

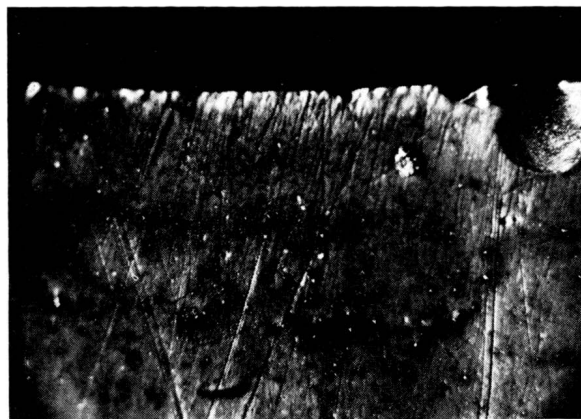
neolithic, as in upper palaeolithic, times two methods of work were employed: 'on himself' and 'from himself'. On one specimen the wear traces are not on the right-hand side (looking from the butt end) but on the left, while the facet had been ground down on the right (fig. 50.1). Knives of this type could only have been used 'from himself' with the application of great physical force by being mounted in a handle (fig. 50.2, 3).

Ground whittling knives played an important part in working bone. There were numerous traces of whittling on the bone and antler objects from the Verkholensk graves, besides evidence for the use of burin and chisel. Some objects could not have been made without whittling knives (fig. 50.4, 5). This was particularly so in the important job of cutting out the barbs on antler and bone harpoons. On their surface, in spite of the grinding down in the final stage of manufacture, traces of cuts made with whittling knives are visible. The removal of the material between the barb and the stem of the harpoon, to judge by the traces of work and form of the cuts, was made in the way indicated in the attached reconstruction (fig. 50.6).

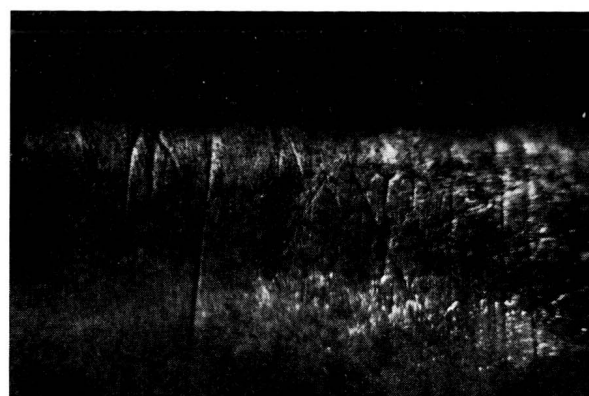
Semi-lunate neolithic knives with concave blades were used for whittling spear and arrow shafts, axe and adze handles, and objects of slight diameter made from saplings, such as poles, stakes, palings and so on. A concave blade was well suited to this. However, for treating broad expanses of wood in large objects it was no use, and for this a two-handed plane would be necessary. That such existed in neolithic times is shown by the two-handed stone plane found on a site in Kamen Island in the River Angar (fig. 51). It was made on a flake or blade of a light-coloured cherty rock, and was 160 mm long and 50 mm broad. It had been ground on both faces, but the working side was flat and the other convex. The working edge was convex, and there were notches at either end for the fixing of handles. The strongly polished part near the edge bore striations, which, as the micro-photograph reveals (fig. 51.2), ran at right-angles to the cutting edge.¹

i. Sickles

Research on stone reaping knives arose through Bibikov's excavations in 1947 at the early agricultural settlement of Luka-Vrublevetskaya on the River Dnestr. In the stone industry from this site a large number of prismatic blades of grey flint were found with traces of severe wear in certain places on their surface, which took the form of a mirror-like lustre on one edge of the flint, the other side being mat. The polishing covered a broad area at one end, dying out towards the middle of the flint to form a triangular shape (fig. 52.1), and it occurred



1



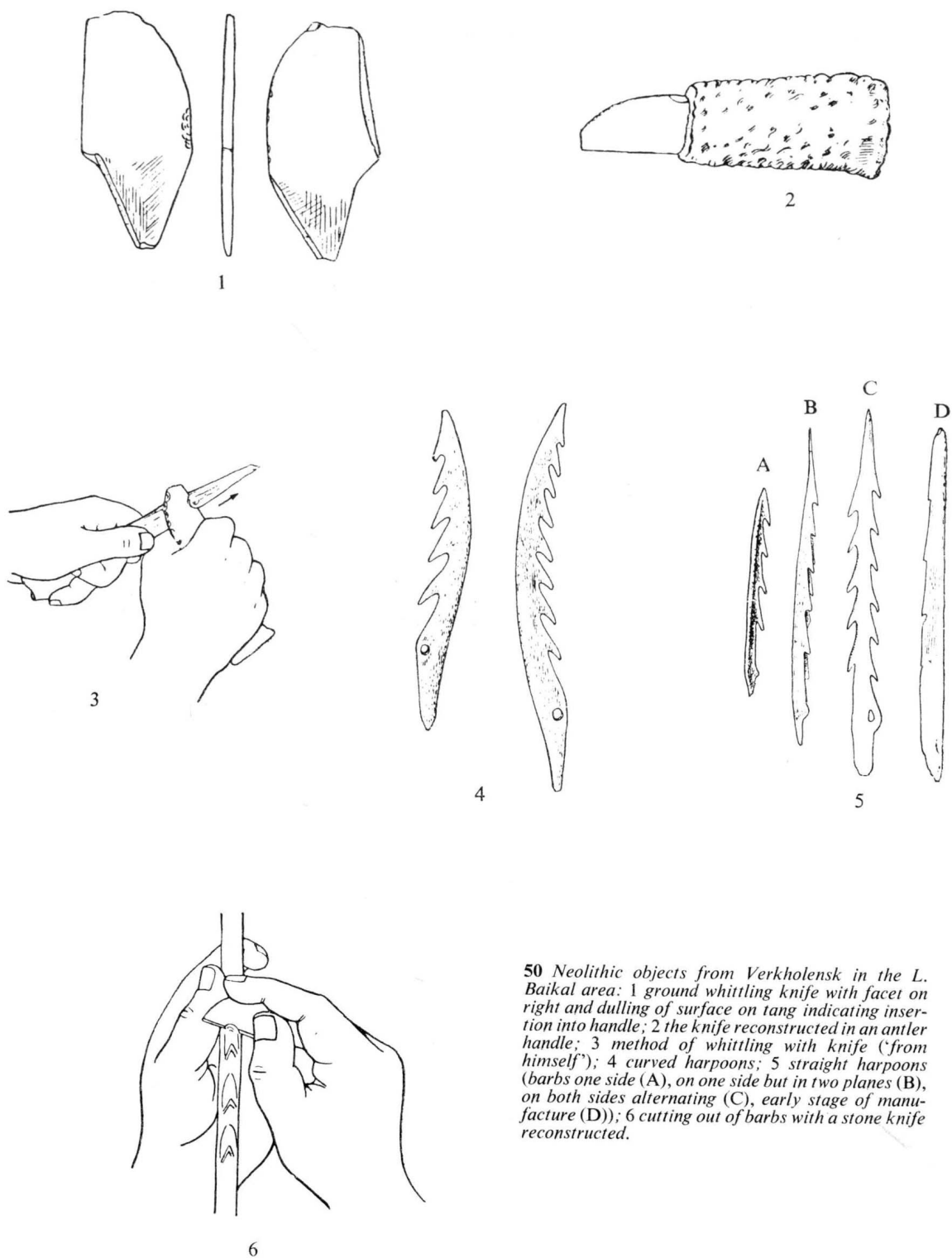
2

49 Micro-photographs of wear striations on ground whittling knives from Verkholensk (the almost horizontal lines in 2 are from grinding and are overlain by the clearer vertical striations from whittling).

on both faces of the flint. On the ventral face it died away from the right edge inwards, and on the dorsal face from the left edge, but, if this side had two facets, it did not pass on to the right one. Where the dorsal face had three facets the polishing might lightly extend into the middle one, but the central arris of the blade acted as a barrier to its further extension.

There was very little retouch on the blades and an attempt to denticulate the edge was never observed. The working edge appeared not only to be polished but in many cases blunted by prolonged uniform use involving

¹ S. A. Semenov, *Materials and Researches on the Archaeology of the U.S.S.R.*, 2 (1941), p. 209.



50 Neolithic objects from Verkholsk in the L. Baikal area: 1 ground whittling knife with facet on right and dulling of surface on tang indicating insertion into handle; 2 the knife reconstructed in an antler handle; 3 method of whittling with knife ('from himself'); 4 curved harpoons; 5 straight harpoons (barbs one side (A), on one side but in two planes (B), on both sides alternating (C), early stage of manufacture (D)); 6 cutting out of barbs with a stone knife reconstructed.

considerable physical force. Some blades had been broken during use.

It was quite obvious that these tools had been fixed in a handle, as the application of considerable force with short blades less than 60 mm long would be impossible if they were grasped in the fingers, especially when not blunted by retouch. Proof of the use of bone or wooden handles can be seen in the sharp demarcation between the polished and mat surfaces.

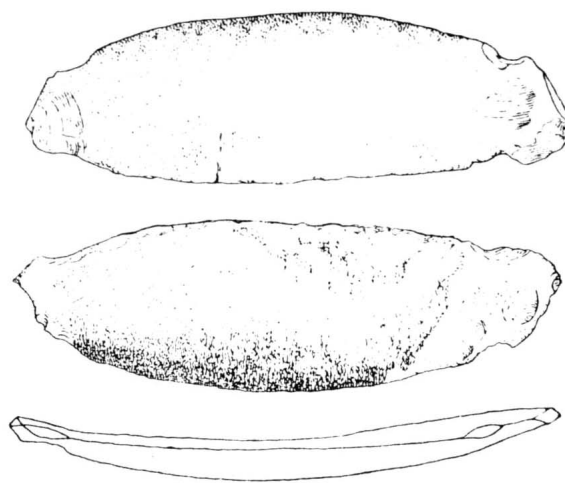
The essential clue revealing the character of the material worked by these tools was the even wear on both faces. Such a disposition of the polishing could only have arisen if the blade penetrated the worked material at right-angles and did so rapidly. It follows that it could not have been a hard material like stone, bone or wood. Yet intense and sharply demarcated polishing leads one to suppose that this material was not plastic, like skin or meat, for the latter would never leave such traces on a flint knife.

Examination of the polished area gave the accompanying micro-picture of the wear (fig. 52.2). The polished area appeared to be covered by tiny streaky scratches running parallel to the working edge of the tool. Only in a few cases did they intersect. Besides this on the paths of these streaks were holes of irregular shape and variable size, evidently surviving remains of the uneven flint fracture surface.

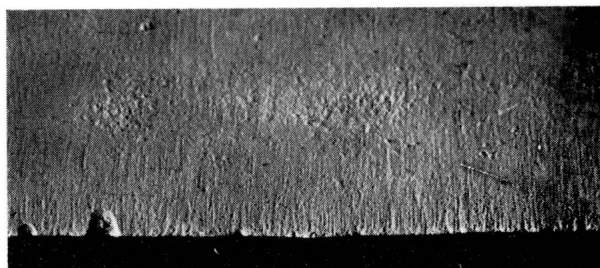
Analysis of these holes revealed another important detail which solved the puzzle of the function of these knife-like flint blades. The holes, as a rule, were higher on the right side than the left; the left edge was appreciably more worn than the right. Consequently in the course of a long period of time the wear of the worked material had produced one-sided attrition on the holes. With the Opak lamp in an oblique position it could be seen that the holes have a comet shape, the tail pointing towards the working end of the blade, the head towards the handle. This fact is proof of the one-way movement of the knife during use, more specifically a movement 'to himself'. The linear traces (streaks parallel to the blade edge) which cover the polished area indicate that the movement 'on himself' was a rapid one, for had the blade been slowly imbedded in the material the striations would have run obliquely to the blade edge.

Of all possible types of work in a primitive economy which involved a sharp blade in a quick movement 'to himself' the only conceivable use is as a sickle blade.

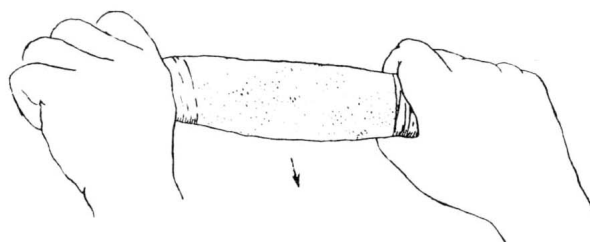
All that has been said about the traces of work on the flint blades from Luka-Vrublevetskaya (disposition and degree of polishing on the surfaces, character of the wear and direction of the streaks), relative to the kinetic peculiarities of the work and the comparative toughness of the material, therefore brings us to the conclusion that these tools were used for reaping. Other inferences cannot be reconciled with the accumulated evidence of the



1

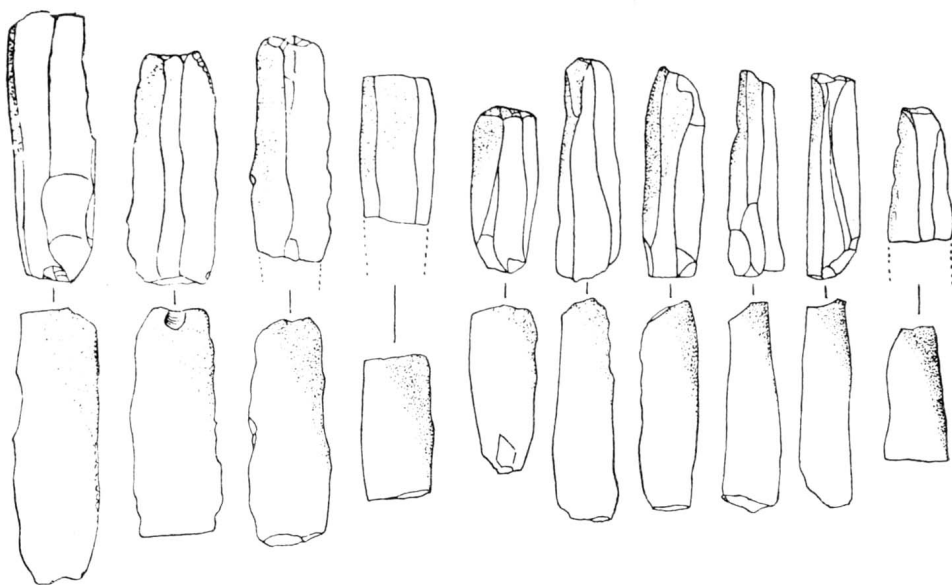


2

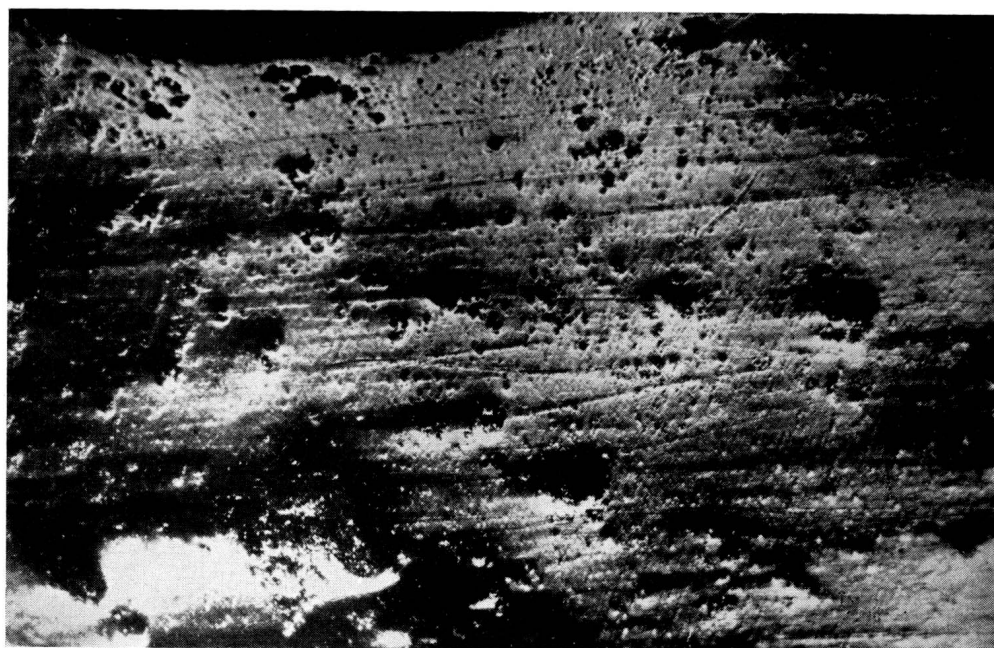


3

51 Neolithic two-handed plane from the L. Baikal area; 1 general view; 2 microscopic use traces on the edge; 3 suggested method of use.



1



2

52 1 Late neolithic flint sickles from Luka-Vrublevetskaya; 2 wear on working edge of first flint on left magnified 120 $\times$.

traces. So on the evidence we have before us a very ancient type of stone sickle used in an early agricultural economy.

We announced the results of these researches and conclusions about the purpose of the flint blades with traces of polishing at the 1947 session of the Palaeolithic and Neolithic Section of the Institute of the History of Material Culture of the Academy of Sciences of the U.S.S.R., and they were published in 1949.¹ Soon afterwards direct evidence emerged of the existence of agriculture among the inhabitants of Luka-Vrublevetskaya; on the clay female statuettes Bibikov identified impressions of millet grains which for ritual reasons had been mixed into the clay paste.

A reconstruction of the sickle (fig. 53.1) that we originally put forward, directly hafted into the end of a wooden handle, is not the only possibility. Since the traces of wear on the blades from this site occupied a larger area at their end, it can be assumed that the end of the blade encountered a greater resistance from the material. This circumstance indicates that the blade was at an angle to the axis of the handle. Such a position of the blade was possible if it was set sideways in a slot at the front end of the handle (fig. 53.3), a reconstruction which is supported by finds near Lucerne, Switzerland, of neolithic sickles fixed in comparatively long wooden handles (fig. 53.4–6). The handles projected forward with pointed ends which acted as a trap for numerous stalks of the cereal being reaped, gathering them into a bunch, as the sickle moved forward, which could be held with the left hand.²

The second reconstruction corresponds better to the kind of wear found on the majority of flints at Luka-Vrublevetskaya, although the first cannot be entirely rejected. By this simple method of insertion it is likely that flints were originally used for reaping. Support for this view is provided by the existence at this site of reaping knives of peculiar construction, which, although they look more advanced, only differ slightly from those fixed directly in the body of the haft.

Amongst the flint blades bearing traces of gloss there are two specimens of somewhat individual character. Like the others they are worn on both faces, but in their case the polishing extends almost the whole length of the blade. If they had been fixed in a slot at an angle to the handle, as shown in the second reconstruction, there would not have been traces of work along their whole length, as half the blade would be in the slot. It is obvious that the blade here could not have been mounted at an angle to the handle, but must have been

parallel to it in a longitudinal groove cut in the forward part of the haft (fig. 53.2).

Such a method of hafting had certain advantages by comparison with seating the flint in the wood, although it would be less efficient in use. Firstly, a blade mounted for almost the whole of its length would not break during use, and secondly, it would be easy to use the blade twice in the same handle by taking it out and turning it round, so the blunted edge was in the handle.

One condition had to be observed, however, in re-using a blade. Flint blades have a slight curve, concave below and convex above, so naturally the grooves in the handle would have to be made to allow for this. To use the other blade edge the flint would have to be reversed in the handle from back to front. That this was done is confirmed by traces of use on both edges of these sickle blades.

Luka-Vrublevetskaya evidently marked a very early stage in the development of agriculture in south-eastern Europe. In the Tripolye settlements we would be unlikely to find such a simple technique of reaping.

The stone industry from Miss Passek's excavations at Polivanov Yar revealed a high level of technique. The flint blades used for reaping had retouched edges, often jagged or even with proper teeth. Cases were found where a blade had been originally used without retouch, but after it had become blunted in use it had been retouched and given a toothed edge. Double-sided use of the blades was not exceptional, and the wear traces proved both longitudinal and diagonal hafting of the blades. In addition the site yielded authentic inserts of a composite stone sickle, consisting of retouched bladelets or segments with wear traces on one or both sides.

Material from different parts of the Soviet Union (Central Asia, Caucasus, Crimea) and from different periods of ancient agricultural societies has been examined, with the object of making a full study of the microscopic differences between stone sickles and other stone tools.

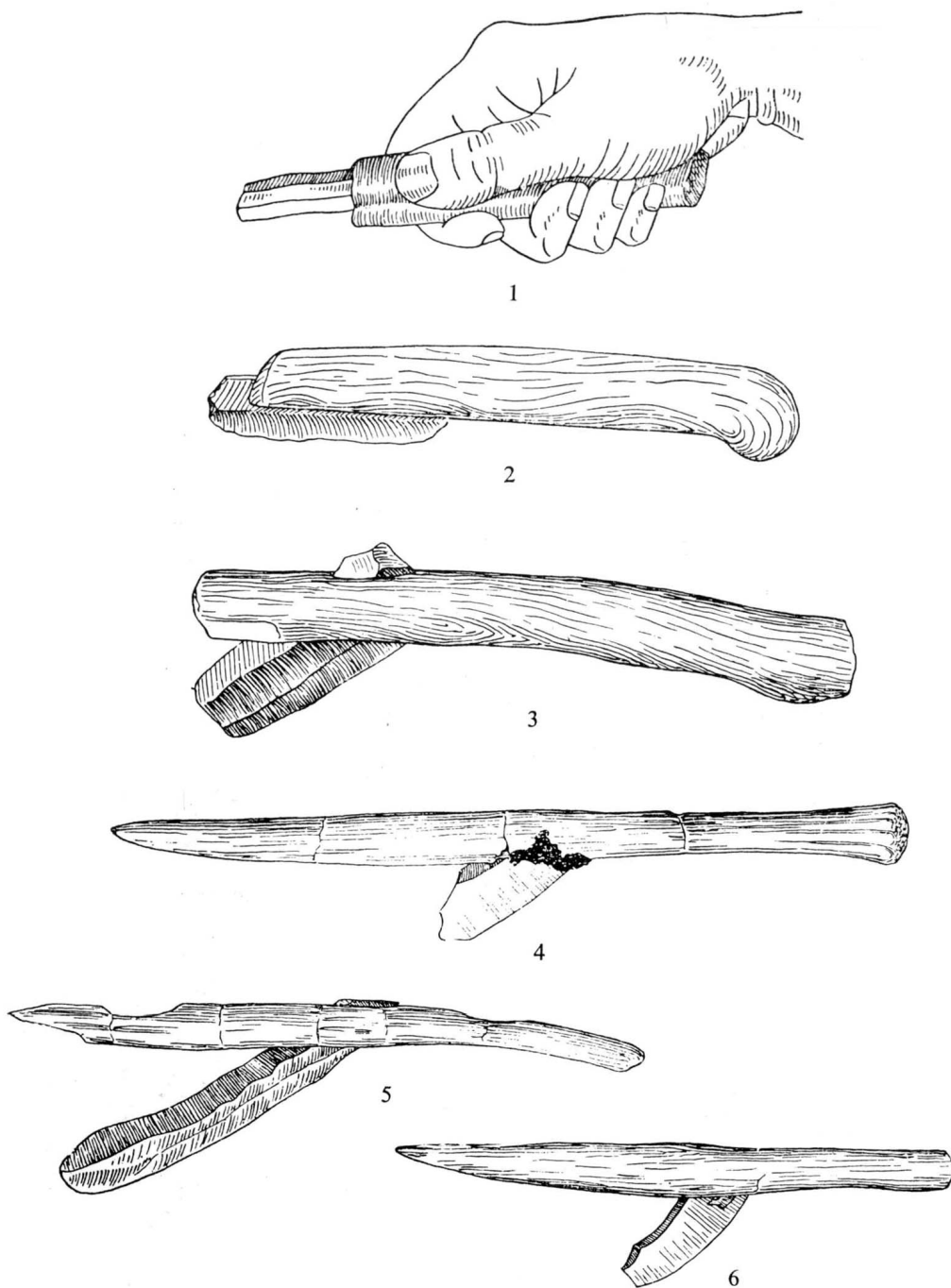
A group of sickles bearing the labels 'unworked arrowheads' or 'end-scrapers' has been identified among the small collection of stone tools from the lower layers of Anau (fig. 54.1–4) preserved in the Archaeological Section of the Museum of Ethnology of the Academy of Sciences. In Pumpelly's main publication these flint blades were called 'flint knives' or 'flint saws'.³

The associated finds from the lower layers of the north tell at Anau testified to an agricultural economy; Pumpelly found stone querns, rubber stones, barley and millet grains, as well as evidence of deliberate irrigation.

¹ S. A. Semenov, *Soviet Archeology*, 11 (1949), pp. 131–54.

² K. Keller-Tarnusser, *Jahrbuch der Schweizerischen Gesellschaft für Urgeschichte*, 42 (1952), pp. 38–42.

³ R. Pumpelly, *Explorations in Turkestan* (Washington, 1908), p. 164, pl. 42–44.



53 1-3 various methods of hafting flint sickles on the basis of the late neolithic material from Luka-Vrublevetskaya (1 in end of handle; 2 in groove at end; 3 diagonally in a slot); 4-6 flint sickles mounted in wooden handles from Lucerne, Switzerland.

In the upper layer of the south tell belonging to the Iron Age iron sickles were found, but the excavator did not recognize the stone sickles from early Anau.

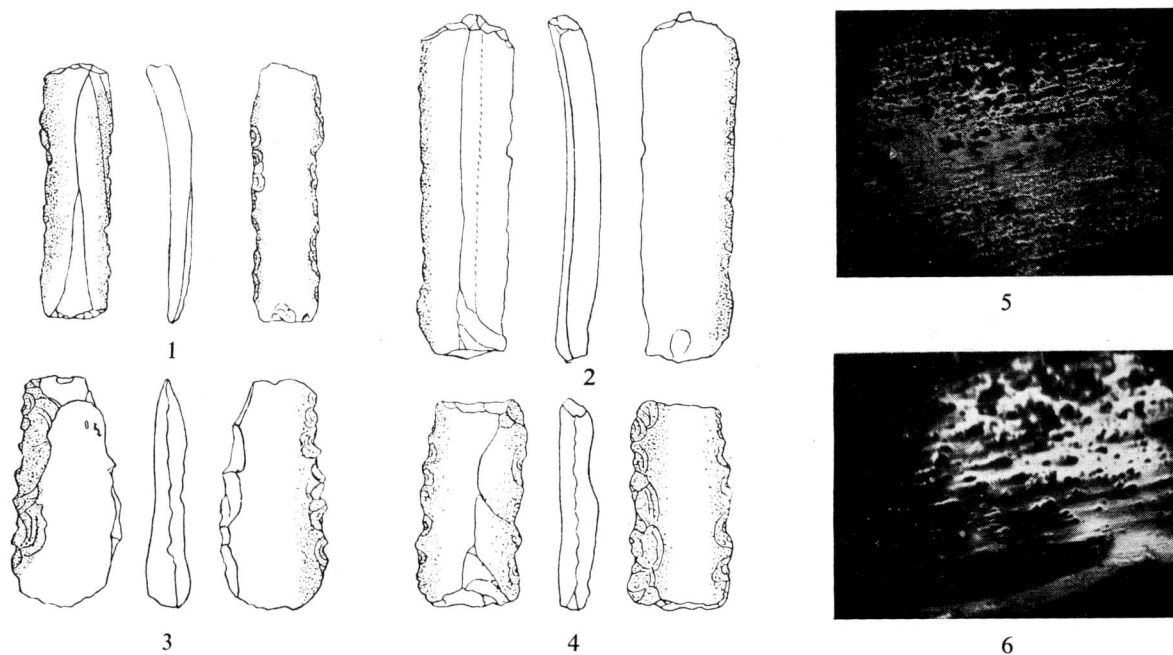
The reaping implements of Anau corresponded in every way to the level of development of those of Tripolye agriculture; with few exceptions they were insert blades with toothed edges for use in composite sickles. Some of the inserts had been used on both edges as the intense wear on both sides indicated. Micro-analysis revealed the characteristic sickle wear on the flint with striations and holes of comet shape, their tails pointing to the left, that is to the working end of the sickle (fig. 54.5, 6).

Without a doubt the Copper and Bronze Ages are distinguished by a higher technical level of making flint reaping tools. Our studies of the composite sickles from Dolinsk station in the north Caucasus (dug by Kruglov) and the pre-Urartian settlement on the hill at Karmir-Blur in Armenia (dug in 1943 by Piotrovsky) dealt with objects retouched on both sides. Their large teeth were well made as on a saw, and intense polishing covered the toothed edge on one or both sides. Sometimes fresh facets could be seen on the teeth showing that they had been re-sharpened after the blade had been blunted. The

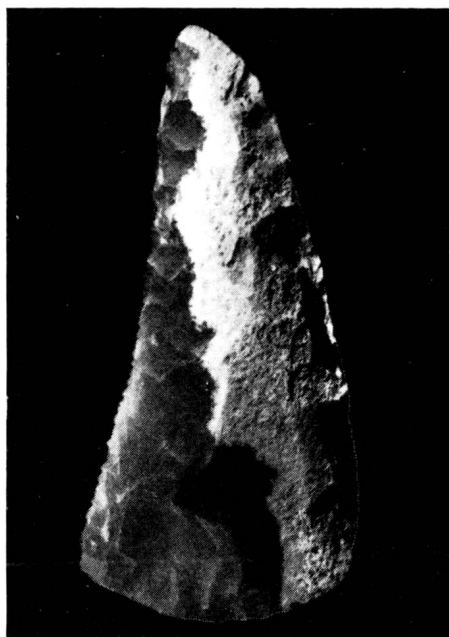
front insertions reached 80 mm in length. There is every indication that we are dealing with large sickles designed for harvesting cereals in big fields.

There is no reason to suppose that the composite sickle of the Bronze Age displaced the reaping knife made of a single flint fitted into a handle; we have a good deal of evidence for its survival until fairly recent times.

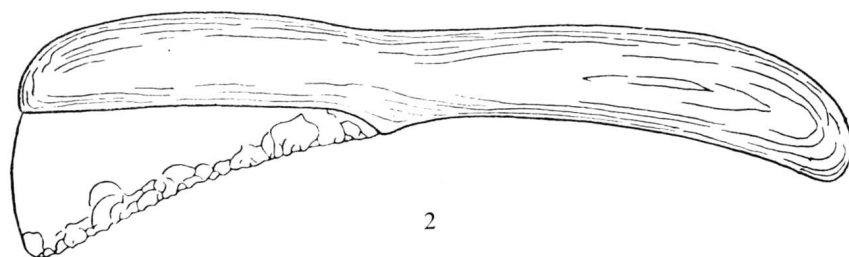
As examples flint sickles may be cited from the village of Mereshevka (Moldavian S.S.R.) and from a place called Gamarie (near Lenkovits in the oblast of Chernovitsk) found by the Tripolye Expedition in 1950 and belonging to the late Bronze Age. These are large triangular flint flakes whose working ends and edges are retouched (fig. 55.1, 2). The one from Gamarie has, in addition to retouch, a series of small teeth, and its concave blade is strongly polished. A peculiar feature of these tools is the method of hafting. The polishing begins at the narrow end and gradually increases to the broad end, extending over both faces in the shape of a triangle, from which it follows that the front was at the broad not the narrow end. When mounted in a longitudinal groove the blade's edge would lie at an angle to the axis of the handle, and so give the implement greater efficiency (fig. 55.2). Obviously these one-piece sickles were firmly



54 1-4 Late neolithic flint sickles (1 and 2) and sickle inserts (3 and 4) from Anau; 5 and 6 micro-photographs of wear traces on sickle flints from Anau.

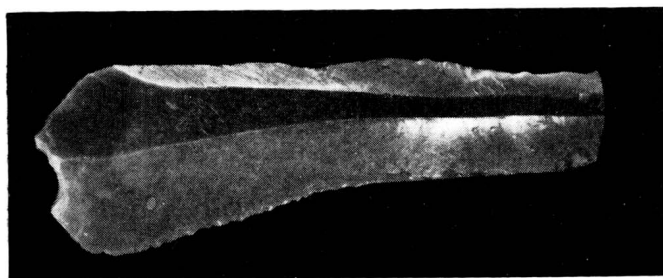


1

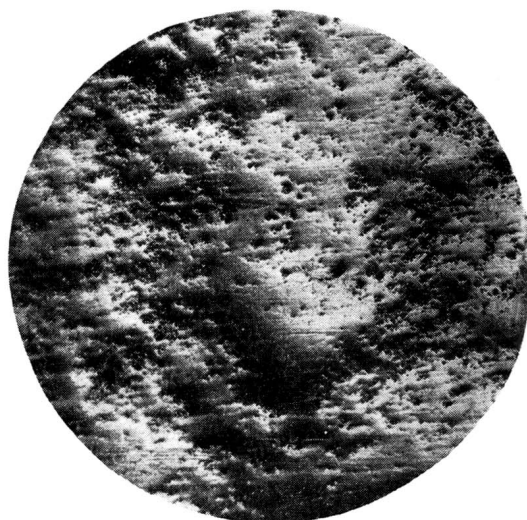


2

3



4



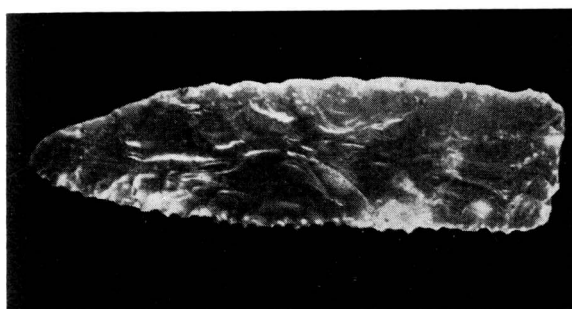
55 1 Flint sickle from Gamarie (both faces); 2 reconstruction of the sickle hafted; 3 flint sickle from Atak on the River Dnepr; 4 micro-photograph of wear traces on the same sickle. Bronze Age.

STONE

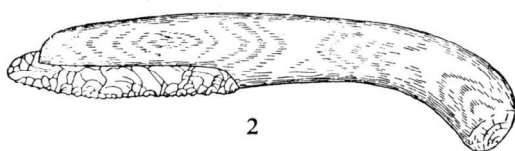
fixed in handles, and due to the considerable width of the blade it could be repeatedly trimmed without taking it out of the handle.

An example of a straight sickle is the dagger-shaped tool from the lower layer of Tyrıtace (Crimea) found by Gaidukevich (fig. 56), which has been made by bifacial pressure retouch and is almost symmetrical in shape. One edge is denticulated by interrupted retouch, and the teeth are slightly separated. The toothed edge is polished on both faces, and the micro-structure of the traces is that characteristic of stone sickles. The other edge bears neither teeth nor polishing. The sickle had been mounted in a side groove in its handle and had not had much use, as is proved by the moderate intensity of the polishing and the absence of traces of re-trimming.

Amongst reaping tools knives without a handle occupy a special position. They were not found amongst the very early tools of Luka-Vrublevetskaya, where we might have expected they ought to occur, but only in later industries. The first of such sickles was found in the collection from Anau, and consisted of a quartzite blade of rough prismatic shape with vague traces of retouch on



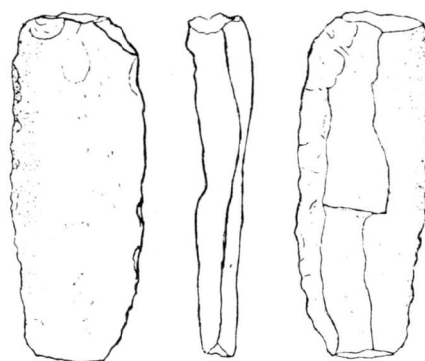
1



2

56 1 Flint sickle of pre-Hellenistic period from Tyrıtace; 2 method of hafting reconstructed.

one side. The opposite side had a thick butt and traces of rough trimming. It was about 70 mm long, 30 mm wide and up to 13 mm thick, with a blade roughly and unevenly toothed and intensely polished along almost its whole length (fig. 57). It would certainly have been difficult to insert a knife with such a thick butt into the



57 Sickle from Anau used without a handle.

longitudinal groove of a handle and this had not been the aim, even when it was made, for, as one can see, there had been no retouch to thin the thick butt.

A second example of a sickle used without a handle was found by the Tripolye Expedition in 1949 at Ozhevo in the Sokorensk area of Moldavia. It could not, it seems, be exactly dated, but, as fine denticulated inserts for composite sickles were found with it, it can probably be referred to the Bronze Age. It was a large blade of rough limestone flint, 115 mm long, 35 mm broad and about 15 mm thick. One edge was sharp, the other thick and blunted by steep retouch. On the front part of the thick side was a notch intended as a rest for the index finger when held in the hand, while typical polishing covered the working edge on both faces along its full length, being stronger at the front.

Analytical study of sickle blades indicates therefore that their shapes and methods of use were varied. Their traces of wear by disposition and micro-structure are unmistakable and cannot be confused with any other type of work. Consequently precise definition of sickles is possible without experiments. The latter can merely show the efficiency of this or that type and test the character of the wear, but is not a method of defining the real function of ancient tools.

We carried out tests in reaping with flint blades of the type found at Luka-Vrublevetskaya. These were done at Voeikovo near Leningrad, where unused blades from the site were tested on fields of barley and oats. One was mounted in the end of the handle, the other diagonally in a slot. The tests were done over one day in late August when the cereals were fairly ripe, and the stalks were cut at about 25 cm above the ground or higher. A handful of twenty stalks could be cut with one or two blows, although in rare cases it required three.

From the test we can understand the relatively high productivity of a flint sickle the length of whose working

edge was only 50–55 mm and moreover not retouched. Some technical deficiency of mounting with the flint set in the end of its wooden handle caused it over a time to become loose and fall out, which did not occur with the knife set diagonally in a slot.

Traces of wear on the flints after only a day's work were weak, although a slight gloss could be detected with the unaided eye. The micro-structure of traces was typical for sickles, as we had identified it on ancient examples.

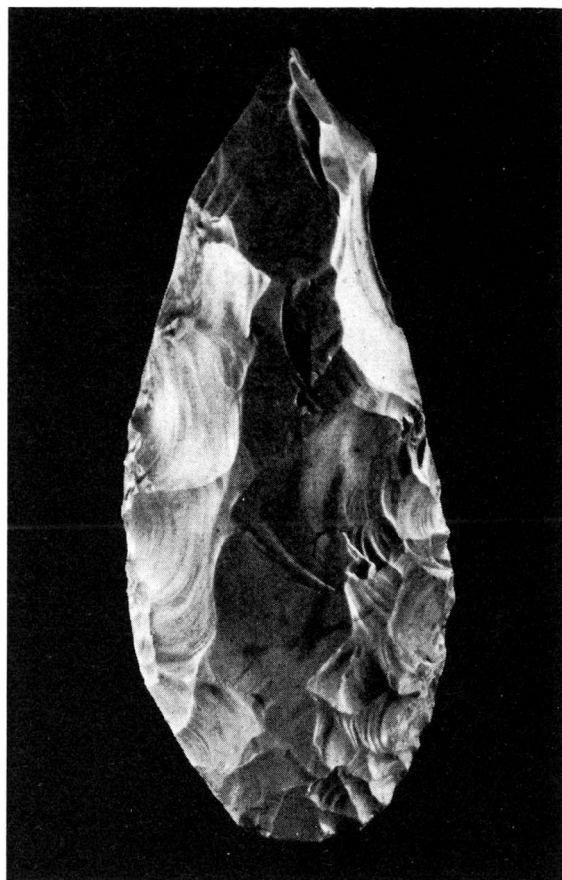
The tests give some basis for believing that wear traces on sickles reaching a mirror-like lustre could only be the result of prolonged use. Probably the long duration of use was due to the considerable areas of ground sown with crops by early agricultural communities.

j. An axe from Kostenki I and an adze from Pesochny Rov

The origin of chopping tools (axe and adze) is an important problem in the history of ancient technology. Hand chopping tools, used without a handle, undoubtedly have a very ancient origin, since they can be traced back to the Chellean period. The hand-axe is essentially an implement for giving blows, but it is impossible to concur with Vayson, who regarded them as having been mounted in handles in lower palaeolithic times.¹ Nor can the opposite view be conceded according to which mounting in a handle was much later and arose in neolithic times, when conditions of life in forests or close to forests made an axe indispensable. There can be no doubt that in the neolithic period, especially in the forest zone, there was an extraordinary extension in the use of chopping tools, but the axe and the adze came into use a good deal before this, as early, in fact, as upper palaeolithic times. At all events with regard to the axe we can say this quite positively.

A word of caution is necessary here. In both the western and Soviet archaeological literature on the palaeolithic period the terms 'discoidal chopping tool' or 'core-like chopping tool' are employed. These terms are used both of lower and upper palaeolithic implements, but they have only formal typological significance, and arose when bifacial dressing, found on Chellean and Acheulian tools, was loosely regarded as a sign of 'chopping' in all bifacially dressed tools. The terms can be regarded as conventional, created for classification and comparative dating, and not to indicate real functions.

The study of real functions of palaeolithic tools by traces of use has allowed us to recognize the existence of the axe in the upper palaeolithic period. In 1932 Efimenko found a flint tool of somewhat unusual form at Kostenki I (fig. 58). It was 120 mm long (or high),

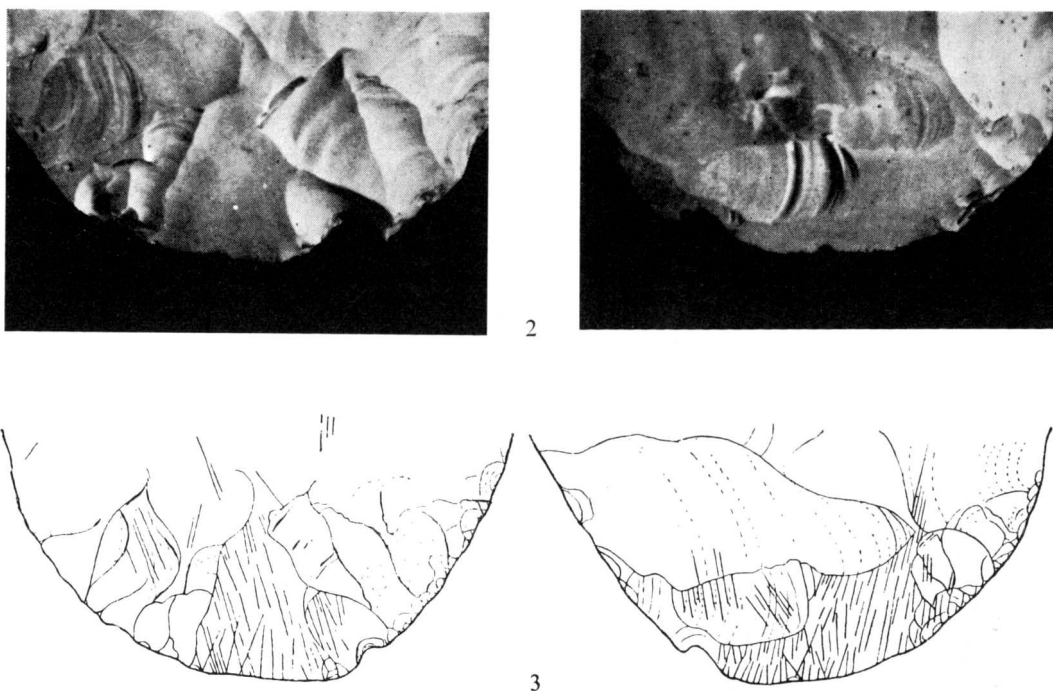


1

45 mm broad and in the middle 25 mm thick, and in its manufacture the whole of an elongated nodule, or half of it but not a flake, had been used. This is proved by the presence of the nucleus and accretion rings in the nodule around which the flint had originally accumulated. The tool was worked bifacially into an oval shape, very like an Acheulian hand-axe, and then at the thick end three transverse blows produced an uneven platform by their scars, while on the opposite side four longitudinal blows gave the butt its present shape. Finally it had been trimmed by pressure and percussion retouch from different directions along its edge, and blunted along its middle convex part or arris by light blows and rubbing against stone.

In all its external features the tool does not differ from

¹ A. Vayson, *L'Anthropologie*, 30 (1920), pp. 479–82.



58 (AND OPPOSITE) Upper palaeolithic flint axe from Kostenki I: 1 axe from left side; 2 both faces of the blade of the axe; 3 both cheeks of axe (4 ×) showing striations.

the rest of the Kostenki I industry. The quality of the material, milky-grey patina with dove-grey specks and other features all show that it is of local origin.

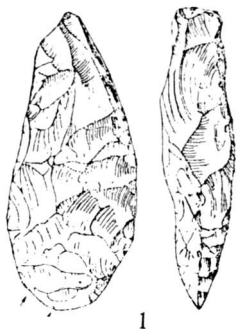
The purpose of the tool was a matter for discussion. Efimenko drew attention to its symmetrical profile, the presence of a blade and projections on its upper part suitable for securing to a haft, and identified the tool as an axe. However, Efimenko's deductions at the time were regarded as having insufficient basis, and Zamyatin, Bonch-Osmolovsky, and Sosnovsky believed that the tool had some other function.

Our first microscopic examination of the tool's surface was made in 1937, but no traces could be found, as they were very faint. The binocular lens with its limited power could not detect them. We know now that we still had not had sufficient experience, nor perfected methods of preparing subjects for study. Not until 1948 were the wear traces identified with a binocular microscope, while today they can be studied even through binocular lenses of low magnification.

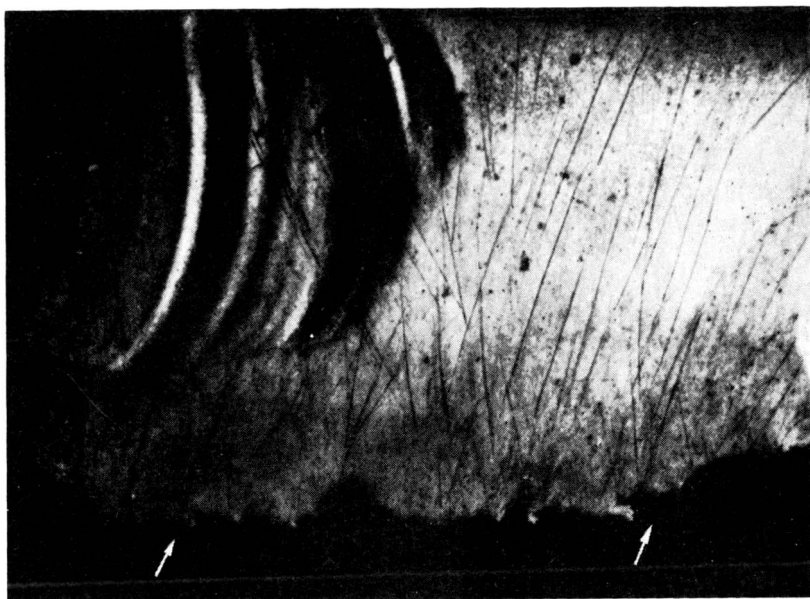
The observed traces were those characteristic of an axe (figs. 58.3 and 59.2). They occurred on the oval

working end of the tool on both faces, and consisted of fine scratches or lines running upwards, inclined to the left at an angle of 20–25° to the vertical axis. Some striations lay at a different angle and intersected the majority. Probably they were produced at a time when the angle of fall of the axe blade was sharply changed; such traces occur on neolithic stone axes and contemporary metal ones. In the photograph of a chopper blade one can see the general background of striations regularly disposed running up from the blade-edge inclined leftwards in relation to the handle, but there are others deviating from this and going the opposite way (fig. 59.3, 4).

The basic mass of striations on the Kostenki axe are short cuts which appear to be straight. In reality they are tiny sections of the curved trajectory of the axe, small chords of its line of movement. Two features, the bifacial and diagonal arrangement of the striations, are the crucial functional criteria of an axe. It is quite obvious that this type of trace could only be produced by blows in which both faces or cheeks of the blade encountered uniform resistance from the worked material, which

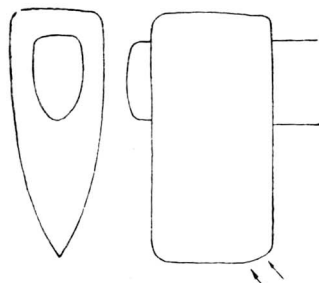


1

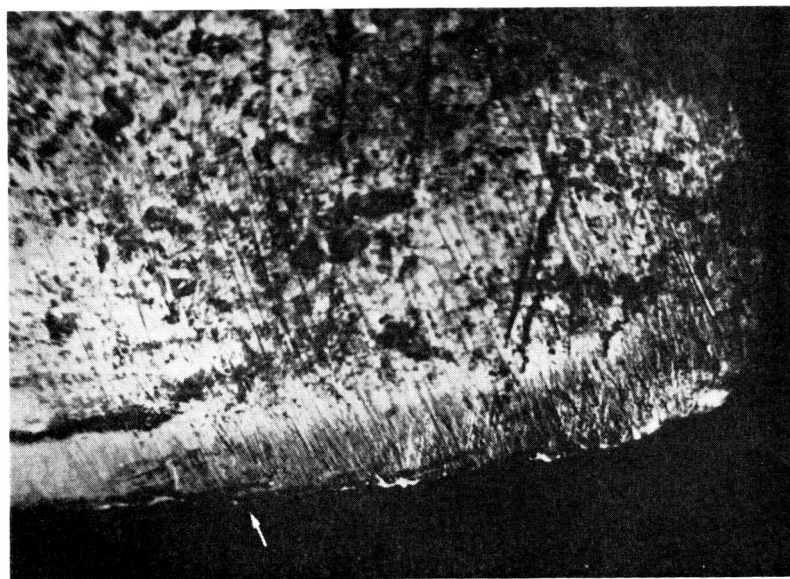


2

59 1 Upper palaeolithic flint axe from Kostenki I; 2 micro-photograph of striations on right cheek; 3 modern steel chopper; 4 enlargement of striations on its left cheek.



3



4

could only arise if the blade-edge, when the tool was mounted, ran parallel to the axis of the handle.

With an adze the traces arise in quite a different way. It is fixed to the handle with blade-edge at right-angles to it, while the tool's axis is at an acute angle to the handle, not a right-angle as with an axe. Consequently the wear traces on an adze are sharper on its front face away from the handle, precisely because this side encounters direct resistance from the worked material. In addition the striations lie, not diagonally, but more or less parallel to the adze's axis (fig. 60.1, 2).

From what has been said we may conclude that we can rely on the striations to distinguish an axe from an adze. Thus it is possible to attempt a reconstruction of the tool as a whole with its handle. The accompanying reconstruction of the Kostenki I axe (fig. 60.4) has taken into account, not only the wear traces, but also the shape of the butt, the general shape of the tool and its size. Axes would, of course, be lashed to the handle with thongs.

In our view every axe is connected with working wood. In all probability the Kostenki axe served this purpose also. All the same, study of the bones and mammoth tusks of such sites as Kostenki I, Gagarino, Suponevo, Eliseevich, Malta and many others (where numerous thin and thick tusks, shoulder blades, ribs, long bones and antlers bore signs of hewing or chopping) leads one to think that wood was not the only material worked with an axe. In a number of cases, for example, tusks had been chopped through not with an axe but with a special type of chisel with narrow working end. Ivory can be chiselled through more quickly than it can be hewn or chopped through. However, there are not a few cases where it has been hewn through with an axe, as revealed by traces of the blade on the material.

Examination of the different notches or cuts on the bones of large animals lends further weight to the contention that the axe existed in upper palaeolithic times. Some of the cuts on mammoth long bones from Kostenki I are noticeably bow-shaped (fig. 60.3). They are all curved one way, which indicates that the edge of the axe probably also was curved. Evidently this form was typical of the axe's working edge in upper palaeolithic times. There are some grounds for supposing that the technique of manufacture of the Kostenki I axe was not accidental, but had analogies elsewhere, albeit still not numerous. For example, the 'gigantoliths' discovered by Pidoplichka at Novgorod-Seversk in 1933

closely parallel the Kostenki I axe. The gigantoliths were made by bifacial dressing, one end formed by flat flaking, the other by longitudinal blows, and one midrib was partially taken off, as at Kostenki, or sometimes fully. The huge axes from Novgorod-Seversk were evidently secured by a handle on this side. The massive weight of these gigantoliths, reaching 8 kg, must have required great strength to use them, although we know of heavy mauls from early Bronze Age copper workings not exceeded in weight by the gigantoliths. Pidoplichka's view that these axes were used for hewing mammoth bones is plausible, but the matter can only be finally settled when the tools have been studied in detail.¹

The development of stone axes in post-glacial Europe shows that the ground neolithic axe was preceded by an axe of unground flaked stone. The earliest may be regarded as those discovered in 1900 in the peat bog at Maglemose (Denmark) where there had been a settlement of hunter/fishers during the Ancylian stage of the Baltic area.² Mesolithic axes have been given the name of tranchet-axes, and are distinguished by a broad blade made by strong flat blows. Axes, known as picks, found on the same site, are longer and narrower with round blades, and sometimes oval bodies. Axes were still relatively rare at Maglemose, but occur in great numbers in Ertebølle kitchen middens and in the Campignian culture. In areas rich in flint, like northern France, such tools continued to be used into mature neolithic times (Fort-Harrouard) together with ground axes made of volcanic rocks.³ They are also known in England. As examples the mesolithic sites at Flixton, Yorkshire,⁴ and at Warren Oakhanger, Hants.,⁵ with unground flint axes may be cited.

As axes occur less often in neolithic settlements than adzes the latter can be regarded as the more necessary tool in more frequent use. Hence it would be supposed that the adze had a more ancient origin than the axe. It is possible that further research will confirm this, but at present we have no evidence for the origin of the adze earlier than the mesolithic period. In the excavations at Pesochny Rov on the River Desna, Voevodsky found a flint tool which he took to be an axe. However, study of the surface has revealed that it was an ancient adze, not ground but worked by pressure retouch. It had a broad blade with rounded corners and was asymmetrical in profile, its flat face retaining traces of severe polishing. The butt was missing as the tool had broken during use (fig. 61.1). Examination of the polished area showed that

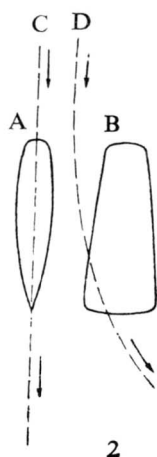
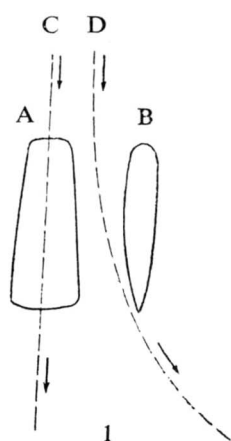
¹ I. G. Pidoplichka, *Materials and Researches on the Archaeology of the U.S.S.R.*, 2 (1941), p. 28.

² G. E. Sarauw, *Aarbøger* (1903), pp. 148–315. (For a much fuller account see: J. G. D. Clark, *The Mesolithic Settlement of Northern Europe*, Cambridge, 1936. T.)

³ J. Philippe, *Cinq Années de Fouilles au Fort-Harrouard* (Rouen, 1927).

⁴ *Proceedings of the Prehistoric Society*, 16 (1950), p. 103.

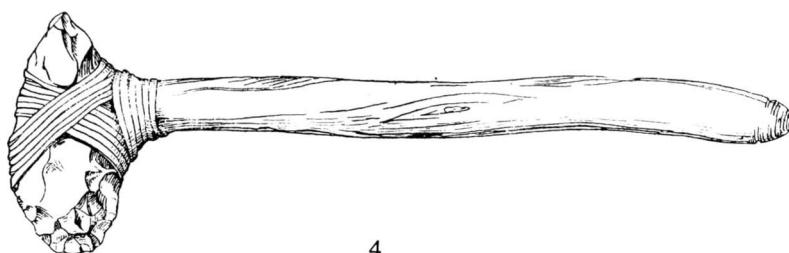
⁵ *ibid.*, 18 (1952), p. 32, pl. 1.



the tool had been mounted with its blade at right-angles to the handle (fig. 61.2). The linear traces in the form of fine lines were closely bunched and lay almost at right-angles to the working edge; such striations can be regarded as typical for an adze.

k. Traces of use on neolithic axes and adzes

Field researches have produced a great quantity of stone chopping implements from neolithic settlements, and certain areas of the Soviet Union have proved exceptionally rich. In the standard archaeological publications these tools are divided into axes, adzes, and chisels. An axe is recognized by its symmetrical profile, an adze or hoe by its asymmetry, and a chisel by its small size. Adzes can be straight or convex. Such a formal subdivision firstly does not by any means always correspond with the real purpose of the tools, and secondly does not take into account the specialized functions of different



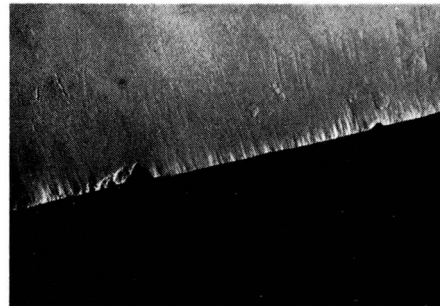
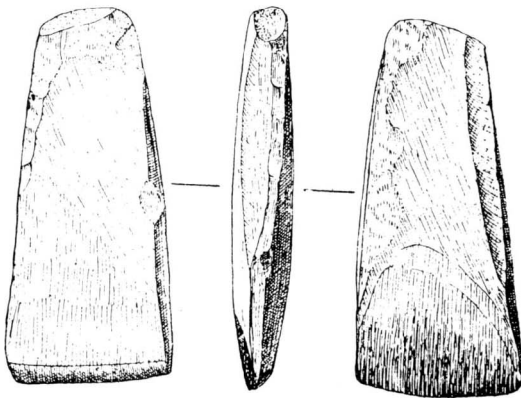
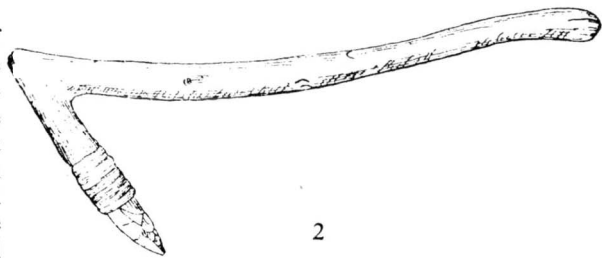
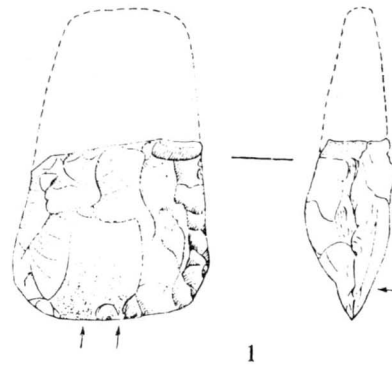
60 1 Trajectory of an adze in frontal and sagittal planes; 2 trajectory of an axe in frontal and sagittal planes; 3 traces of blows with an axe on a mammoth tibia from Kostenki I; 4 reconstruction of axe from Kostenki I in its handle.

chopping tools. Moreover, it is difficult on this basis to distinguish tools used as battle-axes. Commonly the latter are included in the category of working tools or vice versa, while some students call battle-axes battle-hammers or maces.

By merely considering the object's shape one cannot tell whether the tool in any specific case was an axe, a mattock, an ice-pick (tool for breaking the ice in winter fishing) or a pick. An example worth citing is three different opinions that have been expressed on the purpose of the pick-shaped tools from Karelia preserved in Moscow and Leningrad museums under the title of 'miners' picks' (*kail*). These tools, made of a dark fairly soft rock, are cigar-shaped with one side flat and one or both ends pointed (fig. 65.4). Uvarov¹ and Gorodtsov regarded them as hoes, Bryusov² as plough-shares and Tretyakov as ice-picks.³

Foss and Elnitsky wrote very fairly: 'Such a variety of opinion about the function of this tool has arisen because the older methods of formal classification made evaluation of the remains more difficult. They gave rise to the conventional terminology which still has not gone out of use. "Hoe" for example is the name given to certain tools regardless of whether they could have been used for agriculture. Even if the student denied the existence of agriculture in the period or area under discussion all tools of a certain form had to be called hoes for the sake of typology.'⁴

The observation of Foss and Elnitsky relative to the predominance of adzes over axes in neolithic remains is



61 1 Mesolithic flint adze from Pesochny Rov; 2 its hafting reconstructed; 3 nephrite adze from a neolithic burial on the R. Angar; 4 micro-photograph of the nephrite adze's blade.

¹ A. S. Uvarov, *Archaeology of Russia* (Moscow, 1881), I, p. 351.

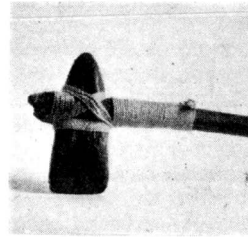
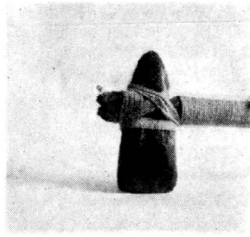
² A. Y. Bryusov, *Soviet Karelia* (Moscow, 1930).

³ P. N. Tretyakov, *Journal of the State Academy for the History of Material Culture*, 14 (1932), p. 27.

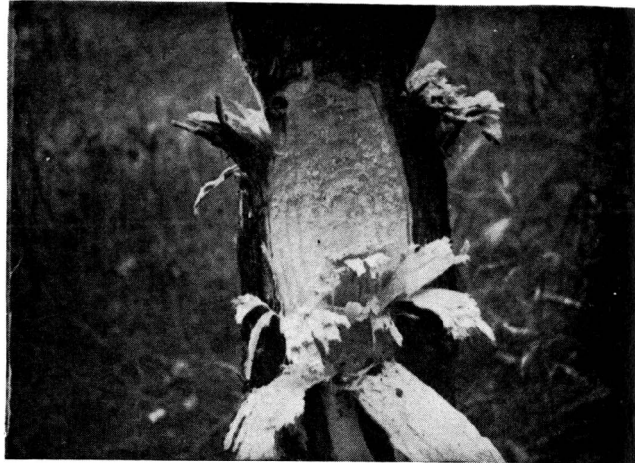
⁴ M. Foss and L. Elnitsky, *Materials and Researches on the Archaeology of the U.S.S.R.*, 2 (1941), p. 184.



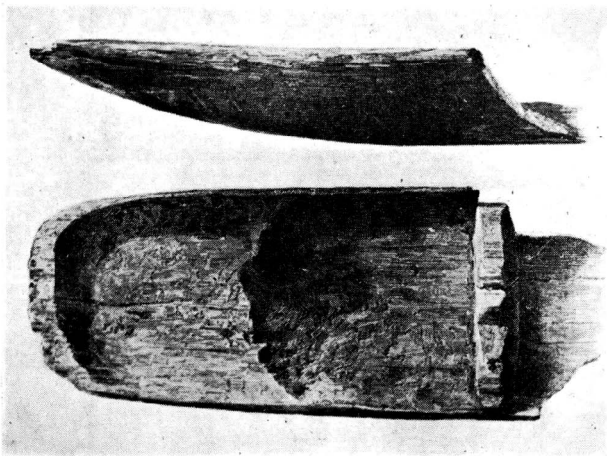
1



2



3



4

62 1 Neolithic nephrite axe from Fofanov used in experiment; 2 the axe as hafted (stereo-photographs); 3 a fir tree of 25 cms. diameter after 6 minutes chopping; 4 part of dug-out canoe from the neolithic settlement on L. Ladoga.