GY. MÉSZÁROS — L. VÉRTES

A PAINT MINE FROM THE EARLY UPPER PALAEOLITHIC AGE NEAR LOVAS (HUNGARY, COUNTY VESZPRÉM)

I

SITE AND EXCAVATION OF THE PAINT MINE NEAR LOVAS

In the spring of 1951, the Veszprém Museum was informed of the discovery of prehistoric bones in the vicinity of Csopak. The finds were entrusted to the custody of *M. Csordás*, an official of the State Forestry Comission of Balatonfüred. On receiving this notification, *Gyula Mészáros* visited the offices of the Forestry Commission on April 2, 1951, examined the material which promised to be a palaeolithic find of outstanding interest, taking it over on behalf of the Bakony Museum, Veszprém.

The collection consists of tools and fragments of tools made of the bones and antlers of herbivorous animals characteristic of the pleistocene. According to *M. Csordás*'s account, the bone objects had been unearthed in the dolomite quarry belonging to the village Lovas on Lake Balaton (the site is called «Mackó» in local parlance), at a depth of 3—4 metres, from a red-coloured layer, while quarrying the dolomite gravel. The dyeing effect of the mineral material was such that the implements used in quarrying were stained red.

The site discovered while quarrying the dolomite weathering product lies between the villages of Felsőörs and Lovas (in County Veszprém), to the W-NW of the former, NW of the Királykut Well, at a distance of 1200 metres.

Around Lake Balaton there are six triassic «Hauptdolomit» plateaux of varying size; the most important of them rises along the Felsőörs highway, reaching across the forests of Felsőörs, Csopak, Balatonarács, and Balatonfüred as far as the Balatonszőllős—Pécsely basin.[1] This plateau rises 280—290 metres above sea level. The dolomite runs approximately in straight direction from east to west and is nearly horizontal in dip (Fig. 1). The terrain is variagated and comparatively well articulated by the valleys of streams running approximately from north to south and draining the water from the district into Lake Balaton; among them are the steep, rocky Királykut Valley, the Nosztor Valley lying west of the site (near Csopak), etc.

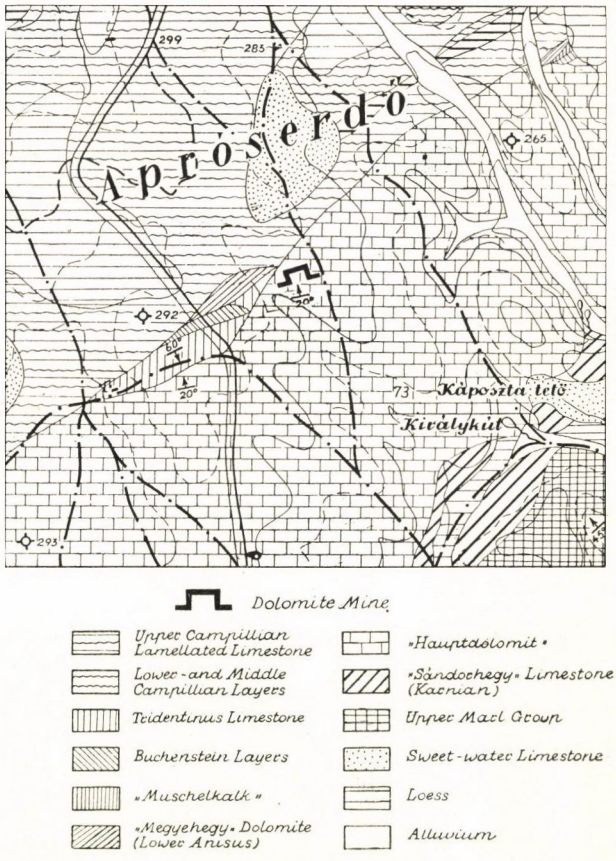


Fig. 1
The Lovas Paint Mine and its Neighbourhood

[1] *L. Lóczy:* A Balaton környékének geológiai képződményei. A Balaton tud. tanulmányozásának eredményei (Geologic Formations in the Area of Lake Balaton. Results of a Scientific Study of the Balaton). Vol. I/1, Budapest 1913, p. 172.

The site itself, the dolomite gravel quarry, is a steep-walled pit, 3—4 metres deep, its entrance being 200 metres east of the Veszprém—Csopak highway. In 1951, at the time we examined it, its area covered 3600 square metres. Red bedding, containing limonite, has repeatedly been found in the quarry; it has been dug out and used for painting houses and for ornamentation.

1. THE EXCAVATION OF PIT NO. 1

While examining the site, it has been established that the wall of the pit containing colouring matter had been dug under while quarrying dolomite, the wall had caved in, and most of the debris had been carried away. At the time of our subsequent examination it was, therefore, difficult to ascertain the original features of the site. The quarrymen present reported that during 1950 they came upon an unusually large cavity, 5—6 metres in diameter and about 5 metres in depth, which was filled with a crumbly, red-coloured material, finer in grain than the dolomite gravel. This layer was easily separated from the harder dolomite wall. Digging downwards in this apparently artificial, crateriform cavity, beginning from a depth of some 3 metres animal bones, fragments of antlers and a boar's tusk had been unearthed. No other extraneous matter or striking feature, besides these bones, had been observed; neither stone implements nor hearth had been found, though there were sporadic finds of pieces of charcoal.

It would have been important to clarify the relative position of this prehistoric pit to the ground level, the situation, shape, and measurements of the shaft leading down or, at least, its precise extent. But informations on these points lack precision. This is understandable since the workers engaged in quarrying dolomite gravel paid no special attention to the red layer which came to the surface; this neglect is explained by the fact that red limonite nests, without any finds, had been found previously on the territory of the gravel pit.

The only thing we could do was to examine thoroughly the limonitic matter found in the pit, which had been mixed and turned over previously. Only a few pieces of broken cortices were found, with old traces of breakage. We wish to point out, in this connection, that among the implements handed in there were several broken specimens showing fresh traces of fracture. The missing parts of these implements could not be traced.

2. EXCAVATION OF PIT NO. 2

Together with the examination of the site of pit No. 1, we undertook a close inspection of the whole territory of the gravel quarry. On the northern wall of this extensive system of pits thin layers of limonite came repeatedly to the surface without, however, showing any traces of prehistoric finds. But in the northern sector of most recent working, at the tapering end of the pit, in the upper third of a perpendicular, 3 metres high dolomite wall a nest-like red streak, 1 m deep, 1,20 m wide was discovered, under a layer of humus 50—60 cm in depth.

The stratification of the red sediment, different in character from the undisturbed layers of gravel, warned us that in this layer we may expect to discover prehistoric finds.

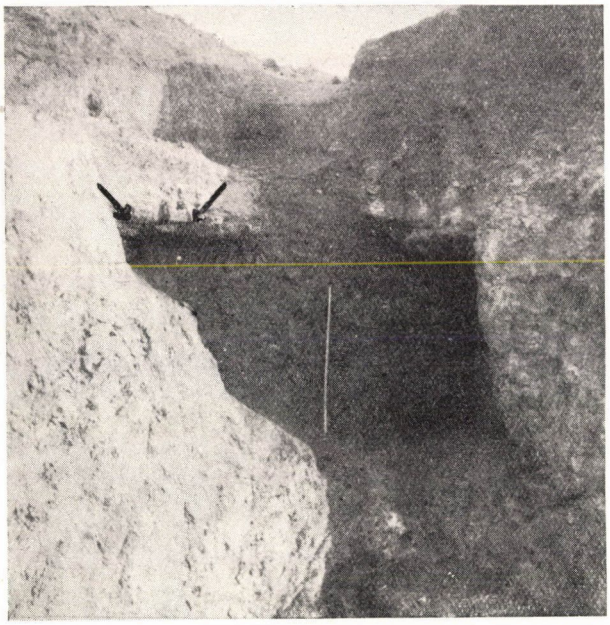
This point of the gravel quarry is situated to the NE of last year's site, at an angle of 50 degrees and a distance of 17 metres.

By the time this new cultural layer was discovered, a considerable quantity of dolomite weathering product, containing limonite, had been found at the foot of the wall rock, an indication that the red mineral matter has recently been quarried. On examining the fresh mound, we found in it a piece of charcoal as well as the fragment of a rib belonging to a fairly large mammal.

We immediately started the work of excavation, partly standing on a ladder and digging in a perpendicular direction, partly by means of a trench measuring 2 by 3 metres and dug from the surface.

The dip, in shape originally like a swallow's nest, gave way to the pick easily and kept extending in depth and width. The loose sediment which filled it seemed to crumble of itself, the pick was used only to scoop it out. But before the bottom of the surface trench could reach the level of the layer which contained the colouring matter, beneath, at the side of the wall rock, progress in the hitherto loose soil was suddenly checked. After proceeding inward in a horizontal direction to a depth of some 60 centimetres, the trough-shaped

cavity, constantly extending in size, became bounded by a hard dolomite ceiling, 70—80 cm in thickness, which barred the way to further explo-



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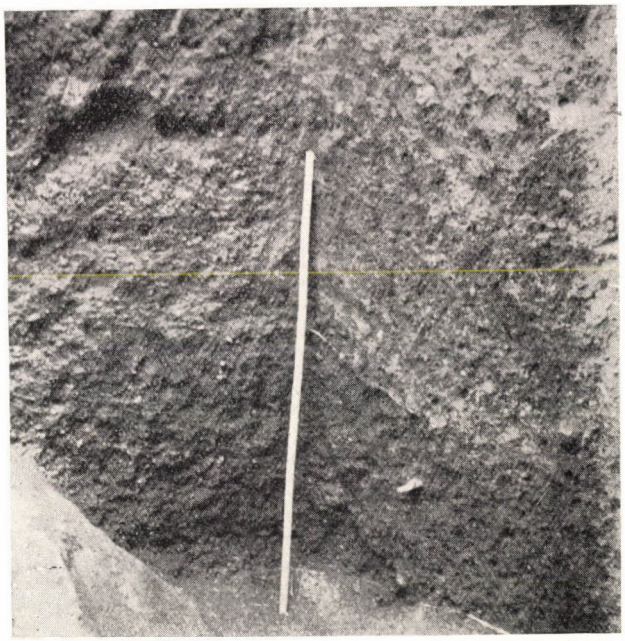

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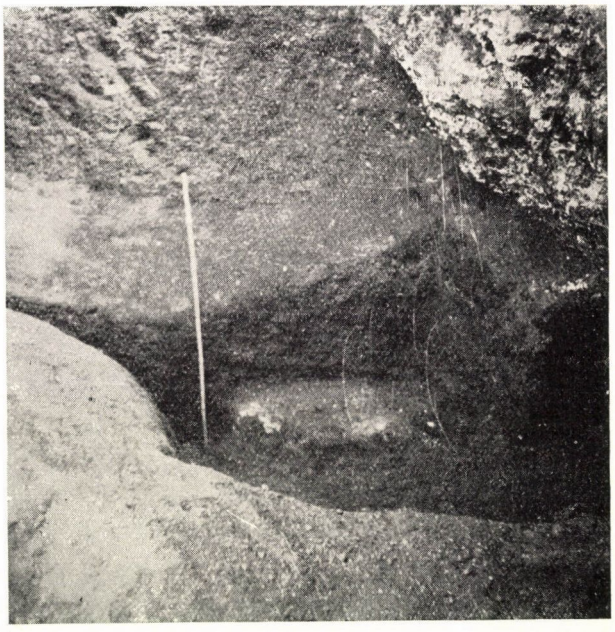

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Fig. 2

1. Southern shaft of pit no. 2 with layers and traces of fire (latter indicated by arrows); 2—3. Layers of pit no. 2; 4. Pit no. 2 after the excavation, with profiles *b* and *c* preserved

ration in the upward direction. This horizontal stone bridge was broken towards the middle by a slanting shaft, 60 cm in diameter at the upper, 80 cm in diameter at the lower end (Fig. 3 and Fig. 2, 1). This shaft cannot be explained as the result of a casual caving in. The internal sides of the shaft were worn, nor could we find any broken debris inside the cavity, such as would have resulted from a sudden collapse. The layer of colouring matter under the shaft was just as homogeneous as under the ceiling. (Incidentally, signs of a ceiling

having fallen in have, in fact, been observed elsewhere during the further course of our excavations).

The cave then widened to a width of 2,30 metres, the sediment being about 1,5 metres deep. Here finds were unearthed in succession. In the direction of the shaft-opening, towards the middle, 30 centimetres above the bedrock the first bone implement was found: a scraper made of a rib, 17,7 centimetres in length, sharpened at both ends. Soon afterwards there came to the surface another implement made of a rib, a vertebra of a herbivorous animal, the fragment of a vertebra, roomy by this time, laying bare the successive layers, working in the midst of the slanting wall rocks, slightly inclining towards NW. The rock-cornice stretching above us on the left proved to be only 60—70 centimetres in width. The wall bordering the interior was broken off perpendicularly; the dolomite debris mixed with humus which had accumulated above it threatened to topple in, with its porous material, and block all further work.

We now decided to continue digging from the surface. But since our first trench (marked with dotted lines on Fig. 4, 1) had not struck rock so

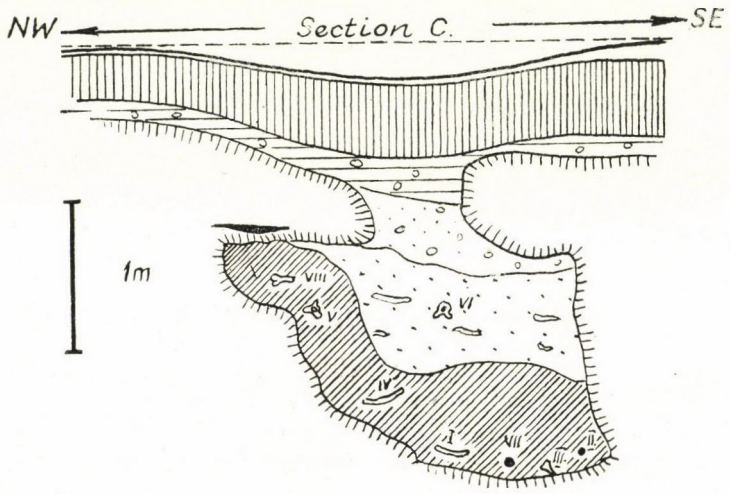


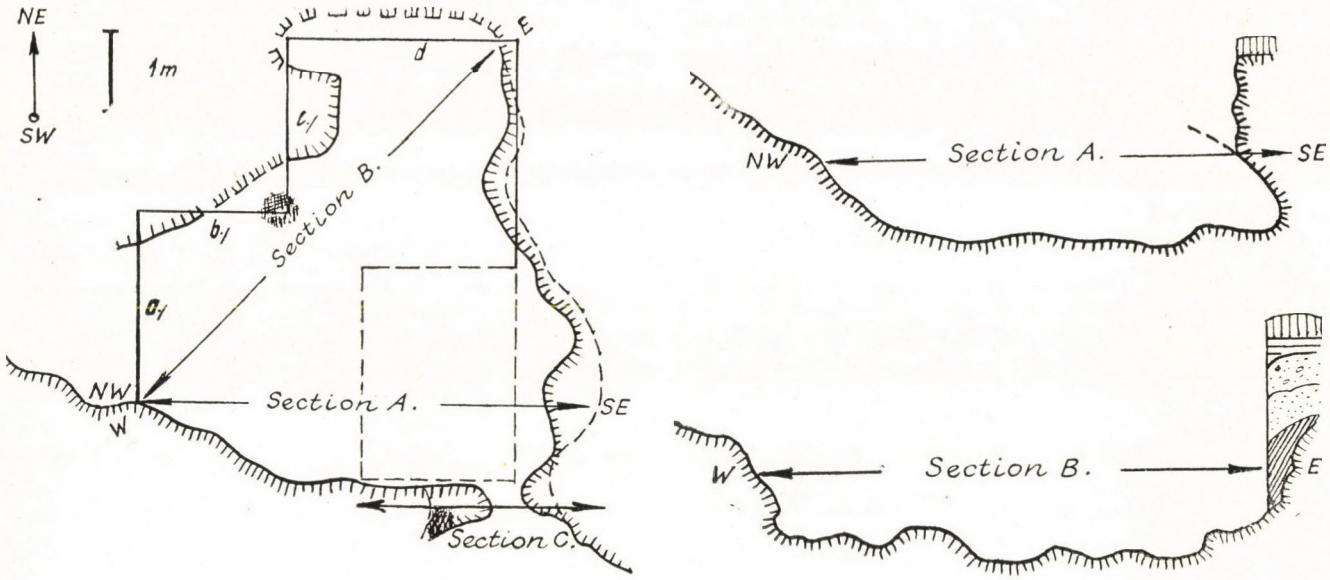
Fig. 3
Section of the southern shaft of paint-pit no. 2; 1—8. Finds of implements and bones

part of the leg-bone of a fowl, and pieces of charcoal. With the exception of the broken vertebra which came from the layer mixed with dolomite debris, all these finds were embedded in the lowest layer, 50—80 centimetres in thickness, dark red in colour, occasionally shading off into purple.

Finally, at the meeting point of the north-western perpendicular wall rock and the adjoining portion of the ceiling, closely clinging to the lower part of the ceiling, the thin black streak of a former hearth was stretching, 50 centimetres in length, towards the opening of the shaft. From the west, i. e. from the direction of the pit in the dolomite quarry, the layer of the hearth was observable at a width of 10—15 centimetres, while towards the east it disappeared in a narrow cleft in the dolomite.

Meanwhile, the deepening of the upper trench had to be abandoned, lest the flimsy, jutting dolomite cornice should topple down. So we continued digging in the interior of the cave, fairly far anywhere, we thought it better to proceed along the wall of the broken ceiling on the left which had been discovered in the course of the internal excavation, in a north-western direction, digging a trench 1 metre wide. But this measurement of the trench could not be maintained after the first 3 metres, because the wall rock, besides the gradual rise of the uneven bottom level, was slowly turning in a slight arch inwards, in a northern direction. At a distance of 4,5 metres our trench, dug in the direction NW—SE, met in its north-eastern sector the south-western wall rock at a sharp angle, the depth of the layer being 1,5 metres. The cave thus proved to be, in all probability, a fallen-in mine or, at least, an artificial pit; the next task was to ascertain its extent towards the east. Accordingly, the digging of the trench was continued, passing the interior edge of the shaft-opening, along the inner wall of the broken ceiling in the SE, while keeping to the direction

of the former sector. Starting from the shaft, the wall rock stretched here towards the east, but dolomite weathering product was found to predominate.



1 2

Fig. 4
1. Sketch and sections of pit no. 2; 2. Cross-sections along sections *A* and *B*

only in its lower part, because at a distance of 1 metre another rock-cornice was discovered. But this niche was not large, either (Fig. 4, 2, at the south-western end of Section A, marked with an arched dotted line). By using this method we obtained a section 6 metres in length and, on an average, 2,5 metres in height.

In the profile of Section A generally the same succession of layers could be observed as in the entrance portion, in the cave under the shaft-opening. (See Fig. 5 and 2—3 on Fig. 2.) The layers were as follows: 1. a layer of humus, 30—50 cm deep; 2. dolomite weathering product mixed with humus, with an average thickness of 20—25 cm; 3. below it about 50 cm of pure dolomite weathering product, the lower part of the layer being already coloured red; 4. a layer 70—80 cm thick, consisting of more finely grained dolomite gravel, entirely permeated by red colouring matter. Layer 3 did not yield any finds; even in Layer 4 it was an exceptional occurrence when we came upon one or two fragments of unprocessed bone (vertebra, knuckle, heel bone) and some pieces of charcoal.

The bone tools and stone implements, as well as the bulk of the charcoal remains, were found in the crumbly matter of the thickest, dark red layer (Layer 5) covering the bedrock. With regard to the composition of this layer, here again the

On completing the excavation, the pit proved to be of an irregular ground-plan, about 20 square metres in area; its lowest layer has yielded 61 bone implements, 7 fragments of tools made of antlers, 64 fragments of cortices (most of them being fragments of tools). In addition, we found a much smaller number of stone implements and their fragments: a smooth-worn, slipper-shaped large wedge, used for quarrying stone; a spear-point shaped like a laurel leaf, and 17 stone flakes. These objects were found in profusion in the purplish-red layer and in the gaps of the uneven bedrock, so that the map indicating the finds finally became overcrowded.

Below the lowest layer of pure paint there was only solid bedrock, with smaller or larger troughs and benches on its surface (Fig. 4). A few implements were hiding even in these indentations. But the layer of paint did not adjoin immediately, without any transition, the rock *in situ*: the space between the two was filled by a few centimetres of flour-like yellow powder, the weathering product of the matrix.

The succession of layers observed at the beginning of the excavation in the «shaft» (Section C) and in the profile of Section B, as described above, proved to be valid for the whole territory of the pit. The only deviation was that, at the beginning of the excavation, traces of burning without finds

(Fig. 5, Layer 4) could be observed at the foot of the ceiling on the left side (Fig. 2, 1, the place indicated by arrows), as well as at the meeting point of profiles *b* and *c*, at a depth of 70 centimetres,

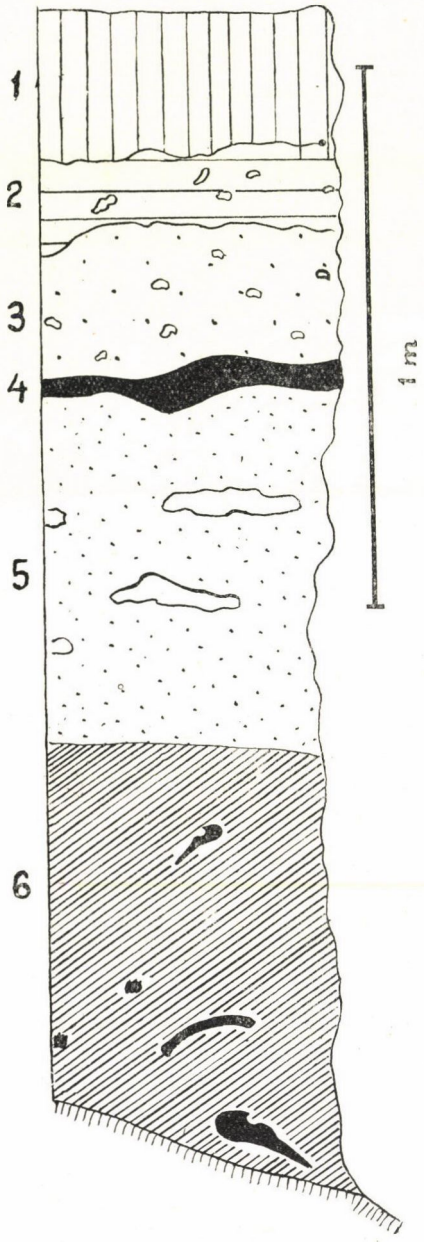


Fig. 5
Ideal succession of layers from the south-eastern corner of the pit. 1. Humus, 2. dolomite weathering product, 3. slightly coloured dolomite weathering product, 4. layer of hearth, 5. red-coloured dolomite weathering product, with lumps of dolomite, and 6. dark-red layer of paint, with bone implements and pieces of charcoal

at the boundary of the dolomite weathering product and the upper red layer. In addition, lumps of fallen-in dolomite, even larger blocks, were frequently found, especially in Layer 4.

The excavation has yielded the following picture for the structure of the pit (Fig. 4) :

After measuring the layers observed in the profile of Section A, we excavated profile *a* of the pit, stretching from NE to SW, thus reaching the northern wall of the pit. Between the two wall rocks, the level of the bedrock, rising gradually in a north-western direction towards the surface, forms a natural passage downwards.

At the meeting point of profiles *b* and *c*, the black blot of the hearth mentioned above was discovered, with a diameter of 60 centimetres, 7—8 centimetres in thickness (shaded blot on Fig. 4, 1 ; between Layers 3 and 5 on Fig. 5). Profile *b* passed through the lowest rock-cornice of the north-western wall of the quarry (only 70 centimetres from the bottom ; Fig. 4, 1).

Profile *d* bridged over the end of the bulge of the quarry towards the NE, connecting the wall rocks in the NW and the SE. The steep wall in the NE extended only 30 centimetres beyond the line of profile *d*.

Finally, along the whole south-eastern wall of the pit, a range of rock-cornices, about 30—70 centimetres in width, could be observed. The cornice is vault-shaped, it seems to incline in an arch towards the interior of the pit, but its width extends only to 30—70 centimetres, after which it breaks off abruptly, with a dented fracture (Fig. 4, Section A).

On the wall opposite this truncated vault, at the northern side of the pit, the adjoining ceiling-wall is missing ; instead, the level of the bedrock is gradually rising towards this wall (see Section A in Fig. 4). Hence it is obvious that the cavity of the quarry had never been overarched by a complete ceiling, only by a cornice-shaped vault. Since dolomite has an easily crumbled, friable consistency, the edge of the rock-cornice kept breaking off, scattering the interior of the pit with fresh rubble.

3. THE CONFIRMATORY EXCAVATION OF 1952

In the autumn of 1952 the authors of this article undertook a trial-excavation in the area between pits nos. I and II, at the place where the surviving truncated wall of pit no. I was standing ; here, at the foot of the wall, a narrow trench was dug. This trial-digging has proved successful. Under the foot of the wall rock a triangular fissure, 1,5 metres long, 50—70 centimetres

high, was found, with a blind ending towards the SW but extending to the surface in the direction of NE. These small remains of cultural layer were also found to contain archeological material identical with the finds unearthed in the two large pits (Fig. 6). The site is situated at a distance of 14,5 metres from pit no. 2, 23 degrees towards the SW. The shape is a scalene triangle, the base measuring 140 centimetres, the two sides 260 and 300 centimetres, respectively.

In the course of the excavation the structure of the southern corner of pit no. 2 could not be fully ascertained, because at the time of the discovery of the site, this part had already been damaged. Part of the material had been carried away, the wall rock (and possibly the ceiling that may have adjoined it) had been knocked down. By way of testimony, we left intact a salient, with a basic area of 100 by 70 by 100 centimetres, in the *b—c* profile of pit no. 2, showing the ideal succession of layers ; but, owing to circumstances beyond our control, this profile has since been destroyed.

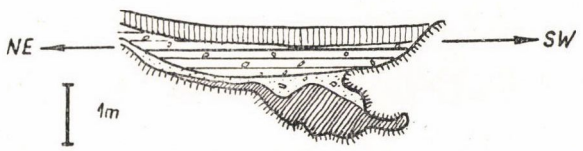


Fig. 6
Succession of layers, confirmatory excavation of 1952

II
DESCRIPTION OF IMPLEMENTS

1. SCOOPING-TOOLS MADE OF ULNAE

Megaloceros ulna sin., 410 mm long (Plate I, 3 and Fig. 7). On the dorsal half of the tuber olecrani an approximately rectangular portion has been removed. The tip of the processus anconaeus has been cut off ; of the incisura semilunaris, only a small portion of the proximal surface has been preserved ; except for this, all the articular surfaces are missing. The implement is longer than the original length of the ulna, because the bone had been severed, not at the point of ossification with the radius, but beyond a strip of the volar half of the radius. The ossified surface has been carved smooth. At the distal end of the tool, there is a mediolaterally flattened tip ending in a rounded shape.

The whole surface of the ulna bears marks of processing. Rougher incisions due to preliminary processing are clearly distinguishable on the olecranon, in the form of dorso-volar and transversal scratches ; they may also be followed along the whole length of the ulna in the form of transversal or longitudinal incisions. Even the roughnesses on the point of the stone implement used as working tool have left their clear marks. In the course of the ensuing finer finish the surface had been scraped smooth, thus obliterating a considerable part of the rough scratches. Near the tip of the tool one may observe finer, longitudinal scratches caused by use.

With regard to the use of the implement, practice demonstrates that it must have been held in both hands : the left hand resting on the tuber olecrani, where the rectangular excision made room for the part between the forefinger and the thumb, while the right hand gripped the tool with the whole palm at the point where the incisura semilunaris had been removed (Inventory no. Pb. 53/2).

Megaloceros ulna dext., 246 mm long (Plate II, 6). The olecranon had been removed, the fracture being at right angles to the length of the implement, with uneven edge:

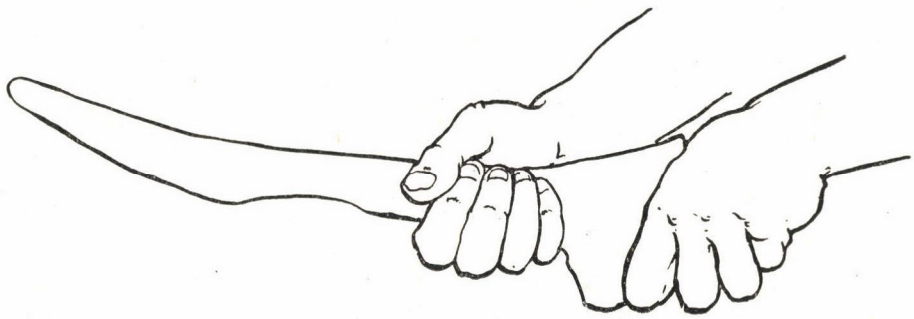


Fig. 7

the parts of the ulna articulating with the capitulum radii have likewise been removed, so that, with the dorsal edge held upwards, and gripped in the whole of the right palm, the tool fits the hand perfectly. On this implement, too, the scratches of preliminary processing are clearly distinguishable, especially in the part cut out from the radius, on which four slanting lines had been incised. The tip of the tool had been rounded off. In its lower third, the implement is sharpened both on the dorsal and the volar side, so that it reminds one of a two-edged knife with a blunt point (Invent. no. Pb 53/6).

Megaloceros ulna dext., 229 mm long (Plate II, 3). The distal end of this fragmentary tool is missing. The olecranon and part of the articular surfaces are intact, the processus anconaeus had been removed, together with the dorsal edge of the olecranon. Around the fragmentary distal portion one may see traces of finer processing (Invent. no. Pb 53/7).

Megaloceros ulna sin., 351 mm long (Plate I, 2). The distal end of the implement is broken, defective. The olecranon is intact but, beginning from the processus anconaeus, the whole articular surface has been removed with a sharp

Fig. 8

1. Stone chisel or pounding-stone from pit no. 2. 2. Chisel made of cortex, confirmatory excavation of 1952 3. Awl made of cortex, confirmatory excavation of 1952 4. Tool made of red-coloured ulna, from pit no. 2 5. Awl made of pseudometapodium, with marks of the processing stone implement 6. Pick-head made of antler, cessing stone implement (Nos. 1—4 half the actual size, nos. 5—6 magnified about 2,5 times)

rectangular incision, so that the surface is formed in several places by the spongiosa. On the medial surface of the olecranon several longitudinal, parallel scratches may be observed; similar scratches appear elsewhere, too, on the body of the implement. The bone has been well preserved, the surface of the medial side is entirely fresh and undamaged, on the lateral side there are defects which remind one of local corrosion or solution. Unfortunately, all traces of staining were so carefully removed during the process of preparation that it is impossible to ascertain whether the unevenness of surface is not due to traces of burning. The implement was found by quarrymen while excavating pit no. I; hence there is a possibility that it may have been embedded in the pit high enough to be affected by the precipitation oozing into the ground. This supposition is, however, contradicted by the circumstance that the edge of the local injuries is sharp, the bone round them is intact and in good condition. We shall later return to the possibility of injury by fire (Invent. no. Pb 53/1).

Fragment of *Megaloceros* ulna dext., 208 mm long (Plate I, 5). Distal fragment of a scooping implement, with a part carved from the radius forming half of the tool. The fragment is not flat and two-edged, like most of the similar implements: its cross-section is an irregular pentagon, with the former, somewhat concave, surface of the medullary cavity of the radius forming the base of the pentagon, the section of the radius wall forming the two diverging surfaces on the sides, while the two upper, converging surfaces are formed by the ridge of the ulna attached to it. Traces of separation should appear on the two lower, diverging surfaces, but these have worn off for the most part during use,

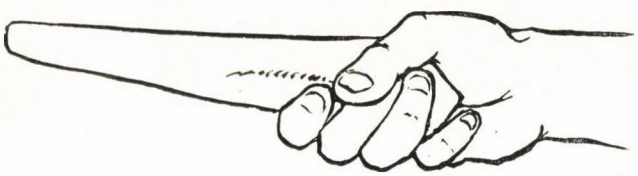


Fig. 9

leaving an uneven, blurred surface, with marks of sharper incisions here and there. The technological methods of processing bone will be discussed more fully later on (Invent. no. Pb 53/18).

Megaloceros ulna dext., 250 mm long (Fig. 8, 4). The olecranon has been roughly removed, together with the proximal half of the incisura semilunaris, while the rest of the articular surfaces are intact. The short tool has not been supplemented by any part from the radius. The body of the tool is strongly flattened along the dorso-volar axis, the tip is finely rounded. The prosector has left this implement in its original red colour (Invent. no. Pb 53/3).

Megaloceros ulna dext., 285 mm long (Plate II, 2). The olecranon is fairly intact, the articular surfaces, beginning from the processus anconaeus, have been removed and incorporated, in a slightly arched line, into the body of the bone. The strong, longitudinal grooves made in processing are clearly visible where parts of the bone had been removed. The flat, round tip is slightly damaged, showing dents due to use. The surface of the bone is in fresh, intact condition (Invent. no. 53/4).

Megaloceros ulna dext., 208 mm long (Plate III, 5). Both the volar and the dorsal edges of the olecranon, together with the processus anconaeus, have been removed, the other parts are intact. The tip has been damaged. The implement fits much better into the left hand than into the right one (Invent. no. Pb 53/12).

Megaloceros ulna sin., 257 mm long (Plate III, 1). The upper part of the olecranon has been removed by a rough stroke, running obliquely from the dorsal edge to the volar. The articular surfaces are intact. The length of the implement has been determined by its jointing with the radius; the former ossification surface has only been roughly smoothed down. The surface of the bone is in fresh, good condition, the tip is fairly sharp, oval in cross-section (Invent. no. Pb 53/9).

Megaloceros ulna dext., 247 mm long (Plate I, 1 and Fig. 9). In the case of this implement, practically the whole surface of the ulna has been processed. The olecranon has been removed, along lines obliquely running upwards both from the volar and dorsal directions, whereby an obtuse angle has been formed in the middle, laying bare the medullar cavity. All articular surfaces have been carved off; at the point of the incisura semilunaris a projecting, hook-shaped part has been scooped out of the spongiosa; this part, if the tool is held in the right hand like a pistol, gives good support to the middle finger. Traces of carving are clearly visible around the removed parts. The tip is somewhat thick and blunt (Invent. no. Pb 53/8).

Megaloceros ulna dext., 165 mm long (Plate III, 7). The olecranon has been removed along the line of the processus anconaeus. The line of severance shows traces of a stone implement. By means of strong, oblique stroke extending from the dorsal to the volar side, the tip has been shaped fairly sharp, while flattening it from the two sides. At the fracture-line of the removed olecranon the spongiosa have been scooped out fairly deep. In the place of the lateral articular surface adjoining the capitulum radii there is a cortex-defect (perhaps due to a fistula), with slightly callous edge (Invent. no. Pb 53/11).

Megaloceros ulna sin., 224 mm long (Plate III, 2). The tuber olecrani of the juvenile animal shows signs of imperfect ossification; the capitulum ulnae is intact, the tip is flat and rounded. The surface of the bone is intensely and evenly corroded, probably precisely because of its juvenile character (Invent. no. Pb 53/10).

Megaloceros ulna sin., 178 mm long (Plate III, 4). The tuber olecrani and the dorsal edge of the olecranon, together with the incisura semilunaris, are missing. Traces of a strong severing stroke are observable on the lateral side. On the medial articular surface adjoining the capitulum radii, a pathological resorption of the bony tissue may be observed; it seems that the absence of the tuber olecrani was due not to human interference, but a disease of the bone. The injured tip is intensely flattened and rounded (Invent. no. Pb 53/14).

Megaloceros ulna dext., 206 mm long (Plate III, 3). The olecranon has been removed in the same way as in the case of implement no. Pb 53/11. At the distal end of the incisura semilunaris there is cortex resorption of the size of a bean, with callous edges. The spongiosa have not been removed where the olecranon had been broken off. The tip is flat, ending in a point. Like most tools made of right ulnae, this one, too, fits the left hand better (Invent. no. Pb 53/15).

Megaloceros ulna dext., 215 mm long (Plate II, 1). A badly damaged implement; its parts around the tip may have broken off in the course of the excavation. The dorsal edge of the olecranon is missing, together with the processus anconaeus and the incisura semilunaris. The other parts are fairly intact, with occasional damages. The surface of the bone is in good preservation (Invent. no. Pb 53/13).

Megaloceros ulna dext., 182 mm long (Plate III, 6). The larger part of the olecranon has been removed in the same way as in the case of implement no. Pb 53/12. The articular surfaces are intact. The tip is rounded, with chips and dents due to use (Invent. no. Pb 53/20).

Megaloceros ulna dext., 185 mm long (Plate II, 4). The whole olecranon has been removed, together with all the articular surfaces. Along the rough fracture there are occasional marks of the carver's tool. The tip is well finished, moderately rounded (Invent. no. Pb 53/16).

Megaloceros ulna sin., 209 mm long (Fig. 11, 1). A fragmentary tool, cut out from strongly cemented dolomite breccia. The object was unearthed at the time of the confirmatory excavation of 1952. As far as one could judge from its fragmentary condition, the articular surfaces were intact, only the dorsal edge of the olecranon had been removed. The sides of the short body of the implement meet at an acute angle in the moderately rounded tip. The exact position of the tool at the time of its discovery is known: it was lying horizontally, with the side since cleared turning upwards. On the volar half of its surface there are several marks of burning; these were black with soot and scorched. Flat holes, scarcely one mm deep have formed in the places which

had been burnt. Holes of a similar structure appear also e. g. on implement no. Pb 53/1 ; here, again, the dents are observable only on one side of the tool. Unfortunately, the restorer was working on this implement while we were away ; he presumably removed the discolouring. At present it cannot be definitely established, only justly surmised, that these damages, too, are the result of burning (Invent. no. Pb 53/22).

Megaloceros (?) ulna sin., 172 mm long (Plate I, 4). A fragmentary implement ; the handle part is missing, only the tip end is extant. The tip is unevenly tapering in shape. The part where a splinter had broken off has subsequently been processed, or it may have become worn again while used in digging the coloured earth (Invent. no. Pb 53/17).

Megaloceros (?) ulna sin., 200 mm long (Plate II, 5). As in the case of implement no. Pb 53/17, the handle has

Fig. 10
1. Ornamented tool made of ulna, from pit no. 1 ; 2. Same tool, with ornamentation restored (Actual size)

Fig. 11
1. Tool made of ulna, with cemented rock and traces of burning, from pit no. 2; 2. Bone spear-head from pit no. ?
(Actual size)

broken off. The tip accidentally formed by the fracture also shows signs of wear; presumably, this tip was also used for work. The ordinary working edge has been very carefully flattened and given a roundish tip. The tool could not have been long in use, because the grooves made in the course of carving are still clearly distinguishable on the surface (Invent. no. Pb 53/21).

Megaloceros ulna dext., 96 mm long (Plate I, 6). This is the broken-off tip of an implement made of an ulna. The lateral surface of the tool is corroded, as in the case of tool no. Pb 53/10; hence it must have been made of the bone of a juvenile animal. On its medial surface there are indentations, probably due to burning (Invent. no. Pb 53/19).

The total number of implements made of ulnae is 22. Of these, 13 implements are made of right-side ulnae, 9 of left-hand ones. The tools were obviously made for use with one hand or with both hands. Implements belonging to the latter category are strikingly large, their extra size being due to the circumstance that, together with the ossification area, a smaller or larger part of the radius has been added to the ulna.

Implements made of left-side ulnae suit the right hand much better than those made of right-side ulnae. This is not only our conclusion, but represents the experience of the makers of these tools. This is shown by the fact that in the case of the 9 tools made of left-side ulnae, the heads of 2 implements are entirely unwrought, in 2 cases the articular surfaces have been left intact, with some carving on the tuber olecrani, while of the 3 intensely processed pieces 2 were made for use with both hands, a circumstance which necessitated a great deal of transformation in the bone material. By contrast, in the case of the 13 tools made of right-side ulnae, 4 pieces have been radically rewrought, on 5 implements the olecranon has been shaped to suit the hand, on 2 more pieces the articular surfaces show marks of intense carving — the bone has in no case been left unprocessed.

All implements, especially those for use with both hands, suit the hand excellently and are fit for a serious exertion of force. They must have been used to dig the comparatively loose earth with a movement directed upwards. This is shown by the circumstance that the dorsal edge, turned upwards, is always more worn round the tip than the volar edge.

Bone implements made of ulnae are not unknown from the Palaeolithic Age. In Hungary, it is true, the only piece known so far is an awl found in Szelim's Cave[2]; even this is the product of some later prehistoric culture, and has erroneously been defined as belonging to the Palaeolithic Age. On the other hand, the Upper Palaeolithic sites abroad — Petersfels,[3] Kesslerloch,[4] presumably one of the 'poinçons à tête' found at La Ferrassie[5] (to mention only a few examples) — are well-known for the frequent occurrence of implements made of ulnae. Beginning from the Mesolithic Age, these implements accompany the development of the younger prehistoric cultures, appearing with ever greater frequency among their tools.

The question may now arise whether the ulna implements found at Upper Palaeolithic sites may not be regarded as mining tools in general, carried by their owners to their dwellings. The question must be answered in the negative, on the ground of the following considerations: 1. such tools usually have a cylindrical tip ending in a point, hence they are awls used for punching, not digging instruments; 2. as far as we know, there are no remains of paint on them.

It is a surprising fact that a culture characterized by heads shaped like laurel-leaves, as the Lovas culture is, should have so many specific, well finished bone implements. With regard to the technical capabilities of palaeolithic man, the following general conclusion may be drawn from this phenomenon: in the Upper Palaeolithic Age man was able to produce and «invent» so quickly and perfectly the tools needed to supply material needs that he could respond, as it were «immediately», with the most satisfactory technological solution. This capacity for quick response, accompanied partly by the presence of the necessary raw materials (in this case the *Megaloceros* bones), partly by the absence of the idea of private property in palaeolithic society, made it unneccessary to carry tools specifically adapted to performing a strictly limited work to a place — the man's dwelling-place — where he could turn it to no possible use. One might object to this that the tools were in personal use and presumably stood in very intimate relation (an intimacy of practically unimaginable quality to us, owing to the animistic-magical outlook of primitive man) to their maker who was also their user; hence — so the argument runs — they represented a sentimental value to their owners. This possibility cannot be denied; in many cases it seems to offer the only explanation for certain manifestations of palaeolithic life. But in our case the mere fact of a find of nearly 100 tools, most of them intact, nor confined to a definite cultural layer but loosely distributed in the thick cultural layers of two pits, seems sufficient proof of our view outlined above. It seems, they did not take to their (so far unknown) abodes the tools used in mining, not even the ornamental ones. Beyond a mere accident, this habit seems to have been a general law in the Palaeolithic Age, in the case of specific tools, not used in everyday life.

We conclude from the above that the well-known ulna implements found at palaeolithic sites are not identical with our tools but are presumably awls used for punching leather.

Besides the headed awls made of ulnae, another, radically different group of tools has been found at this site; the length of these implements has been increased by a part cut out from the radius. These tools are without parallels both in the Palaeolithic Age and in later cultures.

1/A ORNAMENTAL TOOL MADE OF ULNA

Megaloceros ulna sin., 192 mm long (Fig. 10. Tool with ornamentation and painting restored: Fig. 10, 2). A badly damaged, fragmentary, ornamented implement. The olecranon has been removed, together with the articular surfaces. The tip is broken. The lateral side shows linear ornamentation, the medial side intense traces of burning and thick grooving consisting of several parallel lines. On both sides, the surface has been damaged in a number of places (Invent. no. Pb 53/5).

The ornamentation of the ulna consists of the following elements: a line running parallel with the volar ridge, closed in by a scratch which forms an acute angle with the longitudinal axis of the implement. Parallel with the closing line, there is a continuous design in the centre, the two parallel scratches at the edges being connected by four parallel lines running across the distal part. Inside the main lines, the 3 longitudinal parallels near the proximal side are connected at the end. Parallel with this group, but near the dorsal ridge we see a ladder-like ornament consisting of 9 transversal lines and two long lines which connect the former; in the proximal direction, this ornament is continued in 5 separate parallel incisions. The pattern would probably run on, but for the circular, about 40 mm large damaged surface in the middle of the implement, blotting out both this pattern and the other groups of lines. Near the processus anconaeus the traces of 5 parallel lines are observable, while from the dorsal

[2] *M. Gábori:* A paleolitikum csontipara Magyarországon (Bone Industry in Hungary during the Palaeolithic Age). Arch. Ért. 78 (1951). Plate IX, fig. 4.

[3] *E. Peters:* Die altsteinzeitliche Kulturstätte Petersfels, Augsburg 1930. Taf. XIII/1.

[4] *J. Nuesch:* Das Kesslerloch, Neue Denkschr. d. allgem. schweiz. Gesellsch. f. d. gesammten Naturwiss. Zürich, 31 (1904). Taf. XX/1, 2, 5.

[5] *D. Peyrony:* La Ferrassie, fig. 47/5,

end of the tuber olecrani 8 parallel lines are running to the damaged surface, crossed by parallel scratches.

It is possible that these various groups of lines would yield, but for the damaged surface, a homogeneous system of ornamentation or some stylized design ; but with the present condition of the tool, all efforts at reconstruction have proved fruitless.

The lines were first lightly scratched on the surface, afterwards deepened by piercing tiny holes in close succession to one another.

The palaeolithic sites of Hungary have so far yielded very few ornamented objects, and not a single statue or drawing made by primitive man.[6] The striking paucity of artistic manifestations is illustrated e. g. by the fact that among some 170 bone implements in the Istállóskő Cave belonging to phases I and II of the Aurignacian period — a time when palaeolithic art began flourishing in the west — only one is ornamented in a primitive way.

Our finest ornamental object from the palaeolithic age is an amulet made of mammoth bone, found in the Magdalenian zone of the Jankovich Cave and bearing a ladder-like ornamentation. The same site has yielded a bone rod with zig-zag ornamentation ;[7] the list ends with the object, already mentioned, from the Istállóskő Cave — another bone rod ornamented with slanting lines.[8]

In the passage quoted above Hillebrand tries to demonstrate that the amulet from the Jankovich Cave represents a transition from the west-European naturalistic style to the eastern geometric style, from a manner true to nature to the stylized. But it has since been established that manifestations of both styles may be observed both in the east and the west. An object with linear ornamentation found in Hungary allows one to draw very few conclusions, either with regard to the geographic distribution of styles or the direction in which cultures were spreading.

It seems, on the other hand, that the evolution of ornamental art in the palaeolithic age did not follow the development of descriptive art from the natural towards the stylized. The earliest «hunter's marks», which it is hard to separate from a primitive instinct for ornamentation, are seen on Mousterian bones and consist of parallel lines.[9] Similarly, the Aurignacian implements found in the eastern half of Central Europe — tools of great antiquity compared with those of Western Europe — are also ornamented with simple lines.[10]

It is unnecessary to enumerate here all those Upper Palaeolithic objects with linear ornamentation, frequent and known throughout Europe, which — from the British Isles to Siberia — bear testimony to the developed instinct for ornamentation in palaeolithic man, as well as to the urge which, born of a fundamentally animistic-magical outlook, was an even deeper source of this kind of activity than any «instinct for ornamentation». The results of this activity fill the museums of Europe with an abundance of creations that nearly baffles classification, by artists who range from early Aurignacian to late Epipalaeolithic. It seems enough to point out here that among the Upper Palaeolithic finds in Czechoslovakia, so rich in ornamented implements, there are objects showing a similar ornamentation as ours and possibly pointing to connections in age and origin. The most striking agreement is perhaps with the ornamentation of the mammoth ribs found at Předmost.[11]

2. HEADED AWLS MADE OF PSEUDOMETAPODIA

Megaloceros pseudometapodium, 95 mm long (Plate IV, 10). The capitulum of the bone has been left intact, but the whole surface shows longitudinal grooves made by retouch, except for the vicinity of the blunt tip where the grooves of processing have worn off owing to use. The tip is well finished, oval in cross-section (Invent. no. Pb 53/39).

Megaloceros pseudometap., 103,5 mm long (Plate IV, 7). Same as preceding. Here, too, longitudinal grooves are observable, especially in the region where the muscles adhered to the bone (Invent. no. Pb 53/40).

Fragment of *Megaloceros* pseudometap., 88,5 mm long (Plate IV, 12). The tip of the tool is broken off, a shallow furrow is stretching along the lateral side (Invent. no. Pb 53/41).

Megaloceros pseudometap., 118 mm long (Plate IV, 1). A tool with undamaged surface and blunt tip (Invent. no. 53/42).

Megaloceros pseudometap., 118 mm long (Plate IV, 2). A tool with intact surface and damaged tip. Under the capitulum there is a large, corroded injury which, except for a narrow neck, has destroyed both the cortex and the spongiosa. Such a sharply delimited defect could hardly be produced except by burning (Invent. no. Pb 53/43).

Megaloceros pseudometap., 105 mm long (Plate IV, 8). The capitulum is broken off, the tip ends in a fine pin-point, the surface is undamaged. Longitudinal and transversal grooves around the tip show that the tool had hardly been used. Bearing this in view, it does not seem an improbable suggestion that the blunt tools also had similar fine points before being worn off by use (Invent. no. Pb 53/44).

Megaloceros pseudometap., 153 mm long (Plate IV, 6 and fig. 8, 5). The tip of the tool, though not as fine as that of the preceding, is thin and sharp, compared with other specimens of the type. Here, again, the sharp longitudinal grooves indicate that the tool was in use only for a short time (Invent. no. Pb 53/45).

Megaloceros pseudometap., 137 mm long (Plate IV, 4). The longitudinal grooves on the surface are blurred, the tip is somewhat rounded (Invent. no. Pb 53/47).

Megaloceros pseudometap., 98 mm long (Plate IV, 9). The surface is strongly corroded, practically of a spongy character. This manifestation of corrosion cannot at present be accounted for. The tip of the tool is rounded (Invent. no. Pb 53/46).

Megaloceros pseudometap., 122 mm long (Plate IV, 3). The surface is intact, free of scratches. On account of the intense rounding of the tip the medullar cavity has been laid open (Invent. no. Pb 53/48).

Megaloceros pseudometap., 123 mm long (Plate IV, 5). The original red colour of the tool has been preserved. Here and there, longitudinal grooves are seen on the surface. The tip is moderately sharp (Invent. no. Pb 53/49).

Tools made of the rudimentary metapodia of Cervidae are not infrequent among the implements of the Upper Palaeolithic Age. Among foreign specimens, it is enough to mention here those found at Kesslerloch,[12] where they form a considerable part of the rich material of bone implements dating from the Magdalenian period, or the tools found in the proto-Magdalenian zone of Cave Badegoule, described by Cheynier[13] as «stylet de renne appointé». Analogies are

[6] All the «idols» or «statues» published so far are probably only a freak a chance.

[7] *J. Hillebrand :* Az 1916. évi barlangkutatásaim eredményei (Results of my Cave Excavations in 1916). Barlangkutatás V (1917). pp. 101—102, fig. 6.

[8] Ibid., fig. 13.

[9] Cp. *A. Dubois—H. G. Stehlin :* La grotte de Cotencher, station mousterienne. Mem. soc. paleont. Suisse, Basel. 52 (5) (1932), Taf. 15/1—5 ; *D. Peyrony :* La Ferrassie, Préhistoire III (1934), fig. 25 etc.

[10] See *L. Kosłowski :* Starsza epoka kamienna w Polsce. Poznanskie Tow. Przyjaciol Nauk I (1922), p. 1—51 *S. Brodar :* Die ersten bisher in Hochalpinen Gebieten gefundenen Kunstäusserungen des vorgeschichtlichen Menschen, IPEK 1936/37, pp. 128—129.

[11] *K. Maška :* Der diluviale Mensch in Mähren. Neutitschein 1886, figs. on pp. 99 and 101.

[12] *J. Nuesch :* op. cit., Pl. XIX, figs. 15—18.

[13] *A. Cheynier :* Badegoule, Arch. de l'Inst. de Pal. Hum. Mém. 23 (1949), fig. 18/12.

known also from Hungary, from the Jankovich Cave ; a finely pointed counterpart to the tools discussed, from the Magdalenian zone of the cave, was published by Hillebrand.[14]

We do not think it in the least confusing that the analogies mentioned above derive from the Magdalenian zone, considerably later in point of time than the Lovas find. The total material of tools in the Lovas find, precisely because of its special destination, points forward to implements used in younger cultures, frequently passing the limits of the Palaeolithic Age.

Pseudometapodia are eminently fitted to be worked into tools: their distal ends are tapering, their capitula are easily grasped in the hand. In connection with this type, two questions arise and remain largely unanswered : 1. were these awls grasped in the hand during use, or were they fixed into a helve? True, in no case did we discover marks of incision or wear near the capitulum, such as would indicate fitting into a helve ; but the possibility remains that fixing into a shaft did not always necessarily leave marks and incisions on the bone. 2. At what phase of paint-mining were these relatively fragile tools used? The worn state of the tips seems to indicate that the implements were used for work requiring considerable effort, probably – like the ulna tools discussed before – for digging and scooping, though presumably at such points of the paint-pit wher the soil was looser and more homogeneous. Even so, it is hard to understand how the brittle pseudometapodia could compete with the other, considerably stronger types of implements.

With regard to the shallow, longitudinal scratches mentioned before we wish to point out again that these did not change the original shape of the bone, wearing and disappearing from the surface of the bone in proportion to the wear suffered by the tip of the tool (fig. 8, 5). The only explanation we can give is that the fresh bone, with sinews and pieces of flesh still clinging to it, was scratched along its whole length with a stone blade, in order to remove all organic matter into which the adhesible paint-powder would have stuck in an unpleasant manner. Comparing this phenomenon with the poor stock of stone implements found at the site, presumably used only for the most indispensable processes of tool-making, one must conclude that palaeolithic man carried part of his mining implements, more particularly the easily carriable awls made of pseudometapodia, in a ready state from his permanent dwelling. This supposition is reinforced by the circumstance that in the pits – with the rare exception of a few unprocessed pieces of bone – only bones used as tools have been found.

3. TOOLS MADE OF ANTLERS

The bulk of the bone implements of the Palaeolithic Age – spear-heads and arrow-heads, awls, perforated staves, flat skinners, etc. – were made chiefly of reindeer antlers. But in the case of these tools, antlers were utilized only as raw material: they were sliced into long strips and turned into various shapes by finer processing. Tools preserving the original shape of the antlers or even making the best use of knags, twists, etc., though not unknown in the Palaeolithic Age, play an important role chiefly in the Mesolithic Age, beginning from the «Lyngby axe», as hoes, picks used for quarrying chert, etc. At Lovas, the original shape of the knags has largely been retained in the tools made of antlers, because of functional suitas bility. Among these implements we must first discus the large pick-like tools made of the tines of the giant-deer.

a) *Picks and Horns Used for Holding Paint*

Megaloceros tine, 595 mm long (Plate V, 1, a, b). The surface of the tine broken off at its root has been left intact; longitudinal scratches only appear on an area 110 mm long and 15 mm wide, while round the tip there are a few transversal injuries. The tip is intensely worn and defective. The tool was, no doubt, used as a pick for digging. It may have had, however, another – perhaps even more important – function as well. At the unevenly broken root the inner spongiosa of the antler have been removed to a depth of 19 cm, nearly everywhere as far as the hard cortex ; the removal was obviously due to artificial interference. The inner cavity is intensely stained with red paint whic became practically absorbed into the bone. The scooping-out of the cavity may be due to two reasons: either to fit a helve into it and use it as a pick, or to hold paint in the scooped-out antler. The first alternative is contradicted by the unnecessary depth of the cavity and perhaps also by the circumstance that the bonds which may have fastened the tool to a shaft have left no mark on the tool. The second alternative will be discussed later (Invent. no. Pb 53/30).

Megaloceros tine, 470 mm long (Plate V, 2, a, b). It has been cut off, with fairly rough strokes, immediately at the edge of the part where the antler broadens like a palm. The surface is entirely intact. The tip is intensely worn, the cortex has been destroyed through wear, in the course of further use the less resistant spongiosa have also been damaged, so that a concave, cup-shaped hollow has formed at the tip of the antler. At the root the spongiosa are unevenly defective, to a depth of 30–40 mm ; but the cavity is not deep enough to fit the heavy tine into a shaft (Invent. no. Pb 53/32).

Fragment of *Megaloceros* tine, 156 mm long (Plate VI, 1, a, b). Both ends of the tool are defective. Part of the upper rim (obviously not identical with the root of the tine) still shows the comparatively undamaged surface where the tine had originally been sawn off. The original length of the tool is unknown, because its lower end had broken off on all sides during the pleistocene. The surface, especially on the outer, convex side, shows marks of damage, probably due to fire. The spongiosa have been carefully removed, as far as the cortex. The interior cavity is intensely stained with red paint. This antler, like tine no. Pb 53/30, was probably used as a horn containing paint (Invent. no. Pb 53/29).

Cortices used for holding paint have been described at several palaeolithic sites. A paint-tube made of a reindeer's tine, found at des Cottés, has been published by Breuil[5]. Several pieces unearthed at la Quina have been described by Martin[16] as tool-shafts. E. Passemard discusses a bird's bone, used to hold needles or paint, from the Aurignacian zone of Cave Isturitz.[17] Obermaier mentions a paint-horn made of the radius of an eagle, from Cave Valle.[18]

On the analogy of these finds, both hollowed-out tines discovered by us may be regarded as paint-horns, with the proviso that originally they may have been also used as picks, in the same way as the tools made of antlers which have been found in neolithic chert-quarries in Sweden.[19]

[14] *J. Hillebrand :* Az 1917. évben végzett ásatásaim eredményei (Results of my Excavations in 1917). Barlangkutatás VII (1919), fig. 3.

[15] Published in *G. Goury :* Origine et Evolution de l'Homme, fig. 52 (Paris 1948). (The original publication was not accessible.)

[16] *H. Martin :* Nouvelles constatations faites dans la station aurignacienne de la Quina, BSPF (1936), figs. 8–12. *Goury* (op. cit., p. 229, note 1) regards these tools as paint-horns.

[17] *E. Passemard :* La caverne de l'Isturitz en Pays Basque, Préhistoire IX (1944), p. 35, Plate XI.

[18] *H. Obermaier :* «Rötel», in E. R. XI, p. 163.

[19] *B. Schnittger :* Die prähistorischen Feuersteingruben, und die Kulturlager bei Kvarnby und Sallerup in Schonen PZ II (1910), fig. 6.

b) *Handles of Tools*

Megaloceros tine, 350 mm long (Plate X, 2, a, b). A handle made of the first, bent prong of a broad, shovel-shaped antler, with some of the adjoining flat part included. On this flat area the spongiosa have been carefully removed and a trough with high rims has thus been obtained, well-suited to hold the pick-like tool made of stone or bone. The narrow neck below the trough gave good support to the string made of sinews or filaments which bound the tool to the handle, though only on one side. On the other side an irregular fracture justifies the conjecture that there, too, some protruding or hollow part may have lent support to the string.

The surface of the tool is uneven; especially towards the end of the antler, injuries due to energetic incisions may be observed (Invent. no. Pb 53/27).

Alces (?) tine, 212 mm long (Plate X, 1/a, b). The spongiosa have been removed at the place where the straight tine broadens into the shovel-shaped broad part of the antler. This resulted in a trough 25 mm deep and 50 mm wide; one side of the trough is unevenly broken. The tool fixed in the trough could be well fastened onto the neck suddenly narrowing below the braces; judging by the depth, or height, or the braces, this tool must have been some broad point. Near the neck there are transversal incisions, perhaps the marks of the string used for tying the point to the handle. The surface of the implement is, on the whole, undamaged, the tip of the antler unused (Invent. no. Pb 53/31).

Megaloceros tine, 255 mm long (Plate V, 3). At the upper, flattening end of the tine the remaining one of a pair of braces is seen; the other, together with a fairly large portion of the antler, has broken off. On account of the bad state of preservation, no traces of fastening could be observed (Invent. no. Pb 53/28).

The earliest remains of the Palaeolithic Age that may possibly be regarded as tool-handles are the hollow bones, already referred to, found at La Quina; they date from the middle Aurignacian period but were probably not used as tool-handles. The finds at Vogelherd date from a similar period; here Riek[20] describes tool-handles made of ribs from the Aurignacian zone no. 1. At Předmost, too, handles of tools have been found.[21] Absolon describes tool-handles from the Magdalenian zone of Cave Pekarna;[22] these may, however, be rightly regarded as tubes of paint, since their bore is deep and longitudinal in direction.

Very interesting split tool-handles, made of antlers, have been found at Mal'ta, Siberia, in a zone dating from Late Aurignacian times.[23] Judging from the illustrations, some of them seem to agree with our tool-handles made of antlers, although in Gerasimov's view (op. cit., p. 69) their function was uncertain.

Tool-handles, chiefly helves of hatchets, have been described from some of the Upper Palaeolithic settlements in the Ukraine (Chulatovo, Mezine, Kostienki, etc.), as well as from Willendorf II in Austria.[24] Hančar ascribes the appearance of the composite tools to the new methods of work necessitated by the building of houses.

Hafted tools, beginning with the «Lyngby axe», reach their flowering in the Mesolithic Age; this induced e. g. Schwantes to regard helved hatchets as the dividing-line between the Palaeolithic and Mesolithic Ages.[25] This conjecture has since been refuted by the cumulative evidence of recently discovered archaeological material; yet Schwantes drew attention to an important circumstance, viz. that new methods of production appearing in the Mesolithic Age necessarily created different types of hafted implements in such characteristically developed forms that they became leading fossils of successive cultures. We have seen that in Hančar's view it was the needs of building that induced some Upper Palaeolithic builders of huts to develop their characteristic hatchets. Speaking of Mesolithic mining, Foss and Yelnitsky express the view[26] that man begins mining after having settled down and produced helved striking implements. The authors obviously mixed up cause and effect. It is not technical achievements that create special methods and processes of work; the interaction of the two factors is indubitable, yet the primary importance belongs to the needs and requirements: they create the technical equipment necessary for carrying out a particular kind of work.

We wish to extend the validity of this principle to the whole Palaeolithic Age. It saves us, on the one hand, from a false teleological outlook while, on the other, it inspires one with a healthy respect for primitive man's capacity to adapt himself quickly and suitably to all needs that may emerge. The material proofs of this principle may be studied at Lovas where splendid equipment and brilliant technique were created, practically out of »nothing«, to meet the needs arising out of mining.

c) *Picks Made of Antlers*

Megaloceros (?) antler, 240 mm long, with a maximum width of 53,5 mm (Plate VI, 6 and fig. 8, 6). An approximately crescent-shaped slab, cut out from the shovel-like cortex of a Megaloceros antler. Its upper side is the intact surface of the antler, the back side is formed by the interior, partly removed, spongiosa. The outlines of the tool clearly show the manner of its making: first the desired shape was drawn on the shovel, then the surface was repeatedly scratched along these lines with a sahrp stone flake until a deep incision of 5—6 mm was formed. The superfluous bits of antler were then broken off along these incisions. According to the testimony of the concave edge of the tool, the long line was drawn and incised not at once, but on two separate occasions. The sharper tip of the tool is intensely worn, the blunter tip only slightly. The implement is too broad and flat to suit the palm well. Such pick-like pieces were presumably fitted into helves made of antlers. This view seems to be supported by the circumstance that the convex edge shows signs of hard wear towards the thicker tip (Invent. no. Pb 53/35).

Fragment of *Cervida* antler, 143 mm long, with a maximum width of 24 mm (Plate VII, 1). The tool is made of the cortex of a tine. The surface is intact, on the back-side there are scraped-off traces of the spongiosa. The maximum thickness is 6,5 mm, hence the antler used was probably not that of a Megaloceros, but of a red deer or moose. On one end of the tool there is a rounded tip, on the other an edge struck off at right angle to the longitudinal axis but not used for work. The lateral edges diverge fairly regularly, both being processed throughout their length. Towards the

[20] *G. Riek:* Les civilisations paléolithiques du Vogelherd, près Stetten ob Lonetal (Württenberg). Préhist. 2 (1933), p. 169 and fig. 8/1, 6.

[21] *K. J. Maška:* Der diluviale Mensch... p. 93, fig. d. The helve of a hatchet has been published by *Menghin* from the same site. (Weltgeschichte der Steinzeit, Wien 1931, Tafel 22, fig. 14.)

[22] *K. Absolon—R. Czizek:* Paleolithický vyzkum jeskyně Pekarny na Morave. Cas.-Mor. Zemského Mus. XXIV (1926), p. 21, Plate IV, figs. 10—11.

[23] М. М. Герасимов: Обработка кости на палеолитической стоянке Мальта, МИА СССР 2, рис. 3, 5.

[24] *F. Hančar:* Der jungpaleolithische Wohnbau und sein Problemkreis, MAGW. 80 (1950), pp. 92—94 and figs. 3—5.

[25] *G. Schwantes:* Das Beil als Scheide zwischen Paläolithikum und Neolithikum, Arch. für Anthr. N. F. 20 (1923), pp. 13—41.

[26] М. Фосс—Л. Ельницкий: О добывании камня и о древнейших каменоломных орудиях на севере восточной Европы, МИА СССР 2, стр. 187.

middle of the tool, lustre due to use may be observed both on the surfaces and the edges, especially on the left edge: this is probably explained by the fact that thee tool was fixed into a handle and kept sliding to and fro (Invent. no. Pb 53/53).

Fragment of *Cervida* antler, 167 mm long, with a maximum width of 51,5 mm (Plate VI, 3). This tool of uncertain destination must, in all probability, be included in this group. Both endsof the implement are missing. The surface is intact, on the back-side there are traces of the indifferently removed spongiosa, the lateral edges are carefully wrought, melting with slight curvature into the back-side. The two lateral edges slightly converge, running in a straight line; the edge on the right is damaged. On the narrower side the fracture is straight and worn, while the back-side shows no signs of wear: according to the testimony of the spongiosa, this edge was not used for work. The broader side is unevenly broken (Invent. no. Pb 53/36).

Fragment of *Cervida* antler, 63 mm long, with a maximum width of 48,5 mm (Plate VI, 2). Presumably the fragment of a tool similar to the preceding ones (Invent. no. Pb 53/37).

The picks made of antlers, described here, have no analogies among palaeolithic implements. This circumstance, too, testifies to their special function.

4. TOOLS MADE OF CORTICES

a) *Spoon-Chisels*

Fragment of *Cervida (Megaloceros?)* metatarsus, 166 mm long, 41 mm wide (Plate VIII, 7). The tool was made of the plantar side of the proximal half of the metapodium. At the distal end there is a strong, finely rounded, spoon-shaped working edge. The left edge is fragmentary, the right portion, beside the cutting edge, is worn off. At the proximal end of the bone there is a rough point, due to uneven fracture; this, too, has worn off in use (Invent. no. Pb 53/81).

Fragment of *Cervida (Megaloceros?)* metatarsus, 155 mm ong, 37,5 mm wide (Plate VIII, 8). Like the preceding, a tool with a chisel-like edge (Invent. no. Pb 53/77).

Fragment of a spoon-chisel made of a rib, 238 mm long (Plate VIII, 5 and Plate IX, 4). In the present condition of the tool, an incision 135 mm long and 22 mm wide was made on the facies externa, rounded at the end. A large part of the spongiosa has been removed, the edges of the incision have been carefully processed; the left rim is sharp, that on the right rounded. The chiselling edge, originally presumably round, had broken off, but the point thus formed continued to be used (Invent. no. Pb 53/71).

Fragment of a spoon-chisel made of a rib, 110 mm long (Plate VIII, 4). A tool similar to the preceding, with the difference that here a strip of the facies interna, 62 mm long land 20 mm wide, had been removed. The right portion of the original chiselling edge is undamaged, the right portion, together with the grip, are broken off. The borders of the incision are finely wrought (Invent. no. Pb 53/66).

Fragment of *Cervida (Megaloceros?)* metatarsus, 181 mm long. Both ends of the tool are broken. Its shape approaches those of the spoon-chisels, but since the working edge is missing, it cannot be classed in this group with any certainty (Invent. no. Pb 53/78).

Juvenile *Cervida* (?) metapodium, 168 mm long (Plate IX, 2/a, b). The most beautifully wrought specimen of the whole hoard of tools; made of the metapodium of a young animal. The whole surface has been finely polished. On the lateral side, the surface has been removed in its whole width, together with the bone and the spongiosa. In this way a deep, trough-like hollow has been formed, with the rims polished sharp. The original edge of the tool, used for chiselling, has broken off, the fragmentary edge thus formed shows marks of use and wear. One might suspect that the implement, made of thin-walled, brittle juvenile bone, and processed on its whole surface, was used not for rough quarrying, but in some later phase of work, after the paint had been quarried. This view is, however, contradicted by the worn condition of the broken edge, which seems to point to more strenuous use, as well as by the sharpness of the bordering rims which characterizes most digging instruments (Invent. no. Pb 53/50).

An indefinable fragment of cortex, 49 mm long (Plate VII, 7). The semi-circular edge and the processed state of the lateral rims allow us to class the tool in this group (Invent. no. Pb 53/96. 3).

Spoon-chisels were not unknown in the Palaeolithic Age. A similar tool made of a reindeer's antler from the Laugerie haute was published e. g. by Werth;[27] but the most characteristic forms of this type are spoon-chisels chipped from stone, belonging to the Kostienki Group, in a territory stretching from the Ukraine to Předmost and Willendorf;[28] they were presumably used for wood-work, in connection with the building of dwellings. From the Mesolithic Age there are even closer analogies to the tools found by us. Smilar specimens were published by Clark among the tools unearthed at Star Carr;[29] they also occur frequently in the Ertebölle-culture of Scandinavia,[30] but at these latter sites they already became specialized to other, more complex methods of work.

b) *Other Chisels*

Fragment of an indefinable cortex, 125 mm long, 29 mm wide (Plate VIII, 10). A chiselling or scooping tool made of a thick-walled bone, either tip being used for work (Invent. no. Pb 53/82).

Fragment of an indefinable cortex, 157 mm long, 30 mm wide (Plate VIII, 9). An irregular, massive fragment; only the broad, roundish working edge has been processed (Invent. no. Pb 53/72).

Fragment of *Cervida (Megaloceros?)* metatarsus, 213 mm long, 30 mm wide (Plate VIII, 6). The tool resembles the preceding ones. Its original roundish edge has broken off, the present left tip representing part of this edge. After the break the chisel continued to be in use without re-carving (Invent. no. Pb 53/74).

Fragment of an indefinable cortex, 195 mm long (Plate VIII, 2). An irregular fragment showing traces of use on both tips (Invent. no. Pb 53/80).

Fragment of an indefinable cortex, 170 mm long (Plate VIII, 1). An irregular fragment, with one tip rounded, the other ending in a rough point (Invent. no. Pb 53/79).

Fragment of an idefinable cortex, 190 mm long (Plate VIII, 3). The lower end of the fragment ends in a point, the working edge at the upper end is unevenly broken. The tool may have been used as a spoon-chisel (Invent. no. Pb 53/75).

Fragment of an indefinable cortex, 54,5 mm long. The fragment represents the broken-off edge of a massive, round-edged chisel (Invent. no. Pb 53/83).

[27] *E. Werth:* Der fossile Mensch, Berlin 1921, fig. 311.

[28] *F. Hančar:* Probleme der jüngeren Altsteinzeit Osteuropas, Qartär 4 (1942), p. 153.

[29] *J. G. D. Clark:* Preliminary Report of Excavations at Star Carr... Yorkshire 1950, Proc. of Preh. Soc. 9 (1950), Plate XII.

[30] *V. Nordmann:* Menneskets indvandring til Norden, Denmarks Geol. Undersg. III. No. 27 (1936), fig. 117.

Fragment of an indefinable cortex, 117 mm long (Fig. 8, 2). A two-pointed fragment, both tips of which show marks of use ; it may have served as a pick. The original red colour has been preserved (Invent. no. Pb 53/73).

Fragment of an indefinable cortex, 131 mm long (Plate IX, 1). An irregularly broken, awl-like tool, pointed at one end (Invent. no. Pb 53/84).

Fragment of an indefinable cortex, or of a rib, 143 mm long (Plate IX, 3). A finely rounded tool resembling spoon-chisels. Only the working edge has been processed (Invent. no. Pb 53/85).

These tools were only used when occasion arose : they were not purposely produced to suit a definite phase of work, but were picked out from the waste material or the splinters of bone split for eating, if they proved handy for use. Palaeolithic sites have often yielded fragments of bones with more or less worn edges. The dispute whether these may be regarded as bone implements has been largely decided by the works of the Swiss Koby[31] who has convincingly demonstrated that attrition is the result of physico-chemical actions working in the caves.[32] In the case of the Lovas tools there can be no doubt, either, what deformations of the bone surfaces must be attributed to solution or other external agency, what changes to the work of man. With the exception of surfaces worn in the course of work, here, too, the bones mostly show a sharp fracture. It may be taken for certain, on the other hand, that bones used as tools were not always previously processed ; in the group discussed now we may definitely state that these tools were used without previous processing.[33]

c) *Awls Made of Metapodia*

Fragment of *Cervus elaphus* metatarsus, 157 mm long (Plate VII, 2). An awl made of the dorsal side of the proximal end of the bone. The thick tip has been shaped by rough strokes causing splintery fracture (Invent. no. Pb 53/51).

Fragment of *Cervida* metapodium, 172 mm long (Plate VII, 3). A rough awl with hardly processed tip, made of bone in a poor state of preservation (Invent. no. Pb 53/54).

Fragment of *Cervus elaphus* (?) metatarsus, 186 mm long (Plate VII, 4). A well-wrought headed awl, made of the plantar side of the proximal part of the metatarsus. The whole surface has been polished smooth, the sides are finely rounded, the tip has been shaped tapering and sharp, with particular care. The tool was presumably not held in the hand and used as a digging implement ; it may have been a dagger or a pick (Invent. no. Pb 53/52).

Fragment of *Capra ibex* (?) metapodium, 87 mm long (Plate IV, 11). A headed awl made by splitting the distal end of the metapodium. On the lateral side, part of the articular surface has been polished off, on the interior side the fracture has been carefully processed. The tip is broken off (Invent. no. Pb 53/55).

Among palaeolithic implements, the last-discussed type of awls made of metapodia is the most frequent. To the best of our knowledge, awls made of the proximal parts of metapodia are either absent or, at least, do not form a type in the Palaeolithic Age, while occurring frequently in Mesolithic times. A closely resembling specimen from Lammefjord has been published by Nordmann.[34]

5. TOOLS MADE OF RIBS

Fragment of a straight rib, 99 mm long, with evenly rounded tip (Plate XI, 13). (Invent. no. Pb 53/58.)

Fragment of a bent rib, 220 mm long, rounded at both ends, with the tips broken (Plate XI, 7). (Invent. no. Pb 53/65.)

Tool made of the fragment of a rib, 218 mm long, with edges worn round at both ends, and a fragmentary lower tip (Plate XI, 10). (Invent. no. Pb 53/57.)

Fragment of a rib, 235 mm long (Plate XI, 12). The undamaged capitulum was presumably used as a handle. The distal end of the tool shows marks of intense wear (Invent. no. Pb 53/62).

Fragment of a rib, 239 mm long, rounded and worn at both ends (Plate XI, 11). (Invent. no. Pb 53/63.)

Fragment of a rib, 160 mm long (Plate XI, 4). A tool made of a double-pointed, broad rib. The lower tip is uneven, the upper tip has been sharpened by strokes converging from the two sides (Invent. no. Pb 53/66).

Fragment of a rib, 165 mm long, with tips bevelled at both ends (Plate XI, 2). (Invent. no. Pb 53/64.)

Tool made of a rib, 171 mm long, with one tip worn round (Plate XI, 5). (Invent. no. Pb 53/70.)

Fragmentary tool made of a rib, 118 mm long, with a regular, semi-circular chiselling edge (Plate XI, 6). (Invent. no. Pb 53/67.)

Fragment of a rib, 214 mm long (Plate XI, 9). At the lower end, the tip has been shaped by single bevelling. Marks of a stone implement are seen along the line of bevelling. The upper end is broken, but longitudinal grooves left by processing indicate that the tool had another working face there. (Invent. no. Pb 53/60.)

Tool made of a rib, 217 mm long, with a strong, rounded working edge at the lower end (Plate XI, 8). (Invent. no. Pb 53/61.)

Tool made of a rib, 177 mm long (Plate XI, 3). At the lower end there is a semi-circular working edge, with a protuberance of the cortex above it, reminding one of spoon-chisels made of ribs. The upper, pointed tip seems to have been shaped by deliberate bevelling. (Invent. no. Pb 53/68.)

In the Palaeolithic Age ribs were, as a rule, seldom used as raw material for implements. There are, of course, exceptions, such as the tool-handle, made of a rib, found in Cave Vogelherd (this has already been mentioned), the large spear-heads, made of ribs, in »Fürst Johann's« Cave at Lautsch,[35] or the tools, rounded at both ends, discovered in Cave Bockstein.[36] Undoubtedly, tools made of ribs were not frequent at that time. The following observation may perhaps account for this fact, as well as for the frequent occurrence of tools made of ribs in the Lovas find.

In contrast to the Palaeolithic Age, the bone implements of mesolithic finds show a much wider range of variety, the tools being adapted to the needs of special working processes. An examination of mesolithic finds will show that weapons (harpoons, spear-heads, etc.) continued to be made, in conformity with tradition, of antlers ; so were hammers and axes, in the making of which the dimensions and the shape

[31] *F. Koby :* L'ours des cavernes et les paléolithiques, L'Anthr. 55 (1951), p. 304 foll.

[32] See also : *A. Schmidt:* Grundsätzliches zur sog. protolithischen Knochenkultur., Abh. Naturhist. Ges. Nürnberg XXVII (1939), pp. 1—31.

[33] In the course of our Istállóskő excavations during recent years we gave a strong, thick splinter of a cave-bear's bone to one of the workers, asking him to use it, instead of the usual metal scraper, for turning over the clay which had been dug out. After a fortnight's use, the bone splinter had a rounded edge, the shape, structure, and lustre of which corresponded exactly to those of the Lovas bones, used as tools only when occasion demanded it.

[34] Op. cit., fig. 93/a.

[35] *J. Bayer :* Die Olschewakultur, Eiszeit u. Urgesch. VI., pp. 83—101.

[36] *R. R. Schmidt :* Die diluviale Vorzeit Deutschlands, Stuttgart 1912, Plate XVIII.

of the antler becomes the most important consideration. Special »industrial« tools were made, on the other hand, almost exclusively of bones. The antler is elastic and more easily processed ; the bone is more rigid but also more resistant ; it was, moreover, available in much greater abundance to primitive man than antlers. This is the reason why special tools exposed to greater impact of force (such tools were in greater numerical demand than weapons) were made of bone in mesolithic times ; it also accounts for the same practice at Lovas where we have repeatedly pointed out analogies with the Mesolithic Age. These analogies are due to the fact that local conditions of production resembled much more closely those of the Mesolithic than of the Palaeolithic Age.

6. MISCELLANEOUS BONE IMPLEMENTS

a) *Digging Tool Made of a Boar's Tusk*

The tusk has been broken off, together with a small fragment of the left mandible (including the root of P_1 and half of the alveolus of P_2). On the surface of the mandible occasional injuries, due to stone implements, may be observed. The point of the canine is worn, its medial side is badly damaged, probably by burning. For faunistic considerations, too, this implement represents a significant find in the material unearthed at Lovas (Plate XI, 1). (Invent. no. Pb 53/86.

b) *Tools Made of Scapulae*

Fragment of *Cervida (Megaloceros* ?) scapula (Plate VI, 4). The articular surfaces, together with the proximal half of the spina is missing ; so is the whole distal part. On the lateral surface, on the left side of the spina, some grooving in an oblique direction may be observed. On the medial surface, in the region of the fossa subscapularis, there are also some slanting scratches. Farther on, in a distal direction, the surface is damaged and worn in several places. Unfortunately, the margo vertebralis is entirely missing, so that the function of the tool cannot be established from the marks left by use (Invent. no. Pb 53/33).

Fragment of *Cervida (Megaloceros* ?) scapula (Plate VI, 5). A portion of scapula even more defective than the preceding ; only the distal half of the spina and a small part of the adjoining fossa supra et infra spinam have been preserved. The medial surface is somewhat worn and damaged, but the scapula shows no traces whatever of having been processed. It is possible, however, that in the region of the margo vertebralis there may have been marks due to wear (Invent. no. Pb 53/34).

In the stock of palaeolithic tools, the scapula was used only as a palette — in any case, the scapula unearthed at Abri des Roches has been thus described. Its function in the Mesolithic Age is, however, most significant : it appears among the mining tools and, true to its name (scapula), is used as a spade. This is how it has been described by Clark and Piggott[37] in the flint-mines of Grimes Graves and those of Harrow Hill.[38] In the flint-mines at Cisbury, scapulae of cattle, pigs, and deer were used for the same purpose.[39]

At Lovas, too, scapulae were presumably used for removing the loosened earth. This is indicated by the absence of any traces of rubbing on the surface ; the missing vertebral edges would probably point in the same direction, supposing one were disposed to regard these scapulae as tools, though they show no indubitable marks of use. The composition of the whole find which, with very few exceptions, contains only bones used as implements, as well as the oblique scratches, absent from the few fragments of bones not used as tools, certainly seem to support such a supposition.

c) *Spear-Head*

A spear-head carved from the cortex of an antler, 132 mm long, with a maximum width of 9,5 mm (Fig. 11, 2). It is cylindrical in shape, circular in cross-section. The tip is fairly blunted ; this seems to justify the conclusion that perhaps secondarily it may have served as a mining tool — in the same way as African negroes up to this day take off their iron spear-heads and use them as knives.[40] The finishing of the body of the spear-head is fairly rough, the base is double-bevelled, the surfaces converging in the edge (à double biseau). The surface is corroded, the forms are indistinct, somewhat blurred (Invent. no. Pb 53/23).

In the palaeolithic finds of Western Europe, double-bevelled (à double biseau) spear-heads are characteristic of early Perigordian cultures.[41] Such spear-heads have been described by *Peyrony* from Zone Perigordian II at La Ferrassie,[42] but Layer E at Isturitz has yielded similar finds.[43]

It would be a mistake to compare our leaf-point cultures, including that of Lovas, with the cultural levels of the Palaeolithic Age in Western Europe, in the hope of establishing genetic connections. The two ranges of cultures sprang from different soils, at different times ; the formal agreement of certain types of implements cannot justify the identification of the sum total of these cultures.

In any case, analogies to the cylindro-conical spear-head of Lovas may be found much nearer, in the Jankovich Cave.[44] The finds in this cave, as we shall see later, are closely connected with those of Lovas.

d) *Smaller Fragments*

Among the Lovas finds, in addition to the implements described in detail, there are also fragments of varying size which do not differ from the groups enumerated above. For this reason, and also because of their defective condition, we thought it unnecessary to discuss them fully. This group contains fragments made of antlers, cortices, and ribs. The

[37] *J. G. D. Clark—S. Piggott :* The Age of the British Flint Mines, Antiquity (1933), fig. 2/6.

[38] *J. G. D. Clark :* Prehistoric Europe : The Economic Basis, London 1952, fig. 102.

[39] Ibid., p. 178.

[40] See e. g. *K. Kittenberger :* Vadász- és gyűjtőúton Kelet-Afrikában (Hunting and Collecting in East Africa) Budapest 1928, p. 163.

[41] *D. Peyrony :* De Périgordien et l'Aurignacien, BSPF XXXIII (1936), pp. 616—619.

[42] *D. Peyrony :* La Ferrassie, fig. 42/1.

[43] *E. Passemard :* Op. cit., Plate XXI/1.

[44] *J. Hillebrand :* Az 1913. évi barlangkutatásaim eredményei (Results of my Cave Excavations in 1913), Barlangkutatás II (1914), fig. 1/1.

ools described above, plus the group mentioned here, bring the total number of bone implements found at Lovas to over a hundred.

We must, however, mention two unprocessed splinters of bones, nos. Pb 53/98 1 and 2 (Plate VII, 5, 6), since both of them show marks of burning. When describing the various tools, we have already mentioned that occasionally on the surface of the bones there are circular, dark-coloured, 1—2 mm deep injuries, covering a small area; these injuries probably result from burning.

The pieces of charcoal in the pits are always combustion products of soft pine. Should a bone fall into the glowing embers of a pile of pine-logs, its surface would certainly show deep burns, but not on such a limited, small area. On the other hand, if a small live coal of a burning pine-log were to fall onto a fresh bone, it would cool before it could burn its way into the bone. Intense, deep burns, localized to a small area, can be produced only by a material hotter than the glowing embers of wood; such a material is stone heated to glowing. One seems justified in conjecturing, therefore, that palaeolithic man already used fire in the Lovas paint-mine in order to separate solidly conglomerated rock, cemented by lime-tufa. He brought the rock to glowing by a fire of pine-logs, then poured cold water on it. It was the chips of stone splitting off during this process than burnt the tools, always on their upper side. The only implement lifted in its original position, tool no. Pb 53/22, made of an ulna, also supports this view. Only such a use of fire explains the comparative frequency of charcoal in the Lovas mine, without the presence of split and gnawed-off fragments of bone which one expects to find at palaeolithic hearths; it also explains why contiguous traces of hearths, with the exception of those on the section of Fig. 5, were found in narrow places, in the dolomite fissures, where the lighting of fire would otherwise hardly be expected. Our conclusion, therefore, is that the palaeolithic quarryman at Lovas *was already acquainted with the method of splitting rock by the use of fire.*

STONE IMPLEMENTS

a) *Laurel-Leaf Spear-Head*

A tool made of grey hornstone, 62,4 mm long, 35 mm. wide, with a maximum thickness of 12,8 mm (Plate XII, 4/a—b). The tip is broken off, the base has been rounded; owing to imperfect finish, the surface of the former *plan de frappe* and remnants of the convex bulbus are still observable; hence its raw material was a flake, not a nucleus. The cross-section of the spear-head is plano-convex, the finish on the front side is moderately convex and regular, on the back side flatter and executed in a rough-and-ready way. The straight edges show tiny marks of secondary incision on the front side. With regard to its morphological character, the tool corresponds exactly to the leaf-points of the Transdanubian group of the Szeleta culture,[45] more particularly to the laurel-leaf points unearthed at the Jankovich Cave.[46] The quality of finish is, however, impaired by the poor, uneven raw material.

The Lovas spear-head might be compared with the tools found at some Moravian, Austrian, and Polish sites; the people connected with these sites have been shown by G. Freund to have lived during WI/II Interstadial,[47] but to have already been in possession of bone implements. We are, however, primarily concerned with similar finds from Hungarian sites, since these are more helpful in establishing the date of the paint-mine (Invent. no. Pb 53/24).

b) *Processed Flakes*

Massive flake made of semi-opal, 38 mm long, 26 mm wide, 19,5 mm thick. A triangular, nucleus-like fragment, with flat bulbus, having a slightly elaborated scratching-edge on one side. (Plate XII, 2/a—b). (Invent. no. Pb 53/25. 1.)

Blade-like flake made of semi-opal, 59,3 mm long, 16 mm wide. Probably a waste product obtained during tool-making, with unsplintered edges (Plate XII, 6). (Invent. no. Pb 53/25. 2.)

Fragment of silicated marl, 39,5 mm long, 25,4 mm wide. A rough, triangular piece of waste matter, with sharp edges (Plate XII, 9). (Invent. no. Pb 53/25. 3.)

Semi-opal fragment, 34 mm long, 19 mm wide, 15,3 mm thick. A flake with a broad base, the four edges running into a point. There are no traces of secondary processing (Plate XII, 1/a—b). (Invent. no. Pb 53/25. 4.)

Semi-opal flake, 34 mm long, 23,2 mm wide. A flat fragment, roughly quadrangular in shape, with sharp edges. At the joining of the edges there is retouch due to use (Plate XII, 11). (Invent. no. Pb 53/25. 5.)

Semi-opal fragment, 27,5 mm long, 22,5 mm wide. A quadrangular, flat flake, with the negative of a bulbus. The *plan de frappe* forms an obtuse angle with the longitudinal axis of the tool. On the edge opposite the base there is flat retouch, about 7 mm long, made from the back side (Plate XII, 8). (Invent. no. Pb 53/25. 6.)

Semi-opal flakes, 30 to 40 mm long. These waste products have intact edges and sharp tips (Plate XII, 5, 7, 10). (Invent. no. Pb 53/25. 7, 8, 9.)

Semi-opal flake, 31,5 mm long, 17 mm wide. A flat, shapeless, notched flake; in the notching there is very delicate, pearl-like retouch, due to use (Plate XII, 3). (Invent. no. Pb 53/25. 10.)

Besides those described here we have found some 8—10 more flakes, mostly made of semi-opal, all of them without special characteristics and without finer processing. With the exception of the laurel-leaf point, all the stone implements hitherto described were used only when occasion demanded it: they were not tools prepared beforehand. But the retouches due to use show that they were employed as working implements. Because of their good edges and points they must have proved useful in making bone implements.

c) *Stone Chisel or Rubbing-Stone*

A piece of sandstone, 210 mm long, 91 mm wide, 50 mm thick (Fig. 8, 1). A slipper-shaped stone, flat on the bottom, convex on the upper side, with polished surface; one of the ends forms a roundish edge, the other is chipped off

[45] *L. Vértes:* Istállóskő: őskőkori kultúrák Magyarországon a würm interstadiálisban (Istállóskő: Palaeolithic Cultures in Hungary during Wurmian Interstadial) (now printing).

[46] *J. Hillebrand:* A bajóti Jankovich-barlangban végzett kutatások eredményei (Results of the Excavations in the Jankovich Cave, at Bajót), Barlangkutatás III (1918), Fig. 4, below and Fig. 5, above on the left and below on the right; *same author.* Az 1916. évi barlangkutatásaim eredményeiről (On the Results of my Cave Excavations in 1916), fig. 3; *same author,* Az 1917. évben végzett ásatásaim eredményei (Results of my Excavations in 1917), fig. 1, picture in the middle.

[47] *G. Freund:* Die Blattspitzen des Paläolithikum in Europa, Bonn 1952. The finds that call here for consideration are the leaf-points from Layer 5 of Willendorf II at Předmost, the leaf-points in the Mammoth Cave contemporaneous with the Aurignacian culture, etc.

The bottom and the edge show intense marks of wear. Originally, we took it for a stone used for pounding paint; this view was contradicted by the circumstance that the red colouring matter of the mine did not get rubbed in into its tiny rubs and holes. A closer inspection has revealed traces of wear on the roundish edge; under a binocular microscope these marks proved to be scratches parallel to the longitudinal axis of the implement. The wear and chips on the opposite end resulted from forcefu contact with a hard object. Veiga has published a similar tool from a prehistoric tin-mine ;[48] this tool was made of volcanic rock, and corresponds in principle to our implement. In quarrying the strongly cemented rock this implement was probably used as a wedge, with a possible secondary function as rubbing-stone (Invent. no. Pb 53/26).

c) *Stones Used for Breaking of Pounding*

Chert-pebbles of a smaller dimension (half a fist in size) show marks of wear and injury on some points of their surface. They were presumably used for chipping off flakes of chert (Invent. no. 53/94. 1—3).

* * *

On the basis of the copious material of bone implements we must briefly summarize the observations we have made concerning the technology employed by primitive man when making these tools.

The first thing to strike one is that, on practically all tools, marks of the processing implement may be observed in the form of carved surfaces (facets) of varying width; beneath these, one may often see furrowed, sharp scratches due to an even rougher previous processing. (See Fig. 8, 5 and Plate IX, 4.) Such marks could have only been caused by stone implements. Facets, as a rule, are only absent where the tool had worn off during use. Otherwise, even flat, smooth surfaces seem to be *planed*, rather than polished. Planing, in this case, designates the action when a sharp-edged blade, set at an obtuse angle to the piece about to be processed, is used for scratching and peeling a surface, much in the same way as the sharp-edged metal plate in the hand-planes of present-day joiners is working. In the case of cylindrical objects, without flat surfaces. notched blades were probably used for the same purpose, the depth of the notching was in direct proportion to the diameter of the object to be processed. An examination of the surface of the Lovas bone spear-head has led us to the conviction that cylindrical surfaces, too, after being shaped by notched blades, were subsequently planed in the way described above.

Not one tool bears indubitable marks of polishing, in the strict sense of the word, done with stone or any other material.[49] Gerasimov also records that at Mal'ta no rubbing-stones or definite traces of polishing have been found.[50]

Our conclusion is that the bone implements found at Lovas cannot be described as *polished*: they are *carved* or *planed*.

Another observation refers to the severing of tines and cortices. On the plates illustrating Gerasimov's above-quoted article sharp, clear cuts, made apparently by axes, may be observed; such marks may have easily been made by the cutting edges of the hand-axes described in the same article. By way of contrast, the cutting surfaces of our finds do not show pronounced facets: they are shattered, uneven fractures, pointing to the application of force rather than to the use of tools with cutting edges at this particular phase of work.

Nor do we find among the stone implements such types as could be used for the cutting of fairly thick bones or antlers. This circumstance may be explained by the conjecture that while small awls were brought to the mine in a ready state from dwellings situated at nearer or more remote distances (greater distances are indicated by the fact that an awl made of the metapodium of a wild goat, native to mountains, has been found on the dolomite plateau of Lovas, only slightly elevated above sea level), larger implements were made on the spot, with the help of rough stone tools not made expressly for this purpose but used when occasion called for it.

The paucity of stone implements seems to be attributable to the circumstance that bulkier implements, suitable for cutting, would have meant a heavy burden when proceeding to the place of work at the pits. It may be asked, on the other hand, whence the cortices and the unwrought antlers were brought to the site. If our argument

[48] *O. da Veiga Ferreira:* Noticia sobre um pilao de minérios préhistorico, Estudos Notas e traballos do Servico de Fomentario Minério 5 (1949), fasc.1—2, pp. 44—48.

[49] While describing the tools, we remarked about spoon-chisel no. Pb 53/50 that its whole surface had been polished. But polishing, in this case, means rather uniform scraping which does not make the surface of the bone glossy; however smooth the surface is, it shows the fine, sharp grooves caused by planing.

[50] Герасимов: op. cit., p. 73.

concerning the heavy stone implements is valid, it would be unreasonable to suppose that heavy bones, collected in the course of time in the lairs of primitive man, would have been carried in a raw condition to the mine. There is, however, another consideration : the fact that they showed such a marked preference for the bones of the *Megaloceros*, an animal not easily hunted, makes it unlikely that prehistoric men should have left the acquisition of their mining tools to the chance of a successful hunt on their way to the mine. This contradiction might be resolved by the conjecture that their dwellings were situated near the mine ; this, however, is counteracted by the presence of the *Capra ibex* metapodium, perhaps also of the smaller stone implements used for making mining tools. The provenance of the raw material of the bone implements must thus be left open, though we hazard the statement that larger tools were probably made in the immediate vicinity of the mine from the stock of raw bones, with the help of the fewest possible stone implements.

With regard to the technique of making bone implements, an interesting sidelight is obtained from tool no. Pb 53/35, already discussed ; here the outlines »drawn« on the raw material were deepened by successive strong scratches or chiselling until the bone, thus weakened, would break off easily along the desired line (Fig. 8, 6). The same method was probably applied when they wished to cut out from antlers thin, longish bits, the basic forms of spear-heads. In this case two parallel furrows were made in the bone, and the piece thus surrounded was then chipped off.[51] The same technical method is indicated by implements found at different palaeolithic and mesolithic sites.[52] Some of the stone implements found at Lovas are suited to this method, particulary the triangular flakes ending in sharp points or having a somewhat curved, beak-shaped point.

Our conclusion is that the rather poor stock of stone implements, found in the pits, together with the pounding-stones and the sharply fractured pieces of local dolomite (these latter were presumably also used), was sufficient to make the bone tools employed in the mine.

III. THE AGE OF THE LOVAS FIND

Before establishing the place of the Lovas find in the chronology of the Palaeolithic Age, we must examine two problems : how long was the mine in use? do the finds derive from one culture or several cultures?

Some light on the first problem is thrown by the position of layers in Pit no. II, as well as by the distribution of finds within the layers. The bulk of the tools was embedded in the »pure« colouring matter of Layer 5, distributed between the bedrock and the top of the layer, i. e. in an area nearly 1 metre high. Within the layer the distribution of the various types of tools was homogeneous. Such a situation could come about only if at different times several pits were dug into the coloured soil ; some of these pits reached rock bottom. The tools were left in the pits which were soon filled up with loose earth. All this must have taken place rather quickly because the matter found in Layer 5 is homogeneous, free of stones, impurities, and stratification. Having regard to conditions prevailing in the pleistocene, the speed of the deposition must be measured by years, if not by decades. The surface of the coloured layer is comparatively even, it must have become level after the falling-in of the pits.

Layer 4 is divided by a sharp boundary-line from the layer of paint (Fig. 2, 2—3). Red colouring matter is still present in this layer, it also contains some unwrought pieces of bone ; yet its formation is posterior to the flourishing of the mine. If mining was still carried on, it was from the sides of the pit, from the upper levels that paint was obtained, with the help of considerably fewer implements. Nevertheless, the tools found in this layer correspond, in point of typology, to those of Layer 5. The use of the mine definitively closes with Layer 3 which contains neither colouring matter (except for a slight staining at the bottom) nor finds. The quantity of matter in Layers 2 and 3, to some extent also in Layer 4, indicates the quantity of paint dug out and removed from the pit. This quantity

[51] М. М. Герасимов: op. cit., p. 73, fig. 6.

[52] See e. g. *R. R. Schmidt :* op. cit., Plate XXIV/8a ; *J. Nuesch :* op. cit., Plates XII—XIII ; *J. G. D. Clark :* Preliminary Report on Excavations at Star Carr. 1949, Plates X, XIV, and XV.

Fig. 12
1. *Tetrao* sp., fragment of femur. 2. *Rangifer tarandus* L., fragment of antler. 3. *Megaloceros giganteus* Blmb., juvenile tooth. 4. *Megaloceros giganteus* Blmb., phalanx I. 5. *Equus* sp., calcaneus, 6. *Megaloceros giganteus* Blmb., phalanx II. 7—8. *Megaloceros giganteus* Blmb., vertebrae

is fairly considerable : the basic area of the pit is 20 square metres, the thickness of Layers 2—4, taken together, is about 1 metre. On an average, one third of the matter consists of dolomite. Calculated on these data it turns out that the matter lifted out from Pit no. II alone (0,6 m^3/m^2) represents 12 cubic metres of paint.

Our observations thus show that the mine was in use for a relatively short period when implements belonging to the same type were used for excavating the paint. It also follows from this that the tools were in the possession of the representatives of one and the same culture, and that the subsequent filling-up of the pits hid them from men of later ages.

The relative chronological determination of our find is comparatively easy, and rests on sure foundations, in spite of the paucity of typologically assessable objects. This is due, chief of all, to the sharply delimitable characteristics of finds belonging to the leaf-point culture of Transdanubia ; these characteristics enable us, at the same time, to fit the Lovas find with approximate precision into the absolute chronological system of the pleistocene, even if the site itself failed to furnish us with sufficient data to establish the chronology. But before utilizing the lessons of analogy, let us see whether the find can be dated on the basis of the local data alone.

The material of the Lovas find has the following features which may help us in determining chronology : 1. faunistic data, 2. data derived from anthracotomy, and 3. the results of petrographic and geologic observation.

1. FAUNISTIC DATA

Of the 81 bone implements described here the species of 56 could be determined. The distribution of species in these 56 cases was as follows :

Megaloceros :	40 pieces
presumably *Megaloceros :*	6 pieces
Alces :	1 piece
Cervus elaphus :	2 pieces
Cervida (?) :	5 pieces
Capra ibex :	1 piece
Sus scrofa :	1 piece

The bones not processed as tools are as follows :

Megaloceros giganteus Blmb., juvenile tooth (Fig. 12, 3).
Megaloceros giganteus Blmb., phalanx I (Fig. 12, 4).
Megaloceros giganteus Blmb., phalanx II (Fig. 12, 6).
Megaloceros giganteus Blmb., vertebrae (2 pieces) (Fig. 12, 7, 8).
Rangifer tarandus L., fragment of antler (Fig. 12, 2).
Equus sp. calcaneus dext (Fig. 12, 5).
Tetrao sp., fragment of femur dist. (Fig. 12, 1)[53]

Whether one regards the general picture of Wurmian fauna or the geographic local facies, the faunistic view presented here shows strong distortion, with man's selective part playing a decisive role in its composition.

The selective role played by man and birds of prey must be taken into account even in rich cave-faunae consisting of 40—60 species : the caves contain bones of animals accessible to man or serving as specific food to certain genera of predatory animals. The fauna-ensemble found at the sites of primitive man reflects his menu-card rather than a complete picture of »bio-« and »thanato-coenosises« This holds true to an even greater degree about the Lovas find : the bones here were collected by man, without the help of birds of prey ; they are not remains of repasts, but tools used for carrying out particular processes of work.

Bearing all this in mind, we are still entitled to draw certain conclusions from the remains of bones. The bones of the *Megaloceros* are not infrequent on the sites in our country ; but the finds usually consist of few pieces. This is no matter for surprise in caves on hills of medium height where elements of forest fauna predominate : with antlers spanning as much as 4 metres, the giant-deer is certainly not a forest ranger. During the greater part of the Wurmian period, the real home of the *Megaloceros* must have been the Balaton district, a grassy steppe, perhaps with occasional copses at the time.

With regard to the Bükk Mountains, remains of the *Megaloceros* have been found here primarily in the interstadial sediment of caves ;[54] their occurrence in glacial

[53] The determination of the bone material was made by our palaeontologist friend, *D. Jánossy*, to whom we express here our sincere gratitude.

[54] The following sites have yielded *Megaloceros* remains, arranged in chronological order :

Subalyuk, upper layer (WI)
Tata (WI)
Herman Cave (early Wurmian interstadial, so-called WI/II)
Diósgyőr Cave (early Wurmian interstadial)
Kiskevély Cave, brown layer (early Wurmian interstadial)
Berva Cave, light brown layer (early Wurmian interstad.)
Rock-Shelter at Berva völgy (early Wurmian interstad.)
Szeleta, »proto-Solutrian« (early Wurmian interstad.)
Balla, »proto-Solutrian« (early Wurmian interstad.)
Rock-Shelter at Csákvár, Solutreo-Aurignacian (middle Wurmian interstad.)
Szeleta, »middle Solutrian« (middle Wurmian interstad.)
Büdöspest, »late Solutrian« (middle Wurmian interstad.)
Rock—Schelter at Ballavölgy, yellowish-brown layer (W II+III stad.). The data have been taken from an article by *M. Mottl :* Die Interglazial- und Interstadialzeiten im Lichte der Ungarischen Säugetierfauna, K. Ung. Geol. Anst. Annales XXXV (1941), pp. 1—33 ; most of the data on the *Sus scrofa* also go back to this article. For a valuation of the age see *L. Vértes :* Istállóskő : őskőkori kultúrák Magyarországon (Istállóskő : Palaeolithic Cultures in Hungary) ; in contrast to earlier determinations of age it is established here, in agreement with several foreign scholars, that »Solutrian« cultures in Hungary cannot be identified with those of Western Europe ; hence the terms »early Szeleta culture« and »developed Szeleta culture« are recommended. On the territory of Hungary, the former is parallelled in time with Aurignacian I, the latter with Aurignacian II. For morphological considerations it seems necessary to distinguish in the Szeleta-culture of Hungary two subdivisions, connected with the Bükk and the Transdanubian districts, respectively. The temporal parallelization of the

layers (Subalyuk, Tata, Ballavölgy) is rather exceptional: 3 glacial layers as opposed to 10 interstadial. With regard to the *Megaloceros* phalanges we wish to remark here that the specimens found at Lovas were broken open by man in the same way as those found at Kesslerloch.[55]

The other species worthy of notice is the *Sus scrofa* L. It is usually regarded as an animal characteristic of interglacial periods or, at the latest, of the interstadial,[56] though remains of the wild boar have been found at several sites in sediments dating from the ice-ages.[57]

Apart from finds dating from R/W interstadial, the wild boar is known in Hungary in Layer W I at Subalyuk, as well as those layers of Istállóskő and the Caves of Diósgyőr and Bervavölgy which date from the first half of the interstadial. No traces of the *Sus scrofa* are known from the second half of the interstadial or from W II+III stadial.

The other faunistic elements do not contribute to the determination of age. We only wish to remark about the *Capra ibex* that the presence of its bones in this place is an eloquent testimony to human activity: they had been brought to the Balaton plateau presumably from the Bakony Hills or from an even greater distance.

2. THE EVIDENCE OF PALAEOBOTANY

According to the results of the examinations made by P. Simoncsics (see the next volume of the Acta Arch. Hung.), all pieces of charcoal examined by him are remains of the *Pinus silvestris*. The exclusive use of this kind of pine is again due to the selective activity of man.

The resinous wood of the pine burns easily, both in dry and wet condition. The quarryman who, besides warming his hands at the fire, wanted to use it also for »industrial purposes«, must have selected the pine deliberately from the kinds of wood at his disposal.

With regard to climatic conditions, the appearance of the *Pinus silvestris* on the Balaton plateau supports the interstadial age of the find. During the interglacial periods it would presumably have been difficult for primitive man to collect pine-wood in this district, while in the stadial — as is shown by the Ságvár finds[58] — the appearance of some other kind of pine, of Alpine character, is more likely.

3. GEOLOGIC AND STRATIGRAPHIC EVIDENCE

The »Hauptdolomit« plateau at Lovas is covered to-day by a layer of humus scarcely 30—40 cm deep. At each small elevation, the crumbling dolomite rocks appear beneath the soil, forming bare stretches where grass is hardly able to grow. But even this thin covering of humus is sufficient to hide entirely from the surface the nests of limonite; the soil shows no marks of staining by the intense red colouring matter below it. In the pits, too, the nests of limonite were only revealed during the quarrying of dolomite in our days. In the course of our surveys of the terrain, we found more or less pronounced limonitic beddings at several places where the soil had been artificially laid open; but not a single bedding has been traced through the staining of the undisturbed layer of humus. The very fact that pleistocene man was able to discover the paint-mine, is sufficient ground for supposing that, at the time of the discovery, the limonitic matter showed on the surface; in other words, at the time when the paint-mine was discovered — geologically, this time obviously coincides with the utilization, i. e. the quarrying operations in the mine — the dolomite plateau had no layer of humus to cover it.

We have examined the sediment in the pits from the viewpoint of humus content. According to the testimony of finds contained in it and the results of micromineralogical observation, the sediment was not in its original position but has been repeatedly disturbed and is mixed with allogeneous matter. It has been established that it does not contain at all humus or organic matter; hence at the time when the mine was in use, the dolomite plateau must have been bare or covered with matter containing no humus. Of the pleistocene soils which contain no humus or, at most, only a modicum of organic matter, loess deserves primary consideration. Even under present conditions which are extremely favourable to the formation of humus, the productive soil is very thin; hence under Wurmian conditions the degradation of soil in this place may be discounted.

To ascertain the quality of the earth covering the area we subjected the red sediment to micromineralocal examination[59].

»The matter of Layer 5 in the paint-mine pit at Lovas consists of red clay, with macroscopic fragments of dolomite:

The composition is as follows:

$CaCO_3$:	74,3%
$Fe(OH)_3$:	16,8%
SiO_2:	6,7%
heavy fraction:	1,0%
coal, bone:	1,2%

The distribution of the heavy fraction in the order of frequency is as follows:

epidote
zoisite
augite
brown tourmalin
rutile
ilmenite
zircon

$CaCO_3$ is very finely grained calcite, presumably deriving from crumbling dolomite. Dolomite is present only in larger fragments. $Fe(OH)_3$ consists of limonite with colloidal graining. The quantity of the clay minerals is of subsidiary signi-

Transdanubian group with the corresponding Aurignacian layers is not complete; yet in the case of the leaf-point culture of the Jankovich Cave, for instance, it may justly be supposed that it lasted from the very beginning of the interstadial until the second Wurmian stadial. The same study endeavours to establish a twofold division of Wurmian in Hungary, instead of the former triple division. Hence in the present study the usual term »W I/II interstadial« is replaced by the designation »Wurmian interstadial«.

[55] *J. Nuesch:* op. cit., Plate 21.

[56] «A lerakódások állatvilága» (The Fauna of Deposits), in the monograph on Subalyuk, Geol. Hung. 14 (1938), p. 273.

[57] This refers particularly to Western Europe where the man of Magdalenian culture actually gave a powerful representation of the wild boar on his cave paintings, as e. g. at Altamira (see *H. Kühn:* Die Malerei der Eiszeit, München 1922, Plates IV—V).

[58] *D. Laczkó—I. Gaál—F. Hollendonner—E. Hillebrand:* A ságvári felső diluviális lősztelep (The Upper Diluvial Loess Site at Ságvár), Arch. Ért. 44 (1930), pp. 213—222.

[59] The examination was made by János Kiss, Lecturer at the Institute of Mineralogy and Petrography, University of Budapest.

ficance. The origin of the rock may be derived from two directions :

a) Weathering product of carbonaceous rock (dolomite-limestone).

b) Mixture of the weathering products of metamorphic rock.

On account of the residual character of the carbonaceous particles, they may be supposed to derive from thoroughly washed bauxite.

It may be definitely established that the rock does not consist of clay but is a mixture of the weathering products of very finely grained calcite-dust (dolomite-dust) and epi-metamorphic rock, stained by limonite with colloidal graining«.

The presence of heavy minerals supports our view concerning the part played by loess in the origin of the sediment. The proportion of loess in the formation of the sediment is indicated by the percentage of SiO_2 (6,7) : having regard to the fact that loess in Hungary has an average quartz content of 40—50 per cent.,[60] this contribution seems very slight.[61] After the opening of the pit, no intense accumulation of loess seems likely, even if (as we tried to prove) the mine was in use only for a short time ; the loess could have been carried or scattered into the pit only from its immediate neighbourhood.

On the basis of the foregoing, the date of the opening of the mine must be assigned, within Wurmian interstadial, to the time following immediately upon the rule of the easterly winds,[62] that is, the second half of the first phase of the interstadial age ; according to the most recent absolute chronological table, calculated by Bacsák, this would give 80 000 B. C. (± 5000).[63]

A comparison with the Transdanubian group of the Szeleta culture in no way contradicts this determination of age. The site which yielded the richest material of finds in this group is the Jankovich Cave : the layer, at least 5 metres deep, which contains here remains of the Szeleta culture, must have presumably formed during a long time even if the process of depositing was faster than usual, owing to a wide shaft opening on the ceiling of the cave.[64] Here too, however, the Szeleta layers were closed before the beginning of Wurmian II stadial. Similar observations have been made at other sites of this group, furnishing more easily accessible chronological evidence.

It is worth remarking that, to the best of our knowledge, no traces of paint were found at any of these sites.

To sum up : the age of the paint-mine at Lovas may presumably be assigned to the first third of Wurmian interstadial, in any case to its ice-free phase ; its culture may be identified with those of the Jankovich Cave, the Rock-Shelter at Csákvár,[65] the Kiskevély Cave,[66] the Szelim Cave

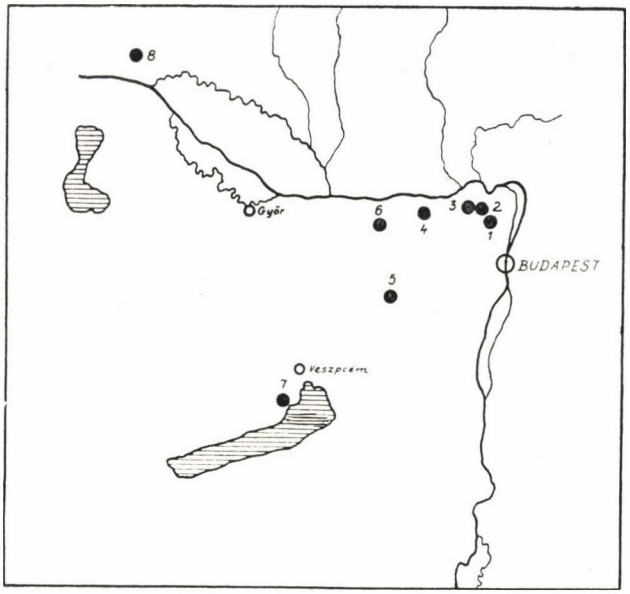


Fig. 13

Sites of the Transdanubian group the of Szeleta culture
1. Kiskevély Cave, 2. Caverne no. II at Pilisszántó, 3. Bivak Cave, 4. Jankovich Cave, 5. Rock-Shelter at Csákvár, 6. Szelim Cave, 7. Lovas, and 8. Dzerava skala

(already mentioned), the Caverne no. II at Pilisszántó,[67] the Bivak Cave,[68] and finally with the finds discovered in the lowest layer of Dzerava skala (Pálffy Cave) ;[69] this last site lies outside the boundaries of Hungary but the material of finds is the same. We propose to give these the common designation of the Transdanubian group of the Szeleta culture (Fig. 13).

IV. THE ROLE OF RED PAINT IN THE LIFE OF PALAEOLITHIC MAN

We have already stressed the fact that the Lovas find, in its unity as a harmonious whole, appears unexpectedly, out of nothing, as it were. The stock of implements found at other palaeolithic sites, of the same age and culture as Lovas, serves almost exclusively the fundamental aims of self-preservation : it consists of articles of hunting ans clothing and the tools used to produce these articles. As against this, the Lovas find consistd of tools suited to quarry red paint — a purely «luxury» article, according to our present outlook. The quantity and perfect finish of the tools,

[60] *A. Vendl :* Geológia (Geology), Budapest 1951, p. 330.

[61] If the matrix is dissolved in hydrochloric acid, the residuum is less than 1 per cent. Hence quartz could not get into the sediment in this way.

[62] *P. Kriván :* A pleisztocén földtörténeti ritmusai. Az új szintézis (The Rhythm in the History of the Earth during the Pleistocene : A New Synthesis), MTA Alföldi kongr. Budapest 1953, pp. 71—81.

[63] *Gy. Bacsák:* A Milankovich-elmélet védelme (In Defence of the Milankovich-theory), Plate 2, printing.

[64] *J. Hillebrand :* Az 1916. évi ásatásaim eredményeiből (From the Results of my Excavations in 1916), p. 101.

[65] *M. Mottl :* Faunen, Flora und Kultur des ungarischen Solutréen, Quartär I (1938), p. 42.

[66] *J. Hillebrand :* A kiskevélyi barlangban 1912. évben végzett ásatások eredményei (Results of the Excavations of 1912 in the Kiskevély Cave), Barlangkutatás I (1913), pp. 153—163.

[67] *L. Vértes :* L'abri II de Pilisszántó, Orsz. Term. Tud. Múz. Évk. I (1951), pp. 223—231 (in this publication the find has wrongly been assigned to Magdalenian I).

[68] This cave was excavated in 1953 by *L. Vértes* and *D. Jánossy:* the systematization of the material is in progress. The archaeological material includes a laurel-leaf point and bone implements.

[69] *J. Hillebrand :* Az 1913. évi barlangkutatásaim eredményei (Results of my Cave Excavations in 1913), p. 118 foll.; *Fr. Prošek :* Výzkum jeskině Dzerave skaly v Malých Karpatech, Arch. Rozhl. III (1951), pp. 293—298.

together with the difficulties involved in obtaining the raw material (the bones of at least 13 *Megaloceri!)* demanded an astonishing degree of concentration and exertion of will, tending to a special object, on the part of primitive man. Such qualities are usually not associated with palaeolithic man who is regarded as a being unable to concentrate his attention, rather clumsy and heavy in his cerebral activities except those connected with the fundamental functions of self-preservation and the propagation of the race.

In this respect, the fact of man belonging to the Szeleta culture quarrying paint at Lovas goes beyond our conception of primitive man's psychical and cultural capacities, and needs some explanation. We must show on a few examples, taken from archaeology and the life of peoples living at present under natural conditions, how paint — especially red paint — means much more in the youth of mankind than a mere «luxury» article.[70]

We believe that the part played by paints in less developed societies is too well known to require detailed discussion ; hence we will only give a few characteristic examples illustrating their function.[71]

The earliest traces of the use of paint by man reach back to the Mousterian period. We may refer here to the classical example of La Ferrassie,[72] where Mousterian Layer (C) contained pieces of red ochre and black manganic oxide. Some of the stones in this layer were marked by formless red blots, but the Neanderthal graves contained no paint. Okladnikov[73] remarks in general about Neanderthal man that he used ochre but did not sprinkle the dead with it.

But beginning with Upper Palaeolithic times, the use of ochre spread also to the rites of burial. At some sites paint of different colours, sometimes over 10 kg in quantity, was found ;[74] moreover, the dead are copiously covered with red paint, even in cases of partial burial.[75] At some Upper Palaeolithic sites ochre was used so lavishly that the whole cultural layer has been stained an intense red.[76] At several sites vessels for holding ochre (already mentioned in the description of finds) have been unearthed ; the finds also include pieces of stone for grinding red paint, presumably for mixing it with grease.[77] With the close of the Palaeolithic Age, the use of ochre continues ; it actually becomes so wide-spread that occasionally it finds place in the designation of cultures, as e. g. in the case of the «Ockergrabkultur».[78] The use of ochre spreads over the whole inhabited world already in the early phase of prehistory.[79]

The prehistoric function of ochre is relatively well-known. Its use in burial is an undoubted indication that ochre played a part in primitive cult. Of all paints, it was probably the most important in colouring cave paintings. Pieces of ochre, shaped like pencils, often with holes bored through them, allowing them to be hung up, have been found in caves without mural paintings ; this suggests that primitive man constantly carried ochre on him (occasionally perhaps as an amulet), using it for the ornamentation of his tools and equipment as well as for painting the body.

In dealing with Hungarian prehistory, Banner discusses in some detail the role of red paint and refers to its appearance in connection with burial in a contracted position.[80] He stresses the impor-

[70] Usually the word «ochre» is used to designate collectively the red paint used by primitive peoples and those living in natural conditions. The paint quarried at Lovas is not ochre, in the strict sense of the word, because limonite, its colouring matter, is cemented by dolomite weathering product, not by clay. Nevertheless, for practical purposes it may be identified with ochre, both in its analogies and its actual function.

[71] We wish to thank here our colleagues, *T. Bodrogi* and *L. Vajda*, for their assistance in collecting the ethnographic data.

[72] *D. Peyrony :* La Ferrassie, p. 21.

[73] А. П. Окладников: О значении захоронении неандерталциев для истории первобытной культуры, Сов. Этн. 3 (1952), стр. 159—180.

[74] See e. g. *L. Didon :* L'abri Blanchard, Bull. Soc. arch. du Périgeux, 1911, p. 241.

[75] At Ofnet remains of cranial bones were found embedded in ochre (see *R. Grahmann :* Urgeschichte der Menschheit, Stuttgart 1952, p. 130).

[76] At Kostienki, Gagarino, etc. ; see *F. Hančar :* Zum problem der Venusstatuetten im eurasiatischen Jungpaleolithikum, WPZ XXX—XXXI (1940), p. 90, 98. The wide distribution of ochre is shown in *A. Tamisier*'s summary of the Upper Palaeolithic ochre finds published in the BSPF between 1939—1951 (Une inventaire des découvertes d'ochre mentionnées de 1939 à 1951 dans le BSPF, BSPF 1953, pp. 8—9, 282).

[77] *F. Felgenhauer :* Aggsbach, ein Fundplatz des späten Paläolithikums in Niederösterreich, Mitt. d. Präh. Komm. d. Akad. d. Wiss. Wien 4/6 (1951), no. 4616.

[78] *R. Pittioni :* Die Urgeschichtlichen Grundlagen der europäischen Kultur, Wien 1949, p. 178.

[79] The early spread of ochre may be illustrated by two characteristic examples : it is known in the Neolithic culture of the Far East *(Yoshikyo Koganei :* Bestattungsweise der Steinzeitmenschen Japans, ZfE 55 (1923), p. 184), while it also appears in South Africa, from the beginning of the Upper Palaeolithic Age (Upper Bambata) right to our own days *(A. L. Armstrong :* Rhodesian Archaeological Expedition 1929 : Excavation at Bambata Cave, Journ. of Roy. Anthr. Inst. LXI (1931), p. 251).

[80] *J. Banner :* A magyarországi zsugorított temetkezések (Burial in Hungary in a Contracted Position), Sz. Dolg. III (1927), p. 48 foll.

tance of ochre in religious cult, illustrating with rich native ethnographic material the special role of red colour in burial customs, some of them surviving to this day.

Red paint figures practically everywhere in Hungarian prehistoric finds; partly to paint vessels[81] (red being the favourite colour, used almost exclusively), partly among the grave goods.[82]

Similarly, red paint plays wide-spread and important role in the life of the peoples of to-day, living under natural conditions; its functions may be studied here by the method of direct observation.

Its most general use is to paint the body permanently or for special festive occasions, before a fight, etc., or to use red paint for artistic ornamentation. In addition, all articles of use are coated with red paint in some districts. L. Biró refers in his collection to the «red paint known as *Mur* (Seleo) in trade. Their wooden implements, carvings, axes, in particular, are lavishly coated with it, obviously to protect them from insects and from cracking».[82a] Biró is probably mistaken when he refers only to protection from insects and from cracking. On the basis of the data to be discussed we must conclude that ochre was supposed to give magical protection to the implements smeared with it.

Another, rather curious function of ochre is to serve as an article of food. Thurnwald mentions that the Papuas eat red clay-balls, known under the name of *kai*.[83] There is evidence to show that clay is eaten in various areas of the earth for different purposes (for pleasure, as a medicine, etc.); clay used as food is usually clay containing iron, i. e. ochre.[84]

This strange custom may be partly accounted for by the widely held belief that a considerable part of peoples living under natural conditions regard red as a «holy» colour, red paint as «holy paint».[85]

Thurnwald mentions about the Andaman-negritos that they ascribe magical power to ochre.[86] Observations among peoples living under natural conditions have led Laviosa—Zambotti to the conclusion that prehistoric men put ochre into the graves because red was regarded as the colour of resurrection, «propriatore di energia vitale».[87]

The magic power ascribed to red colour, the fact that red was regarded as the colour of life, raises red paint *among goods of vital importance* both in prehistoric times and among peoples living under natural conditions. It is this quality which lends such value to ochre that no pains were thought excessive in acquiring it.

Howitt describes the expeditions organized by certain Australian tribes to obtain ochre. The Dieri undertake every year, in July and August, a dangerous journey of 500 km with this object in view. It is the strongest armed warriors of the tribe that start on such expeditions. The Yantruwunta travel a distance of 800 km to obtain their ochre and engage in heavy fighting with the tribes on whose territories the mines are situated. The alternative to fighting is barter: they can receive ochre in exchange for other products from the tribes owning the mines.[88] Howitt also mentions that these tribes, in their turn, exchange the valuable paints used for magical purposes.

Other sources also inform us that certain tribes in Southern Australia invade the territory of the mine-owning tribes with well-armed groups in their quest for ochre, and the weaker party is compelled to endure these raids, yielding to superior force. In general, «the rights of the horde over its territory can be briefly indicated by saying that no person who is not a member of the horde has the right to any animal, vegetable or mineral product from the territory except by invitation or consent of members of the horde...»[89]

Hence all the evidence goes to show that food-gathering and hunting tribes — or «hordes» — which hardly passed the stage of primitive communism, regard e. g. the paint-mines as their strictly

[81] *I. Kutzián:* A Körös kultúra, D. P. II (1944), p. 74.

[82] In this case it is put either beside the dead person in the form of clods or is used to sprinkle the body, causing the bones to be stained. (See e. g. *Kutzián:* op. cit. p. 93.)

[82a] *L. Biró:* Német-új-Guineai (Berlinhafeni) néprajzi gyűjtéseinek leíró jegyzéke (A Descriptive Catalogue of his Ethnographic Collections from German New Guinea [Berlinhafen]), MNM. Népr. Gyüjteményei, Budapest (1899), vol. 1, item 179.

[83] *R. Thurnwald:* Die menschliche Gesellschaft I, Berlin 1931, p. 101.

[84] *G. Stahl:* Die Geophagie, ZfE 63 (1931), pp. 346—374

[85] *O. Finsch:* Südseearbeiten, Hamburg 1914, p. 277

[86] *R. Thurnwald:* op. cit. III, p. 101.

[87] *P. Laviosa—Zambotti:* Origine e Diffuzione della Civilta, Milano 1947, pp. 102, 274. Among Hungarian scholars, *K. Marót* also refers to the question, pointing out, by way of generalization, that the painting of the body, especially with red paint, has a magical, religious significance among most primitive peoples (Homerus Comparatus III, Egyet. Phil. Közl. 39 (1925), p. 201, note 61).

[88] *A. W. Howitt:* The Native Tribes of South-East Australia, London 1904, p. 710 foll.

[89] *A. R. Radcliffe—Brown:* Patrilineal and Matrilineal Succession in Structure and Function of Primitive Society, Glencoe, Illinois 1952, pp. 33—34.

delimited group-property, defend it by force of arms, and are willing to give up their mining products to strangers only by way of barter, in exchange for other goods.

L. Biró mentions about the Papuas — it is true that these people live on the more advanced economic level of garden tilling — that «they get the red earth-paint necessary for smearing their bodies from the mountainous interior of the country and are engaged in regular barter with the inhabitants to obtain these goods».[90]

One of the authors of this article has elsewhere discussed the possibility of commodity production in Palaeolithic times, together with the establishment of regular, non-casual barter relations, dealing also with problems raised by the Lovas find.[91] In the passage quoted he repeatedly referred to the attitude of more advanced peoples living under natural conditions to the ownership of mines; his conclusion was that, parallel with the development of society, within the larger framework of a community there are always smaller groups or powerful individuals who try to acquire proprietory rights over the mines.

We may now add that, with the loosening or dissolution of communal economy, the small groups or powerful individuals naturally try to lay their hands only on such values as proved to be valuable to the whole community: in a word, on values fit to produce profit.

Let us sum up our conclusions. Among peoples living under natural conditions as well as in the case of Upper Palaeolithic man, red paint possessed a transcendental, magical value in the consciousness of the community; for this reason it was placed on the same footing as the primary necessities of life. This explains why prehistoric man at Lovas took infinite pains to quarry paint with perfectly adapted tools and, as a corollary, with relatively perfect methods of work.

In a previous portion of our study we have endeavoured to demonstrate in detail that the man of the Szeleta culture must have worked this mine only for a brief time, but intensely. The abundance of tools as well as the maximum depth reached in the pit testify to intense exploitation within a brief space of time; production must have been many times in excess of the needs of any palaeolithic community, however large in number. The aim followed in production was, presumably, barter; if this is so, the Lovas paint-mine would represent one of the earliest manifestations of production for the market — a primitive type of commodity production, no doubt, yet possessing the essential criteria given to this term by Marxist economy.

V. THE PAINT MINE AT LOVAS AND PREHISTORIC MINING

Our find represents a highly significant phase in the development of man's mining activity; according to our present knowledge, it is the earliest find that can certainly be associated with a mine. The literature on the subject contains a number of data on mining from the time of the mesolithic flint-mines, but it is surprisingly reticent on the subject of mining in earlier times. Burkitt suggests, on the ground of the morphological features of the implements found there, that the working of the flint-mine at Grimes Graves may have begun as early as the Mousterian period.[92] Andrée, too, admits the possibility, referring to certain features of the flint-mine at Senetière, that the mining of flint may reach back to the times of the Chelles or Acheul man.[93] Clark and Piggott, on the other hand, discussing the age of flint-mines in England, think it hardly likely that they had been in use during the Palaeolithic Age, since they see no faunistic or geological evidence for such a supposition.[94]

There are even fewer data to show how palaeolithic man was able to get at the paints he was making such an intensive use of.

Thus the earliest mines are known from the Mesolithic Age when man was no longer contented with the pebbles of flint found on the surface but dug into the depth of the earth to bring up damp. easily processed raw material. The systematic archeological excavation of meso-

[90] *L. Biró:* Leíró jegyzék (Német-Új-Guinea) (Descriptive Catalogue) (German New Guinea) III (1901), p. 26.

[91] *L. Vértes:* Az őskőkor társadalmának néhány kérdéséről (Some Problems of Palaeolithic Society), Arch. Ért. 80 (1953), p. 95. foll.

[92] *M. C. Burkitt:* Our Early Ancestors, Cambridge 1926, p. 174.

[93] *J. Andrée:* Bergbau in der Vorzeit, Vorzeit II (1922), p. 2, n. 1.

[94] *J. G. D. Clark—S. Piggott:* op. cit., p. 170.

lithic flint-mines started in the last third of the last century ;[95] since then many interesting flint-mines have been laid open in France, Belgium, the British Isles, Sweden, Holland, the Soviet Union, Sicily, Poland, Hungary, the United States, and North Africa. A noteworthy economic observation was published by Clark concerning the sudden appearance of flint-mines in the mesolithic and early neolithic ages ;[96] he connects this development with the greatly increased demand for stone implements, caused by the switch-over to an early type of clearing agriculture. This explanation supports our view, outlined above, that the needs of society shape the new technological methods and processes by which these needs can be satisfied.

Flint-mines of mesolithic and early neolithic times were much larger and more developed than the Lovas mine. They often penetrated through hard layers of rock, and consisted partly of perpendicular shafts, partly of horizontal tunnels connecting the former. Shafts occasionally reaching a depth of 12—13 metres were joined by a network of tunnels. The dimensions of the hollowed-out galleries show that considerable quantities of flint had been excavated.

The implements in general use in the flint-mines were the deer-horn pick[97] and the flint-pick, rather like a hand-axe in shape. Deer-horn picks were usually made of the antlers of the *Cervus elaphus* in such a way that some of the knags, left intact, formed the points of the pick while the body of the antler served as a handle. The types of implements used also include spades made of scapulae, spoon-chisels, as well as various awl-like tools made of bone.

Some of the flint-mines continued to be in use through several archeological ages ; Clark quotes,[97a] by way of illustration, the example of the flint-mine at Windmill Hill where traces of different ceramic traditions may be observed. These indicate that the mine was used, not only by men of different periods, but also by different communities living at the same time. An examination of the products of the flint-mine at Grand Pressigny would probably lead to similar results ; these products, of a distinctive colour, spread over an enormous territory, a sure sign that the material had become an article of trade very early.[98] With regard to the age of the British mines, the usual opinion is that they reached their flourishing in the Neolithic Age.[99]

The technical methods employed in flint-mining are relatively little known. Considering the weakness of the implements, the work done here is tremendous ; the shape and distribution of shafts and galleries point to a high technical ability. Blasting rock by means of fire was already known at this early date.[100]

Conditions of work in prehistoric metal-mines and salt-mines[101] are considerably better known than technical methods employed in flint-mines. Here, too, the material was first heated, then suddenly cooled, before the work of hewing and removal began, aided by a rich and various equipment made of stone, metal, wood, and leather. These miners penetrated to considerable depths below the surface of the earth ; the mines were equipped with passages for ventilation and the clearing of smoke. In the Austrian salt-mines, used since the Bronze Age, the leather suits of the miners, together with the baskets for transporting salt, have also come down to us.

As regards blasting by fire, a method well-known in prehistoric times, Treptow remarks[102] that this technique continued in use from the beginning of mining until the 17th century when explosives came to be used for technical purposes.

Evidence on prehistoric paint-mining is extremely scanty. There is a reference to a neolithic ochre-mine at La Cornetie (Dordogne) ;[103] here

[95] *Briart—Cornet—de Lehaye :* Rapport sur les découvertes ... à Spiennes, Mém. Soc. des sciences... du Hainaut 1866—67 (quoted after Andrée, further particulars unknown).

[96] *J. G. D. Clark :* Prehistoric Europe : The Economic Basis, p. 174 ; *same author*, Forest Clearance and Prehistoric Farming, Economic Hist. Rev. XVII (1947), pp. 45—51.

[97] *H. W. Sandars :* On the Use of the Deer-Horn Pick in the Mining Operations of the Ancients, Archeologia 62 (1910), pp. 101—124.

[97a] Prehist. Eur., p. 179.

[98] Flint from Grand Pressigny has been found in Switzerland, England, Northern France, and Belgium *(Clark—Piggott :* op. cit., p. 166).

[99] Ibid., pp.177—178.

[100] М. Фосс—Л. Ельницкий: op. cit., p. 187.

[101] On this group of questions see *P. Reinecke :* Die Bedeutung der Kupferbergwerke der Ostalpen für die Bronzezeit Mitteleuropas (Schumacher Festschrift, Mainz 1930, pp. 107—115) ; *E. Treptow :* Der älteste Bergbau und seine Hilfsmittel (Beitr. zur Gesch. d. Technik und Industrie 8 (1918), pp. 155—191) ; *R. Pittioni :* Prehist. Copper-Mining in Austria (Annual Rep. Univ. of London Inst. of Arch., 1951, pp. 10—28) ; *Ferreira Veiga :* op. cit. ; *G. Kyrle :* Der prähistorische Salzbergbau am Dürrnberg bei Hallein (Jahrbuch für Altertumskunde VII (1913), pp. 1—58), etc.

[102] op. cit., p. 168.

[103] *I. Dechelette :* Manuel d'Archeologie I, Paris 1908, p. 567 refers to an article, inaccessible to us, by *Lagrain* in Bull. Soc. hist. Périgord, 1891.

paint was quarried from a timbered pit, 4 by 2,6 metres in area, from neolithic times until the Bronze Age. Mines yielding cinnabar, ochre, and haematite are mentioned from Portugal, but no details on these mines could be procured.[104] A cinnabar-mine on Mount Avala, near Belgrade, is described by Milojčič V.[105] Here, again, fire was used to cut a complicated network of shafts and galleries into the rock ; the mine was in use from the Baden culture until the end of the Bronze Age. An article by A. Mochi[106] discusses an Italian cinnabar-mine, but this article has also proved unobtainable. There are, in addition, general references to ochre having been quarried »from earliest times.«[107]

Information on paint-mining by peoples living under natural conditions is equally scanty. Data referring to Australia and New Guinea have already been quoted ; for the rest, we have found only sporadic references in the works accessible to us to such peoples obtaining paint by mining. There is e. g. the laconic statement that, at the beginning of the last century, the Commanche Indians used to quarry cinnabar, painted their bodies with it before going to war, and traded in it with the neighbouring tribes.[108] For the purposes of our investigation it would be important to know what implements were used in paint-mining in prehistoric times or among present peoples living under natural conditions ; but such information is unfortunately lacking.

Early prehistoric mining in Hungary is surrounded by a similar uncertainty. The chalcedony-mines on Avas Hill, Miskolc, have been described by Hillebrand[109] who assigned them to the »Proto-Campignien« period. Owing to lack of evidence and the absence of definite types of implements this determination of age can only be accepted with certain reservations.[110]

On the sides of Avas Hill the moist earth and the banks of andesite and tufa were broken through by shafts several metres deep in order to reach the layer of chalcedony ; at several places in the immediate neighbourhood this mineral occurs also on the surface. Nearly 30 pits have been laid open, yielding thousands of stone flakes on which the marks of man's hand are shown only by a few broken-off facets or bulbi. The find does not include a single mining implement or a definitely processed, chipped stone tool. Insufficient faunistic data and the uncertainty of finds, owing to pits having been dug subsequently in the area, preclude the possibility of giving an exact determination of date. There is, however, a distinct possibility, rendered more plausible by the results of the Lovas find, that the Avas mines had already been used by men of the Szeleta culture, continuing to be in use beyond the Neolithic Age. This conjecture cannot, however, be supported by any concrete evidence at present, unless for the fact that a very high proportion of the implements of the Szeleta culture in the Bükk Mountains is made of the same material, viz. ash-grey chalcedony ; this seems to point to the collecting and purposeful selection of the raw material. The quantity of the raw material utilized makes it, however, unlikely that it could have been collected merely from the surface.

No other flint-mines have so far been found in Hungary and archaeological literature on this subject is correspondingly meagre. There are only a few studies in Hungarian which deal with general questions of mining in prehistoric times.[111]

By way of conclusion, we wish to draw certain lessons, on the basis of the material culture manifested in the Lovas find, concerning palaeolithic society — lessons which go beyond the immediate evidence of the material finds.

We are thinking primarily of questions connected with production, specialization, and property. We agree with Childe's view on prehistoric cultures, according to whom the character of a culture may be expressed in terms of adaptation to a given environment.[112] From the viewpoint of the ques-

[104] *Ferreira Veiga :* op. cit., pp. 46—47 quotes a work by *Estacio da Veiga :* Antiguidades Monumentals de Algarve, Lisboa 1893, vol. III ; this work, again, has proved inaccessible.

[105] Das vorgeschichtliche Bergwerk »Suplja Stana« am Avala-Berg bei Belgrad (Serbien), WPZ 30 (1943), pp. 41—54.

[106] Indizi di miniere prehistoriche di cinabro nella regione dell'Amiata, Bull. Pal. Ital. 1915.

[107] *E. Treptow :* op. cit., p. 157.

[108] *Johson J. Harlan :* A History of Mercury-Mining in the Terlingua District of Texas, The Mining Magazine, Sept. 1946, p. 390.

[109] *J. Hillebrand :* Über ein Atelier des »Proto-Campignien« auf dem Avas-berg in Miskolc, Eiszeit u. Urgesch. V (1928), pp. 53—59 ; *same author*, Neuere Ausgrabungen auf dem Avas-Berg bei Miskolc in Ungarn, Eiszeit u. Urgesch. VI (1929), pp. 136—142.

[110] Л. Вертеш : Мезолитические находки на вершине горы Кёпорош при г. Эгер (Венгрия) Acta Arch. ASH 1 (1951), p. 154. foll.

[111] *E. Vadász :* Az ősember bányászata (Mining by Prehistoric Man), Term. Techn. Jan. 1950, pp. 45—52 ; *G. Téglás :* Praehistoricus arany-, vas- és kőbányászati eszközök Dáciában (Implements Used in Prehistoric Mining of Gold, Iron, and Stone in Dacia), Arch. Közl. 14 (1886), pp. 106—125, etc.

[112] *V. G. Childe :* Prehistoric Migrations in Europe, Inst. for Sammenlignende Kulturforskning, Oslo 1950, p. 2.

tion raised here this thesis implies that the forces and factors inherent in the life of a human community (moulding the manner of production, manifested in the traditions, determining social structure), as well as the capacities of man as a biological unit, adapt themselves to the environment, to the sum total of the exterior milieu, in other words, to the conditions fixed by the nature of the country, the climate, the flora and the fauna.[113] The resultant of these forces may be briefly described as *the needs of society*.

To make the point clearer let us quote the example of the Chellean man. Living under given external conditions (favourable climate, eatable plants, abundance of game, etc.) and on a given level of development (on a low level of biological development, in a loose organization of hordes, with rudimentary capacity for abstraction, etc.), possessing primitive implements of little variety (judging by the evidence of his material culture), the Chellean man reached the same high degree of adaptation as the Magdalenian man who is characterized by the colourful abundance of his tools and the raw materials utilized, by a high degree of development in his social, religious, and artistic life : because changing adaptation reflects the development of his social needs.[113a]

The same holds true of groups developing identical needs within the same period but living in different conditions of environment, or of groups living under similar external conditions but endowed with different internal abilities.

To sum up what has been said so far : in the formation of the character of a culture, besides adaptation to the conditions of a given external environment, the decisive factor is always man himself, man living in society. In our view, the inner capacities and strivings of society (not as regards content, but simplified in the surviving remains of its material culture) are reflected — at least in prehistoric times — in the requirements of society and in the productive forces which aim at satisfying these social needs. The state of development of the productive forces aiming at the satisfaction of these needs may thus be measured by the implements best suited to the external environment, viz. the specialized tools.

It was owing to social needs that the man of the Szeleta culture had the willingness and capacity to quarry paint, or that man in the Late Mesolithic Age was engaged in intensive flint-mining.

For this reason, the usual list of causes by which the rise of mining is explained is never comprehensive. According to Pittioni, for instance, all that is needed for mining flint is to have adequate knowledge concerning flint and the earth's crust and, having found out their characteristics, to use suitable tools (e. g. helved tools) in carrying out the work.[114] But the fact is that all this must be preceded by the primary need, the demand which, tending to the acquisition of a certain kind of goods by means of mining, creates suitably specialized tools or fits existing tools to carry out the work required,[115] bringing about at the same time specialization in an individual or a group to make possible the production of the new article.

The rise of specialists concentrating on the production of certain types of goods may be influenced by geographic environment which offers, as it were, suitable raw material for stone implements or jewels, or (as in our case) the makings of a paint-mine ;[116] but such a development may be due solely to the rise of social need, independent of environment, when the group in question specializes on the production of articles from raw material found in abundance everywhere. In our case we have to deal with the first alternative which is, in any case, more frequent.

It stands to reason that articles wanted by those who are unable to procure them immediately, i. e. the products of locally specialized groups, represent value not only to these external groups but, retroactively, under the effect of demand, to the producers as well. This gives us a chance to get at least an indirect glimpse into the structure of early Upper Palaeolithic society, the questions of ownership, barter, and production, problems we have already touched in the preceding chapter.

[113] *A. Leroi Gourhan :* Milieu et Techniques, Paris 1945, p. 451 foll.

[113a] The high degree of the adaptive capacity of the Chellean man is shown precisely by the circumstance that his tools became standardized over such a huge territory as that covered by the use of the hand-axe. In a territory of such vast extent there can be no question of migration or diffusion, only of convergence due to identical conditions.

[114] *R. Pittioni :* Vom geistigen Menschenbild der Urzeit, Wien 1952, p. 88.

[115] According to *Foss* and *Jelnyitsky*, prehistoric tools were not always specialized to one process of work, in the same way as men did not specialize to the profession of one craftsman only. «Hence the occurrence or absence of a tool with a certain definite shape is not a necessarily decisive argument with regard to the presence or absence of a certain branch of profession at a given time» (op. cit., p. 186).

[116] *R. Thurnwald :* op. cit. III, pp. 95—96.

In applying the above arguments to our particular case we wish to repeat briefly the point made elsewhere[117] that valuable, unusual, not easily accessible products, including paint, are conducive to developing the idea of property, precisely because being regarded as valuable goods of vital importance, their acquisition is made imperative by the supreme demand of social need. This compels certain groups to engage in mining, other groups to acquire from the former the goods produced.[118] Property developing in this way could be, for the time being, only personal or group property. The differences and agreements between these kinds of ownership form too complicated a question to be discussed here in detail. The essential feature, common to personal and group property is that it cannot be identified with accumulative private property which makes possible the exploitation of individuals; for this very reason the rights of ownership are not sharply delimited between the individual and the group.

We have thus come to the conclusion that at Lovas a group of specialists in mining were engaged in producing paint beyond their own requirements, with the purpose of exchanging it with neighbouring groups (tribes?), the products forming the group's property becoming the subject of a regular barter arrangement, as far as this was possible under palaeolithic conditions. In our view, this state of affairs created only the technical foundations for those social factors and functions, viz. production for the market and the exchange of goods, which later on, when productive forces reached a higher level of development, became the mainspring of the progressive growth of society.

ДЬ. МЕСАРОШ—Л. ВЕРТЕШ

ЛИМОНИТНЫЙ КАРЬЕР РАННЕГО ПЕРИОДА ВЕРХНЕГО ПАЛЕОЛИТА ВОЗЛЕ С. ЛОВАШ (ВЕНГРИЯ)

(Резюме)

Весной 1951 г. музей в г. Веспрем получил извещение, что на доломитном, триасовом плоскогорье, лежащем к северу от озера Балатона, возле с. Ловаш — при добыче камня — были обнаружены кости древних животных. По поручению музея, музеолог Дь. Месарош собрал найденный материал и произвел раскопки на его местонахождении.

В свое время при добыче щебня там были найдены гнездообразные, красные залежи лимонита, но о находках костей до сих пор никаких сведений не поступало. Из раскопок Месароша, равно как и из раскопок, произведенных в 1952 году для выяснения стратиграфических условий местонахождения, было взято свыше 100 орудий, изготовленных из костей животных, характерных для ледникового периода. Они были изготовлены, повидимому, для добычи ярко красного красильного материала. Кроме них было обнаружено и несколько орудий из роговика и полуопала.

Находки доставлялись из двух красильных залежей. О первой мы имеем только скудные сведения, так как ее разработка была уже закончена до прибытия археолога, но часть находок все же сохранилась. Данные другой залежи (яма № II) были вскрыты раскопками почти полностью (см. рис. 2—5).

Лимонит находился во впадение неопределенной формы длиной в 7 м. и шириной в 6 м., глубина которой местами доходила до 2 м. Впадина или яма, наполненная красильным веществом, никогда не была покрыта, а над ней, на юговосточной стороне возвышался свод. На противоположной стороне дно ямы — постепенно поднимаясь — достигало поверхности земли. Отдельные слои залежи оказались, следуя сверху вниз, все более и более неровными. Было констатировано наличие следующих слоев (см. рис. 5): 1) гумус, 2) щебень, 3) щебень со слабой красной окраской, 4) тонкий слой очага без костей, 5) яркокрасный щебень с обломками доломита и некоторыми необработанными костями и 6) темнокрасный, гомогенный слой красильного материала с костяными орудиями и кусками древесного угля. При раскопках в 1952 году были констатированы приблизительно те же самые слои и в сохранившейся части ямы № I.

Неровности, наблюдаемые в нижнем слое, содержащем красильный материал, свидетельствуют о том, что ямы несколько раз вырывались в рыхлой почве для добычи красильного материала. Орудия по окончании работы оставались в ямах и были покрыты обвалившимися обломками доломита.

Найденные костяные орудия — за исключением одного — оказались забойными инструментами. Они были изготовлены из костей (в большинстве случаев из локтевой кости) или рогов гигантского олена (Megaloceros). Головная часть кости служила рукояткой, а дистальный конец в отточенном виде — рабочей поверхностью. Иногда встречались орудия несколько удлиненные вследствие того, что к изготовлению их применялась и часть лучевой кости, сросшейся с локетвой. Среди орудий (22 экз.), изготовленных из локтевых костей, оказались как одноручные, так и двухручные экземпляры (см. табл. I—III, рис. 7, 9, 12).

На одном из экземпляров, изготовленных из локтевой кости, видна линейная орнаментика (рис. 10). Поверхность кости, к сожалению, настолько повреждена, что невозможно было восстановить орнаментику во всей полноте, но все же удалось установить, что предмет был украшен мотивами, известными из европейского палеолита. Орнаменты напоминают узоры, находящиеся на мамонтовом бивне из Пшедмоста.

Очень характерными являются шилья с головками (poinçon à tête), изготовленные из костей пясти гигантского оленя. К этой группе могут быть отнесены 10 орудий, охарактеризованных тем, что при выделке их подлинная форма не изменилась. Поверхность кости

[117] *L. Vértes:* Az őskőkor társadalmának néhány kérdéséről (Some Problems of Palaeolithic Society), p. 96.

[118] «Acquiring» naturally includes the possibility of acquisition by force of arms.

была очищена скребком от остатков жил и мяса, а конец оформлен согласно требованиям утилизации (см. табл. V и рис. 8, 5).

Немало орудий было изготовлено из рогов гигантского оленя. Среди них встречаются кирки, концы которых сработаны (табл. V, 2a-b). Из отростков рогов была изъята губчатая внутренность — в одном случае до глубины в 19 см. Эти предметы служили хранилищем для добытого красильного материала (см. табл. V, 1a-b; VI, 1a-b). Отростки применялись и к изготовлению черенков для орудий. С этой целью у основания рога был сделан паз перпендикулярно к продольной оси (табл. V, 3 и X), к которому прикреплялась кирка, выточенная из плоской части рога (табл. VI, 2, 3, 6; VII, 1 и рис. 8, 6).

Множество орудий было изготовлено из компактного костного вещества конечностей. Самыми характерными среди них являются ложкообразные долота (табл. VIII, 4, 5, 7, 8 и IX, 2a-b, 4 и т. п.). Долото- и шилообразные орудия были сделаны также из ребер и пястных костей гигантского оленя (табл. VII, VIIi, IX и XI).

Обращают на себя внимание орудия из бивня кабана (табл. XI, 1), равно как и несколько лопато- или заступообразных орудий из лопаток (табл. VI, 4, 5).

Среди находок имеется только один объект, который не был рабочим орудием. Это — цилиндрический наконечник копья с тупым острием, основание которого сжато с двух сторон (à double biseau, см. рис. 11/2). Он известен и из раннего периода перигордийских культур, но, конечно, это сходство не может быть рассматриваемо как доказательство генетической связи.

Помимо тщательно отделанных костяных орудий было обнаружено и множество необработанных, а все же отработанных костей, которые применялись, повидимому, в качестве случайных орудий. Среди них особого внимания заслуживают экземпляры, на которых наблюдаются небольшие, но глубокие (1—2 мм.), темные пятна ожогов. Эти пятна встречаются только на одной стороне костей (табл. VII, 5—6). При более подробном обследовании выяснилось, что ожоги появились от соприкосновения с раскаленным материалом, степень нагрева которого превышала температуру горящего соснового угля: повидимому, пятна получились от раскаленных осколков пород. Поэтому можно предполагать, что первобытный человек, проживавший когда-то в районе с. Ловаш, уже пользовался огнем, применяя его и к расколу пород. Этим объясняется и факт, что в очажном слое не было костей, представлявших собой характерные остатки пищи около очагов эпохи палеолита.

Среди каменных орудий самым интересным является наконечник копья в форме лаврового листа, обработанный с обеих сторон техникой, столь характерной для культуры Селета, считавшейся раньше солютрейской (табл. XII/4a-b). Остальные орудия из камня (табл. XII) обработаны небрежно или же представляют собой совершенно необработанные осколки, которые только случайно были использованы в качестве орудий.

Наконец, надо упомянуть и о каменном долоте из песчаника или о трущем камне для удаления шероховатостей (рис. 8/1), равно как и о нескольких ударных орудиях из кремня.

В связи с костяными орудиями возможно было установить, что они были изготовленя не шлифовкой, а скорее резьбой или обтеской. Плоские роговые орудия изготовлялись, повидимому, постепенным обрезыванием (рис. 8/6).

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А что касается возраста находок, прежде всего надо подчеркнуть, что орудия были изготовлены человеком той же самой культуры, а именно в течение очень короткого времени, следовательно карьер находился в использовании недолго. Несмотря на это, из него было добыто сравнительно много красильного вещества: 12 м³ только из ямы № II.

Находки могут быть датированы и на основании наконечника в форме лаврового листа. Они являются современными с находками, обнаруженными в пещере Селета, т. е. они представляют собой межстадиальный период Вюрма I—II. Естественно-исторические данные отчасти подтверждают, отчасти же уточняют это.

Из обследования костей находки получилась следующая фауна:

гигантский олень	45 экз.
гигантский олень (?)	6 »
обыкновенный олень	2 »
олени неизвестного вида	5 »
лось	1 »
северный олень	1 »
козерог	1 »
лошадь	1 »
куропатка	1 »

Все древесные угли оказались остатками сосны. Материал, наполнивший яму, был подвергнут анализу с точки зрения химии и минералогии. Его состав дал следующую картину:

$Ca\ CO_3$	74,3%
$Fe\ (OH)_3$	16,8 »
SiO_2	6,7 »
тяжелые ископаемые	1,0 »
уголь, кость	1,2 »

Среди тяжелых ископаемых встречались (по количественному порядку): эпидот, зоизит, авгит, бурый турмалин, рутил, ильменит и циркон. Допустимо, что материал произошел из промытого боксита. Ввиду наличия тяжелых ископаемых и SiO_2 можно предполагать, что в происхождении сыграл роль и лесс.

Сличая все наши сведения с данными столь тщательно изученного отечественного Вюрма, наши находки могут быть датированы концом первой трети межстадиального периода Вюрма I—II, или, выражаясь иначе, 80.000 (± 5.000) г. до н. э. (по Миланковичу).

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Теперь является небезынтересным коснуться вопроса: какую же роль играло в жизни первобытного человека красящее вещество красного цвета, добываемое им с большим трудом и при помощи соответствующих орудий. Было ли оно исключительно предметом роскоши или же имело какую-нибудь другую ценность, ради которой человек, пользующийся готовыми дарами природы, не жалел труда, связанного с добычей?

Если мы — желая получить ответ на этот вопрос — рассмотрим жизнь примитивных народов, то увидим, что красный цвет и вместе с тем и красная краска играют большую роль почти у всех, независимо от географического положения и образа жизни. Множество этнографических данных свидетельствует о том, что красный цвет у большинства примитивов является святым. Он считается цветом жизни, жизненной энергии, бессмертия. Верования, связанные с этими представлениями, придают охре такую важность в оценке некоторых отсталых племен, что они стремятся добыть ее во что бы то ни стало, не страшась никаких опасностей. У нас, к сожалению, мало сведений о красочных копях, находящихся в имении теперешних примитивных народов, но все же знаем, что они ревниво хранят их и готовы защищать их, если нужно, и с оружием в руках.

На основании археологических находок допустимо предположение, что охра играла подобную же роль и в жизни первобытного человека. Ею пользовался еще и неандерталец, и с тех пор нам неизвестно ни одной культуры, среди памятников которой не встречается красной краски.

Подытоживая сказанное, можно установить, что красная краска не была туалетным реквизитом для первобытного человека, а — учитывая приписанное ей культическое значение — жизненно важным материалом. Поэтому-то и приступил первобытный человек, проживавший в районе с. Ловаш, к его добыче.

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До открытия местонахождения в с. Ловаш, кремневые карьеры мезолита считались самыми древними копями. О том, что кремень добывался еще и в палеолите, мы не имеем никаких сведений, подтвержденных вещественными или стратиграфическими доказательствами.

Потребности общества определили период, в котором люди приступили к добыче необходимых им ископаемых. Запросы принудили людей создать подходящие орудия, и научиться пользованию ими. Таким образом, специализировались одинокие трудящиеся или же группы рабочих по добыче при примитивном разделении труда, свойственном палеолиту.

В отличие от других даров природы эпохи палеолита, продукты, приобретенные добычей, не были доступны для каждого члена общества. Они были доступны только для тех, для кого приобретение их оказалось возможным при данных географических условиях племени. Однако, потребность появилась у всех. Поэтому продукт представлял собой специальную ценность не только для чужих, но под возвратным действием спроса и для забойщиков.

Ценные продукты, в том числе и красная краска, способствовали возникновению понятия собственности. Будучи жизненно ценной, она возбудила общественную потребность. Это принудило некоторые группы заняться ее добычей, а другие старались приобретать ее от них.

Собственность сперва имела персональный или групповой характер. Оставляя в стороне теперь различие и сходство этих видов собственности, требуется подчеркнуть, что они не были тождественны с частной собственностью, которая, скопившись, дает возможность для эксплуатации людей. С другой стороны, граница между индивидуальной и групповой собственностью также не была резко очерчена.

Имея в виду все это, можно установить, что одна группа людей, проживавшая когда-то в районе с. Ловаш, сверх своей потребности занималась добычей краски и уступала избыток другим, вследствие чего постепенно развивался — в рамках первобытной экономики — постоянный обмен продуктами. Таким образом, создалась чисто техническая возможность на возникновение и развертывание общественных факторов и функций, т. е. производства товаров и товарообмена, которые затем при более высоком уровне развития средств производства дали толчок и дальнейшему развитию общества.