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A Neolithic Vehicle from Klosterlund, Central Jutland

by PER OLE SCHOVSBO

Klosterlund, situated near the edge of the now dried-up Bølling lake, has become renowned in Danish archaeology. This is the place where, in 1936, habitation layers were discovered which dated from the Early Stone Age (Mathiassen 1937), i.e. slightly later than the site at Star Carr (Eastern England), which dates from the 8th millennium B.C. Similarly, Bølling lake has become a classic locality for studying the history of climatic developments since the last Ice Age (1). Here the first traces were found of the Late Glacial climatic amelioration around 10,000 B.C. which is named the Bølling period (pollen zone I b) (fig. 1).

At the edge of Bølling lake an excavation was carried out in 1961 which had relatively little impact on archaeological research, but which nevertheless yielded a remarkable object unknown elsewhere in Western Europe: a natural fork of oakwood (Quercus sp.), just over three metres long, shaped by an axe into a cross section which is rectangular to square throughout its length (fig. 2). We shall demonstrate that the object is probably the undercarriage and shaft of a two-wheeled cart similar to the one depicted in Scandinavian rock engravings. Wheels from this type of vehicle have been found both in Denmark and North-West Europe but not on the British Isles. They have been dated to the late period of the Middle Neolithic, the Single-Grave culture, which is an offshoot of the Corded Ware Culture complex, and to the Late Neolithic/Early Bronze Age.

CIRCUMSTANCES OF THE FIND

To drain the water away from the peat bank near the dried-up lake a ditch was dug towards the south. The shaft was found at a depth of approx. two metres, together with scattered pieces of unworked wood, Neolithic potsherds and Waste flint. Silkeborg Museum was notified of the discovery and the shaft was taken to the Museum, where it was placed in dry sand for a year, then treated with a fungicide and coated with varnish (2). The shaft retained so much dry matter that the conservation treatment was successful, and only a few shrinkage cracks and some slight deformation are visible. The object was thought to date from the Iron Age or possibly a later period, but a radiocarbon dating in 1965 demonstrated that it is much older. The discovery at Foerlev Nymølle near Skanderborg (Central Jutland), during the same years, of a worked wooden fork of similar dimensions but with a different appearance (Becker 1970: 162, Abb. 10; Becker 1972: 48, fig. 20), which was rightly interpreted as a crudely trimmed female figure, changed the attitude to the fork from Klosterlund. It was believed that it too might be a female figure.

The locality

The dried-up lake filled a depression in the south-west corner of the old county of Viborg. This is where the watershed extends along the Jutland ridge, and the depression is drained off through an enormous system of subglacial stream trenches reaching from the area around Århus and Silkeborg in the east to the Karup moorland plain in the west. The pollen analyses published by Johannes Iversen in 1975 have illuminated environmental changes in Bølling lake since the last Ice Age. During the Early Stone Age the water level of the lake may have followed the 65 m curve, since the settlement was located on an adjacent plateau of post-glacial fresh-water sand. Yet the surface relief has altered so much over time that a contour map is insufficient and has to be supplemented by a geological map (fig. 1). This shows that lower areas have filled up with washed-down sediments from the slopes of the morainic hills and with deposits of organic material. Judging from the pollen diagram the organic material provided a suitable soil, even during the time of the settlement, for alder

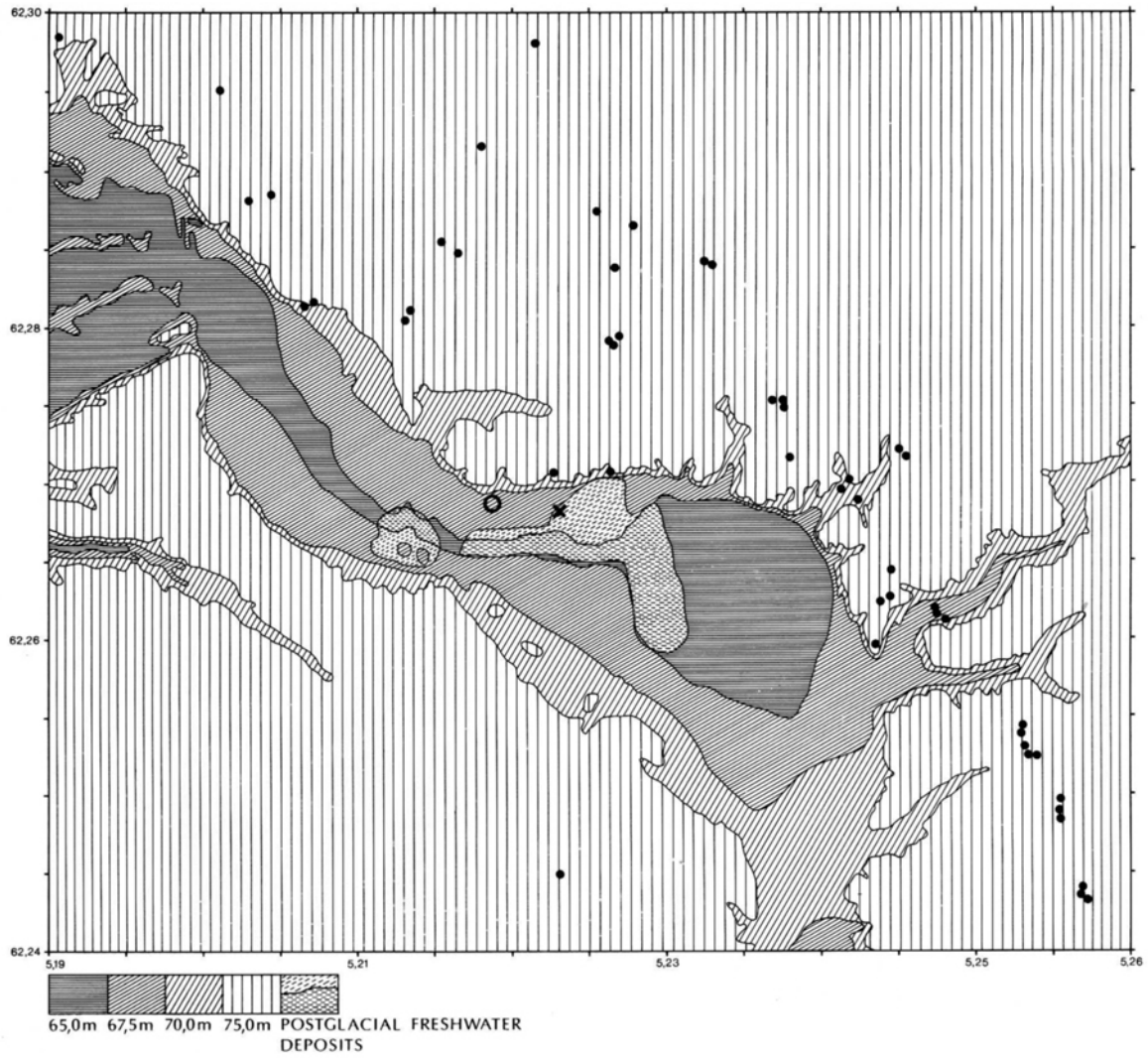

Fig. 1. Bølling lake and its vicinity. Contour lines indicated up to 75 m above Danish ordnance datum. The Mesolithic settlement is marked: o, the site where the vehicle shaft was found: x, and prehistoric mounds: ●. Broken hatching shows the distribution of post-glacial fresh-water peat, which may indicate the extension of the lake during the Stone and Bronze Ages. Drawn by Orla Svendsen on the basis of a 4 cm map from the Geodetic Institute and soil map No. 1214 IV NE Bording, Geological Survey of Denmark.

thickets and peat moss. During the Late Stone Age and the Bronze Age the lake was surrounded predominantly by forest trees, such as lime, oak and elm, while grasses, sphagnum and heather became more common during the Pre-Roman Iron Age.

The only parts of the depression which are known to have been water-logged in prehistoric times are those filled with post-glacial fresh-water peat. This is suggested not merely by the discovery of a dugout canoe from the Early Neolithic, period B, in the southern part of the lake (Tauber 1971: 136, K–1214), but also by the follow-up excavations of the site where the vehicle shaft was found. These revealed a mixture of water-deposited artefacts, floating wood and worked wood, most of which probably date from the Late Stone Age (3). The peat formations do not go above the 75 m contour. However, there is a preponderance of morainic deposits and post-glacial fresh-water sand, on which the Stone Age and Bronze Age burial mounds were built. If the mounds were strung out along the side of ancient trackways, as Sophus Müller has suggested (1904: 1 ff.), these would have passed east of Bølling lake, not – as one might have expected – west of the lake where the tunnel valley narrows, and where in later times the Jutland 'military road' (the ancient arterial road through Jutland) and the present main road from the south to

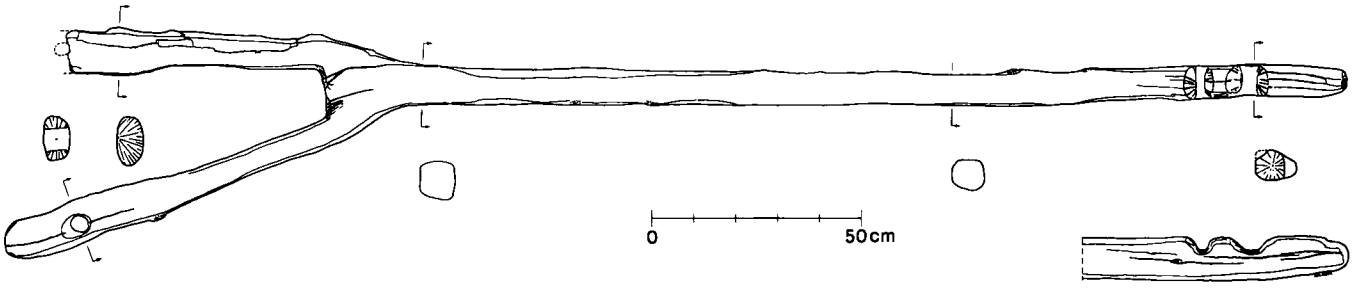

Fig. 2. Measurement and drawing of the vehicle shaft from Klosterlund by the author (autumn 1976).

Viborg passed. Incidentally, another branch of the 'military road' leads past the burial mounds (Mathiessen 1959: 38 and maps). Thus the known as well as the suggested road communications curve around Bølling lake and its vicinity.

DATING

The vehicle shaft from Klosterlund was radiocarbon dated in 1965, which resulted in a date of 1560 ± 110 B.C. (uncalibrated) (Tauber 1967: 109, K–1009). The wood is fairly young, hardly more than 50 years old, so it may be possible to advance the date towards 1500 B.C., a conventional C^{14} year. It is a risky undertaking to assign a find to any cultural context on the basis of a single C^{14} date, but judging from Ebbe Lomborg's account (1977, fig. 9) the Klosterlund shaft may date from the Late Neolithic, period C, i.e. the latest period of the Danish Stone Age. If the dating is calibrated, it results in a calendar year of approx. 1900 B.C.

THE VEHICLE SHAFT (fig. 2)

The shaft is fashioned from a natural oak fork, with all the heartwood still present. One branch was damaged on recovery but was restored after conservation. The tip of the branch is missing as it was used for radiocarbon dating. The slant of the fork in relation to the longitudinal axis is probably not an original feature, but was caused by deformation as a result of dehydration or soil pressure. Consequently, the object can be reconstructed symmetrically without any problem. The cross sections of the branches are flattened while the shaft itself has a nearly square cross section, with two notches cut at the edge. If the notches are turned upside, the shaft is orientated horizontally as it probably was in prehistoric times, and the underside of the branches now shows signs of wear. It is impossible to determine whether these marks occurred in prehistory or when the shaft was recovered in 1961. The whole surface of the shaft has been examined under a horizontal light beam to detect signs of wear and pressure, but all that was discovered were marks of rope lashing on the branch that was glued together, and the impressions are clearly a result of the conservation process, and do not date from prehistoric times. Thus the whole surface of the shaft was probably trimmed.

Natural forks of wood have been used for numerous construction purposes through much of prehistory and right up to our time. Shipwrights selected bent wood for joints and ribs so that the fibres of the wood followed the shape of the finished product and thus gave it greater strength than if the fibres had been cut across. Similarly, bent trunks, branches and forks were used for house building and for tools. Prehistoric farmers used wooden forks when they made their ards (Glob 1951): the crook ard was made from a wooden fork, and the sole of the bow ard consists of a bow-shaped, bent piece of wood – hence the name. Forks and branches may have anthropomorphic features – they especially suggest the pelvic region – and this is presumably the reason for the crudely carved wooden sculptures known from several sites. Apart from the above-mentioned find from Foerlev Nymølle near Skandeborg, which probably represents a woman, a male counterpart (Feddersen 1881: 369 ff.), the date of which is uncertain, was found in 1880 at Broddenbjerg in Asmild parish east of Viborg. Others are known from North Germany and Poland. We know for certain, then, that carved natural forks serving non-utilitarian purposes have been found

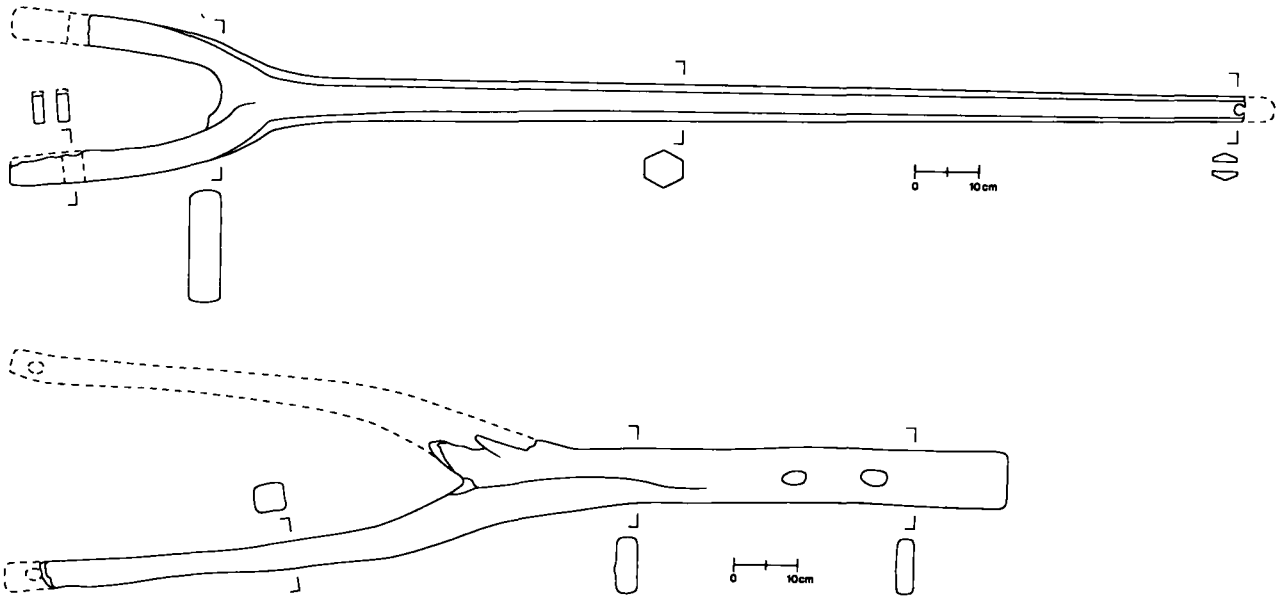

Fig. 3. Vehicle parts from natural forks of wood. *Above* a vehicle shaft and *below* a chassis from Tranbær bog south of Vejle (Jutland) dated to the Early Roman Iron Age. Measured by the author (autumn 1976) and drawn by Orla Svendsen.

in Danish bogs. It is therefore essential to be able to distinguish, with a resonable degree of certainty, the wood used for implements and construction from that used for sculptural purposes. Theoretically, wood used for construction may have been designed to contain anthropomorphic features, as Georg Kunwald has suggested was the case with the chassis from Rappendam near Hjørlunde on Zealand (Kunwald 1970: 42 ff.), which has been dated, together with a number of other vehicle parts, to the Pre-Roman Iron Age. However, in this particular case the »sexual characteristics« of the chassis fork were probably not carved deliberately, as suggested by Kunwald (1970: 63 ff., Abb. 13). There is every reason to believe that it arose from the particular fibrous structure of the wood and the resulting breakage. In other words, the fork is a purely structural part of a four-wheeled vehicle with discoid wheels, very similar to the chassis from the contemporaneous find at Dejbjerg bog near Ringkøbing (Petersen 1888) and the slightly more recent find from Tranbær bog near Vejle (Schovsbo 1983) (fig. 3) – both in Jutland.

It is different with two wooden forks published by C.J. Becker and apparently dating from the Early Neolithic. They were found in a little bog at Sørbylille, Sorø county (Zealand) and are described as fork-like wooden implements, carefully shortened, de-barked and trimmed. At the root end the cross section is nearly circular, but flattens at the branches. The original length was almost two metres, and the objects are completely devoid of incised notches or drilled holes for rivets. When recovered they were at some distance from each other, buried in the peat so that the crooks of the forks intersected at right angles. At the same level as the fork ends there were potsherds dated to the Early Neolithic, period B. C.J. Becker has refrained from interpreting the function of the forks, and a comparison with other finds does not help to answer the question. But it is unlikely that they are vehicle parts.

According to the latest estimate, we know of 15 fork-shaped chassis and vehicle shafts made from natural forks of wood found in nearly ten Danish bogs (fig. 3). To this figure must be added finds from Western Europe, especially Germany (Schleswig-Holstein and Niedersachsen), dating from the Early and Late Iron Age. This material falls into two main groups:

1) forks with horizontal holes drilled in the two branches, usually with a vertical hole drilled at the root end or a cut and notch for lashing. Owing to their functional and morphological similarity with the shaft of the Dejbjerg find, this group can be identified as *vehicle shafts*, an interpretation supported by their often uniform length and elegant execution. They belong to a four-

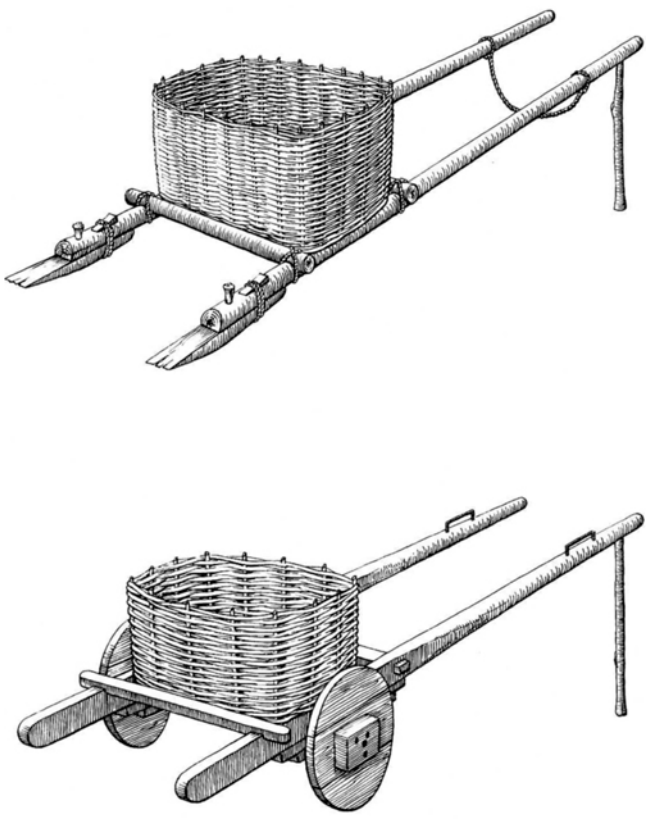

Fig. 4. *At the top* a sledge from Co. Antrim, *below it* a two-wheeled cart with disc wheels (sledge with wheels) from Co. Tyrone – both from 20th century Ireland (after Mogey and Thompson in *Man* 1951: 3–5, fig. 3).

wheeled type of vehicle with a revolving front end, which was probably familiar in Scandinavia as early as the Late Bronze Age, judging from the rock engravings and the finds of imported vehicle fittings at Skerne on Falster, and Egemosen (Jacob-Friesen 1970) and Lusehøj near Voldtofte on Funen (Thrane 1977, fig. 8). It is possible that the Niedersaxon find from Glum indicates that the four-wheeled waggon with discoid wheels was known here in the Early Bronze Age. However, only the wheels have been recovered, not the remaining parts of the waggon.

2) Wooden forks with *vertical* holes drilled in both branches and one or two vertical holes drilled at the root end. Because of their resemblance to corresponding objects from Dejbjerg they are identified as *chassis* (undercarriages) characteristic of the so-called »European« vehicle with four wheels and a revolving front end – just like the vehicle shafts (Witt 1970: 111 ff.). In Denmark they can be traced back to the Pre-Roman Iron Age and, as already mentioned, the type is represented by the vehicle from Dejbjerg and the waggons from Rappendam. In contrast to the forked vehicle shaft, the forked chassis has persisted till this century in Scandinavia. A well-known specimen from Norway is the Oseberg behicle, the chassis of which is not made from a natural fork but from a partially split plank. This is also encountered in the Danish Roman Iron Age (Tranebær) (4). The Dejbjerg find is a good example of the difficulty in distinguishing these two types of chassis forks, the natural and the artificial. Both the vehicle shaft and the chassis were probably made from bent wood which was either assembled or shaped by heating to form the finished pieces. Unfortunately, we have no detailed studies of this matter (5).

The Klosterlund fork (fig. 2) is obviously an intermediate type. It exhibits the vertical holes drilled in the branches typical of the chassis, and the length and lashing notch typical of the vehicle shaft. Considered as a vehicle shaft, however, it is longer and sturdier than that of the Iron Age, just over 3 metres long as opposed to slightly under two. Its robust dimensions make it well suited to carrying cargo, whereas Iron Age shafts were slender and only meant for drawing and steering the vehicle. One possibility therefore would be to interpret the Klosterlund object as the combined chassis and shaft for a two-wheeled cart: the drilled holes in the branches contained rivets to secure the axle, and the incisions at the end of the root held the lashings strung round the yoke (see reconstruction, fig. 5). Axle and yoke are thus related forms of suspension, between which the fork supported the body of the vehicle, as with ox carts and sledges from this century in Scandinavia and the British Isles (fig. 4).

That two-wheeled carts were known during the Scandinavian Bronze Age is demonstrated by rock engravings (fig. 6) which, according to Gösta Berg, show two different groups: 1) a fast light chariot, the body of which is balanced slightly forward over the axle, drawn by two horses with a yoke (Kivik, Frännarp and Villafarasten in Scania) (6). 2) a slow heavy cart with a circular outline, which may suggest a curved body, positioned between axle and yoke and drawn by two oxen – which thus pull and partly carry the load (Sannesund and Begby, Østfold in Norway; Disåsen and Rished, Bohuslän in Sweden) (7). In other words, this cart resembles the type from Klosterlund.

It is possible to view in this light the many pairs of disc wheels found in several parts of Western Europe (8) and often dated to the Late Mid-Neolithic, the end of the TRB culture and related groups, and especially the Single-Grave culture (van der Waals 1964: 51 ff. – Rostholm 1978: 204, fig. 8). It has even been suggested that the Mid-Neolithic stone-packing graves known from Jutland may be parallels to the Central European ox graves known from the Globular Amphora culture (Rostholm 1978: 202). The former normally consist of two parallel, oblong graves and an almost rectangular so-called mortuary house. Piggott thinks the graves might have contained the oxen and the mortuary house may have been a symbolic vehicle (Piggott 1968: 308). Hans Rostholm has extended this idea to include Central and East European vehicle graves, particularly the South Russian pit graves containing disc wheels of exactly the same type as the Neolithic ones from Holland and Denmark (9). So far the parallels are too tenuous, however. Western Europe possesses no actual vehicle graves, and affinities in the construction of disc-wheeled carts may easily be deceptive. This is clear from the fact that typologically very ancient forms were still in use at the beginning of this century in the Mediterranean area, the Far East, and the Spanish-speaking parts of Latin America, and also in isolated cases in large parts of Western Europe, especially in mountainous regions but also in the lowlands (fig. 4). These types of vehicles were used primarily for heavy transport, but were also made by local people for their own transport needs.

VEHICLE AXLES

So far there are no definite finds in Denmark of vehicle axles older than the Pre-Roman Iron Age, but there are some potential candidates. Parts of a vehicle axle of oak (Quercus sp.) were found in 1943 at Knudmose near Herning (Central Jutland). They have not survived physically, but are retained in the records of Herning Museum. It appears that the central part of the axle had a rounded cross section, contracted at the middle, and a length of 82 cm. The partly preserved axle arm had been sharpened and was 32.5 cm long – which gives a minimum gauge of 114.5 cm. It is very similar to the axle

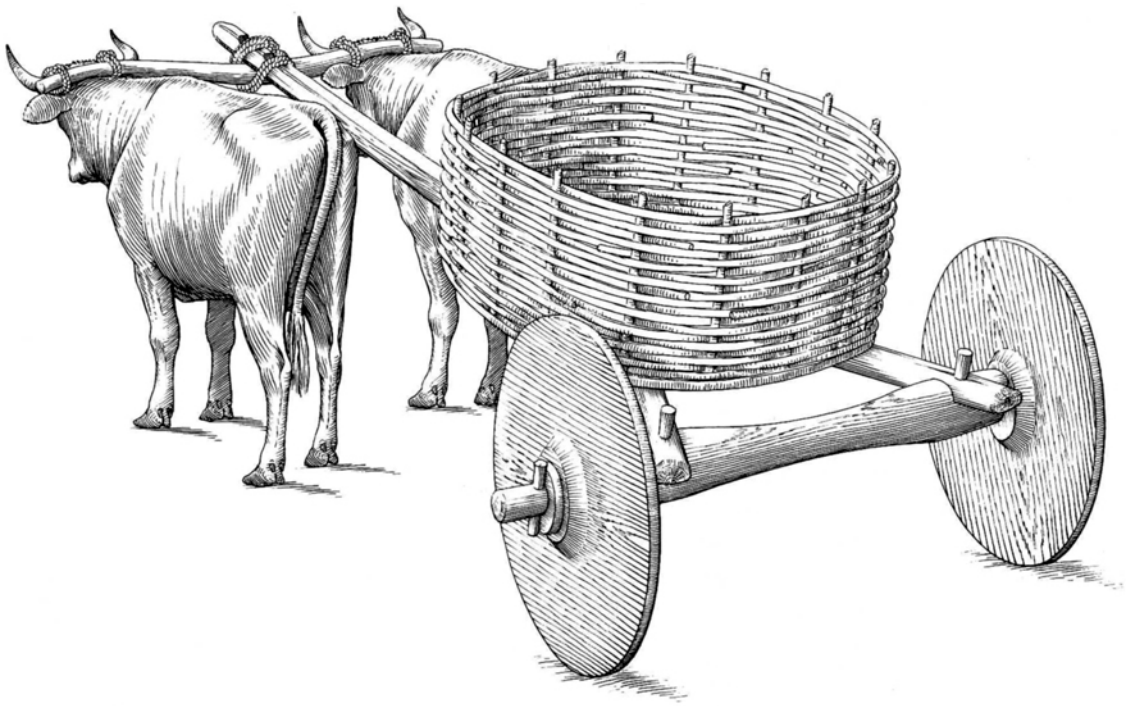

Fig. 5. Attempted reconstruction by the author of the type of vehicle which the shaft from Klosterlund may represent. Drawn by Orla Svendsen.

from Buchau (Wasserburg) in Baden-Württemberg, which is dated to the Urnfield culture, Hallstatt A–B (fig. 7) (11). There may be other parallels in Niedersachsen, but they are hard to assess because of lack of publications. The axle from Knudmose near Herning has been dated by pollen analysis to the Sub-Boreal period, probably the Late Stone Age (12).

It is probably characteristic of vehicle axles from North-West Europe that pre-date the Iron Age that, in contrast to later types, they have a rounded or circular cross section, the central piece is contracted at the middle and the top side at either end has a rectangular notch, often with vertical holes drilled in the centre. In many ways this shape is very similar to the yokes found in bogs. Unfortunately, far too few of them have been dated, and we do not have a scientific study of yokes found in bogs, despite the introductory papers by Alexander Fenton (13).

DISC WHEELS

The type of disc wheel that was used in Holland, Niedersachsen and possibly in adjacent regions of the North German lowlands extending east towards Poland and north towards Denmark is solid, with a fixed hub made from oak (Quercus sp.), or in a few cases alder (Alnus sp.), cut at a tangent (van der Walls 1964, fig. 17). Their dates range from the Late Stone to the Early Bronze Age, the majority belonging to the Corded Ware culture. The wheel diameter is between 60 and 80 cm and the length of the hub between 20 and 30 cm. Strangely enough, this type of wheel is absent from the British Isles, as is the following type with a solid wheel disc and with a moving tubular hub, which in Niedersachsen is dated to the Early Bronze Age and in Denmark to the Late Pre-Roman Iron Age (Rappendam) (Piggott 1979: 3 ff.). There is a simultaneous occurrence in Denmark of the disc wheel with a compound wheel disc and with crescent-shaped carvings, combined with a moving tubular hub. Apart from Denmark and Niedersachsen this type is also found in Holland and the British Isles (Doogarymore, Ireland and Blair Drummond Moss, Scotland) (14). The type belongs to the Pre-Roman Iron Age or the European la Tène period, though in Baden-Württemberg it apparently dates from the Bronze Age (Buchau). There are sporadic traces of disc wheels through the Iron Age up to the Middle Ages in Scandinavian finds and, as mentioned above, they are also found in more recent times in very much the same forms as those known from prehistory. Frankly, there is not much scope for variation, so it is not inconceivable that different types of disc wheels appeared spontaneously.

Until further evidence is available, therefore, the demonstrable patterns in the chronology and typology of disc wheels must be attributed to general technological conditions, economic requirements and the topographical possibilities of building and using a disc-wheeled vehicle. The vehicle material from Central and Eastern Europe implies social status, since it appears that the vehicles from these regions were not designed to carry heavy loads but were used for personal transport. In other words, they were prestige vehicles (Piggott 1968: 266 ff.) like the much later vehicles of the Dejbjerg type found in cremation graves in Northern Jutland (Kraghede) and on Funen (Langå) – or the Viking Age vehicle from Oseberg in Norway.

VEHICLES, SLEDGES AND PLOUGHS

A collation of finds and depictions from the Neolithic and Bronze Age in Scandinavia reveals a characteristic set of implements used in connection with teams of oxen. Most important is the plough (or ard), which P.V. Glob has analysed and interpreted in the light of finds and rock engravings, and which Gösta Berg has previously associated with the two-wheeled cart and with a plough-sledge which are said to be integrated parts of early agriculture in Europe (Berg 1935: 101). Even Sophus Müller entertained related ideas (1900: 203 ff.). It has been shown that the plough was frequently made from a natural fork of wood like the cart from Klosterlund, and both were drawn by a yoked pair of oxen. The pronounced signs of wear on the Klosterlund find, though they may not be prehistoric, nevertheless suggest that if the axle, and therefore the wheels, is removed, the cart may easily function as a sledge, just like the Irish specimen (fig. 4). The only difference is that the Irish sledge was drawn by a single horse between two poles, while the Klosterlund vehicle was drawn by a team of oxen. If this supposition is correct, the distinction between vehicles and sledges can be removed, since it seems likely that people used wheels whenever the terrain and climatic conditions made it practicable,

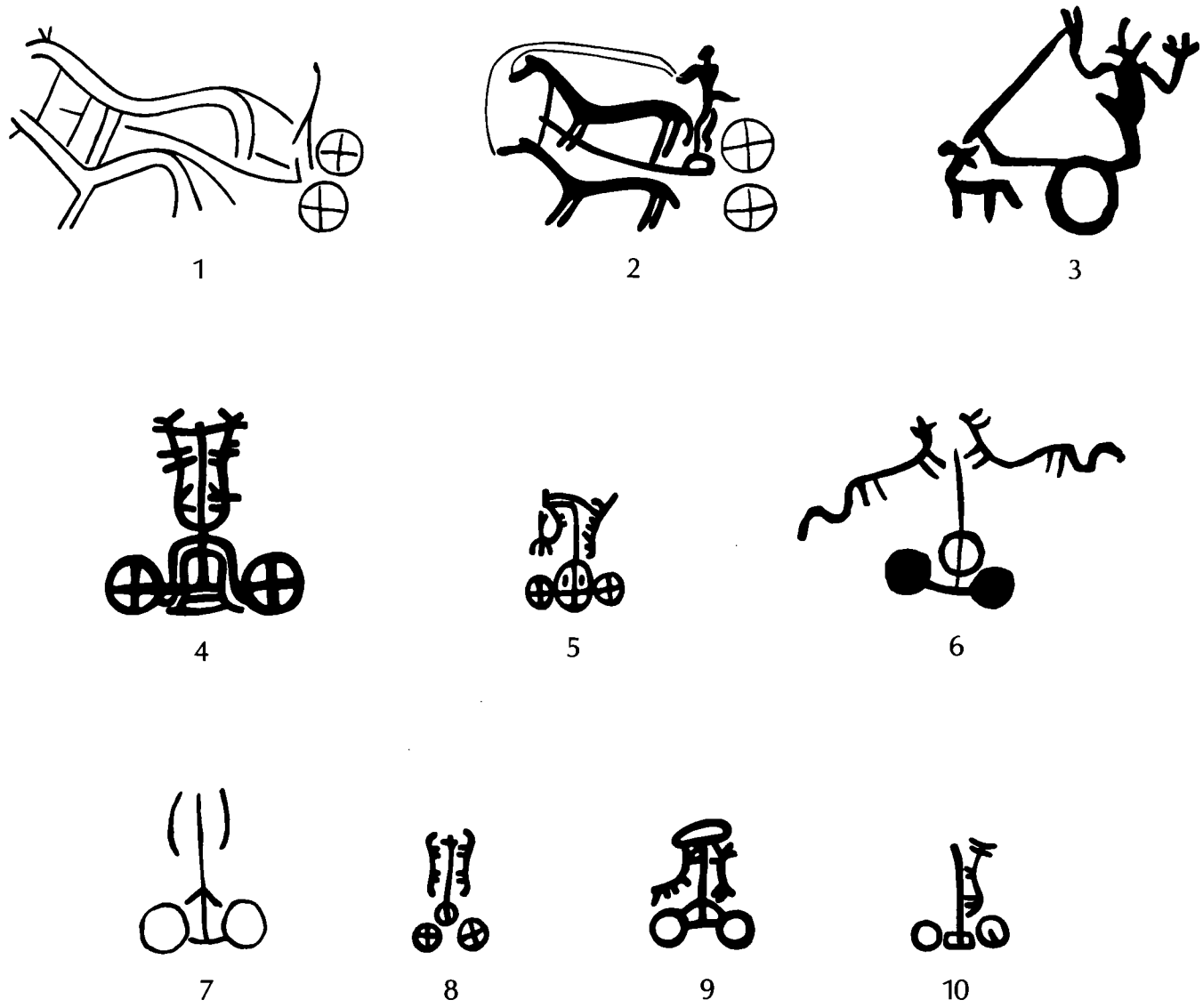

Fig. 6. Swedish and Norwegian rock engravings of two-wheeled carts. 1–5, *chariots* of a light and fast construction, often with four-spoked wheels known from Danish finds such as the sun-chariot from Trundholm (Zealand), Early Bronze Age, period II. The same dating may apply to the engraving from the Kivik grave in Scania (2). 6–10, *carts* with forked shaft of the Klosterlund type (7, 9) and probably a round wickerwork basket (6, 8). The wheels appear to be disc wheels, with one exception (8). Drawn by Orla Svendsen after Sverre Marstrander 1963, figs. 44–46.

but let the oxen draw the vehicle, after the wheels had been removed, in other areas and at other times.

This may explain the difficulty in distinguishing furrows from wheel tracks and the possible tracks of sledges in the Neolithic and Bronze Age. It also suggests why disc wheels have been found in pairs, sometimes probably also together with their axle, in peat bogs that contained no other vehicle remains.

VEHICLE AND PLOUGH AS BOG FINDS

It is unlikely that the motives underlying the deposition of wooden objects, such as vehicles and ploughs in bogs, lakes and streams were the same as those governing the deposition of other artefacts in similar localities. It is evident that, with a few exceptions, these wooden objects cannot be interpreted as votive finds as a number of special factors point in an entirely different direction.

A great number were simply rejected or lost during traffic or work in swampy areas, near streams or other areas which accidentally preserved the objects. This is particularly true of broken axles, ruined wheels, loose parts of ploughs and many other wooden objects found isolated and broken. It is also true of the worked pieces for hubs, rims, possible vehicle axles, boats, and a great many other objects that most resemble unidentifiable worked timber. Until recent times people in Scandinavia and the British Isles have submerged unfinished wooden hubs under water in order to leach the nutrients from the wood, presumably in an attempt to make it more resistant to dry rot and fluctuations in humidity. It is possible that the blackening of oakwood in acid bog water was particularly sought after because it apparently increased the strength and resistance of the wood. When the opposite happens, it is because the cellulose chains break down and the strength of the fibres is reduced (15).

Yet another factor is probably of greater significance for an understanding of the many bog finds. Prehistoric technology was »wet« in the sense that the wood was worked while it was completely fresh and full of nutrients, especially water. In this condition wood is flexible and can be easily bent into shape and worked. This condition can be prolonged by keeping the wood wet. If the wood dries out, it loses its flexibility, becomes harder to work and cannot be bent into shape. Soaking the wood again only results in a partial recovery of these properties. It is therefore expedient to keep the fresh wood wet until the working is over: the »wet chain« must not be broken. Similar conditions apply to the osier used for wickerwork, and the building of dugout canoes and Scandinavian clinker ships, as demonstrated in trial experiments.

There may also have been an attempt to preserve some of the »green« qualities of the wood for when it was put to use. This consideration may prove stimulating when dealing with the ploughs, yokes, vehicle axles and peat spades found in bogs. A problem of paramount importance, however, may have been shrinkage and deformation resulting from complete drying. Oak, in particular, splits easily when being dried, and this may be the reason why so many Neolithic disc wheels of oak cut at a tangent were deposited under water. There are examples of ruined disc wheels which had been joined together by means of dovetailed slips of wood (Kideris), so the problem was real enough.

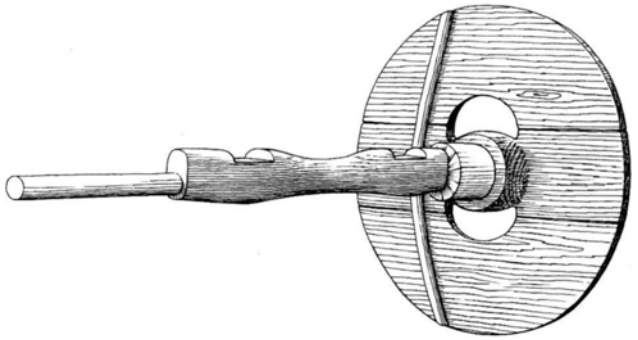

Fig. 7. Vehicle axle from Buchau, Baden-Württemberg, West Germany, dated to Hallstatt A–B. Drawn by Orla Svendsen after W. Treue 1965: 184.

Vehicle parts that were actual votive offerings were deposited for reasons other than rejection, manufacture or storage, and in Denmark this group constitutes a small but significant component in the range of characteristic types from the Early Iron Age (Dejbjerg, Rappendam and Tranbær). These finds tell us nothing about the Neolithic bog depositions of disc wheels and other vehicle parts, which suggests that Neolithic and Bronze Age wooden objects from bogs, apart from the anthropomorphic wooden figures, cannot be associated with prehistoric religious cults.

CONCLUSION

Accordingly, we may assume that bog finds of vehicle parts and wooden ploughs that can be dated to the Scandinavian Stone Age and Bronze Age are all for everyday use. The earliest vehicle parts from North-West Europe can definitely be assigned to the Corded Ware culture which, as far as Scandinavia is concerned, signifies renewed contacts with the rest of Europe, to some extent in contrast to the conditions obtaining during the late Funnel Beaker culture. European trends clearly influenced Scandinavian burial customs, weapons (battle axes), pottery types and probably also agricultural methods. It may be that these changes reflect a new orientation in religious cults and social structure, but we do not know, and we cannot use the finds of vehicles and wooden ploughs as evidence in the debate. What they show are parts of the technology which, as a result of stockbreeding, achieved crucial importance in agriculture.

Postscript

During the winter 1982–83 three different prehistoric vehicles were reconstructed at Forhistorisk Museum, Moesgård near Århus, Jutland. The first is a four-wheeled waggon with spoked wheels from the Roman Iron Age based on the find from Tranbær. The next a disc-wheeled waggon from the Pre-Roman Iron Age based on the finds from Rappendam. The third is, of course, the Neolithic vehicle from Klosterlund. The reconstruction-work is being continued, and in co-operation with other Danish Museums we are trying to learn more about land transport in prehistoric times by using the replica in systematic experiments.

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NOTES

I would like to thank the Danish Research Council for the Humanities for supporting the costs of illustrations.

[1] Iversen 1975: 362. Bølling lake was drained at the end of the last century, which resulted in the recovery of large quantities of bones and antler, especially from adult red deer. It is possible that the inhabitants of the adjoining Mesolithic settlement exploited the deer migrations at this narrowing of the subglacial trench (Mathiessen 1959: 25–26).

[2] Silkeborg Museum No. 231–1966. The site is located in Engesvang parish, Hids district, Viborg county.

[3] Follow-up excavations of the site by Silkeborg Museum in 1969 (No. 2–1969) and in the summer of 1976 by Christian Fischer.

[4] The Tranbær find, the National Museum, Copenhagen, No. C4972.

[5] It is not impossible that the objects were made from a partially split plank with a bent end, resulting in the characteristic »knee« at the end, covered by cast bronze mountings. Such a procedure suggests deliberate deformation of young trees for a special purpose, not just selection of naturally deformed trees.

[6] Mötefindt 1917: 209 ff.; Berg 1935: 99 ff.; Hagen 1955: 9 ff., and others.

[7] Berg 1935: 101 ff. See also Marstrander 1963: 167 ff. and 1966: 103 ff., and Thrane 1970: 102 ff. For an interpretation of rock-engraved ship depictions, see also Schovsbo 1980: 15–16.

[8] See e.g. Mötefindt 1918: 31 ff.; van der Waals 1964; Rostholm 1977: 185 ff., and references.

[9] Rostholm 1978: 197–98. Similar viewpoints are found in earlier writers, especially Piggott 1968 and van der Waals 1964, and were originally advanced by Childe 1954: 1 ff.

[10] Herning Museum No. 10–1944. Information kindly supplied by Hans Rostholm.

[11] The axle is depicted in Treue 1965: 184, fig. 7. The dating was kindly supplied by the curator, Mr Ladenburger, Buchau.

[12] Letter from J. Troels-Smith to Herning Museum, 1943. The axle from Knudmose and several others were found in 1983 in storage at Herning Museum (No. 54–41). The axle is neither Neolithic nor Bronze Age, but must be dated to the Pre-Roman Iron Age. Its peculiar shape is due to secondary use as a double paddle-spade (Grit Lerche: Double Paddle-Spades in Prehistoric Contexts in Denmark. *Tools and Tillage*, vol. 3,2, 111*ff.* Copenhagen 1977).

[13] See Müller 1900: 223 ff.; Balslev 1940: 3 ff.; Fenton 1972: 69 ff. Cf. also ethnological literature from Europe, e.g. Jacobeit and Kramarik 1969.

[14] Doogarymore, see Piggott 1979: 9. Blair Drumond, see Piggott 1957: 238–41.

[15] These questions have been discussed with Mr. Thomas Thomassen of the Technological Institute, Tåstrup and Professor Peter Moltesen of the Royal Veterinary and Agricultural High School, Copenhagen. I am very grateful to both.

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