

A PRELIMINARY REPORT
ON THE LATE-PALÆOLITHIC CAVE OF CHOUKOUTIEN¹

By

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I. HISTORY OF THE DISCOVERY AND METHOD OF EXCAVATION

When removing the superficial soil on the top of the hill over Choukoutien Locality 1, in order to locate the southern extension of the *Sinanthropus* sediments, we discovered in 1930 a cave facing north, filled with grey, slightly consolidated and fossiliferous breccia. This site was then designated as "Upper Cave". The grey and loose sediments, where in contact with the red colored and hard *Sinanthropus* beds, were disconformable and separated by a thick stalagmitic floor. The bones contained therein also looked much less mineralized than the fossils generally collected in the Choukoutien Formation. It was, therefore, supposed that the deposits represented some very young and rather uninteresting formation. The Upper Cave was not further investigated at that time. But the place was mentioned and located in our last publication, "Fossil Man in China".²

On May 20th, 1933, we started a systematic excavation in the Upper Cave which turned out to be much richer and more interesting than we expected. Interrupted on the 25th of July by the rainy season, the work was resumed on October 15th, and carried on up to the 19th of December, when the weather became too cold for field work. At that time only a little part of the sediments were still untouched. In the spring season of 1934 a careful excavation was resumed in the narrow, deepened, and lowest part, which is here named "Lower Recess" of the Upper Cave. After removal of the gray loose sedi-

¹ Received for publication, May 1934.

² Mem. Geol. Surv. China, Ser. A, No. 11, 1933.

ment, the red and hard breccia of Choukoutien age is exposed everywhere at the bottom. On account of the difficulties of working in such a deep place, and in the absence of any valuable fossil material in the hard breccia, the work was abandoned. Today, with the exception of the patches or pillars reserved as "témoins", the Upper Cave is emptied. As a result of this systematic excavation four human skulls, a great number of other human skeletal and cranial bones, a large series of remarkably complete animal remains and a number of archeological objects have been recovered, these new finds leading to the conclusion that the Upper Cave was occupied in Late Pleistocene times by a Man of Late Palæolithic type and culture.

The work done in the Upper Cave was carried on very carefully and systematically, in order to keep a record of those archeological data which can only be recognized in the field. The remnants of the cave wall and roof, and all the collapsed limestone accumulated on the surface of the cave sediments had been removed in 1930. Before we started the excavation work of 1933, the exposed deposits were divided into "squares" of an area of 1 sq. m. each. Each field technician was in charge of investigating the sediments of four squares, one being half a meter deep, each time. He would start from one corner of the four squares, and go on gradually until the whole area was covered, and each find located in its own square. After investigation, the loose material would be transported to some other place, where it was again sieved.

At the same time two series of maps were drawn at a scale of 1:50: the first series consisting in horizontal sections (indicating the squares); the second one in vertical (N-S) sections of the deposits. The horizontal sections were taken from meter to meter (the 1/2 m. thick layer of deposits between two horizontal sections being called a *level*). The vertical sections are 2 m. apart from each other, starting from a definite point. In this way, a geometrical net has been constructed, in which all the finds can be replaced.

In addition, every day, if possible, we took three photographs from different directions, in order to get the actual records of the progress of the

excavation. Such a method was kept on for 141 days, over a period of two seasons during 1933 and the early part of the spring season in 1934.

For the success of such a delicate task, I am much indebted to Messrs. M. N. Bien and L. P. Chia who have assisted me in the field in 1933 and 1934. If not for their help, I should not have overcome many of the difficulties met with in the course of the work.

II. DESCRIPTION OF THE CAVE OF THE SEDIMENTS

I. THE SHAPE OF THE CAVE

The so-called "Upper Cave" is not, as it was first supposed, a mere fissure in the limestone, but represents a real dissolution cavity, which however, previous to the excavations, was *completely buried* under the superficial soil of the hill, and *entirely filled* with deposits. By the subsequent excavation, it was recognised that this cave forms an irregular N. S. recess, in which the following parts can be distinguished:

- a. Entrance (Fig. 1, *En*)
- b. Main "Upper room" (*ibid.*, *R*)
- c. "Lower room" (*ibid.*, *r*)
- d. "Lower recess" (*ibid.*, *L r*)

The entrance, when unearthed, was forming a regular archway in the limestone, about 4 meters high, measured from the roof to the floor, and 5 m. wide at the floor (Pl. I, Figs. 1 and 2). After the removal of the sediments filling this part of the cave, the limestone arch became so crumbling that we had to remove it entirely in the fall of 1930.

The upper room, wider than the archway, is limited southward (that is opposite to the entrance) by a steep E.W. wall of limestone, dipping along the natural bedding of the rock. The distance from the entrance to the wall is 8 meters, the E.W. length of the southern wall 14 meters.

The Lower room, forming an abrupt depression beneath the western half of the "Upper room", is 8 meters deep (Pl. III, Fig. 2). On the

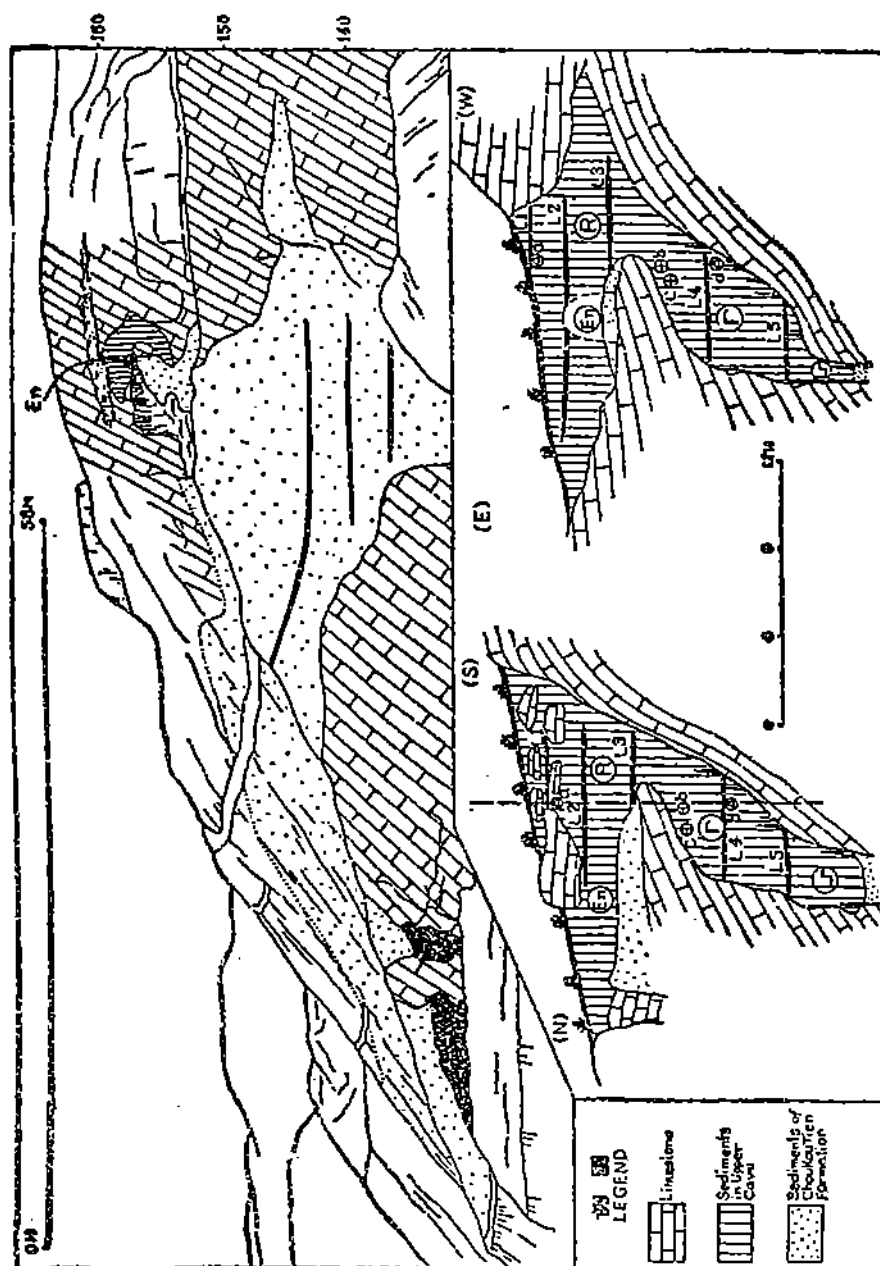


Fig. 1. (I) Diagrammatic section of Choukoutien Loc. 1 hill, sighted from the north, showing the position of Upper Cave (vertical lines); En, entrance of Upper Cave. (Top-figure).

(II) East-west composed section of Upper Cave, (Lower right figure).

(III) North-south composed section of Upper Cave, (Lower left figure).

L1-L5, cultural layers;

R, Route needle;

western part of this room the limestone bottom, entirely covered by stalagmitic incrustation, is somewhat steep. On the eastern part the solid limestone wall and bottom deepen suddenly and form the "Lower recess".

The "Lower recess" is the lowest portion of the Upper Cave. It has the shape of a narrow cavity, south-north in direction, about 3 meters long and 1 meter wide. Most of the limestone walls are almost vertical and covered by a thick layer of stalagmitic incrustation. The bottom is formed by the hard and red colored breccia of Choukoutien age.

Largely on account of a slaty structure of the limestone in this particular place, the roof of the "Upper room" was found mostly collapsed into small fragments, mixed with the sediments. A portion of the roof however is still preserved in the western part, overhanging the "Lower room" (Pl. II, Figs. 1 & 2). In the course of the quarrying work, an artificial opening was made by us in the north wall of the same "Lower room" (Pl. III, Fig. 1).

2. THE BOUNDARIES OF THE CAVE

The Upper Cave is almost entirely limited by the massive limestone. In two places, however, the floor consists of hard breccia and stalagmitic layers forming the top of the *Choukoutien Formation* (or *Sinanthropus* beds), namely: at the entrance; and, at the bottom of the "Lower recess". In both cases, the contact surface is wavy, irregular, and marked by thick stalagmitic formations.

3. THE NATURE OF THE DEPOSITS

Anterior to its filling by loam and pieces of limestone, the cave was entirely lined by a heavy sheet of stalagmitic productions: thick crust of calcite, and (chiefly in the "Lower room") long stalagmitic needles. These latter ones were unearthed, still erected in their natural position, in the lateral recesses of the "Lower room" and "lower recess". In the more central parts of the room, they occurred in a broken condition, and were mixed with the deposits.

The cave deposits themselves consist of a grey loam, so densely mixed with the pieces of the gradually collapsing roof, that, after removal

of the loam by the rain, the formation looks as a regular heap of angular stones. A few consolidated layers have been observed, for instance at the entrance, just over the floor formed by the Choukoutien formation; and also near the northern wall, in the middle of the deposits. But those cemented patches, never more than 50 cm. thick, are purely local. Nowhere is there any general consolidated horizon extending all over the cave. Most generally, the sediments are scarcely hardened, but appear almost loose. Limy incrustations, however, occur abundantly, sticking to the fragments of rocks and to the bones. Regularly rounded concretions (4.5 cm. in diameter) were found, isolated near the bottom of the "lower room". In the same deepest part of the cave, a few patches of crystalline calcite, interbedded in the loam, prove that the deposition of the stalagmites lasted until some time after the beginning of the filling of the "lower room". In the "lower recess" the cave loam is very fine and sticky and contains but a few limestone fragments.

On the whole, the grey, practically loose, sediments of the Upper Cave differ sharply from the red, strongly cemented, underlying "Choukoutien Formation". As told below, a similarly marked opposition is obvious in the degree of fossilisation exhibited by the bony remains occurring in the two formations, respectively.

4. DISTRIBUTION OF THE CULTURAL LAYERS

In the Upper Cave the cultural layers are distributed as follows:

a. Entrance and "Upper room"

Layer 1 (uppermost layer). About 30 cm. thick at 3 meters above the floor, near the entrance (Fig. 1, L 1). A few human bones, a perforated tooth, two flint implements.

Layer 2, subdivided in several thin beds, 1 meter above the floor of the "Upper room" (Fig. 1, L 2). A few human bones, and 28 perforated teeth (canines of fox or badger);—these latter were accumulated in the same spot.

Layer 3. At the very bottom of the "Upper room". Black, and thick (up to 60 cm.) (Fig. 1, L 3). Very few cultural remains, but clear traces of human occupation: the stalagmitic floor and the limestone are burnt.

b. "Lower room"

Layer 4. 3 meters above the floor (Fig. 1, L 4).

Layer 5. On the right of the floor formed by the Choukoutien Formation (Fig. 1, L 5).

Those two Layers 4 and 5, rather thick, have yielded a few isolated human teeth, numerous perforated tooth bone pendants, and a flake of chert. Slightly above it, three complete human skulls, and a large series of other human bones were discovered. This was possibly a burial place, later disturbed by the Carnivores. No human, nor cultural remains were discovered in the "Lower recess".

5. ORIGIN AND HISTORY OF THE CAVE

Putting together all these facts, and considering also the general connection of the Upper Cave with the Choukoutien hill (vide Fig. 1), we can attempt the following reconstruction of the history of the cave:

a. The Upper Cave represents originally an uppermost branch of the general complex cavity filled by the Choukoutien Formation (or *Sinanthropus* beds).

b. This upper branch does not seem to have ever been filled by the Choukoutien Formation—possibly because it was largely closed from the outside originally. Similar empty recesses can still be observed, for instance, between the Lower Fissure and the Kotzetang Cave in the Main Deposit.

c. After the pre-Loessic erosion (Chingshui stage) re-modelled the Choukoutien hill, and exposed the *Sinanthropus* breccia along the northern and eastern slopes of the hill, the Upper Cave became open on its northern side (Entrance).

d. Before the first animals entered it, the cave was lined with stalagmites, deposited at the same time as the Choukoutien Formation, and possibly also in the course of the Chingshui stage. Subsequently, the stalagmitic deposition practically stopped.

e. The cave might have first worked as a natural trap, in which wandering animals were caught and died, unless the skeletons found in the Lower recess have been carried in by some Carnivora. Later on it was surely inhabited successively by Man and by various Carnivora (tiger, hyæna, bear). In spite of several cultural layers, however, it does not seem that Man did live there in a protracted way: ashy layers rather thin, practically no traces of workshop.

f. The occupation of the cave lasted up to the complete filling of the "Upper room", the roof of which was gradually becoming thinner by weathering, and finally crumbled down. No appreciable change in the culture for this period of time.

g. Between the *Choukoutien Formation* and the Upper Cave deposits we have to place, not only an evident disconformity (both are separated from each other by a thick stalagmite and a strong lithological change in the sediments), but, if we can say, by a decided *unconformity*. Although both originally opened by dissolution of the limestone at the same time, yet the *Sinanthropus* cave (main deposit) and the Upper Cave belong by their filling to two different physiographic systems. When the "Upper Cave Man" was going down the Choukoutien hill towards the river, he would walk on the *Sinanthropus* consolidated and exposed breccia, just as we ourselves do now¹.

The stages of this history can be expressed in the following table:

Physiographic stages in North China	Physiographic stages in Choukoutien
<i>Panchiao</i> (erosion)	Slight modifications in the shape of the hills? Removal of the mantle of loess?
<i>Malan</i> (sedimentation) Deposition of the Loess and Late Pleistocene sands <i>Chingshui</i> (erosion)	Gradual filling of the Upper Cave, finally buried under the soil. Occupation by Man (Late Palæolithic) Reshaping of the Choukoutien hill. The cave- deposits of the precedent age become largely exposed. Opening of the "entrance"
<i>Choukoutien</i> (sedimentation) Deposition of the younger red loams in Shansi, Honan and Shensi	Gradual filling of the large cavity containing the "main deposit". Occupation by <i>Sinanthropus</i>

¹ In other words, the Upper Cave is inserted in, not superposed upon the Main Deposit.

III. NOTES ON THE FAUNA

1. FOSSILISATION AND PRESERVATION

The fossils found in the Upper Cave are but little fossilized. With the exception of the burnt bones, they are white in color, and light in weight. If dried too quickly, they incline to crack and to twist. Judging by all their characters, they differ entirely from the much more mineralized bones occurring in the *Sinanthropus* beds.

Another remarkable character of the animal remains collected in the Cave is the fact that most of them are fairly complete and only seldom are broken pieces found. On the contrary, complete skeletons of carnivorous and herbivorous animals often occur in the sediment but slightly disturbed.

The most abundant forms are the deer (*Sika* and *C. elaphus*), the hare (*Lepus*), the cats (*F. tigris* and *pardus*), the badger (*Meles*), the molerat (*Siphneus*) and a large eagle etc. All of them are represented by numerous skulls and mandibles or even by entire skeletons. The rarest type is the civet-cat, of which only a maxillary has been found.

Fossils occur everywhere abundantly in the Upper Cave. Near the bottom of both the Upper Room and Lower Room the fossils are particularly numerous, and occur in a condition without disturbance. In the Lower recess complete skeletons of deer and bear were all piled together. How to explain such an accumulation of skeletons in the Lower recess (twenty-five deers) is rather difficult.

2. PROVISIONAL FOSSIL LIST

FLORA

Celtis koraiensis Nakai.

Numerous well preserved seeds.¹
Abundant in Upper room and absent
in Lower room and Lower recess.

¹ Fossils examined by Dr. S. N. Liu, section of Botany, National Academy of Peiping.

FAUNA. Invertebrata

Gastropoda¹

- Helix (Eulota) pyrroazona* Philippi
 " " *schensiensis* Hilber
 " " *choukoutiensis* Ping

Amphibia

- Bufo bufo asiaticus* Steindachner
Bufo raddei Strauch
Rana asiatica Bedriaga

Reptilia

- Elaphe* sp.

Aves²*Struthio*

Two femurs, several ribs and vertebra

Mammalia

Insectivora

- Scaptochirus* sp.

Lower jaws. Everywhere in the deposits.

- Erinaceus* sp.

Several skulls and a number of lower jaws. Everywhere.

Chiroptera

- Chiroptera indet.

Skulls and lower jaws unprepared. Possibly two forms. Everywhere.

Carnivora

- Canis* sp.

Several skulls and lower jaws; size smaller than *C. lupus*. Lower room and Lower recess.

1 Fossils examined by Mr. N. Bien of Geological Survey of China.

2 Fossils examined by T. L. Tchang of Fan Memorial Institute of Biology. Most of them are not yet determined.

<i>Nyctereutes procyonoides</i> Gray	Three lower jaws. Upper room and Lower recess.
<i>Cyon</i> sp.	A single lower jaw, with teeth preserved. Upper room.
<i>Vulpes vulgaris</i> L.	Skeletons, skulls, and many other isolated remains. Everywhere.
<i>Vulpes corsae</i> L.	Skulls, lower jaws, etc. Everywhere
<i>Ursus</i> sp.	Represented by two skeletons, several skulls, and lower jaws. It perhaps represents an interesting form, linking the cave bear <i>U. spelæus</i> and the brown bear <i>U. arctos</i> . Upper room, Lower room, and Lower recess.
<i>Meles leucurus</i> Hodgson	Several complete skeletons, skulls and lower jaws. According to the size and shape of the skull, two types of badger may occur in the Upper Cave. Everywhere.
<i>Mustela</i> sp. (size large)	Skull and lower jaws. Everywhere.
<i>Mustela</i> sp. (size very small)	Lower jaws. Upper room.
<i>Paradoxurus</i> cf. <i>larvatus</i> Temm.	Only represented by a maxillary with teeth preserved. The genus is no longer found to be actually living north of the Tsinling range.
<i>Hyæna ultima</i> Matsumoto	Complete skeletons and isolated skulls. Very different from the archaic <i>H. sinensis</i> (Owen) Zdansky commonly found in the <i>Sinanthropus</i> beds. Upper room and Lower recess.

<i>Felis tigris</i> L.	Skeletons, skulls, lower jaws and isolated teeth. Everywhere.
<i>Felis pardus</i> L.	Skeletons, skulls, lower jaws, etc. Everywhere.
<i>Felis microlis</i> M. Edwards	Skeletons, skulls and lower jaws. Everywhere.
<i>Felis teilhardi</i> Pei	Skulls. This new form was first recognized in the Choukoutien Main Deposits. Everywhere.
<i>Cynailurus jubatus</i> L.	One entire skeleton, from the upper level of the Cave. Compared with a skeleton of the living <i>C. jubatus</i> from India, this specimen stands closer to the modern guepard than to the fossil guepard found in the <i>Sinanthropus</i> beds. Only in the Upper room.
Rodentia	
<i>Sciurus</i> sp.	Lower jaws. Everywhere
<i>Tamias</i> sp.	Lower jaws. "
<i>Pteromys</i> sp.	Complete skulls, with lower jaws etc. Everywhere.
<i>Cricetus</i> sp.	Lower jaws. Everywhere
<i>Cricetulus</i> sp.	Skulls and lower jaws. Everywhere.
<i>Microtus brandti</i> Pallas	Skulls and lower jaws. Perhaps not different from the forms found in the Choukoutien Main Deposits. Everywhere.
<i>Siphneus</i> cf. <i>armandi</i> M.-Edwards	Numerous skulls and lower jaws. It is clearly representing a member of the <i>armandi</i> group as indicated by

- the peculiar shape of M^1 and the strong reduction of M^3 . But it looks, however, somewhat different from the type of Milne-Edwards' species. Everywhere.
- Hystrix* sp. Lower jaw and isolated teeth. Everywhere.
- Lepus* sp. Numerous skeletons, skulls, lower jaws. It is one of the most abundant forms in the Cave. Everywhere.
- Ochotona* sp. Skulls and lower jaws. A closer determination will be made later on. Everywhere.
- Perissodactyla
- Equus* cf. *hemionus* Pallas Broken skull with milk teeth, broken lower jaw and isolated teeth. It is a very small form and possibly referable to the wild ass (*E. hemionus*). Upper room.
- Rhinoceros* sp. The possible presence of *Rhinoceros* is indicated by two pieces of tooth which were collected from the contact surface between the sediments of Upper Cave and the Choukoutien Formation. But these specimens may, of course, come from the Choukoutien Formation.
- Artiodactyla
- Sus* cf. *lydekkeri* Zdansky Lower jaw with the teeth preserved and a few other pieces. By the structure of M_1 , this form is com-

Capreolus cf. *manchuricus*
Lydekker

Cervus elaphus L.

Pseudaxis hortulorum Swinhoe

Gazella przewalskyi Buchner

Bovidae indet.

Primate

*Homo sapiens*¹

parable to *S. lydekkeri*, the common boar in the main Choukoutien deposits.

Several complete skeletons and skulls in the "Lower recess"

Several skeletons, broken antlers, and lower jaws. The tines of the antler are more strictly distributed in the same plane than in the Wapiti, thus closely resembling a form from the Sjara-osso-gol. Everywhere.

Several skeletons, complete antler, skulls, lower jaws. Apparently closer to the Peking Sika than to the fossil Sika of the Choukoutien formation (*Pseudaxis grayi* Zdansky). Everywhere.

One broken horn core and some isolated teeth. Upper and Lower rooms.

A few isolated upper and lower teeth, possibly *Bos primigenius*. Upper room and Lower recess.

Four complete skulls, one of them perfectly preserved; remains of several other skulls; isolated teeth, numerous limb and foot bones. Upper and Lower rooms.

¹ On account of the death of Dr. Black, those specimens will be described subsequently.

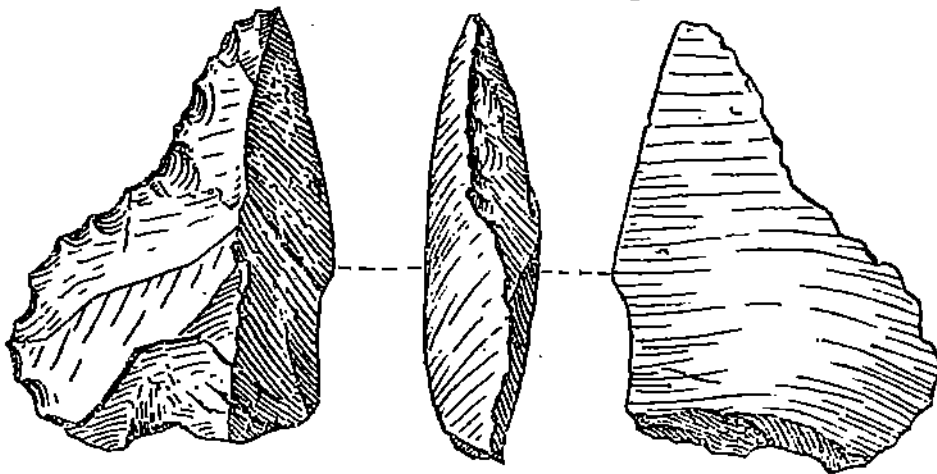
IV. PRELIMINARY DESCRIPTION OF THE ARCHEOLOGICAL FINDS

Since we found perforated teeth of similar technique all across the sediments of the cave, and since we could not trace any change of faunal elements from the lower to the upper levels, it seems that during all the time of its filling the Upper Cave was occupied by a single race of Man. Of course, a few thin zones of consolidated breccia or stalagmitic layers have been observed locally (s. above). But they do not correspond, it seems, to any industrial or cultural breaks. Therefore, it is not necessary to subdivide the sediments into some cultural levels.

1. STONE AND BONE IMPLEMENTS

a. *Stone Implements*

Stone implements are, on the whole, very rare in the cultural deposits of the Upper Cave. Only five pieces of flint or chert were found, one of them being only a broken fragment, no trace of being an artifact.



0 2 4 Cm

Fig. 2. Flint concave scraper (vide Pl. IV, Fig. 2); natural size.

In text figure 2 (Pl. IV, Fig. 2), a side-scraper, made of beautiful black flint, is represented. The specimen is well retouched along one edge only.

A second specimen, of doubtful nature (end scraper? or flint graver?) is illustrated in Fig. 3-A (Pl. IV, Fig. 1). The piece, nicely flaked and retouched along its upper, short edge, is limited laterally by a sharp break due to a single blow, producing a decided *burin* appearance. This break

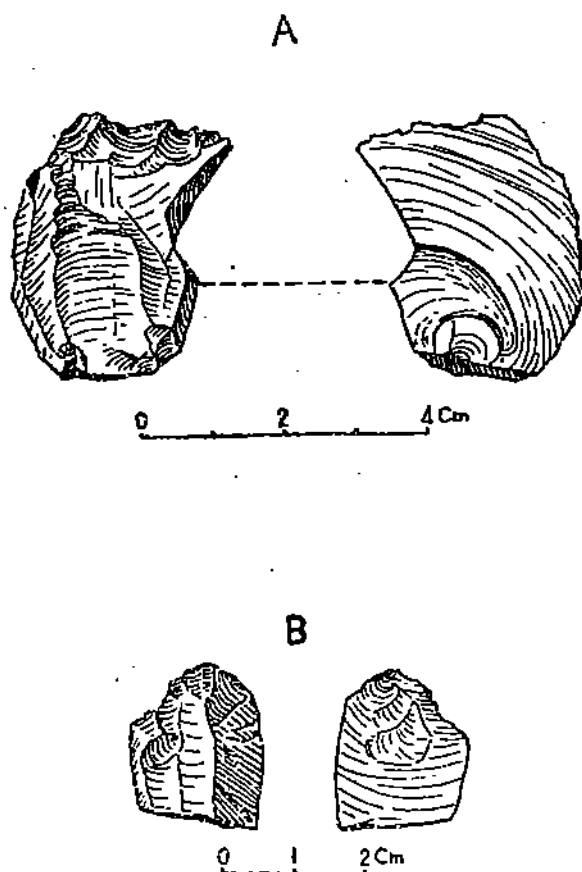


Fig. 3. A: Flint graver (*burin*) or end scraper (vide Pl. IV, Fig. 1); natural size.
B: Broken flint implement with lateral retouches; natural size.

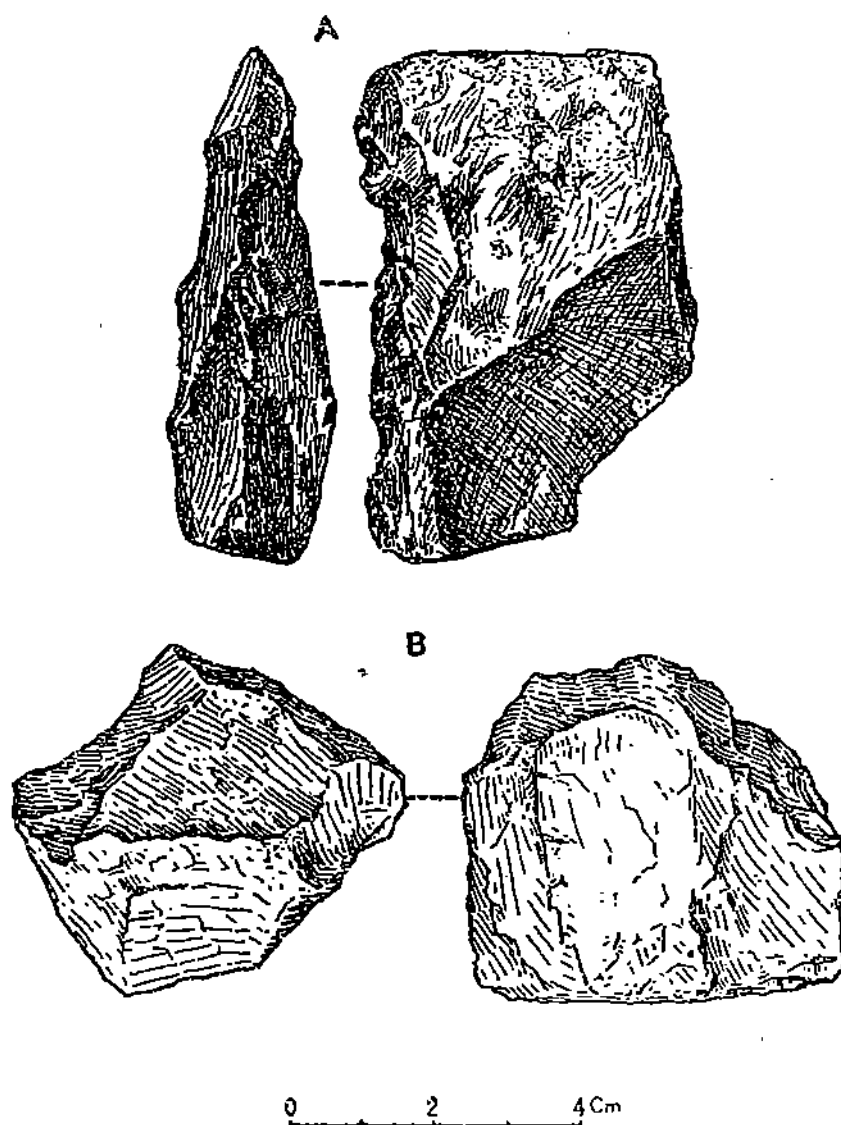


Fig. 4. Implements made of vein quartz; natural size.

however, is not straight but conchoidal: so that it has possibly to be explained by a mere accident in the preparation of the piece.

A third implement, made also of flint, (Fig. 3-B), shows distinct traces of lateral retouches. The piece represents apparently the lower half of a broken point.

All those three implements were collected in the Upper level, at the eastern part of the cave (Layer 2, Fig. 1, L-2). A chert flake, unretouched, was collected in the lowest level of the Lower room (Layer 5, Fig. 1, L-5).



Fig. 5. Bone needle (vide Pl. IV. Fig. 5); natural size.

Exactly as in *Sinanthropus* times, vein quartz was still commonly used as material for implements by the Man living in the Upper Cave. As a matter of fact, worked pieces of quartz were often found in the sediments, much more abundantly than flint or chert.

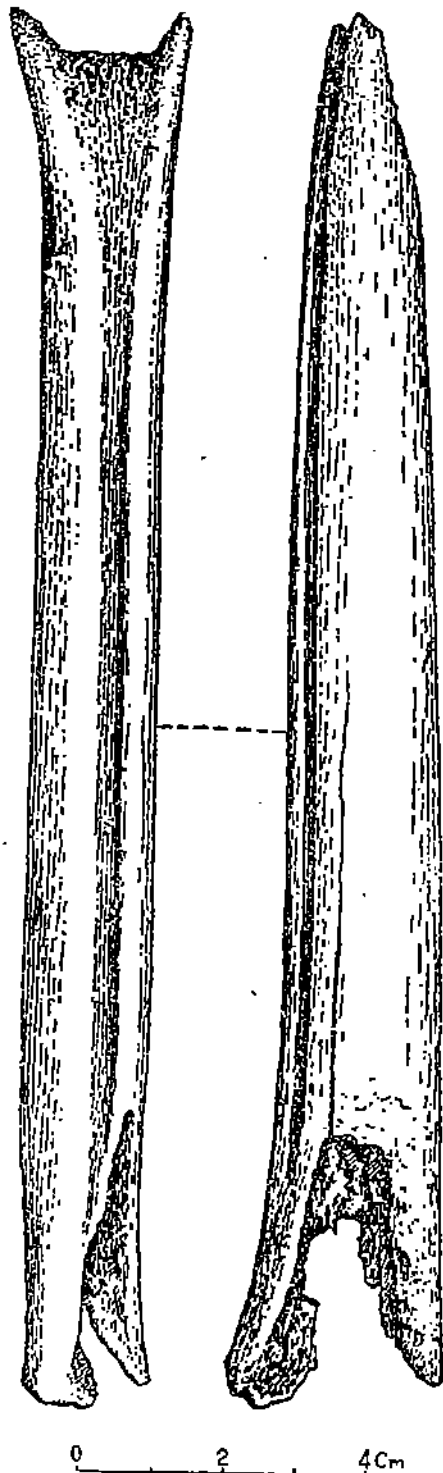


Fig. 6. Bone implement (vide Pl. IV, Fig. 4); natural size.

Of those quartz implements, generally rough, we shall mention here two specimens only (Fig. 4): A is a well retouched side scraper; and B a well worked nucleus.

b. Bone implements

In addition to the numerous ornaments of bone to be described in a following paragraph, two bony tools have been recovered from the Upper Cave.

The most interesting one, (collected in Layer 1, Fig. 1, L-1) is a bone needle (Fig. 5 and Pl. IV, Fig. 5), just broken at its eye. The shaft is slightly curved, and 82.0 mm. long in the present state. The shape seems to have been obtained by abrading or grinding. Tip well rounded and sharply pointed. The eye, as far as we can judge in its broken condition, was not made by drilling, but by excavating or scratching with a pointed implement.

Another implement, made of a Deer's canon bone, is difficult to interpret (Fig. 6, Pl. IV, Fig. 4).⁷ The diaphysis of the bone is thinned and forked at both ends, the forks opening in two almost perpendicular planes, more or less as in a shuttle.

⁷ A series of similar specimens, but not so suggestive because they are clearly nibbled by animals and forked only at one end, was collected from the "Lower recess", where no human remains nor clear artifacts were discovered.

2. ORNAMENTARY ARTIFACTS

Perforated Stone Pebble. A single specimen of this type was collected in Layer 4, (Fig. 7, Pl. IV, Fig. 3). The piece consists of a nice, naturally rounded, limestone pebble in which a foramen has been *drilled*, from two sides, using a blunt driller. By the technique it displays, this specimen is probably the most achieved expression we have of the degree of workmanship reached by the Man of the Upper Cave.

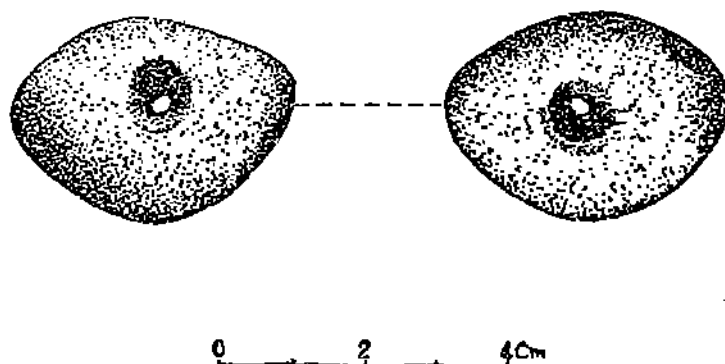


Fig. 7. Perforated stone pebble (vide Pl. IV, Fig. 3), natural size.

Perforated teeth. Perforated teeth are the most abundant and characteristic artifacts known in the Upper Cave. Two kinds of teeth were used for this purpose: a) the upper canines of deer (Fig. 8, Pl. IV, Figs. 9 and 10) (4 specimens); and b) the canines of fox or badger (Fig. 9, Pl. IV, Fig. 8) (more than 60 specimens). The perforated teeth were often found grouped together within a small spot. For example, 28 perforated fox's canines were collected over an area not exceeding 1 square meter (Layer 2). In such cases they represent apparently the remains of a necklace.

After studying all the material at my disposal, I did not observe, on those teeth, a single rounded or circular foramen, which might be attributed to

drilling. All the perforations are irregular, as if made by *scratching* from both sides of the tooth root. Some of the scratches are still distinct under a magnifying glass.



Fig. 8. Two perforated teeth (canines of deer), (vide Pl. IV, Figs. 9 and 10): natural size.

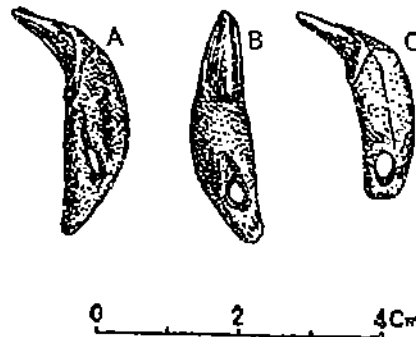


Fig 9 Three perforated teeth (canines of fox or badger).

A smooth surface, sometimes visible around the perforation, is probably due to a wearing action of the string inserted in the hole.

Perforated Shells. From the lower level in the western part of the cave (Layer 4), 3 perforated marine shells (*Arca*) were collected (Pl. IV, Figs. 11 and 12). The perforations occur near the beak, and were most probably made on purpose. Their shape however, is irregular, and does not show any trace of drilling.

Bony pendant. This last type of ornament consists in four pieces of hollow bones, nicely worn and trimmed into cylindrical pendants (Fig. 10, Pl. IV, Fig. 6).

3. OTHER MATERIAL FOR CULTURE PURPOSES

In addition to the well-defined objects above described, we have collected in the Upper Cave a series of foreign substances evidently brought in by the Man for cultural purposes. Such are some vertebrae of fish and several pieces of *mother-of-pearl* and hematite.



0 1 2 Cm

Fig. 10. Cylindrical bone pendant (vide Pl. IV, Fig. 6); natural size.

a. *Fish Vertebrae.* About 20 vertebrae of a large fish (*Cyprinus carpio* L.¹) were collected in the western part of the cave together with the perforated shells and teeth (Layer 4). Besides those bones, one spine, one intervertebral cartilage, and one sclerous plate were found from the same spot of sediments; but no other part of skeleton. Those conditions suggest a selection of the vertebrae for some ornamental purpose. No one of them is artificially worked; but the Man has possibly made use of their natural perforation (neural canal).

b. *Mother-of-pearl.* Large pieces of big shells belonging to an Unionid (*Lamprotula*?) were frequently found in the Upper Cave. On these fragments no traces of workmanship, and no shape could be recognized. Living *Lamprotula* of such a large size are not actually known north of the Yellow River.

¹ Determination made by Dr. Tschang Tschun-ling.

c. *Hematite*. Pieces of oolitic hematite were frequently recovered all across the cave deposits, possibly brought in by the Man from a long distance¹. Obviously, this substance was used for *coloration*. A few pieces of bone with a red stain have been observed. But it is not clear whether this coloration has been directly stuck on the bone, or represents only a pigment secondarily derived from the hematite contained in the deposits.

V. GENERAL CONCLUSIONS

(AGE OF THE UPPER CAVE DEPOSITS, AND STAGE OF THE CULTURAL REMAINS)

1. AGE OF THE DEPOSITS

The main difficulty for dating the Upper Cave deposits is due to the fact that the locality stands actually in an isolated condition, cut from any direct connection with the loessic formations of the plain. It seems however that the period of filling of the cave, much later than the *Sinanthropus* time (vide supra p. 334), can be safely regarded as still of an Upper Pleistocene age. This assumption is based on the following points:

a) The decidedly old features noticeable in the site: complete filling of the cave; appreciable incrustations of the sediments by limy concretions; collapse of the roof; buried conditions under the soil, at the top of the hill.

b) The nature of the fossils collected in the deposits. Of course we do not know exactly, so far, whether and how long the "Late Pleistocene fauna" of N. China has been possibly surviving the true Pleistocene times. However, in the present state of our knowledge, the Upper Cave fauna is most closely linked with the Loessic fauna of China, as represented for instance in the Sjarosso-gol; *Hyæna ultima* (cf. *spelæa*), *Equus hemionus*, *Cervus elaphus* (of a peculiar type), *Struthio*. The absence of *Rhinoceros* is probably accidental,

¹ So far oolitic hematite is not reported from the Western Hills. The nearest known locality for this mineral is Yentungshan, Lung-Kuan-hsien near Shuanhuahsien.

or largely due to the environment. Although peculiar so far to the Upper Cave, the *Cynailurus* and the Civet-cat (the former actually restricted to India, and the latter to Central and South China) give also to the fauna a distinctly archaic character.

2. STATE OF THE CULTURAL REMAINS

In full accord with this assumed geological age, the cultural remains found in the Upper Cave bear an obvious *Upper Palæolithic* appearance: osteological characters of the Man; shape of the flint implements; advanced industry of the bone; use of the ornaments and the ochre; no microlithic industry. Most of the finds made in the Upper Cave would seem perfectly in place in an Upper Palæolithic cave of Western Europe.

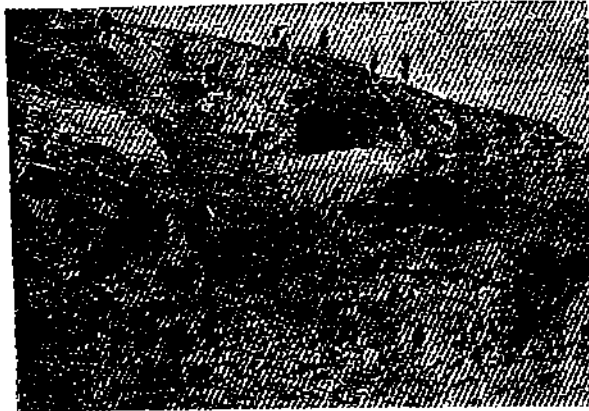
Now we would like to know the possible relations between this Upper Palæolithic culture of Choukoutien and the other Upper Palæolithic cultures already discovered in N. China. But this question cannot as yet be positively answered. Our actual impression is only that the Upper Cave industry seems more advanced, and consequently younger, than the Aurignacian-looking remains of southern Ordos (Shuitungkou and Sjara-osso-gol), in which no clear traces have been observed so far neither of ornaments, nor of refined bony implements. On the contrary, it fits rather well with the advanced cultural stage recognisable in the Late Palæolithic site of the Djalai-nor (Hailar).

If this should be the case, the dweller of the Upper Cave would become a close equivalent of the Magdalenian Man in Europe.

**Explanation of
Plate I.**

PLATE I

1. Original opening (Entrance, Text-fig. 1, *En*) of Upper Cave, taken from N-E in 1930; showing the relationship between the Upper Cave and the Choukoutien Formation.
2. Original opening of Upper Cave, taken from North in 1930, before the limestone wall and roof were removed.
3. Sediments in the Upper Cave, taken from North after the limestone wall and roof were removed.



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**Explanation of
Plate II.**

PLATE II

1. Progress of the Excavation in Upper Cave, taken from South in 1933, showing the upper part of the whole cave.
2. Remnant of the collapsed roof over the Lower Room of Upper Cave; taken from East in 1933



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**Explanation of
Plate III.**

PLATE III

1. Artificial or secondary opening of Upper Cave, taken from North-east, in 1933.
2. Progress of the Excavation in the deep western part (Lower room) of Upper Cave, taken from South, in 1933.



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**Explanation of
Plate IV.**

PLATE IV

(All figures are in natural size)

- Fig. 1 a-b Flint graver or end scraper
- Fig. 2 a-b Flint concave scraper
- Fig. 3 a-b Perforated stone pebble
- Fig. 4 Bone implement
- Fig. 5 Bone needle
- Fig. 6 Cylindrical bone pendant
- Fig. 7 Perforated tooth (canine of badger)
- Fig. 8 Perforated tooth (canine of fox)
- Figs. 9 and 10 Perforated teeth (canines of deer)
- Figs. 11 and 12 Perforated marine shells

