom of the ravine directly above it. The rock and soil which fell produced a dam, as it were, across the passage and the modern visitor, to enter the cavern, simply comes to the bottom of the ravine, below the break, and walks down the steep slope of this débris. All the drainage coming down the ravine from the plateau now falls over the upper edge of the break and lands at the foot of the dam, but ultimately finds its way through this loosely packed obstruction and continues down the ravine to the river.

The position of the original entrance is of some concern to the archaeologist. It may have been either a couple of hundred feet farther down the ravine or it may have been through the entrance to what is known as Dixon's Cave, some three to four hundred yards to the north. If the old entrance

¹ The cave is ordinarily reached over the Louisville and Nashville railroad by way of Glasgow Junction.

was only two hundred feet or less in front of the present one the cave inhabitants might possibly have lived in the vestibule, as determined, though the daylight reaching them would have been negligible. If, however, the old entrance was by way of Dixon's Cave then it is reasonably certain that the Indian did not camp in the Mammoth Cave until after the present entrance was formed. But whatever may be true about the old entrances — and it is by no means impossible that the two were open at the same time — the presumption is strongly against habitation at that early date.

AGE OF ENTRANCE.

The implied age of the present entrance is a pertinent question for discussion. Perhaps expert opinion might differ on this point although geologists acquainted with the facts of erosion and deposition would hardly deny a respectable antiquity. It is my own opinion that the entrance originated simply as a sink-hole. At the time the vault underneath was 25 to 35 feet high and the roof, when it collapsed, fell *en masse* to the floor of the cave passage leaving a deep hole, measuring about 35 to 70 feet, in the bottom of the ravine. Now from all reports this hole when first entered, over one hundred years ago, was almost completely filled with rock and timber and alluvium rolled or washed into it from the ravine above. There is no certain way of measuring such accumulation, but in view of the fact that the roof-break was near the head of the ravine and the amount of drainage consequently very limited, it seems a safe guess that it involved a really considerable period of time. How long, whether one thousand or ten thousand years, would suffice to choke the entrance to the Mammoth Cave we shall have to leave for others to decide: the archaeologist may rest satisfied for the present at least in the assurance that the age of the entrance puts no narrow time limit on the occupation of the cave by the early aborigines.

DESCRIPTION OF THE VESTIBULE.

Descending about thirty-five feet down the artificially created débris slope fronting the yawning entrance, the visitor finds himself on the floor of a large vestibule or antechamber. At the forward end this vestibule is about 40 feet wide and 18 feet high; but a glance rearward shows the ceiling to drop and the walls to draw in, so that at a point about two hundred feet from the entrance the passage is barely 15 feet wide and 7 feet high. Most of these facts are sufficiently apparent in the appended sketch plans (Fig.

10) of the cave, but it is to be specifically noted that the present condition is at least partly artificial, because the floor level has been raised very considerably at the front of the chamber and excavated for passage at the rear, through the so-called "narrows."

The vestibule is dry and comfortable, subject only to draught according as the out-of-doors temperature rises above or falls below the constant temperature of the cave. A small stream of water falls, as before stated, directly into the entrance and daylight at present reaches back about one hundred feet. If the entrance had faced southeast instead of northwest it would have been a most ideal place for aboriginal occupation, more ideal in fact than the long occupied Castillo Cave in Spain.

Knowing beforehand that the Indians had frequented the far interior of the cave, it was impossible while visiting the place in May to resist the idea that they had camped more or less permanently in the vestibule. Indeed the flint flakes found in front of the cave and part way down the entrance slope made it seem absolutely certain. However, the cave management informed me that the slope was graded not many years ago and that the vestibule floor had been raised and leveled by the addition of rock and cave earth brought from the interior. But Trustee Janin was interested and gladly consented to some trial excavations.

EXCAVATIONS IN THE VESTIBULE.

Before describing the work done in the vestibule it may be well to state that the investigation was intended to be of an entirely preliminary character. During the tourist season it could be nothing else. In the dead of winter, when visitors are few, it would be feasible perhaps to open up an extended area of the cave floor such as would be necessary in order to get down to any considerable depth. But the work was carried far enough to determine some highly important facts, so that until the general cave problem takes a new turn the Mammoth Cave may safely rest.

The excavations began in the bottom of the ravine out in front of the cave and extended down the entrance slope and for about 175 feet back into the cave, i. e., very close to the iron gate. Three series of trial pits were dug, one along the east wall, one along the west wall and one down the center of the front slope and floor space. Those outside the entrance promised little and were therefore not developed very far except in the case of a single trench near the top of the entrance slope. This yielded nothing whatever and the excavations were therefore soon confined to the middle section of the vestibule proper where camp refuse came to light in several

places. The accompanying floorplan and sections are designed to indicate the position and extent both of the relic-bearing débris and of the principal excavations made in it and near it.

EAST SIDE TRENCHES.

Trench I. Immediately inside the entrance there is a large "rockfill" in the floor through which the water pouring into the cave finds its way to the open ravine below. According to common report this fill occupies a depression "over twenty feet deep" a depression presumably created in part by the water carrying away the intermixed soil and in part by the water dissolving the limestone itself. As we could not expect to reach a depth of twenty feet or more, the first floor trench was located several feet inside the rockfill in what appeared to be solid cave earth.

The site selected was 37 to 47 feet from the entrance — i. e., the point at which the falling water strikes the floor — and about 10 feet from the east wall. It seemed a place at which any depth might be reached without difficulty, but at little more than 5 feet below the surface we struck the living rock, evidently the undercurving cave wall, and could go no farther. The formation encountered was a yellowish clay-like substance, seemingly identical with the leached saltpetre earth stacked in the interior cave. In the matrix were mixed rocks, occasional bits of wood, bone, etc. Evidently the material was filled in, possibly more than a century ago, when saltpetre was being produced in the cave and when a driveway for ox carts, etc., had to be made over the uneven rocky entrance floor.

Trench II. The second excavation was 58 to 73 feet from the entrance. It marked the point where the yellow clay of Trench I gave way to bedded materials of entirely different natures. One of these new formations, lying near the surface, turned out to be Indian camp refuse, but it was so loose and so devoid of bedding planes that I was unable to decide for awhile whether it was a primary or a secondary deposit — i. e., whether it lay as the aborigines left it or had been moved by modern man from some place in the interior. But after working the vertical breast back for a few feet stratification duly appeared. Lying partly beneath the loose extremity of this Indian refuse and partly beneath the adjacent yellow clay (see Sect. A-B in Fig. 10) was found a thick oblique stratum which seemed also to be refuse. It was a homogeneous muck-like substance, rather black in color and characterized by numerous small white specks which for a time were taken to be disintegrated shell fragments. There was much charcoal in it and at a depth of 9 feet was found a roughly flaked flint, but whether

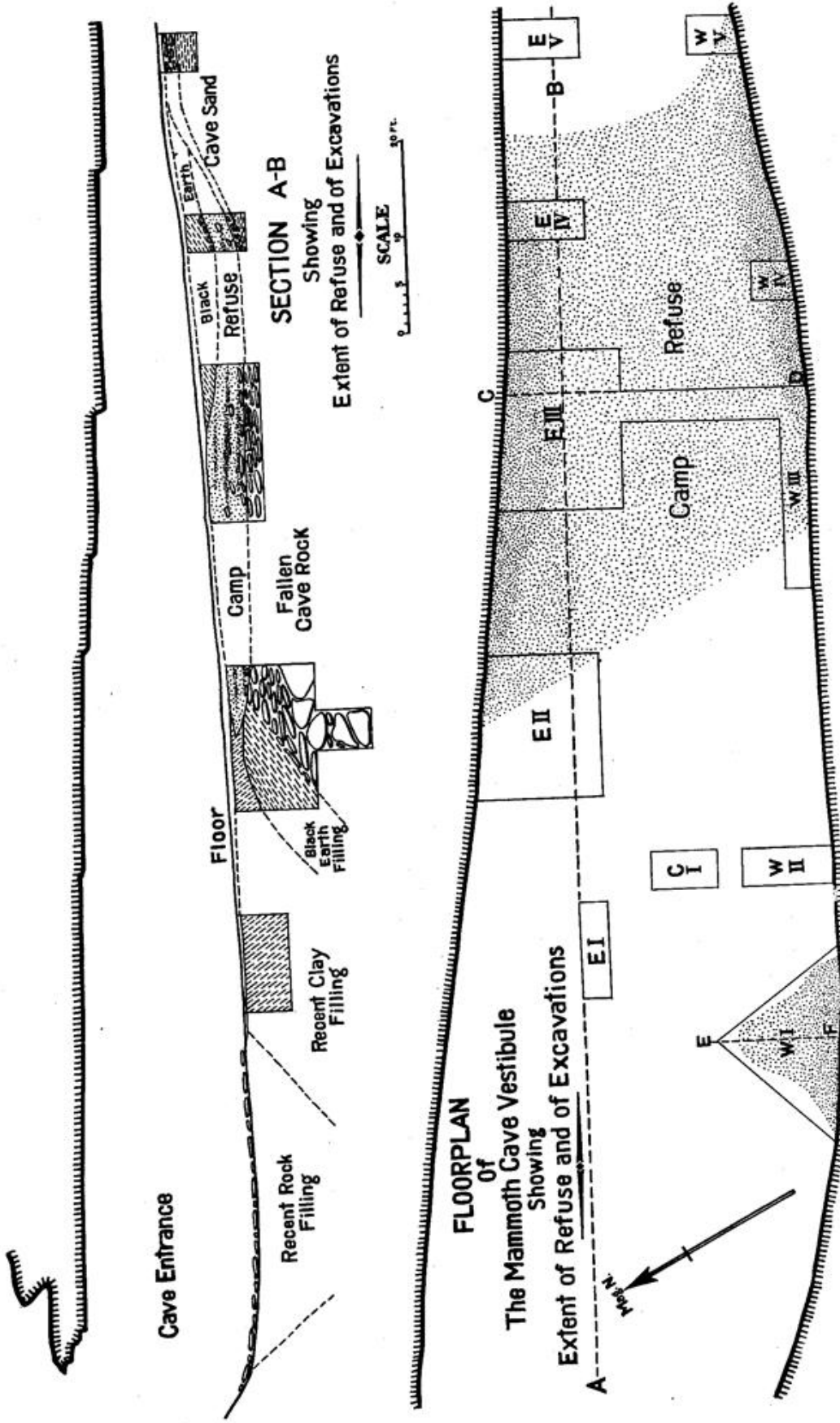


Fig. 10. Floorplan and A-B Section of Mammoth Cave Vestibule showing Extent of Camp Refuse and of Excavations.

natural or artificial would be difficult to say. In general appearance the formation seemed to be camp refuse, possibly of a very ancient date, and yet there were no animal bones, no shells, and no certain artifacts such as were found in the refuse above. On the other hand, the débris after awhile yielded bits of wood — apparently shingles — etc., and the conclusion finally reached was that it could be nothing else than modern débris.

Through this compact mass a trench had been cut, evidently a long time ago, and this trench was filled with all sorts of rubbish of a modern character. Beneath the whole we came upon broken rocks, at first small slabs and later great boulders. These latter were so large that it was impossible to carry the excavation below 10 feet, but the shovel could be let down through a crevice between two boulders fully 5 feet farther. Consequently, if there is any relic-bearing débris at this point in the cave entrance it is at least 15 feet below the present floor level.

Trench III. The next opening made in the cave floor began at a point 88 feet from the entrance and ended at 104 feet. This excavation was in

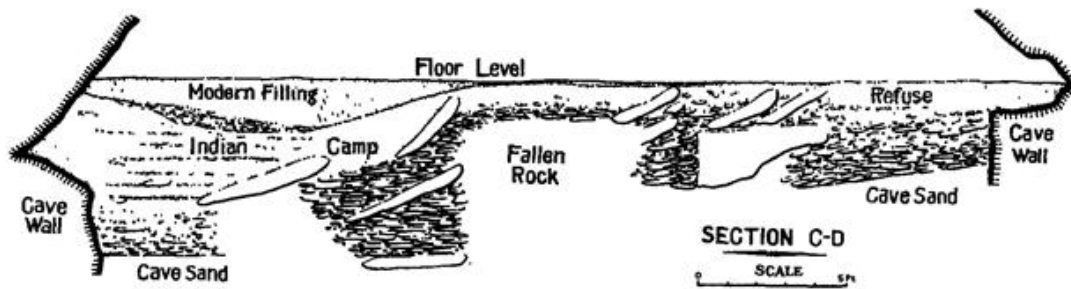


Fig. 11. C-D Section across Mammoth Cave Vestibule at about One Hundred Feet from the Entrance showing Order and Nature of Floor Deposits.

the heart of the relic-bearing deposit yielding a fair number of artifacts and for that and other reasons difficult to abandon. It was finally connected with an excavation along the west wall by means of a trench running clear across the cave (see floorplan, i. e., Fig. 10). The A-B and C-D sections (Figs. 10 and 11) of this excavation show the bulk of the distinctly stratified camp refuse to lie close to the east wall where in places it attains a depth of about 4 feet, while towards the center of the cave it thins out to a mere sprinkling. The forward end of the artificial stratum rises practically to the surface while the inner end dips under a sterile layer of what is probably, at least in part, modern filling. Limestone rock closely packed and placed in position as if dropped from the cave ceiling underlies the whole excavation, and the transition from camp refuse to clear rock is somewhat gradual. Over near the east wall the rock foundation consists of immense oblong slabs or blocks producing a sort of hollow shelf on which the greater portion of the camp débris lies. The main excavation was carried down into

the underlying rock mass, where possible, but in general only as far as the Indian débris had sifted, which was approximately 6 feet below the floor level.

Trench IV. The last east side trench to encounter the relic-bearing stratum was dug 116 to 120 feet from the entrance. It revealed conditions corresponding in a general way to those obtaining at the inner extremity of Trench III. Beneath the thin black surface veneer came first a 2-foot layer of sterile yellow clay, next a few inches of rock mixed with black earth, then the Indian refuse 2 to 3 feet in thickness, again a layer of rock, and finally a yellow laminated bed of fine sand, identical with the sand found in the interior of the cave. As the sand was apparently of aqueous origin it seemed useless to go any deeper. The noteworthy fact, shown in Sect. A-B, (Fig. 10) is that both the upper and under surfaces of the Indian débris rise towards the rear of the vestibule.

Trench V. The last trench indicated in the general A-B section conformed entirely with the suggestions of the preceding excavation. After passing through less than 2 feet of broken rock the fine sand appeared at once. This sand, as already stated, was carried to its place of deposition by flowing water and it is therefore very unlikely, in view of the position and general nature of the vestibule, that aboriginal remains are to be found beneath it.

THE WEST SIDE TRENCHES.

Trench I. This excavation, begun as a trench projected along the wall from about 20 to 40 feet inside the entrance, became a triangular cavity before it was finally abandoned. A glance at the general floorplan shows that a small pocket of relic-bearing refuse was found at this place. The accompanying E-F section (Fig. 12), taken at the point of maximum expansion of the débris, indicates a rather suggestive phenomenon. A layer of modern filling, consisting mainly of red clay, will be observed to cover the greater portion of the refuse; but for a distance of about 2 feet, next to the limestone wall, the plainly stratified Indian débris rises practically to the surface, attaining a depth of about 16 inches. The under surface of the débris is nearly level, resting as it does in part on a shelf of living rock covered with a trace of aqueous sand. Everything about the section is normal except the sudden drop of the upper surface of the refuse. The alternating layers of ashes and black débris are left hanging in the air, as it were. In other words, the indications are that a portion — probably the greater portion — of this refuse deposit has been removed. How this was done could not be verified but it seems most probable that it was accomplished

by the swirling waters of a pool created in the entrance to the cave perhaps at times of abnormal precipitation. Closer study of the section will throw some light on the amount of material removed. The white and dark streaks in the refuse section are observed to thicken and also to rise towards the right, i. e., in the direction away from the cave wall towards the center of the vestibule. This fact can mean only one thing, viz., that we have pre-

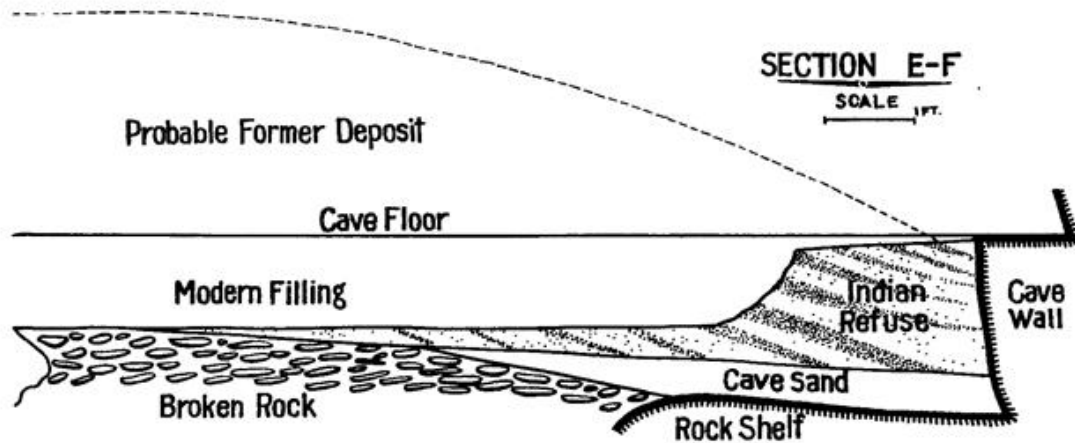


Fig. 12. E-F Section of Mammoth Cave Floor Deposits at about Thirty-two Feet from the Entrance.

served for us merely the shallow periphery of the original relic-bearing deposit. How large the deposit was, is of course impossible to say, but the evidence at hand seems to warrant the opinion that the Indian camped here for a long period of time. The mere fact that he camped so close to the entrance also suggests that daylight did not reach as far back in those days as it does at present. In other words, the array of facts here presented strengthens the opinion, already advanced, that the entrance to the cave was nearly closed by débris when discovered by the white man.

Trench II. We have now considered in some detail all the more important conditions obtaining in the various excavations and may therefore pass rapidly over the remaining trenches. The present cut extended from about 47 to 52 feet along the wall and, if we group with it the adjoining center excavation (C I on the floorplan) it reached practically to the center of the cave. From the wall for a distance of 8 feet the living rock was again encountered, only 2 feet below the floor surface; but farther out no bottom was reached. Our trench proper showed alternating layers of red clay, black refuse and even some ashes, but it was sterile and undoubtedly all of modern origin. In excavation C I came first one foot of red clay, next about a foot of broken rock and then red clay again, continuing to unknown depth. We penetrated only about 8 feet of the material, which was as in contiguous trenches of the nature of modern filling.

Trench III. This excavation commenced at about 80 feet from the entrance and ended at about 100 feet. It was merely a narrow trench 1 to 3½ feet deep. At 80 feet the floor was yellow laminated sand, at 85 feet the Indian refuse commenced with a thin wedge and at 100 feet it had attained a depth of 9 to 15 inches, as shown in section C-D. The débris rested on broken rocks down among which it had sifted for a foot or more.

Trench IV. This mere test pit, located at 109 to 113 feet from the entrance, revealed conditions similar to those on the opposite side of the cave. On top was found about 1 foot of red clay (modern filling), next 2 to 3 inches of clear Indian refuse, then 1½ feet of rock mixed with refuse, and finally clear broken rock, penetrated to a depth of only 1 foot.

Trench V. The last excavation to be mentioned was located at 135 to 139 feet from the entrance, exactly opposite Trench V by the east wall. It brought to light a very shallow deposit of camp refuse constituting the floor surface and lying on a rock foundation composed mostly of large blocks. The site marks the extreme inner end of the signs of habitation in the cave vestibule.

COMPOSITION OF CAMP REFUSE.

The deposit recognized as of aboriginal origin is composed mainly of ashes. In some of the sections obtained this substance occurred in a pure state as white lenticular streaks or beds; but as a rule it was mixed with other things — especially charcoal and presumably camp wastage of all sorts — which gave it a dull gray appearance. It was extremely dry and powdery. Omitting the artifacts proper, an ordinary ocular analysis of the refuse revealed the following components, listed in decreasing quantitative order:—

1. Ashes.
2. Charcoal.
3. Animal bones.
4. Fresh water shells.
5. Osseous human remains.
6. Fragments of sandstone — the so-called Chester sandstone.
7. A few waterworn pebbles.
8. Two or three small lumps of blue-green clay.
9. A small cemented lump of charred sunflower seeds.

The absence of bits of wood, corncobs, nutshells, etc., excited at first no particular thought. These things could have decayed, although one would suppose that objects of this character might have been preserved indefinitely under the conditions presented. But when potsherds as well

as all the finer examples of polished stone artifacts, common to the region, also failed to turn up, interest began to be aroused and consequently more of the refuse was worked over than was originally intended. Nothing availed, however, and the list submitted covers everything found. Of the items thus cited only a few merit further consideration.

Animal Bones. The osseous faunal remains taken out amount in quantity to barely half a cubic foot and the individual bones are for the most part fragmentary and therefore not entirely identifiable. The more obvious forms, as determined by Mr. H. E. Anthony and Miss Mary C. Dickerson, of the Museum staff, include: —

1. Black bear (*Ursus americanus*).
2. Virginia opossum (*Didelphis virginianus*).
3. Porcupine (*Erethizon dorsatum*).
4. Virginia deer (*Odocoileus americanus*).
5. Elk (*Cervus canadensis*).
6. Dog (*Canis*).
7. Brown bat (*Eptesicus fuscus*).
8. Box turtle (*Terrapene carolina*).
9. Turtle (*Kinosternon*).
10. Turkey (?).
11. Crane (?), and probably other birds.

If we compare this with similar lists published in recent years for Delaware,¹ Pennsylvania,² Ohio,³ Kentucky,⁴ and Missouri⁵ sites, we note, aside from the paucity of species in the Mammoth Cave (due most likely to the limited amount of work done), a general agreement. Thus the bison is absent, as is usually the case in most of the archaeological sites east of the Mississippi River.⁶ On the other hand, the bat has not before been reported, but as these creatures normally inhabit caves the presence of their remains here may or may not be due to human agency. The one possible new note appears to be the presence of the porcupine, although I am not in position to say that the Green River country is beyond the normal range of this animal. No fish bones whatever were discovered; but, strange as that may seem, it accords with findings elsewhere in the Ohio drainage, even where fishhooks are present.⁷ Exceptions⁸ do occur, however, and this, if anything, makes the rule all the more interesting.

¹ Cresson, 148.

² Mercer, 156.

³ Mills, (b), 32; (c), 26-32; (f), 78-82, etc.; Moorehead, (b), 98.

⁴ Smith, 179.

⁵ Peabody and Moorehead, 118.

⁶ Regarding the question of the bison and his appearance east of the Mississippi see bibliography under Allen and Shaler.

⁷ Smith, 180.

⁸ Mills, (b), 50.

Fresh-water Shells. From scattered places in the refuse a little over 1 cubic foot of shells, mostly bivalve, were obtained, the majority of them in an unbroken condition. Among the lot I did not myself recognize more than four or five species and of those what I supposed to be a well selected series were brought away. To my surprise Curator L. P. Gratacap of the Museum Staff and Dr. Bryant Walker have out of this possibly incomplete selection made the following identifications:—

1. *Unio crassidens*, Lam.
2. *Unio gibbosus*, Barnes.
3. *Quadrula undulata*, Bar.
4. *Quadrula coccines*, Hild.
5. *Quadrula rotundata* (*Q. tuberculata*, Raf.) Raf.
6. *Lampsilis recta*, Lam.
7. *Lampsilis ligamentinus*, Lam.
8. *Lampsilis ovata*, Say.
9. *Plagiola securis*, Lea.
10. *Cyprogenia irrorata pusilla*, Simp.
11. *Pleurocera canaliculata*, Say.¹

Under the circumstances I shall venture no comments of my own, but will cite instead the pertinent remarks accompanying the identifications. "These shells," says Gratacap, "are not quite typically developed. They range somewhat under normal dimensions and exhibit features, in that respect, familiar to collectors in the Green River area, viz., a dwarfing in size with a moderate repression of the salient specific details. They do not, however, suggest any differentiation by reason of age from living species, and offer not the slightest criterion as to the period of their use and accumulation except that they do not postulate a very ancient date. In confirmation of the foregoing opinion, these words from Dr. Walker may be considered authoritative: 'Judging from the excellent preservation of the nacre I should presume that these shells are comparatively recent.'" The implications of these last remarks are perhaps at first a little startling. But, while admitting the correctness of the observations on the specimens in question, I think it well to reiterate that the matrix in which these shells were found was absolutely dry and subject to very little change in temperature. Under such conditions it would seem possible for the nacre and epidermis on a shell to have been preserved for a long time, if not indefinitely.

¹ Cf. Mills, (b), 30-31; (c), 32; Smith, 180.

HUMAN REMAINS DISCOVERED.

The skeletal remains found in the Mammoth Cave vestibule are few and fragmentary and apparently of no very special significance. Nine separate finds were made, all of them in the camp refuse proper and at widely different levels. The largest fragment, found in Trench W I, consists of the distal half of an adult left femur. No study or even description will be attempted other than to remark that the anterior portion of the patellar facet and the part of the shaft directly above present a notably deep longitudinal groove. In Trench E III were found the symphyseal portion of a left female pubis, a fragment of partly charred cranium, an adult metatarsal bone, one upper molar and two canine teeth, the left half of the lower jaw of a child with two milk teeth, and finally most of the osseous remains of a foetal burial. None of the bones exhibit traces of having been cut or scraped or crushed — in other words, there are no indications about them suggesting cannibalism though the isolated occurrence of fragments might easily lead to such a supposition.

ARTIFACTS DISCOVERED.

The last and most important groups of data to be considered are the artifacts. In a sense, every particle of the refuse deposit is the work of man and our delimiting of certain elements of it as artifacts cannot but be arbitrary. Nevertheless, definition is a practical necessity and we regard as artifacts those objects which appear to have been intentionally worked or shaped for some more or less evident purpose, such as tools, weapons, and ornaments. The lateral distribution and material nature of these objects may be set forth in tabular form as follows: —

Trench	Volume	Bone	Flint	Shell	Stone	Totals
E II	20 cu. ft.	2	1			3
E III	400 " "	11	6	5	2	24
E IV	40 " "	4	1	1	1	7
W I	70 " "	4	3	2		9
W III	15 " "	6	1			7
Totals	545 cu. ft.	27	12	8	3	50

In addition to the tabulated specimens there are at hand about seventy flint flakes, presumably rejects, although many of them might easily have

been used for cutting and scraping. The bivalve shells might conceivably have been put to similar usage, but not for long or the fact would have been evident.

The table as a table may be left to speak for itself. The approximate volume of refuse handled has been added for the benefit of those who may desire to figure percentages, etc. Approximate data are also at hand for the different depths at which artifacts were obtained, but as there appears to be nothing especially significant about the figures and their publication would require a much more extended table they have been omitted.

OBJECTS OF BONE.

Awls. The commonest type of artifact is a more or less sharply pointed implement of bone or antler. Of such, the collection contains twenty-four examples and at least seventeen of these may be regarded as ordinary awls. Most of the specimens appear to be made from deer bones, although a small mammal and a bird are also represented. As regards workmanship the lot falls into two classes: (1) those improvised from accidental splinters of shank bones, and (2) those carefully shaped from selected bones. The improvised class is most numerous and shows a good deal of variation as to size and somewhat as to general finish or rather lack of finish. The carefully finished class is made generally from the metapodial or cannon bone of the deer — used either entire or halved or quartered. Two specimens are curved and slender throughout, i. e., with no accommodating butt, and may be needles with the eye portion broke off. All the typical forms are illustrated in Fig. 14 and are duplicated in the cited reports of both Mills and Smith.

Chipping Tools. Two of the implements (Figs. 14c and 14h) are less suitable as awls than as scrapers or chipping tools. One presents a broad square-cut point like a chisel, while the other possesses a similarly dull but rounded point. Their exact use is not apparent, but while it is conceivable that they are merely awls in process of manufacture they could no doubt have been used for purposes of chipping flint.

Projectile Points. Four short stout antler points were found, resembling the class of artifacts generally grouped under the designation arrow points,¹



Fig. 13. Projectile Point of Antler from the Mammoth Cave Vestibule. Nat. size.

¹ Mills, (a), 27; (b), 41-42; (c), 51-53; Smith, 182, Pl. XXI, fig. 1-5.

though occasionally also labeled spear points. One of these, little more than $1\frac{1}{2}$ inches long, may be a natural production; two are in process of manufacture, having been roughly broken off at the base and laboriously whittled down all over their surfaces (see Fig. 14g); and the fourth, a really finished form, is indicated on the accompanying sketch (Fig. 13). Unfortunately, the specimen itself disappeared from the collection not long after its discovery; but it was symmetrically cone-shaped, about $2\frac{3}{4}$ inches long, and nearly 1 inch across the base. The outer surface was smooth and polished, the rim of the base very neatly cut with a perceptibly curving bevel, and the core hollowed out. The point of the object was partly destroyed through decay, but it appeared to have been only mediumly sharp. On the whole, it seemed a remarkably fine piece of work — rather too large, I should say, for an arrow point, but might no doubt have served as a spear point.

Tubes. The remaining articles of bone consist of two tubes or cut sections of bird bone — Figs. 14f and 14l. The smaller is made presumably from the humerus of a turkey. It is about 3 inches long and shows scarcely any signs of wear. The other specimen, possibly the leg bone of a crane, is about 10 inches long with one end cut off on a slant and the entire surface polished by usage.

OBJECTS OF SHELL.

Spoons or Scrapers. The commonest type of artifact under this heading consists of an entire half-shell of either *Lampsilis recta* or *L. Ligamentinus*, the ventral edge of which has been worn down and straightened by frictional usage (see Figs. 15a-b). The worn part is always on or near the end opposite the hinge, by which it was undoubtedly grasped; and it is of interest to note that all but one in a collection of five are adapted for the right hand. Some difference of opinion exists as to the use of such articles, their service either as knives, scrapers, or spoons having been suggested by previ-

Figure 14. Artifacts of Bone from the Mammoth Cave Vestibule.

- a. (20.1-192) Pointed implement of antler.
- b. (" -182) Pointed implement of bird bone.
- c. (" -155) Chisel-pointed implement of deer ulna.
- d. (" -154) Awl of ulna of small mammal, possibly lynx.
- e. (" -190) Awl made from splinter of mammal bone.
- f. (" -151) Tube or bead made from humerus of turkey (?).
- g. (" -152) Arrow point (?) of antler in process of manufacture.
- h. (" -175) Chisel-pointed implement made from ulna of young elk.
- i. (" -174) Awl made from entire metapodial of deer — probably improvised from a worn-out skin scraper.
- j. (" -156) Awl made from split metapodial of deer.
- k. (" -184) Slender curved implement of mammal bone — possibly a broken needle.
- l. (" -150) Cut and polished section of bird bone, 10 inches long.

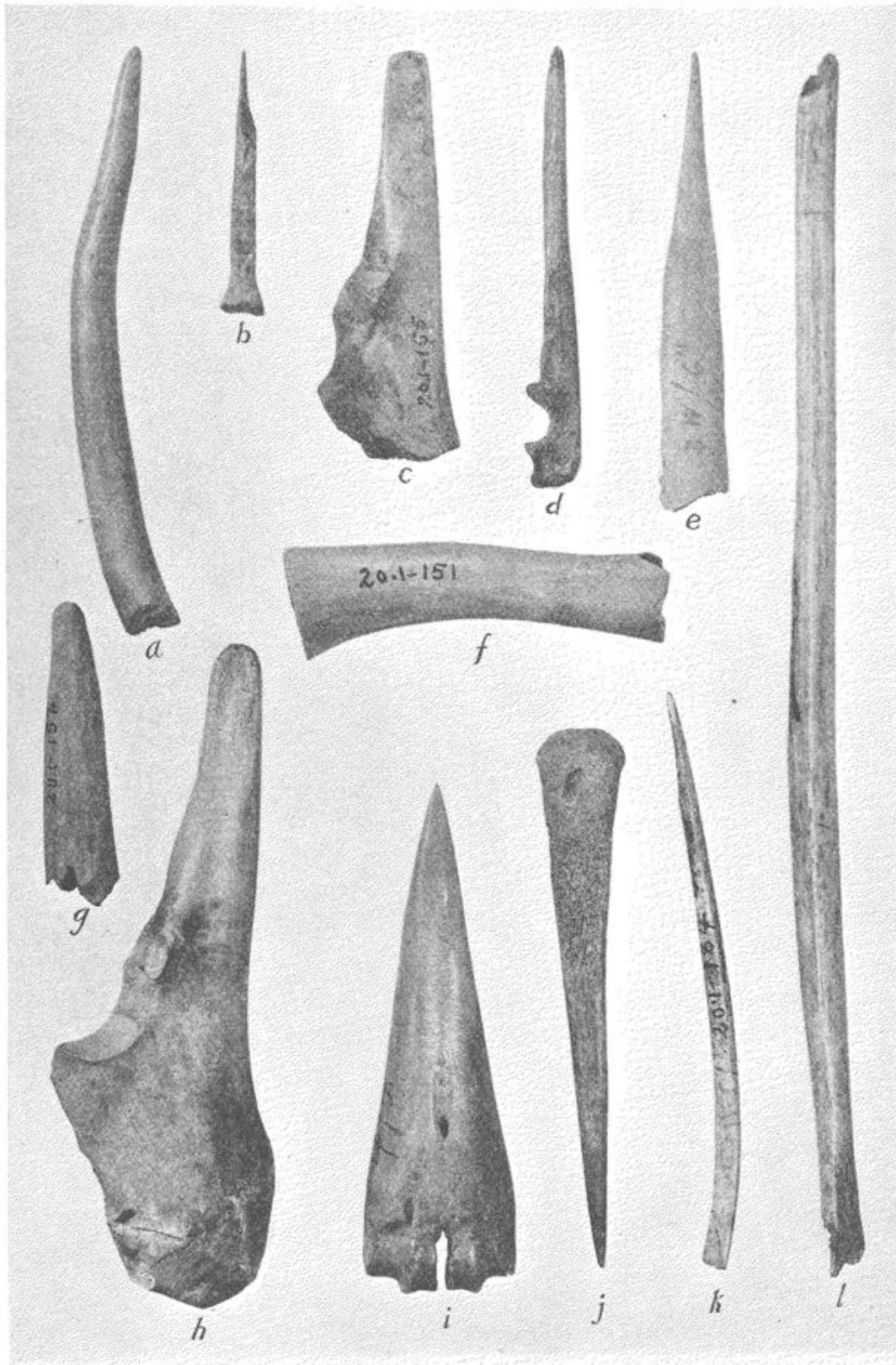


Fig. 14. Artifacts of Bone from the Mammoth Cave Vestibule. $\frac{3}{4}$ Nat. size.

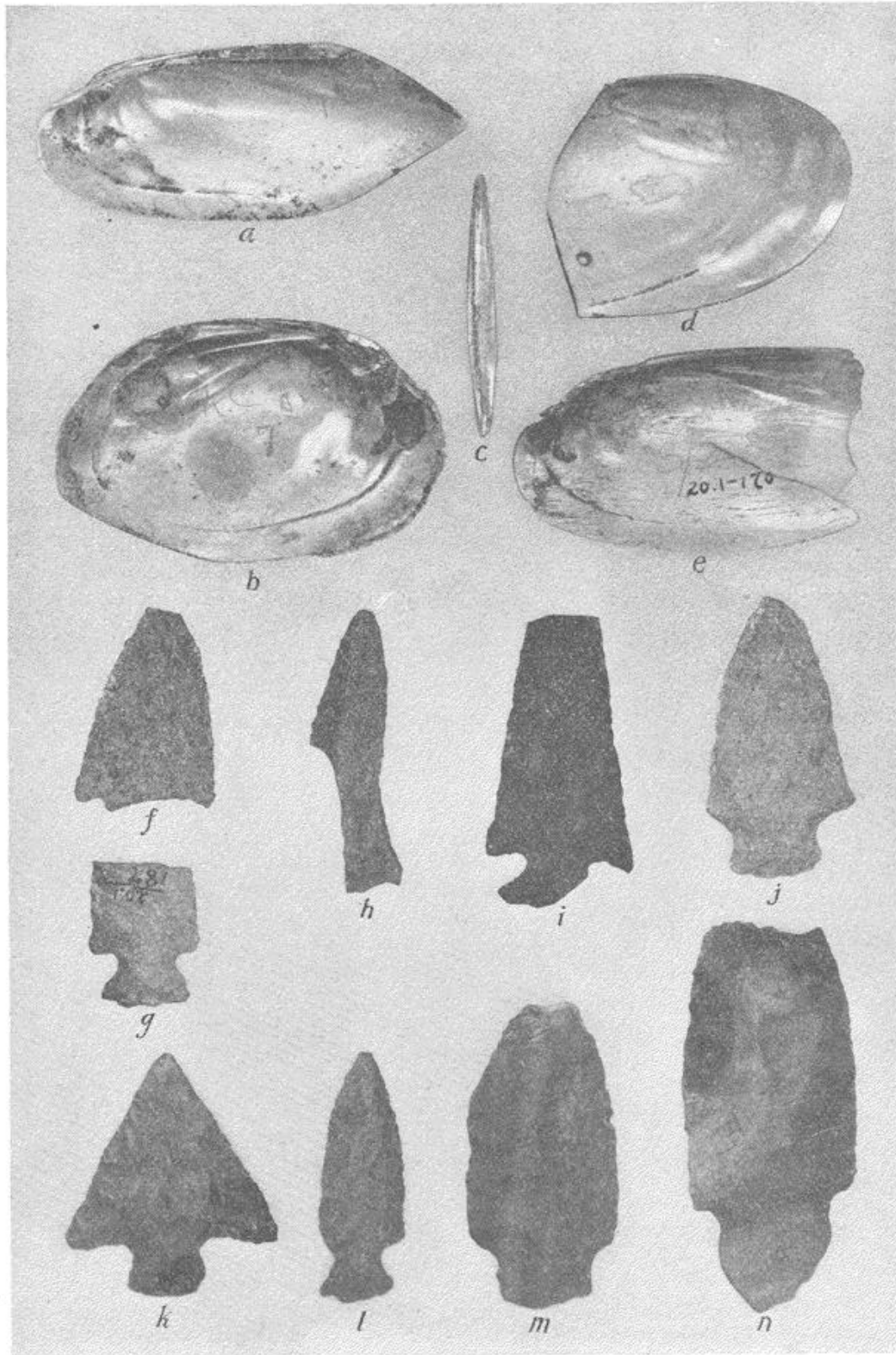


Fig. 15. Artifacts of Shell and Chert from the Mammoth Cave Vestibule. $\frac{2}{3}$ Nat. size.

ous writers.¹ But while the employment of shells as knives and scrapers is a possibility, a study of the present specimens leaves little doubt that they served as spoons exactly after the manner in vogue among the Indians of northwestern California until quite recently, if not at the present day.

Pendants. Figs. 15d-e show two fragmentary bivalve shells (*Lampsilis recta* and *L. ovata*) which have been rubbed down on the outside and afterwards polished on both sides to a fair degree of iridescence. One has a single perforation some distance inside the ventral margin, very neatly executed by drilling from both sides. The other has been twice perforated near the dorsal margin, where, owing to the curvature of the shell, nearly all the drilling had to be done from the outside. The perforations in the latter specimens were studiously placed so that the shell would balance or suspend in a horizontal position and there can be little doubt that the former in its complete state was similarly perforated. Their use as pendants for necklaces, or something of that sort, can hardly be questioned.

Unknown Form. Fig. 15c shows a slender double-pointed object, worked out of the hinge portion of a *Lampsilis* shell. The specimen is two inches long and is suggestive of the substitutes for fishhooks used by the California Indians, but in this case there is no accommodating groove around the middle for attaching the string.

OBJECTS OF STONE.

Chipped Arrow Points, Spear Points, and Knives. In Fig. 15 are shown the entire collection of chipped points found in the Mammoth Cave entrance. As will be noted at once, the forms correspond closely to some of those found on the surface sites around the cave entrances and which are illus-

Figure 15. Artifacts of Shell and Chert from the Mammoth Cave Vestibule.

- a. (20.1-180) Spoon of *Lampsilis recta* shell.
- b. (" -172) Spoon of *Lampsilis ligamentinus* shell.
- c. (" -189) Unknown object of *Lampsilis* shell.
- d. (" -169) Pendant of *Lampsilis ovata* shell, polished, perforated, fragmentary.
- e. (" -170) Pendant of *Lampsilis recta* shell, rubbed, double perforation, fragmentary.
- f. (" -163) Stemmed point of pinkish, jasper-like material; fragmentary.
- g. (" -178) Stemmed point of mottled blue-gray chert; point end missing.
- h. (" -159) Knife or accidental blade chipped from pinkish gray chert.
- i. (" -164) Stemmed point chipped from dark gray chert; fragmentary.
- j. (" -196) Stemmed point roughly chipped from an impure light gray chert; complete
- k. (" -185) Stemmed triangular point chipped from a fairly pure bluish chert.
- l. (" -186) Arrow point roughly chipped from light gray weathered (?) chert.
- m. (" -165) Stemmed point of streaked grayish chert; unfinished.
- n. (" -179) Stemmed point of streaked grayish chert; roughly finished.

¹ Mills, (b), 22; (c), 70-71; Smith, 183, 189, 193, Pl. XXII, fig. 6.

trated in Fig. 1. Apart from difference in size, the specimens show only a normal variation in fundamental outline, all but one (?) being of the stemmed type; but the technique exhibited — or rather the degree of finish attained — varies considerably, though seemingly in correspondence with the nature of the material employed. A few of the specimens appear to be made of the type of chert or hornstone found in the interior of the cave and which has already been considered; others, however, are of foreign material of a less pure state, resembling jasper. The particular function of each is perhaps a matter of individual preference; but in all probability there are specimens suitable for each of the purposes suggested in the paragraph heading.

Scrapers. Among the seventy miscellaneous flakes already mentioned as found in the vestibule refuse, there are quite a number provided with straight razor-like edges which may have served as knives or to some slight

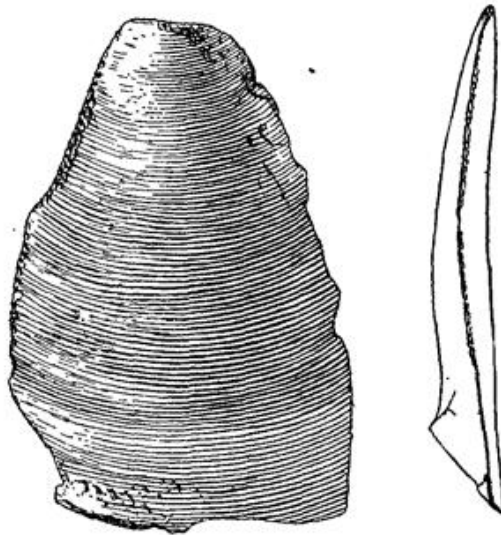


Fig. 16 (20.1-160). Small Side-Scraper from the Mammoth Cave Vestibule. Nat. size.

extent even as scrapers. Only a few, however, show unmistakable signs of usage, the evidence being a minute "retouch" or resharpening by means of secondary chipping of the cutting edge. Fig. 16 is one of these. It is a flake eminently suited for purposes either of cutting or scraping, but it is a fair question whether the fine chipping indicated is the result of design or merely of usage as a scraper. In common with the typical palaeolithic side-scraper (*racloir*), the chipping on these specimens is all — or nearly all — on one side of the flake; but unlike the European forms, it is here sometimes on the concave side, as, for instance, in the given illustration. The sum of the evidence seems to be that this particular specimen was a scraper and that if used in the right hand, as seems certain, it was brought down hard only in the motion or stroke away from the body of the workman.

But if the precise function of the above formless flakes remains doubtful,

there can be no question that the accompanying Fig. 17 represents a scraper. It is unfortunately the only specimen of its kind found in the cave débris; although, as we have seen, others approaching it in form were obtained around the entrance to some of the neighboring caverns.¹ Unfortunately, too, the drawings do not quite bring out its salient features. It is a roughly prismatic flake, $3\frac{1}{8}$ inches long, $2\frac{1}{4}$ inches across, and as much as $\frac{3}{4}$ of an inch thick; but blunt at one end (though not well suited to the hand) and sharp-edged at the other end, having been retouched or chipped on the convex side. Possibly it is only a fragment of the original implement; but in either case

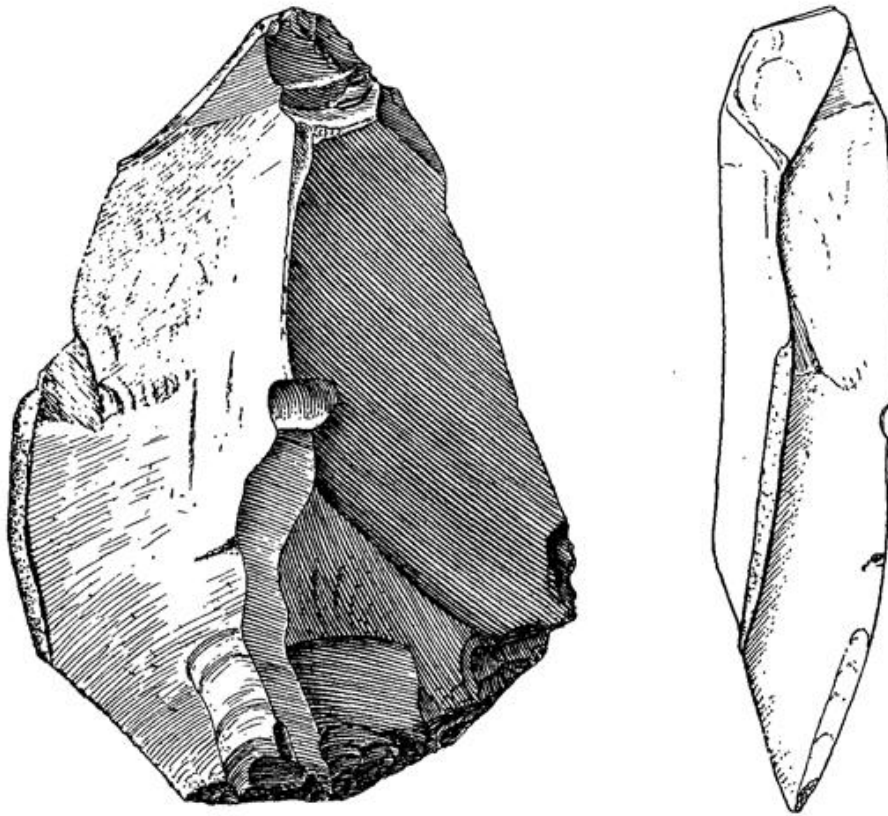


Fig. 17 (20.1-166). End-Scraper from the Mammoth Cave Vestibule. Nat. Size.

it bears a strong resemblance to the European end-scraper or *grattoir*, which was supposedly used after the manner of our modern plane, in contrast to the side-scraper (*racloir*), which could be made to remove shavings with both the forward and backward strokes.

Pestles. The remaining stone implements to be described consist of three pestles, illustrated in Fig. 18. All are of limestone, one having been improvised from a slender oblong block and the others purposely shaped by a pecking process, the evidence of which is still visible. Fig. 18c, the impro-

¹ See p. 18 (Fig. 1 k).

vised specimen is 9 inches long, quite irregular in outline, and has a rounded base or grinding surface as if it had been used in a common mortar. The designed forms, on the other hand, are somewhat symmetrically cone-shaped, with much expanded bases and perfectly flat grinding surfaces. One measures about 5 and the other barely 6 inches in length, and the grinding surfaces — though now much reduced by fractures — originally attained diameters respectively of 3 and $3\frac{1}{2}$ inches. Neither could have served the ordinary mortar, but was designed rather for use on some flat-surfaced anvil rock.

Work had progressed for some time before these specimens turned up and I was almost ready to conclude that the culture stratum in the Mammoth Cave vestibule antedated the discovery of the rubbing and pecking processes. To be sure these are crude specimens, made of rather poor material, but the more elaborate bell-shaped forms are, if not common, yet typical of the Kentucky region and beyond.¹ Just what the presence of the pestles implies I am at a loss to say. "Mortar holes" are said to occur in the surface of the living rock exposures in the Green River country; and, as already stated, corncobs have been found repeatedly in the interiors of the local caves. But if these various suggestions signify that maize was cultivated by the people who inhabited the Mammoth Cave vestibule, then it is extraordinary that no other evidence was found in support of the fact.

ABSENT TRAITS OF CULTURE.

Having now considered in some detail the evidences of aboriginal activities found in the Mammoth Cave vestibule refuse, it seems in order also to mention some of the cultural remains commonly found in Kentucky archaeological stations but which were here absent. Maize has just been suggested as one such item. In a charred state traces of this food staple should have been preserved indefinitely and under the given physical conditions it would seem as if these traces might have kept for a very long time even if not charred. However, no uncarbonized vegetal substance of any sort was discovered.

In the second place, no pottery was found. This is a remarkable fact inasmuch as ceramics are reported as tolerably frequent at least in northern and western Kentucky. We know that pottery occurs in the Green River country because it was found by the writer, as already described, in a rock-shelter only three miles from the Mammoth Cave and we have it cited in

¹ Young, 105; Moorehead, (c), 98, 102; Fowke, 88.



Fig. 18 *a* (20.1-167), *b* (20.1-178), *c* (20.1-168). Pestles from the Mammoth Cave Vestibule. $\frac{3}{7}$ Nat. size.

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Col. Young's list of specimens as occurring also in the interior of the Salts Cave. Its absence in the Mammoth Cave vestibule was noted from the beginning and excavations were prolonged beyond the original intentions with a special view to make sure on this point.

In the third place, no stone artifacts of the strictly polished types were found. The two or three pestles mentioned constitute the only specimens exhibiting the so-called purely neolithic workmanship. Celts, pipes, chunky stones, and all that great variety of problematic forms typical of the mounds and village sites of the general region are absolutely wanting. But, while this is true, it is proper to remark also that so far as the concrete evidence goes, these same artifacts are all but wanting both in the surface sites around the caves and in the interiors of the caves. Col. Young's collection list includes three specimens only from the interiors of the caves, while from the surface sites we have only a few finds reported on hearsay.

In the fourth and last place, objects of copper and other metals were likewise not met with at all, although they occur in mounds and in stone graves throughout that whole section of the Mississippi Basin. But again it should be stated that copper objects have not been reported from the cave interiors.

SUMMARY AND CONCLUSIONS.

The substance of the preceding details concerning the discoveries in the Mammoth Cave entrance vestibule appear to establish:—

1. That the present entrance is of considerable antiquity.
2. That aborigines camped in the vestibule at two different places, leaving débris sufficient to indicate a relatively long period of occupancy.
3. That the shellfish and vertebrate remains found in this débris belong to existing species, though they appear to antedate the coming of the bison.
4. That cannibalism may have been a feature of their life.
5. That the artifacts of bone, stone, and shell, so far as they go, correspond in the main, quite closely to those of the neighboring surface sites and also to those of the mounds and village sites elsewhere in the Ohio Valley, but
6. That all traces of maize growing, pottery making, and the production of polished stone implements characteristic of the Moundbuilder culture as a whole are entirely absent.

It might be urged that 545 cubic feet, more or less, is a small quantity of débris to have handled. Still, taking into consideration the range of the test pits, the amount of work done seems sufficient on which to establish at least a tentative conclusion. Again, it might be said that the apparent outcome is accidental; but in view of essentially similar discoveries in the Jacobs Cavern¹ of Missouri, in the Naaman Creek Rock-shelter² of Delaware, and also in a whole series of rock-shelters in upper New Jersey³ and lower New York states,⁴ it seems to the writer far more than probable that the facts related about the Mammoth Cave vestibule settlement are exactly what they seem. That is, we have here evidence of a type of culture very similar to that of the Stone-grave and Mound-building tribes, but much more limited in its scope of development; in other words, essentially more primitive. The primitive group lived off the natural products of the land and the advanced group gained subsistence mainly through the practice of agriculture. Whatever the racial connections may be, the cultural relations are plain enough: the Mammoth Cave vestibule culture antedated and in a measure at least gave rise to the culture of the Moundbuilders.

¹ Peabody and Moorehead, 24, 27.

² Cresson, 147.

³ Schrabisch, 153, 165.

⁴ Harrington, 130.

This conclusion, it may be remarked in closing, is in no sense at variance with what we already know. Professor Mills, for instance, after many years of mound investigation in the Ohio Valley has only recently announced the determination of *lower* and *upper* stages to his so-called Hopewell culture.¹

¹ Mills, (h), 266.

GENERAL CONCLUSIONS.

Detailed conclusions have been stated at the end of each of the special divisions of the Green River archaeology herein treated and it is deemed needless repetition to cover the ground again. Altogether, we have considered data from four different sources, namely: (1) surface sites adjoining several well-known cave entrances, (2) the interiors of these and other caves, (3) the entrance vestibule to the Mammoth Cave, and (4) one small rock-shelter. We reached the conclusions that the surface sites are probably workshops where the chert, quarried in the respectively adjacent caverns, was fashioned into implements; but that the specimens themselves, while exhibiting both common and uncommon traits, cannot be dated as they may range over the whole period of aboriginal time. We found the remains from the rock-shelter and from the cave interiors (the latter being the accumulation of a whole century of collecting activity) both to be identical in nature with remains reported from the stone graves and the earthmounds of the entire east-central portion of the Mississippi Basin; and to be in all probability of relatively modern, though perhaps prehistoric date. Finally, we came to the conclusion that we have discovered in the Mammoth Cave vestibule a closely related but earlier and more primitive stratum of culture; but which, nevertheless, in view of the associated modern fauna, cannot be looked upon as particularly ancient.

In conclusion, then, so far as the antiquity of man in America is concerned, nothing essentially new or important has been added to what we already know from other caves, from the Trenton deposits, and from the Florida shellmounds. Omitting the Trenton station as perhaps debatable, we find conditions everywhere else in this substratum of culture to be about the same. On the one hand, there is the absence of pottery and of maize as well as of the advanced polished stone technique; and on the other hand, there is the continued presence of the historic fauna. We may be dealing with cultural developments stretching over some thousands of years but certainly not with anything reaching back anywhere near to glacial times.

But while we may be frankly skeptical about discovering anything more ancient or primitive in eastern North America than that which we already possess, it does seem highly desirable to continue cave investigation in Kentucky and elsewhere until we find our successive culture stages in actual superposed contact.

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(Continued from 2d p. of cover.)

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