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On the Adzes of the Northwestern Linearbandkeramik

The adze was an important member of the Linearband-keramik toolkit. It was a tool for men, it gave them status and accompanied them in their graves. The majority of the blades was made from foreign rocks and must have been obtained through exchange.

1. Introduction

The adze is one of the most characteristic attributes of the earliest farming communities of Central Europe, notably those belonging to the so-called Linearbandkeramik or Linear Pottery Culture. The tool is made of crystalline rock. It is provided with a sharp cutting edge. One side is domed, the other flat. As a result, the artifact has only one plane of symmetry (*fig.1*). Adzes are found in settlements and in cemeteries.

The study presented here concerns the adzes from the northwestern part of the Linearbandkeramik world. It covers finds from the loessbelt of the German Rhineland, The Netherlands and Belgium. The stretch of land in question is bounded in the east by the river Rhine, in the north by a belt of sandy soils and in the south by the Eifel and the Ardennes. The western border is geographically not well defined. For practical reasons the line is drawn at the frontier between Belgium and France (*fig.2*).

The Linearbandkeramik of the area thus described is considered to present a single cultural unit. Occupation started in the eastern part, in the area between Cologne and Rosmeer. Settlements in this area date from 5400 BC (calibrated) onwards. The western part was occupied some generations later. The end of the Linearbandkeramik is set at 4900 BC.

The settlements are not distributed evenly over the belt of loess, but tend to cluster. The unhabited areas between the sites may be quite small, but wider zones also occur. The widest is the zone between the rivers Méhaigne and Dendre in Belgium. The clustering has a complex social, economic and ecological background.

It is thought that the settlements of a particular cluster have more in common with each other than with settlements of the other clusters. In one case it has been proven that a cluster was formed from a mother settlement. This is the cluster on the Aldenhoven Plateau in Germany (Lüning 1982), which is called the Merzbach cluster in this paper because its settlements are situated on the banks of the rivulet Merzbach. However, this need not to be the case everywhere.

Because the available data concerning adzes are scanty on settlement level, the investigations carried out for this paper often refer to the level of the cluster. Four clusters are mentioned in the text: the Merzbach cluster, the Graetheide cluster, the Heeswater cluster and the Dendre cluster. These are indicated in *fig.2*. Of the Merzbach cluster five settlements and a cemetery have been analysed, viz.Langweiler 2 (LW2), Langweiler 8 (LW8), Langweiler 9 (LW9), Langweiler 16 (LW16), Laurenzberg 7 (LB7) and Niedermerz. The Graetheide cluster is represented by the sites Elsloo, Stein, Sittard, Geleen-Urmonderbaan, Beek-Molensteeg and the cemetery of Elsloo. The Heeswater cluster comprises Rosmeer, Vlijtingen, Caberg and Maastricht-Cannerberg. It is a very scattered cluster. The Dendre cluster consists of the recently excavated sites of Aubechies-Coron Maton, Blicquy-Petite Rosière and Blicquy-Porte Ouverte.

Data obtained from clusters is not the only form of information considered here. Some excavations of sites from unidentified clusters or from clusters which have not been described in sufficient detail yielded enough adzes to be valuable on their own account. These are Köln-Lindenthal, Müddersheim and the cemetery of Hologne-aux-Pierres. Analysis has been restricted to larger-scale excavations. Collections of adzes found at the surface of ploughed settlement sites have not been studied.

2. Definition of types

In his outline 'Der Donauländische und der westische Kulturkreis der jüngeren Steinzeit' W.Buttler classifies the adzes into two main types. He calls the artifact a flat hoe (*Flachhacke*) if its thickness is much less than its width. A thicker model is referred to as shoe last celt (*Schuhleistenkeil*), a term already in use before Buttler's time (Buttler 1938 p.34). Within this group of artifacts he distinguishes two subtypes: a Flomborner Keil, which is not exceptionally thick, and a much thicker and slenderer Hinkelstein Keil. The classification shows that the thickness versus the width is an obvious criterion on which to base an adze typology.

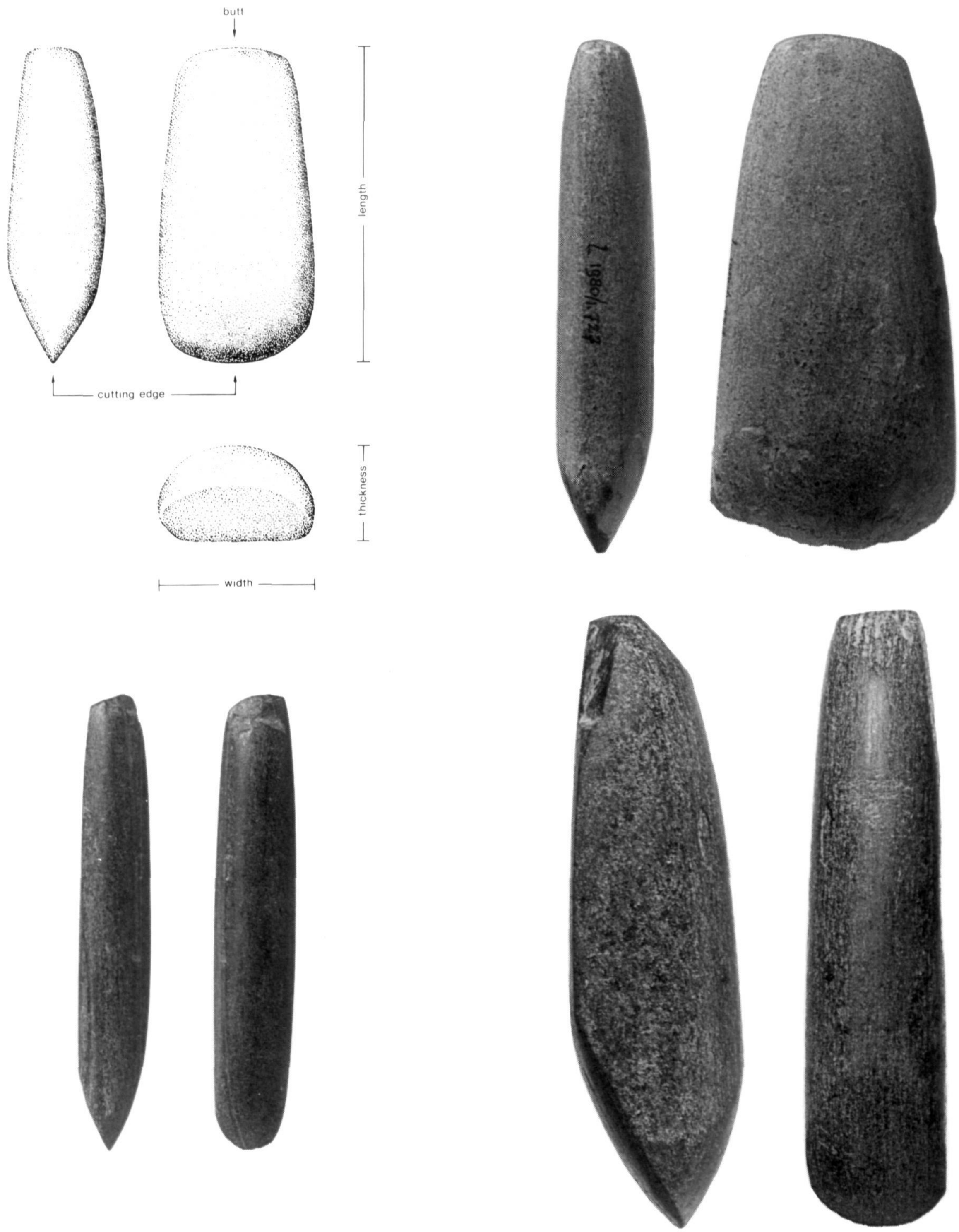


Fig. 1 Linearbandkeramik adzes. 4:5

K.Schietzel, the excavator of Müddersheim, was the first to use the exact measurements of the artifacts as a starting point for a typology. He divided the adzes from his site into two groups, that is, into thick adzes (*Schuhleistenkeile*) and flat adzes (*Flachhacken*). The line was drawn at a 10 x maximum width/maximum thickness index value of 20. His thick adzes have index values between 8 and 17 and his flat adzes values between 23 and 38 (Schietzel 1965 pp.30-31).

When P.J.R. Modderman tried to use this criterion in grouping adzes from the Elsloo cemetery, he discovered that it failed. The reason for this, he thought, lay in the fact that it was based on an insufficient number of adzes and he therefore started afresh with a larger group and combined all measurable adzes from the Netherlands known at the time. This resulted in six different types based on three criteria: the 100 thickness/width index, the absolute width, and the 100 width/length index (Modderman 1970 pp.186-187). The six types are given in *table 1*.

Table 1 Adze typology according to Modderman. T = Thickness, W = Width, L = Lenght.

type	100T/W	W_{max},mm	100W/L	description
I	> 100	> 21	-	large, thick
II	> 70	< 20	-	small, thick
III	55-95	> 27	-	wide, thick
IV	< 50	< 50	< 75	long, flat
V	< 50	< 50	> 75	short, flat
VI	< 50	> 51	-	wide, flat

Table 2 Adze typology according to Farruggia. T = Thickness, W = Width.

type	W/T	W_{max},mm	description
I	< 2	⩽ 20	small, slender
II	> 2	⩽ 40	small, flat
III	> 2	> 40	large, flat
IV	< 2	> 20	large, slender

J.P. Farruggia repeated the analysis with 63 adzes from the settlements Langweiler 2, Langweiler 9 and once again Müddersheim (Farruggia 1977 p.272). He concluded that the index suggested by Schietzel is indeed applicable,

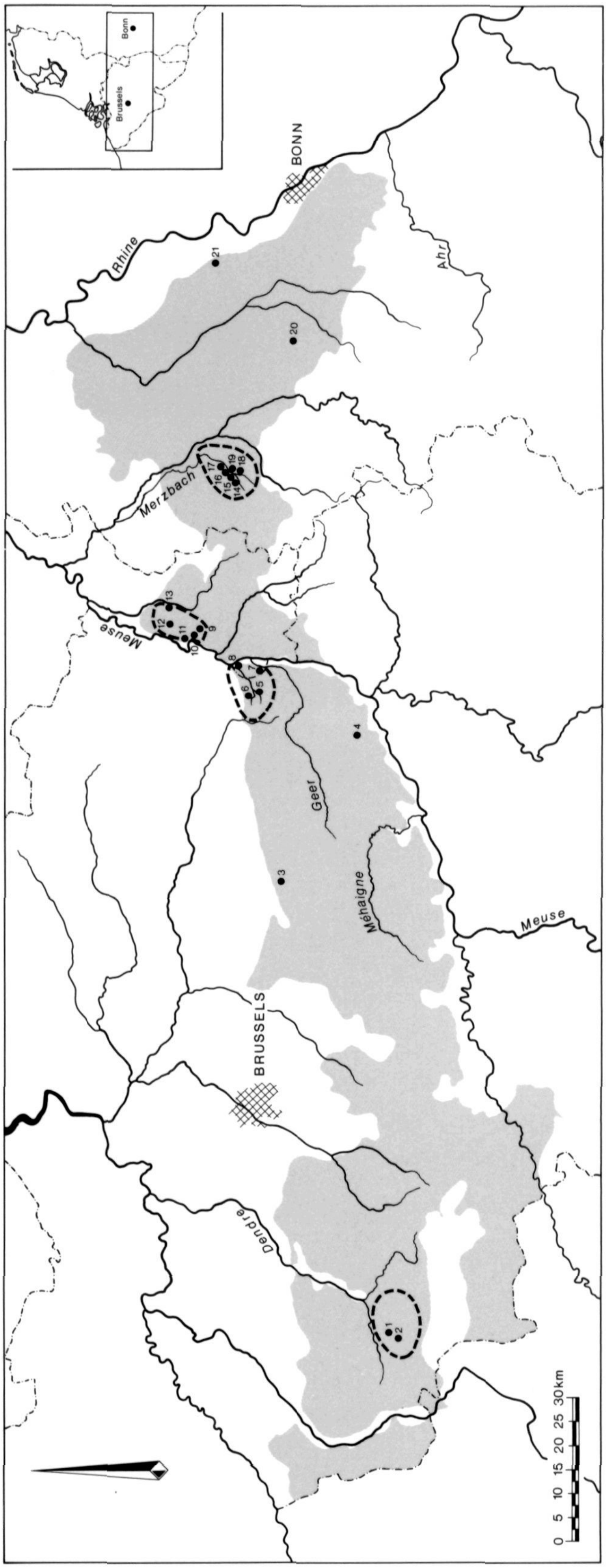


Fig. 2 The area of the northwestern Linearbandkeramik. Shaded: loess; broken lines: clusters mentioned in the text; black dots; individual settlements. 1. Blicquy 2. Aubechies 3. Landen-Wange 4. Hollogne-aux-Pierres 5. Vlijtingen 6. Rosmeer 7. Maastricht- Cannerberg 8. Caberg 9. Beek-Molensteeg 10. Elsloo 11. Stein 12. Geleen-Urmonderbaan 13. Sittard 14. Langweiler 2 15. Langweiler 16 16. Langweiler 9 17. Langweiler 8 18. Laurenzberg 7 19. Niedermerz 20. Müddersheim 21. Köln-Lindenthal.

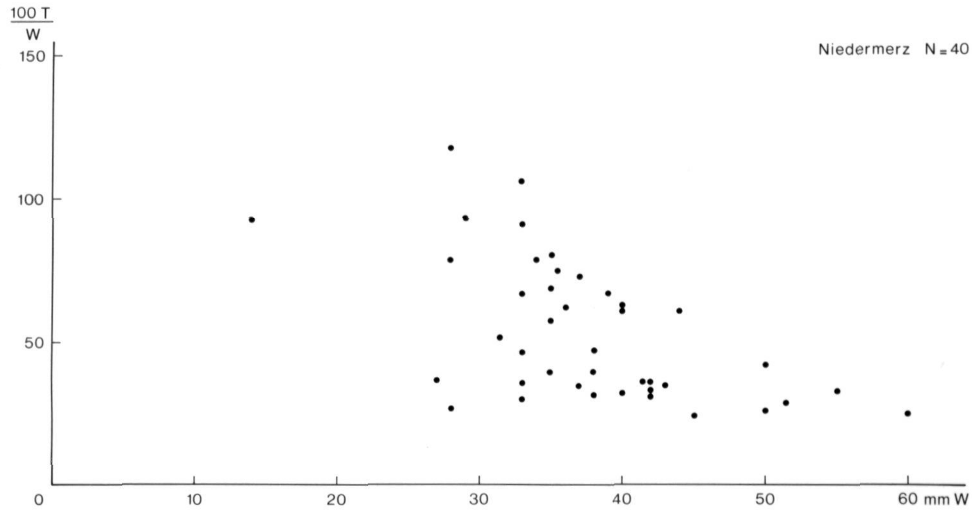


Fig. 3 The adzes from Niedermerz.

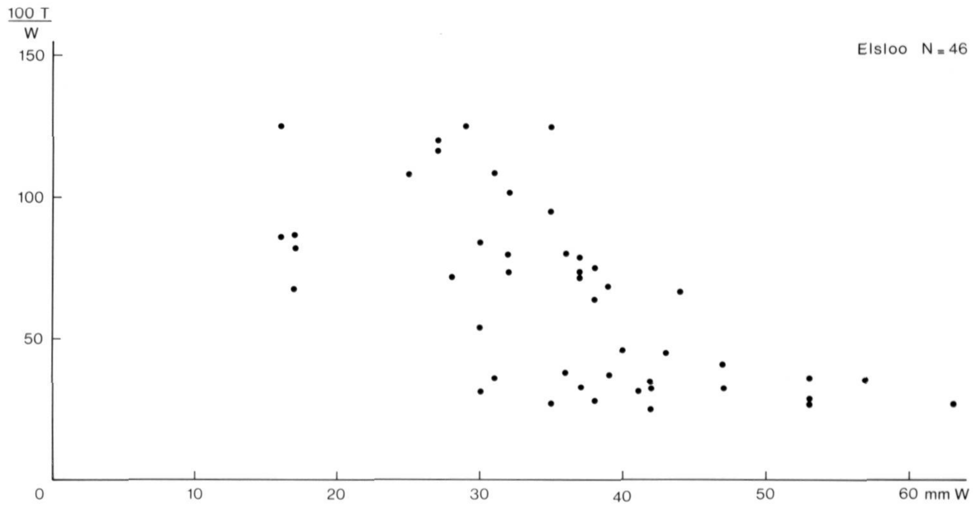


Fig. 4 The adzes from Elsloo.

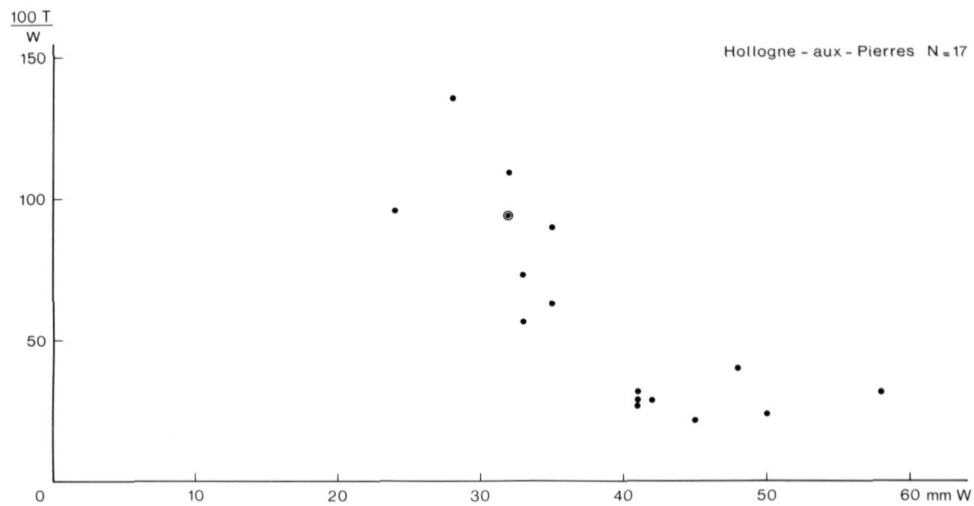


Fig. 5 The adzes from Hollogne-aux-Pierres.

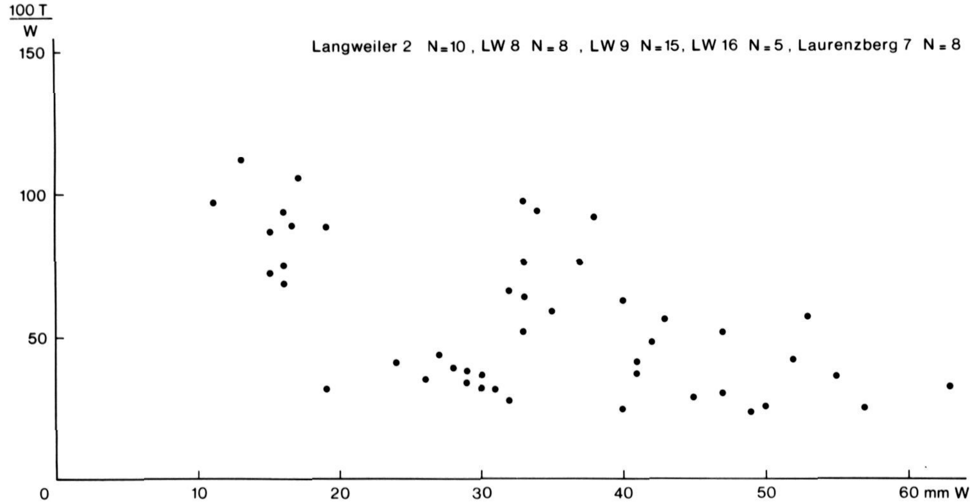


Fig. 6 The adzes from the Merzbach cluster.

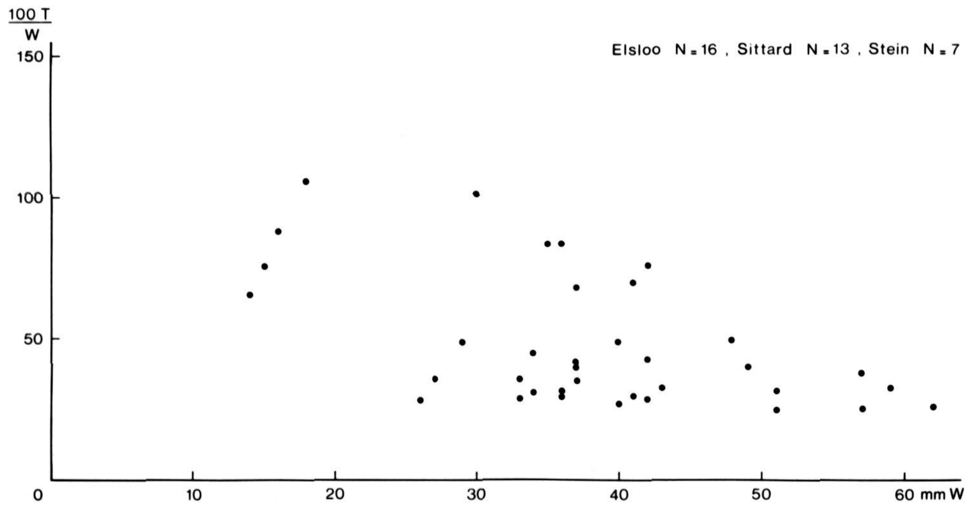


Fig. 7 The adzes from the Graetheide cluster.

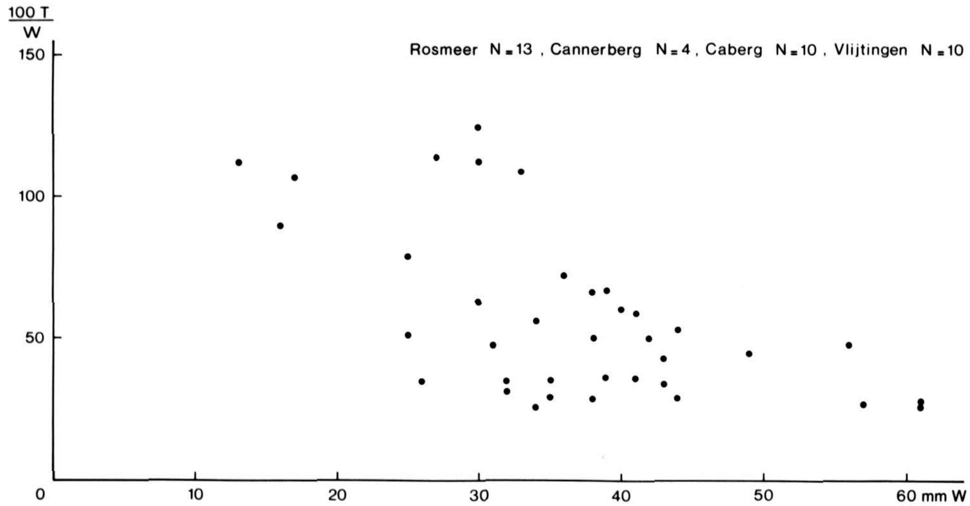


Fig. 8 The adzes from the Heeswater cluster.

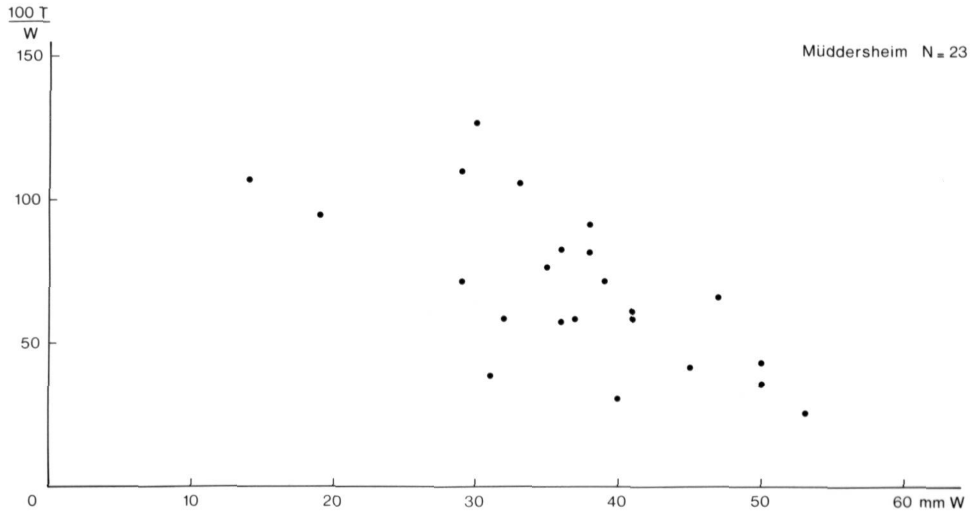


Fig. 9 The adzes from Müddersheim.

though less convincing in the case of Langweiler 2. He therefore added a second criterion, the absolute width also used by Modderman (*table 2*).
In 1983 M. Dohrn-Ihmig expressed opinions on the typology of the adze, now based on the material from the cemetery at Niedermerz which she had excavated (Dohrn-Ihmig 1983). She showed that there is no sense in involving the length of adzes in a typology. As a serviceable tool, an adze is often resharpened during its life, the result being that it became shorter and shorter. This she has convincingly demonstrated. The maximum width and thickness are not much affected by the resharpening and therefore Dohrn-Ihmig judges these measurements, and especially an index based on them, to be of use for a typology. According to her, a simple division into thick and flat adzes will suffice where the cemetery of Niedermerz is concerned. A graphical representation of thickness versus width shows two clusters. The dividing line is drawn at a thickness of 20 mm. Only one flat adze has a thickness of 21 mm and one adze defined as thick measures 13 mm. The latter is an exception anyhow, because it is also much slenderer than the others.
Adze typology therefore started with three types, was then increased to six types, to drop back to two types. This bewildering history gives me reason to look into the morphology once more.
A graphical representation of all measurements available from the region under investigation results in a point scatter which contributes nothing towards a better insight into the underlying types. The information seems rather blurred, perhaps by the mixing of data from cemeteries and settlements, or by the mixing of data from different settlement clusters. Therefore, data will be regarded separately in the following.
So far three cemeteries are known from the area under review, viz.Niedermerz, Elsloo and Hollogne-aux-Pierres (Dohrn-Ihmig 1983, Modderman 1970, Thisse-Derouette/Thisse 1952). All three yielded adzes which have been buried as gifts for the dead. *Figures 3, 4* and *5* show the relation between their absolute width and 100 thickness/width index (TW index). This kind of graph had already been used by Modderman and gives the best impression of the clusters. As has already been remarked above, the relation between the thickness and the width seems to be a distinguishing feature of adzes. The absolute maximum width must also be considered in order to distinguish a certain class of small adzes. I accept the arguments put forward by Dohrn-Ihmig and shall not make use of the length of adzes.
Niedermerz (*fig.3*) of course shows the two clusters already described by Dohrn-Ihmig. One group has a TW index between 20 and 50 and an absolute width ranging from 27 to 60 mm. The second group has a TW index above 50 and an absolute width which becomes less as the index increases. Only one adze does not fit into this pattern: it is a small, slender yet thick adze.
The cemetery of Elsloo (*fig.4*) counts at least three point scatters. One yielded adzes with a TW index between 20 and 50 and an absolute width of 30-63 mm. The second shows adzes with an index of over 50 and widths from 25 onwards. Here too the widths increase as the adzes become comparatively flatter. The third cluster consists of a group of very slender adzes with a TW index of more than 60.
The third cemetery, Hollogne-aux-Pierres, has two clusters, one of adzes with TW indices between 20 and 50 and one with thick specimens with TW indices above 50. There is a difference in absolute width as well. Flat adzes show values between 41 and 58 mm and thick adzes values between 24 and 35 mm.
When the data from the three cemeteries are combined,

they reveal at least three morphological types. 1. flat adzes with a TW index >20 and <50 and a width between 27 and 63 mm, 2. thick adzes with a TW index >50 which are never as wide as the broadest flat adzes, 3. slender, thick adzes with a TW index >60 and an absolute width ranging from 14 to 17 mm. This last type seems to be lacking from Hollogne-aux-Pierres.

There is no sense in discussing each settlement separately for want of sufficient measurable adzes. On the other hand, there is no reason to lump all of the settlement material together. The most elegant solution is thought to be combining adzes from clusters.

The data from the Merzbach cluster have been brought together in *fig.6*. The slender and yet thick adzes are once again conspicious. Their width ranges from 11 to 19 mm. As to the other types, the lower limit of the TW index remains at 20, but the limit at 50 is less clear.

The adzes from the Graetheide cluster are presented in *fig.7*. Here the three groups are easily distinguished.

The cemetery of Hollogne-aux-Pierres has no settlement data to match. Instead, the Heeswater cluster measurements are given (*fig.8*). The slender adze is present as usual, as is the lower limit of the TW index at 20, but the TW index at 50 has been replaced by a limit at TW = 100.

Finally, *fig.9* shows the adzes from Müddersheim. Schietzel already indicated a dividing line at TW = 50 for this site, though the slender thick adzes also occur.

Figures 3 to *9* induce me to distinguish at least one clear type, notably the slender thick adze with a TW index >60 and a width <20 mm. This is the adze known as Modderman type II or Farruggia type I. The larger adzes are less easily classified into separate types. One very conspicious aspect of these large adzes is that they never have a TW index below 20. There are also limits where the width is concerned. The largest width measured is 63 mm. Smaller specimens of this group seldom have widths under 25 mm. It is obvious too that the adzes become slenderer as they increase in thickness, but the widths seem to provide no indication for a further subdivision. We must therefore search for indications in the TW index.

All of the data, except those from the Heeswater cluster, point towards a limit at TW = 50. Evidence of this was even provided by the cemetery of Niedermerz of the Merzbach cluster. In the case of the settlements with a fair number of adzes with an index around 50, for example the settlements of the Merzbach cluster, the distribution of the values obtained for the width indicates a limit near 50. Adzes with an index above 50 have a much narrower range of widths. Schietzel, Modderman and Farruggia all set the limit at 50, thus dividing the large group into flat adzes and thick adzes.

The next question is whether the flat adzes can be split up into smaller groups. Modderman and Farruggia based their division on width. Modderman drew a line at 50 mm and Farruggia set the limit at 40 mm. The graphs of *fig.3-9* show that such divisions are not practical. As already mentioned, widths do not form a suitable criterion for that purpose. I propose to refrain from further subdivision of the flat adzes.

Modderman split the group of thick adzes up into adzes with an index below 95 and adzes with an index above 100. Farruggia did not use this criterion, which is understandable, since the settlements around the Merzbach did not yield adzes with an index above 100. In the other sets of data the very thick adzes are rather scarce. It is therefore not completely clear whether they form a separate type. I shall return to the subject of the further subdivision of the thick adzes later.

The following discussion will be based on three types. The first is the slender, thick adze which is the equivalent of Modderman type II and Farruggia type I. The second is the flat adze, which comprises Modderman's type IV, V and VI and Farruggia's type II and III. The third is the thick adze, which is a combination of Modderman I and III or Farruggia IV.

Besides metric characteristics, adzes, of course, also display semi-metric characteristics. One of the semi-metric characterictics is the presence of facets. On many pieces the only ridges are those between the domed side and the flat side. These adzes are D-shaped in section (*fig.10*). There are adzes, however, which show a second set of parallel ridges, resulting in completely flat sides. Their cross-section tends to be more rectangular, especially where flat adzes are concerned. In some cases these lateral sides have dissolved into a series of parallel facets. Other, mostly faint, facets may be seen on the transition of the domed side to the butt. An attempt to use this kind of characteristics in drafting a typology has had negative results. The same is true for the facets on the transition between the sides and the part bearing the cutting edge. These facets are almost always the result of resharpening.

Another semi-metric characteristic is the contour. An adze may be roughly rectangular to trapezoidal. This characteristic does not afford a starting-point for typology either.

Nor has the shape of the cutting edge been of use. Its lower face has sometimes been ground hollow, which is best seen on thick adzes. It is a characteristic which is difficult to evaluate since the corroded state of most pieces presents a problem in this respect.

Adzes with two domed sides, however, do form a clearly distinct group. These are more like axes than adzes and are very rare.

Finally, the most remarkable non-metric characteristic is the conic perforation. It is always perpendicular to the cut-

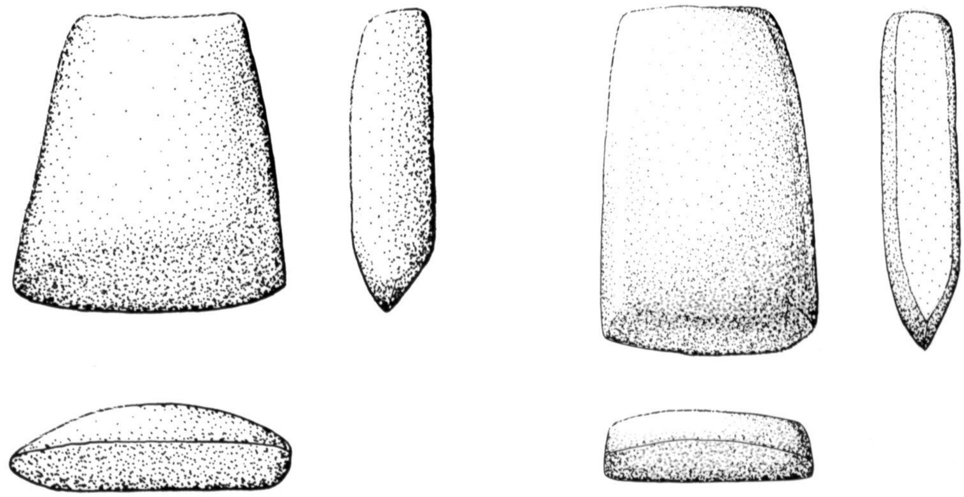


Fig. 10 Left: adze with D-shaped section (Niedermerz grave 48) ; right : adze with rectangular section (Langweiler 2 No.1081).1:1.

ting edge. The few pieces known from the region under consideration are flat perforated adzes.

3. Type and the aspect of time

In the foregoing the adzes have been divided into types without considering the possibility that their shape changed with time. Theoretically, the three types could represent the development of only one kind of adze blade. Closed finds, however, show that this is an unlikely possibility. Good examples come from interments. Grave No.39 from Niedermerz, for instance, combined a slender and a thick adze and grave No.60 from the same cemetery a flat and a thick adze. All three types were found in grave 83 at Elsloo. The different adze types seem to form part of a tool kit. Nevertheless we may wonder whether all three types were continuously in use during the entire period of Linearbandkeramik occupation. A particular model may have vanished from the tool kit in the course of time, or, the other way round, may have been added to it. Furthermore, it is quite possible that the main types were present all the time, but that changes in morphology, for instance in the TW index, took place within these types.

Since the publications by Modderman (Modderman 1970) and Dohrn-Ihmig (Dohrn-Ihmig 1974) the Linearbandkeramik era is usually divided into two periods, viz. period I - the Older Linearbandkeramik - and period II -the Younger Linearbandkeramik.

These periods have been split up into phases: three phases for period I, called Ib, Ic and Id (Ia is missing in this region) and four phases for period II, namely IIa through IId. Fortunately the phases proposed by Modderman for the Netherlands and those developed by Dohrn-Ihmig for the Rhineland run concurrently. The division is also applicable to Belgium (Constantin et al. 1980 for instance). For the Merzbach and Graetheide clusters even narrower subdivisions have been proposed, based on the development of pottery types and decoration, but these will not be used here. The adzes have been analysed on the middle level, notably that of phase.

To be assigned to a phase, an adze must belong to a closed find assemblage, which, moreover, must be datable on the basis of the presence of a sufficient amount of pottery. Of all measured adzes only those from the Merzbach and Graetheide clusters meet this requirement. As for the rest of the adzes, the well-dated specimens could no longer be measured and the measurable adzes could not be well dated.

The Merzbach cluster counted 57 suitable adzes and the Graetheide cluster 54. The cemeteries of Niedermerz and Elsloo yielded a substantial percentage of this number. Their influence is clearly visible in *table 3*, where the adze types and their age are brought together. The Graetheide data give an unbalanced impression on account of the fact that the Elsloo cemetery contained interments from phases IIc and IId only. The cemetery of Niedermerz, on the contrary, was in use from phase Ic up to and including phase IIc.

It is clear from the table that the three adze types occurred in all of the seven phases. No new type was added to the tool kit nor did any of the main types fall into disuse.

Let us now return to typology. Modderman states that one of his types provides dating value. This is his type I, the very thick adze with a TW index over 100. In his opinion, it dates exclusively from phase IId. He describes the process in which his type I replaces his type III (Modderman 1970 p.189). As I wrote above, I cannot find enough evidence for drawing a line at TW = 100. Nevertheless, it may be true that an evolution took place within the class of thick adzes resulting in increasingly thicker adzes. In total, 35 well dated thick adzes are available from the Merzbach and Graetheide clusters with which this hypothesis can be tested (*table 4*). A nonparametric test for trend in the TW indices of the Merzbach adzes, in which the phases Ic + Id, IIa and IIc were compared, showed no significant increase of the TW index with time ($T_0 = 0.5$). The highest TW value was found in phase IIa (Niedermerz grave 7, index 118) and the second highest belonged to phase Ic (Niedermerz grave 91, index 106). The same test applied to adzes from phase IIc and IId of the Graetheide cluster, on the contrary, showed a significant increase of the index ($T_0 = 1.99$). Of the material from the older phases too little remained that could be tested. The results are influenced by the presence of four very thick specimens found in phase IId graves.

The contradiction between the data from the two clusters makes it difficult to draw conclusions about the status of the very thick adze. The number of measurable and datable adzes may still be too low. In this respect it is a pity that the adzes from Hollogne-aux-Pierres cannot be dated on account of the poor circumstances in which they were recovered.

According to Modderman, the slender adzes with high TW indices are late too. Of the Graetheide cluster investigated by him this is indeed true (*table 5*), but again the same does not apply to the Merzbach cluster. A specimen with a

Table 3 The relation between adze type and phase.

	Ib	Ic	Id	IIa	IIb	IIc	IId
Merzbach cluster:							
cemetery N = 25							
slender	-	-	-	1	-	-	-
flat	-	2	1	2	1	4	-
thick	-	3	2	6	-	3	-
settlements N = 32							
slender	-	3	-	3	-	2	-
flat	1	3	-	7	5	2	2
thick	-	-	-	3	1	-	-
Graetheide cluster:							
cemetery N = 32							
slender	-	-	-	-	-	2	3
flat	-	-	-	-	-	5	8
thick	-	-	-	-	-	7	7
settlements N = 24							
slender	1	-	-	-	-	-	1
flat	3	-	-	1	-	7	7
thick	1	1	1	-	-	-	1

Table 4 TW index of well-dated thick adzes

Merzbach cluster:	
Ic	62, 91,106
Id	79, 80
IIa	57, 61, 61, 63, 67, 67, 76, 97,118
IIb	66
IIc	73, 75, 93
Graetheide cluster:	
Ib	76
Ic	83
Id	83
IIc	64, 69, 72, 73, 73, 75, 80
IId	54, 74, 84, 109, 116, 125, 125

Table 5 TW index of well-dated slender adzes.

Merzbach cluster:	
Ic	75, 89, 106
IIa	73, 87, 93, 112
IIc	69, 94
Graetheide cluster:	
Ib	88
Ib-c	66
I	76
IIc	82, 86
IId	68, 87, 106, 125

Table 6 Width in mm of well-dated flat adzes.

Merzbach cluster:	
Ib	26
Ic	29, 33, 45, 50, 50
Id	40
IIa	24, 27, 27, 33, 38, 40, 47, 47, 55
IIb	29, 41, 42, 45, 49, 52
IIc	30, 32, 35, 42, 43, 60
IId	28, 41
Graetheide cluster:	
Ib	27, 37, 37
IIa	34
IIc	29, 33, 34, 36, 36, 42, 43, 47, 49, 51, 53, 56
IId	30, 34, 35, 37, 40, 41, 42, 51, 53, 57, 63, 68

TW index of over 100 has been found there with a date as early as phase Ic.

Flat adzes can be tested for evolution of width. In total, 26 pieces belonging to the Merzbach cluster and dated to phases Ic, IIa, IIb and IIc have been analysed in this way (*table 6*). No changes could be established ($T_0 = 0.06$). The result was the same when the Graetheide adzes were examined ($T_0 = 0.275$ for 24 adzes from phases IIc and IId).

Finally, the dating of the axe-adze and the perforated adze deserves some attention. As mentioned above, both types are scarce. In fact, only one axe-adze was found, No.524-

8-55 from Langweiler 9 dating from phase IId. Of the perforated adze only five or six examples were recovered. A small fragment was found at Langweiler 8, No.5033. This piece belonged either to a perforated adze or to a macehead. It is from phase Ib. A second Langweiler 8 specimen, No.2607-19, is to be placed early in period II. Only one of the two Graetheide cluster adzes has been dated. It was found at Stein and dates from phase IId. The other is also from Stein. A third fragment, from Elsloo and described by Modderman, is in my opinion part of a Rössen tool. The Heeswater cluster yielded a perforated adze, notably No.32 from Caberg. This too lacks a date. The fifth good example is a stray find from Haelen, a village in the Netherlands lying at a considerable distance to the north of the loess-belt.
The date of the Langweiler 8 adzes show that the perforated tool existed already in rather early phases of the Linearbandkeramik. It did come into vogue after the Linearbandkeramik era.

4. Types and phases in relation to the raw materials

Adzes are not made from the flints and cherts so commonly used for the manufacture of tools with cutting edges. For the adze, material was chosen out of a rather narrow, but well-defined range of crystalline rocks.
The first systematic mineralogical-petrographical investigations go back to 1936, when L.Koch published his analyses of the adzes from Köln-Lindenthal (Koch 1936). J.Frechen followed in 1965 with the material from Müddersheim and C.E.S.Arps in 1978 with the adzes from Elsloo, Stein and Sittard (Frechen 1965, Arps 1978). As regards the Belgian sites, the work of M. and G.Toussaint deserves mention (Toussaint/Toussaint 1982). C.E.S.Arps and C.C.Bakels analysed the adzes from Rosmeer, Vlijtingen, Blicquy, Aubechies and those of the Merzbach cluster (Arps/Bakels 1980, Arps/Bakels 1982, Bakels 1973 and unpublished material).
The most important rock is amphibolite, a term used here in its broadest sense. It is a fine-grained, tough rock generally displaying a foliated or banded structure. The rock is generally composed of a light-coloured bluish-green actinolitic hornblende in association with an opaque mineral (ilmenite), plagioclase and/or quartz, biotite, chlorite, epidote and titanite as minor constituents or accessories (*fig.12*). The metamorphic grade generally ranges from upper greenschist facies to lower amphibole facies.
The next group of rocks is a series of dense basalts. These are fine-grained porphyritic compact rocks in which olivine, titanaugite, dark-brown hornblende, magnetite and, to a lesser extent, biotite and plagioclase occur as phenocrysts. The groundmass is composed of the same minerals. The rock displays a weak fluidal structure (*fig.13*).
The third group is a group of fine-grained siliciclastic rocks which comprises several dark-coloured quartzitic rocks and lydite (*fig.14*).
Finally, there is the usual group of 'other materials'. Most of these are encountered only once. Descriptions of individual adzes can be found in the above-mentioned literature.
The first question which has to be answered is whether there is any relation between adze typology and raw materials. The answer can be found in *table 7* which shows all of the adzes referred to in paragraph 2. It is clear that each type could be shaped from every kind of rock mentioned. Flat adzes are not made of one particular kind and thick adzes from another. This is all that can be concluded from the figures given in the table, because the data used are not really quantitative. Only measurable adzes can be listed. Easily fragmented rocks can be underrepresented, whilst rocks with high status value may be overrepresented because of the large share of grave-gifts.
Even if there is no true relationship between raw material and type, it is a known fact that rock and morphology are related. The structure of the rock dictates the orientation of the artifact. In amphibolitic tools the longitudinal axis always runs parallel to the foliation or banding of the original stone, which is quite logical, because this gives the least risk of breakage. The greatest risk threatening an adze is of it snapping across.
The manufacturers of adzes from basalts took due account of the fluidal structure, if present. The way in which the shape of the artifact is always determined by the structure of the rock is best observed in the case of adzes made from siliciclasts. The cutting edges of flat blades lie in the same plane as the original rock layers. In thick adzes the banding runs perpendicular to the cutting edge.
Presumable this characteristic is a result of the shapening of the rough-out. The largest surface of the adze is formed along a natural plane of cleavage. Adzes in which the banding of the rock runs across the blade are, of course, never encountered. Further details on adze manufacture are given in paragraph 6.
A second question is whether the choice of raw material changed in the course of time. To answer this question, well-dated fragments may now be added to the data-base. In spite of this supplement, it is still only the Merzbach cluster and the Graetheide cluster which at the moment provide sufficient data. The Müddersheim adzes should prove suitable too once the closed finds have been correctly assigned to the recently established phases. This has not yet been done for want of time.
Table 8 and *figure 11* show the relation between rocks and phases. The Graetheide material has been supplemented by

Table 7 Adze type and raw material (measurable adzes only).

	amph.	basalt	silic.	others
Müddersheim N = 23				
slender	2	-	-	-
flat	1	5	-	-
thick	5	10	-	-
Merzbach cluster N = 85				
slender	9	2	-	-
flat	31	11	3	-
thick	17	10	1	1
Graetheide cluster N = 82				
slender	8	-	1	-
flat	25	14	5	2
thick	12	9	5	1
Heeswater cluster N = 29				
slender	-	-	1	-
flat	7	6	4	-
thick	5	3	3	-
Hollogne-aux-Pierres N = 17				
slender	-	-	-	-
flat	5	3	-	-
thick	3	4	2	-

the adzes from the small excavations at Beek-Molensteeg and Geleen-Urmonderbaan. Nevertheless, the data regarding period I are so scarce that they had to be combined. The same had to be done for phases IIa and IIb. For the same reason, the Merzbach cluster period I has been regarded as one unit. Siliciclastic and 'other' rocks have been combined as well. A few trends are observable. We see that at first amphibolite dominates in both clusters. After period I the rôle played by this rock is taken over by basalt, in so far as this conclusion may be drawn on the basis of the rather meagre data (particularly on the Graetheide). In the end it is the group of other rock types which prevails, mainly because of the increased use of siliciclastic rocks.

The predominance of the siliciclasts in phase IId is confirmed by the finds from Maastricht-Cannerberg. In all probability these date from phase IId and comprise only one adze made of amphibolite, two adzes of lydite and one of a quartzitic sandstone. The predominance of amphibolite in phase I is emphasized by the adzes from Geleen i.e. the classic site, not the site Geleen-Urmonderbaan, which were still available for investigation. The eight specimens were of amphibolite.

It would seem that I may conclude, with some caution, that the selected rock types changed with time. This cannot be a matter of the discovery of better materials. Indeed, it is rather the reverse, since amphibolite is the better rock. It is tougher and tends to splinter less than any of the

Table 8 Raw materials and phases (in the Graetheide cluster the phases IIa and IIb have been combined).

		I	IIa	IIb	IIc	IId
Merzbach cluster:						
cemetery	amph.	3	9	1	5	-
	basalt	4	-	-	2	-
	others	2	-	-	-	-
settlements	amph.	20	11	5	7	2
	basalt	10	8	11	5	2
	others	2	2	3	2	6
Graetheide cluster:						
cemetery	amph.	-	-	-	8	8
	basalt	-	-	-	6	4
	others	-	-	-	-	7
settlements	amph.	19	2		11	4
	basalt	3	7		6	1
	others	2	-		2	7

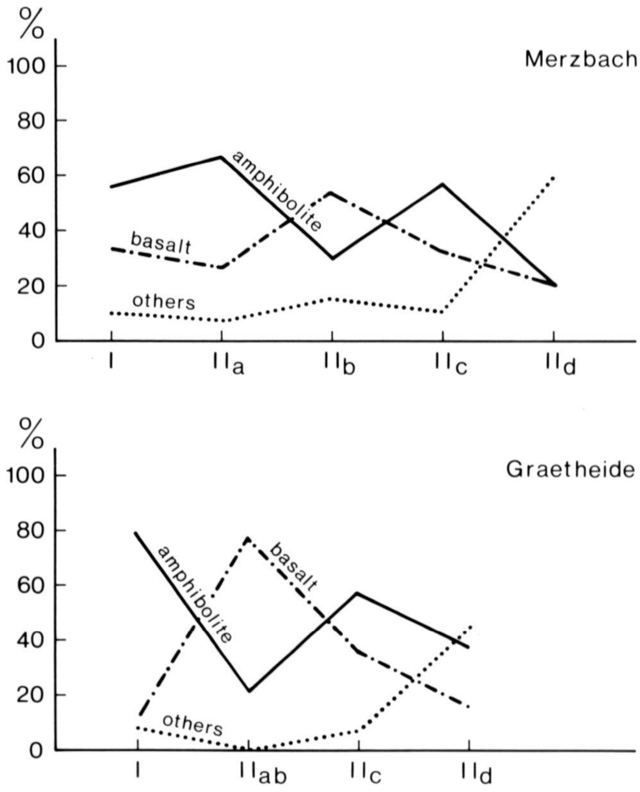


Fig. 11 The relation between rock-type and phase.

siliciclastic rocks for instance, as is quite apparent in settlement waste. Moreover, the amphibolites were reworked and reused many times, which shows that they were highly valued. It is more likely that the developments are the result of changes in the lines of supply, which brings us to the question of the origin of the rocks themselves.

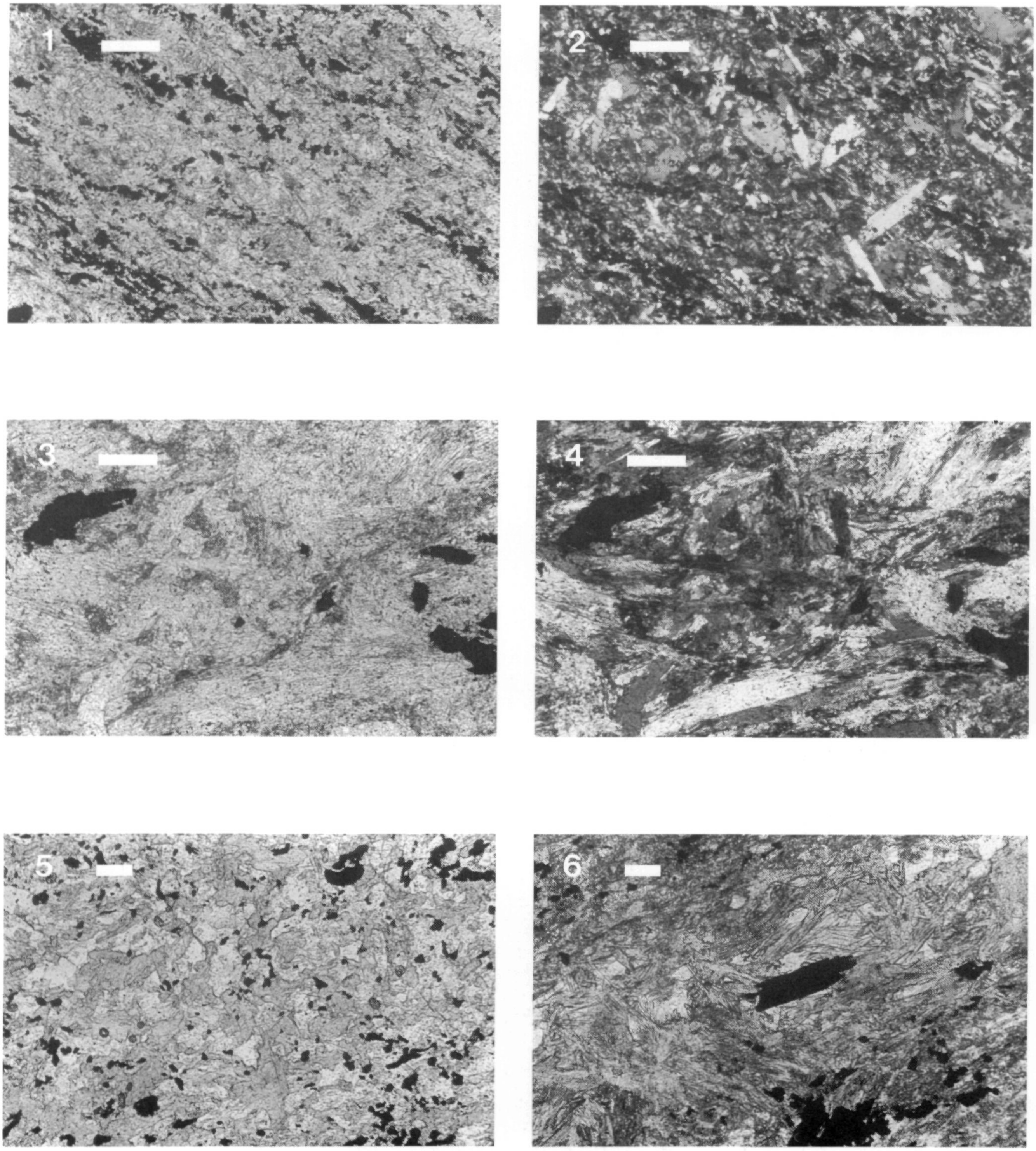


Fig. 12 Examples of amphibolite, thin sections, scale unit 100µm. 1. Langweiler 9, 146-339, banded amphibolite rich in opaque minerals; the actinolitic hornblende crystals are partly arranged in sheaves 2. as 1. crossed nicols 3. Langweiler 9, 1010-8, hornblende in sheaf-like clusters 4. as 3, crossed nicols 5. Vlijtingen K49.16-78, amphibolite with well-crystallized bluish-green hornblende 6. Langweiler 8, 3078-5, amphibolite with typical sheaves of actinolitic hornblende crystals.

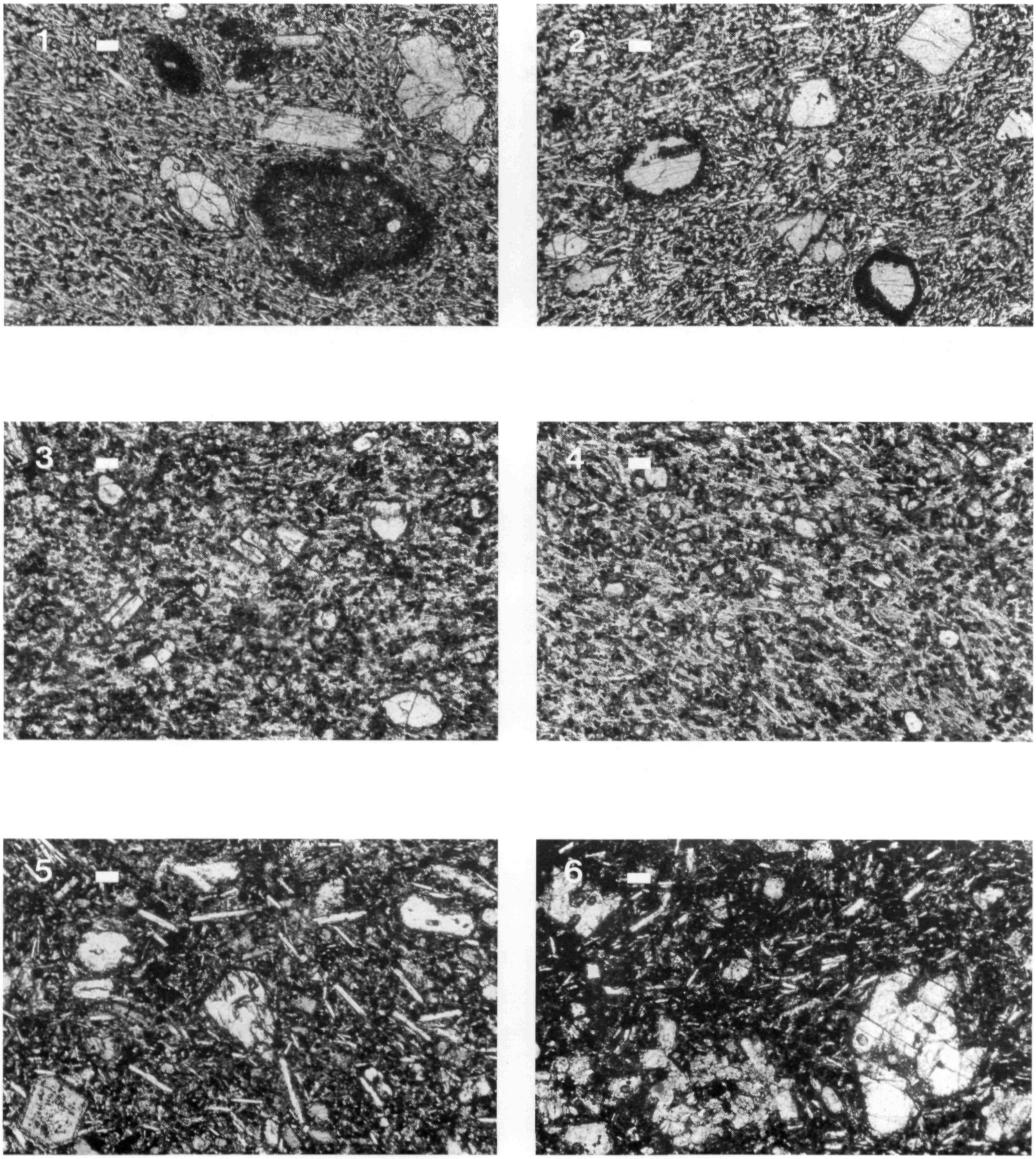


Fig. 13 Examples of basalts, thin sections, scale unit 100µm. 1. Langweiler 9, 1160-6, basalt of Lyngsberg type with phenocrysts of pyroxene, olivine and almost completely altered hornblende 2. Vlijtingen K26-10 basalt of Lyngsberg type, basaltic hornblende partly altered 3. Rosmeer 1285 4. Langweiler 8, 3961-6 5. Rosmeer 2213, basalt with phenocrysts of olivine, pyroxene and laths of plagioclase 6. Langweiler 9, 812-3, basalt with large olivine phenocrysts and a cluster of pyroxene.

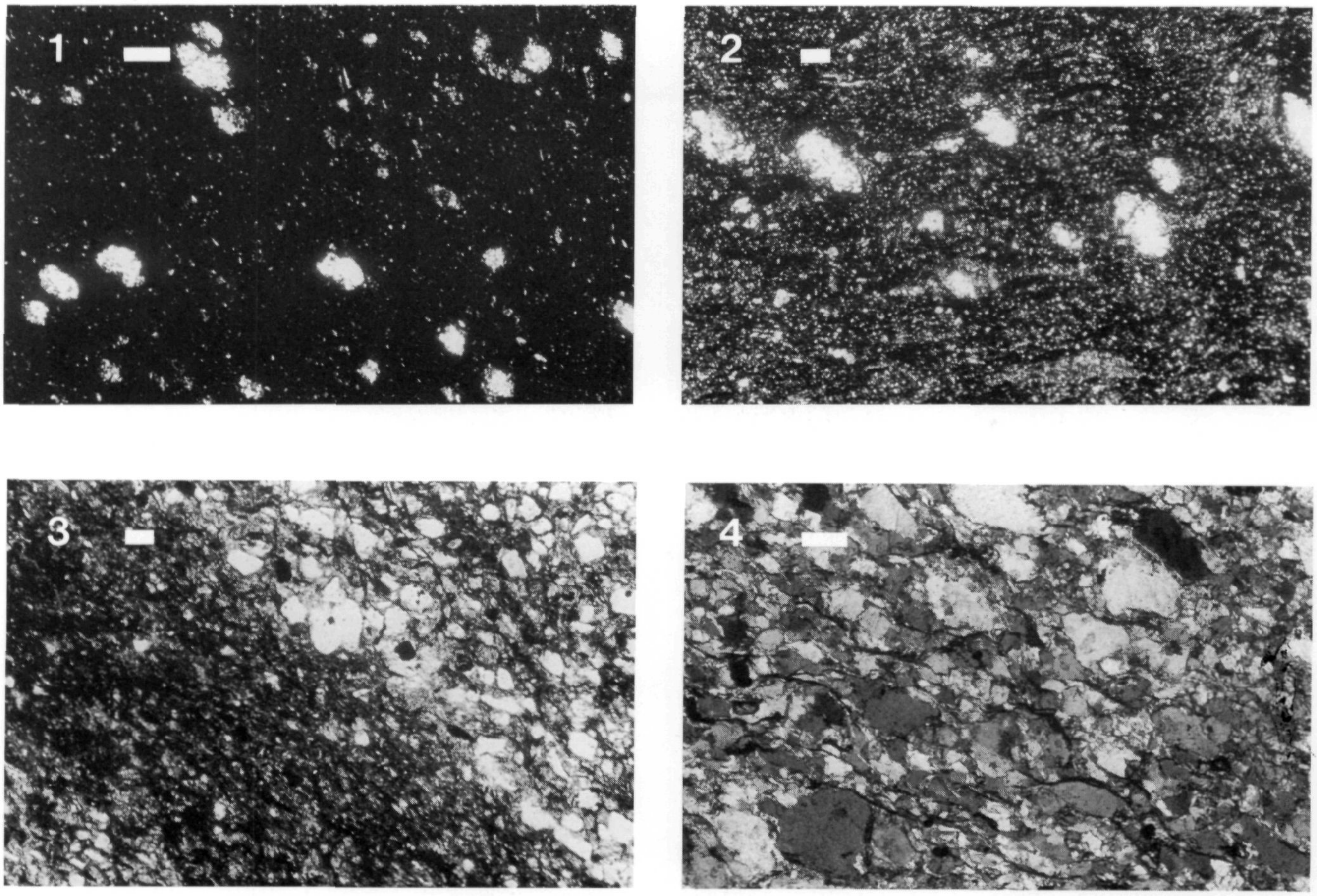


Fig. 14 Examples of siliciclastic rocks, thin sections, scale unit 100µm. 1. Aubechies Coron-Maton F 4, lydite 2. Wange, lydite, *richer in crypto-crystalline quartz 3. Blicquy Petite Rosière 17-386 grès de Horion-Hozémont 4. Langweiler 8, 1702-6 weakly* deformed quartzite.

5. The provenance of raw materials

As a rule, adzes were not made in the settlements. Contrary to signs of the working of flint, remnants of the working of rock are scarce. Practically none of the fragments found are of unworked primary rock. The artifacts must have arrived in the settlements in finished or almost finished state.

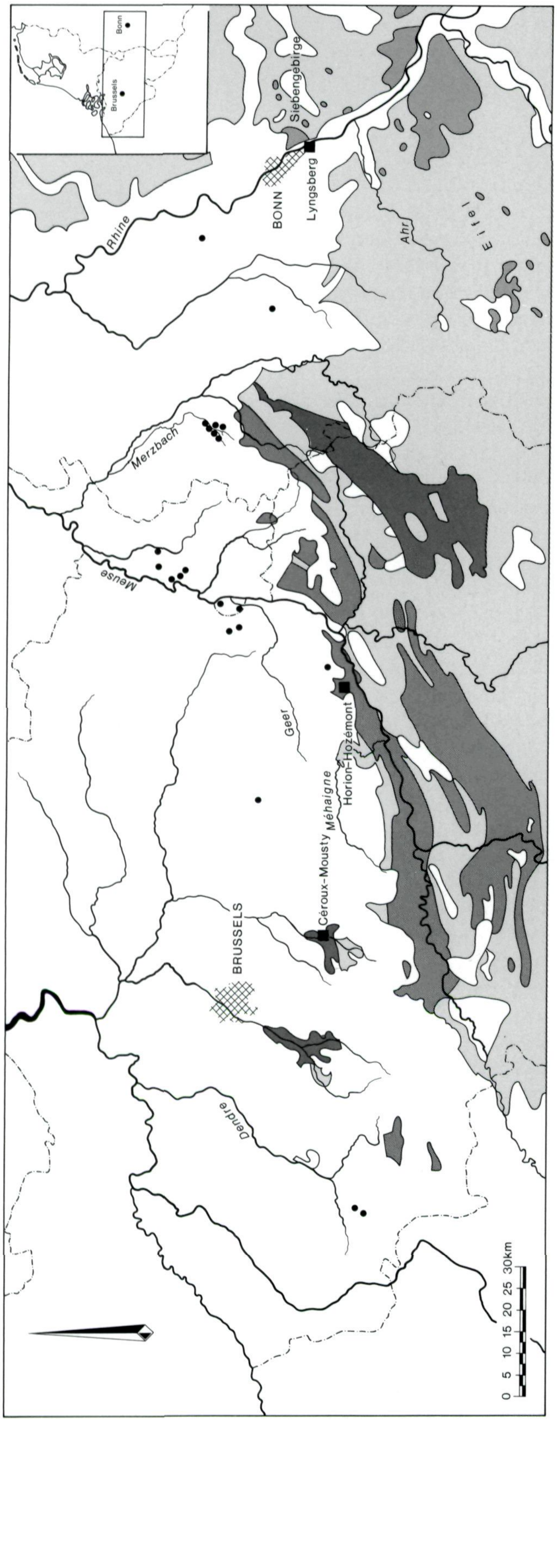
The origin of the amphibolitic adzes is not yet known. The outcrops closest to the settlements under consideration are small bands or lenses occurring in the low-grade metamorphic rocks of southeastern Belgium. They were sampled by Arps who came to the negative conclusion that they cannot have been one of the amphibolitic sources. Another obvious possibility is a provenance from local gravel deposits, but the Rhine and Meuse gravel beds are known to contain amphibolite only very rarely and the amphibolite in question is different from the types sought for.

Nevertheless, Koch has examined Rhine gravels in order to find the origin of the Köln-Lindenthal material. He came to the conclusion that the amphibolitic adzes cannot be traced to local pebbles. Amphibolite does occur in the drainage-basin of the Rhine, but the pebbles which have reached the Rhineland are far too small to allow the shaping of adze blades. Later Dohrn-Ihmig discovered a piece of the right size in a gravel pit near Niedermerz. However, this is an exceptional find. Moreover, the amphibolite in question is rich in quartz and bears no resemblance to the type of rock used for adzes (Dohrn-Ihmig 1983). The conclusion must be that the source or sources of amphibolite are on no account local.

Where the rock actually came from is still a subject which engages the attention of several scientists. The problem attracts much interest because amphibolite was the main rock used for adzes throughout the entire area occupied by the Linearbandkeramik settlers and was indeed not confined to the northwestern part only.

Most attention has been paid to the mountains of the

Variscan Basement of Central Europe (Spessart, Odenwald, Harz, the Bohemian Massif, for instance) and the Carpatians (Arps 1978, Schwarz-Mackensen/Schneider 1983) as possible geological source. The underlying reason is that these regions lay within reach of the users of the rock. The Quaternary moraines of Northern Europe and the Alps seem to be less probable sources.
Frechen connected the Müddersheim adzes with a rock source near Sobótka in Polish Silezia (Frechen 1965 p.39), but this possibility has been refuted by Arps as well as Schwarz-Mackensen and Schneider. Arps suggested there may be sources in the Harz, Spessart and Oldenwald. These are 'near' the region under review, but he failed to find the right kind of rock. Schwarz-Mackensen and Schneider also proved the Harz to be an unlikely source. The discussion on the origin of the amphibolitic adzes is still being continued. One of the main problems hampering the progress is the fact that all possible outcrops have to be specially sampled for the purpose. Museum collections tend to include mainly the amphibolites of typical metamorphic importance. The fine-grained varieties used by the Linearbandkeramik people are generally not represented. One fact, however, is certain and that is that the amphibolitic adzes investigated here came from the other side of the Rhine and from a region far away, somewhere in the east or southeast. The adzes must have been transported in some system of long-distance exchange.
The origin of the basalt is less problematic. Both Frechen and Arps point to the volcanos of the Siebengebirge and the Eifel (Oberkassel, Papelsberg, Lyngsberg to mention a few). The Tertiary and Quaternary volcanos are the primary source, but need not necessarily be the immediate source of the adze material. Koch states that basaltic pebbles are found quite frequently in the gravels of the Rhine and even more so in the gravels of the rivers coming directly from the mountains, the river Ahr for example. Consequently, the raw material need not have the ideal origin in the form of a single geographical source. Pebbles may have been collected from all kinds of gravel deposits, even in seemingly unlikely places. An example is the discovery of a large fragment of a basalt column of Lyngsberg type in a Rhine gravel deposit cut by the river Meuse, 12 km north of Sittard. The fragment is large enough to be cut up into dozens of adzes.
Nevertheless, the fact that hardly any basaltic pebbles or other signs of basalt working have been found in the settlements points to the existence of special places or settlements where adzes were made. The only block of raw material known is a specimen from Köln-Lindenthal. The only rough-outs that have so far been described are from Langweiler 2 (No.1514-84, a piece shaped from a pebble) and Rosmeer (No.1287). The actual workshops, however, are yet to be discovered.
As stated above, the remaining rocks form an even more heterogeneous group that the amphibolites and basalts. What they have in common is that they are fine-grained, compact, tough, dark-coloured sedimentary rocks. Other kinds of material are exceptional, for instance the dolerite from Stein, No.218, which is different anyhow because it is a perforated adze.
Köln-Lindenthal, Müddersheim and the Merzbach cluster yielded a range of adzes of dark-gray quartzitic rocks. The variety is such that it is impossible to subdivide the group, except in those special cases where two adzes were clearly made from one and the same piece of rock. Examples are Köln-Lindenthal Nos H11 and H77 and Langweiler 8, Nos 3812-70 and 3812-228. The materials appear to have been picked up somewhere. Nevertheless, both Koch and Frechen state that some rocks were imported.
Koch has looked for a possible origin of four Köln-Lindenthal adzes made from dark silicified shale in the local gravels deposited by the Rhine. This '*Kieselschiefer*' constitutes 1.2% of the Lower Terrace near Köln-Bickendorf. According to I. Musa, A. Schnütgen and H. Altmeyer, this may be even more, possibly even 5% (Musa 1974, Schnütgen 1974, Altmeyer 1975). Koch, however, stresses that the adzes are not made out of the normal silicified shales, but out of a carefully selected homogeneous black variety. The appropriate pebbles he did find, seldom had the right size; most were too small. He therefore suggests import, possibly from the Upper Lahn or the Ardennes (Koch 1936 p.136). These imports concern only three pieces of rock anyhow, since two of the adzes are the two mentioned above. The two remaining Köln-Lindenthal adzes of sedimentary origin are graywackes, which may very well have come from the local Rhine gravel.
Frechen came to the conclusion that the two adzes made from siliciclastic rock found at Müddersheim could not be local. Both are made of a silicified shale which, according to its description, is different from the Köln-Lindenthal rock. For its type locality Frechen suggests Vielsalm in the Ardennes.
The majority of the 17 investigated adzes from the Merzbach cluster are of dense quartzites. All settlements counted pebbles of pyrite-bearing quartzite among their rubbish, several of which show traces of having been shaped into something resembling an adze rough-out. Nevertheless, no finished adzes made from this material have been found. The only rough-out, Langweiler 8 No.1702-6, was made from a different kind of pebble. The provenance of the Merzbach adzes is still unclear. An origin in the local accessible gravels is not unlikely. Outcrops from both Rhine and Meuse deposits are to be considered. Import, however, is not entirely excluded, because coarse gravels with acceptable concentrations of the right



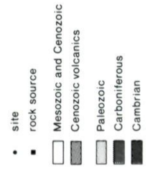


Fig. 15 Sources of raw material. Map based on The Atlas of The Netherlands; Plate II-1, Delft, 1972.

kind of quartzites are scarce. The group of rocks is in any case heterogeneous. If they were imported, they must have been picked up individually by people wandering beyond their daily range.

The group of sedimentary rocks of the Graetheide cluster is also heterogeneous (Arps 1978). Several relatively light-coloured quartzitic implements may have originated in the gravel beds of the river Meuse. Evidence of this theory of a local source is also provided by the presence of a rough-out, Elsloo No.684, belonging to this group. However, no waste indicating the working of these rocks had been found in the settlements. Besides, the presence of a rough-out does not necessarily prove that stone was worked nearby; as will be pointed out below, other rough-outs were clearly imported.

Apart from presumable local rocks, the cluster yielded pieces which cannot be of local origin. Thanks to Belgian investigations, the origins of two types have now been traced. One is the rock described as 'grès à micas de Horion-Hozémont' and the other is the lydite or 'phtanite' of Céroux-Mousty.

The first-mentioned is a dark-grey to dark-brown quartzitic 'phyllite' containing a varying but conspicuous amount of organic matter. The rock shows a distinct banding. Coarser bands with angular quartz grains alternate with finer-grained bands containing more dark matter. The name 'grès à micas' is derived from the muscovite present. The rock belongs to the Carboniferous and has several outcrops along the Meuse and its tributaries. Nevertheless, its pebbles are only rarely found in Meuse gravels. In 1967 M.G. Dradon discovered a site quite near one of the outcrops where the rock had actually been shaped into adzes. Site and outcrop are named after the nearest village, Horion-Hozémont, in Belgium (Dradon 1967). Until a similar site is discovered, this site is considered to be the source of all 'Horion-Hozémont' adzes.

The second rock is a black to dark-grey radiolarian chert, a true lydite (in french *phtanite*). It contains lenses of cryptocrystalline quartz enclosing rutile crystals. This lydite is known from the valley of the rivulet Ry-Angon in the municipality of Céroux-Mousty in Belgium. It is found as nodules and banks in a weathered matrix belonging to the Revinian (Cambrian) (Cumont 1897-1898). Part of the nodules have been incorporated in Quaternary sediments on the slopes of the valley. The rock is described in the literature under the name of lydite (or 'phtanite') from Céroux-Mousty or lydite from Franquenies or Ottignies, after two local villages. No sites have been found in or near the valley where Linearbandkeramik adzes may have been made. It is known now that they were manufactured on a more than local scale in two sites lying 35 km from the valley, the sites Landen-Wange and Lintel-Overhespen (Lodewijckx 1984). The investigations of J.P. Caspar suggest that there may indeed be other sites besides these two (Caspar 1984).

Adzes of Céroux-Mousty lydite have not yet been encountered in the Merzbach cluster and the settlements to the east of this. One adze that may have originated in Horion-Hozémont was found at Langweiler 9, notably No.524-8.

In paragraph 4 it has been demonstrated that the percentages of the different rock types in the total collection of adzes altered with time. In period I amphibolite predominated, at least in the Merzbach and Graetheide clusters. At the beginning of period II basaltic rocks took over. This development ended with an increased use of siliciclastic rock. In view of the origin of the rock types, this would mean that initially adzes, i.e. the finished products, came from the east or southeast. This must be connected with the 'roots' of the Linearbandkeramik population. Later on the inhabitants of the Rhineland started to exploit a local source, the basalts. Basalt came into use here during period I, as is observed not only in the Merzbach cluster, but also in Müddersheim[1]. In this respect it is regrettable that the material from Köln-Lindenthal is no longer accessible for study. The basaltic adzes manufactured somewhere near or on the boundary of the Rhineland found their way to the regions in the west. In period II they first became common in the Graetheide area. Eventually they even reached the Dendre cluster.

In the western part of the region studied here, amphibolite and basalt are quite common, but not as common as in the area east of Rosmeer. This western part was only occupied during period II. People seem to have been rather quick in discovering suitable local rocks and in exploiting them. M and G. Toussaint described the adzes found between the rivers Geer and Meuse. They came to the conclusion that the adzes from sites in the surroundings of Horion-Hozémont include a large percentage of the grès à micas types. To the west, in the direction of Céroux-Mousty, lydite predominates (Toussaint/Toussaint 1982). Unfortunately, most of these adzes were collected from the surface or came from older excavations. Therefore, it cannot yet be determined when the sources Horion-Hozémont and Céroux-Mousty were exploited for the first time. The results of the investigations by the two Toussaints, for that matter, seem to pertain to settlement sites only. The only cemetery known from this area, Hollogne-aux-Pierres, yielded only few adzes of local material. Of the 17 specimens found, eight are of amphibolite, seven of basalt, one of lydite and one of another kind of originally sedimentary rock. This unusual composition may be a question of status.

Further to the west lies the already-mentioned Dendre cluster. It is quite isolated, being separated from the others by a wide zone devoid of settlement traces. Despite of this, it was not cut off from the main networks of exchange. The rocks which have a distant source, the amphibolites and basalts, are scarce, but present. Most material, however, is siliciclastic rock (*table 9*). Surprisingly enough, the settlements Aubechies-Coron Maton and Blicquy-Petite Rosière seem to differ in their preferences. Adzes were manufactured on both sites, witness the presence of waste and failed rough-outs, but at Aubechies they were made mostly from lydite from Céroux-Mousty whereas Blicquy shows a preference for rock from Horion-Hozémont, besides three other types. However, the difference may be deceptive. The material is too scarce to permit any conclusions. Moreover, the fragments of Horion-Hozémont rock found at Blicquy may all have come from the same piece. This has been proven by thin sectioning in the case of two of the fragments, Blicquy-PR 3.371 and 7.392.

In the first sentence of this paragraph it was stated that, as a rule, adzes arrived in the settlements as finished or almost finished products. There must have been an exchange of finished adze blades, mostly of amphibolite and basalt. Less finished were perhaps the adzes made from siliciclastic rocks. The Céroux-Mousty and Horion-Hozémont rocks, for instance, were also distributed as unfinished products, witness the presence of rough-outs at sites as far removed as Geleen (Céroux-Mousty rough-out) and Elsloo (Elsloo No.71, a Horion-Hozémont rough-out) (*fig.16*). The rocks may even have been transported as blocks of unworked material, as is suggested by the finds from Aubechies, some 65 km away from the source Céroux-Mousty. It would seem that adzes from distant rock sources are encountered as finished blades and that adzes made from nearby sources need not have been transported or exchanged as finished products. This conclusion is in accordance with what is often observed in the distribution pattern of much sought-after kinds of flints and cherts.

Table 9 Adzes and raw material from the Dendre cluster.

	amph.	basalt	lydite	Hor.Hoz.	others
Aubechies Coron Maton	4	2	19	5	-
Blicquy Porte Ouverte	-	1	1	-	-
Blicquy Petite Rosière	2	2	-	6	6

Fig. 16 Rough-outs from Horion-Hozémont (left) and Céroux-Mousty (right) material. 1:2.

6. The adze and its life

The life of an adze begins with a suitable piece of rock. In paragraph 5 we learned what is to be understood by 'a suitable type of rock', but we still do not know what exactly is to be understood by 'a suitable piece of rock'. The reason for this is that we do not know much about workshops.

The piece may have been a fragment quarried from an outcrop. A second possibility is a block loosened in a natural way, by weathering. Such material lies at the foot of outcrops. It may also have been incorporated in a younger formation, as is the case with the Céroux-Mousty lydite. The third possibility is a pebble or boulder from a gravel bed. For want of knowledge of Linearbandkeramik quarrying (except where flint is concerned[2]) the original piece must be traced by the analysis of the waste produced in shaping adze rough-outs. It is often difficult to distinguish between quarried or naturally loosened material. The latter may show clearer signs of weathering on its surface, not only because it broke along ancient cracks, but also because it may have lain exposed for some time. Waste from the working of amphibolite indeed shows this kind of weathering (Quitta 1955, Bakels 1986), but since amphibolite was not worked in the region described here, this information is at present not relevant. Basalt is not suitable for such analysis because it weathers too easily. Even finished adzes and their fragments show a rather thick crust when they are found.

More relevant to our study are the rocks of Horion-Hozémont and Céroux-Mousty. According to the observations by Dradon, the origin of an adze made at Horion-Hozémont is a slab of rock and not a pebble (Dradon 1967). Rough-outs found elsewhere, Elsloo No.71 for instance, confirm this. Slabs point towards a primary source that is either the outcrop itself or a collection of debris in its immediate surroundings. Signs of weathering are not reported and it is not clear whether they are present or not. This rock type does not weather readily, so it may be difficult to decide whether the rock was quarried or not.

According to Caspar, the origin of an adze of Céroux-Mousty material is a nodule or part of a bank dug out from either the weathered matrix or the Quaternary deposits on the slopes of the Ry-Angon valley (Caspar 1984).

Pebbles were used too in adze manufacturing. Theoretically, waste resulting from the shaping of pebbles should be easy to recognize. However, in only one case could a pebble be indicated as the source of an adze: the failed rough-out from Langweiler 2 was made from a basaltic pebble. The Köln-Lindenthal material includes a pebble of basalt which may have been destined to become an adze. The same applies to three pieces of siliciclastic rock from Langweiler 8 and Laurenzberg 7. In my opinion, however, these few examples do not present an accurate impression of the actual situation. Basaltic and quartzitic adzes may indeed have quite commonly been made from pebbles. This is difficult to prove, however, for lack of the right kind of waste.

The piece of rock had to be shaped into a rough-out. In the case of fissile rocks this was done by splitting off a slab of the required thickness, if such a slab was not already available. This is, at least, the way in which the rock of Horion-Hozémont was worked. The same method has been suggested for amphibolite. The thickness of the slab then more or less equaled the intended thickness of the adze if a flat type was required, and the intended width if a thick type was to be made. The other sides were obtained by knapping or, if the rock splintered too readily, by sawing (Dradon 1967, Bakels 1986). The butt and cutting edge were shaped in several blows, unless sawing was again necessary.

Basalts and lydite were shaped by techniques related to those applied in flint working. Especially lydite has flint-like properties. Caspar has studied its waste and rough-outs. He describes how small nodules, or flakes of larger nodules were shaped into adze blades. Ridges, the result of knapping and retouching, were smoothened by pecking (Caspar 1984). The rough-out thus fashioned was finished by grinding. The entire artifact was ground, not only the cutting edge, mostly resulting in a smooth surface all round. Only the butt did not always receive the same amount of attention as the rest and deep traces of flaking were not always completely effaced. In my opinion most of the facettes mentioned in paragraph 2 are the result of grinding. Some facettes were already present in the basic shape however. Flat sides are the result of the shaping methods, when the artifact is sawn for instance. Flat sides are mainly observed on adzes shaped from slabs.

Grinding always left scratches. These are easily observed on the adzes made of Horion-Hozémont and Céroux-Mousty rock. The surface of these artifacts is the least weathered which may account for the scratches still being visible.

The result of shaping and grinding is an oblong blade with a domed upper side, a flat lower side, a butt and a cutting edge. The sides taper slightly towards the butt. Dohrn-Ihmig has shown that the maximum TW index is to be found in the centre of the artifact (Dohrn-Ihmig 1983 p.74). The cutting edge lies exactly in the axis of the blade (*fig.17*). The transition from the domed side to the cutting edge is shaped like a smooth curve. The transition from the lower side to the cutting edge is less gradual; sometimes it is a ridge. The lower part bearing the cutting edge may have been ground hollow, a characteristic mainly observed on high adzes.

The cutting angle of flat adzes lies around 55°. A collection of 40 measured specimens has a mean angle of 54° and a standard deviation of 9°. The smallest angle measured is 30°, the widest 75°.

The cutting angle of thick specimens lies around 60°-65°; the mean angle is 63° ($N = 30$) and the standard deviation 4°. The smallest angle observed is 55° and the widest 70°.

The next step was the hafting of the blade. The investigation of the traces of hafting have been the subject of detailed studies by Dohrn-Ihmig. The presence of a haft is recognized by an additional lustre or a difference in colour on the butt half of the blade. It can be seen best on blades from interments. Dohrn-Ihmig ascribes the lustre to the chafing and polishing effect of a haft or socket that did not fit too tightly or their soft (leather ?)lining. She believes that the blade was set in wood and not in a socket of bone or antler, since traces of the latter have never been found in settlements, not even in those where abundant bone material has been excavated[3]. A difference in colour is ascribed to the action of certain substances in the material used for the haft (Dohrn-Ihmig 1978-1979, 1979-1980 and 1983). Sometimes the haft was cut to the right size when the blade was already inserted. This resulted in transverse scratches on the adze blade (*fig.18*). The haft or

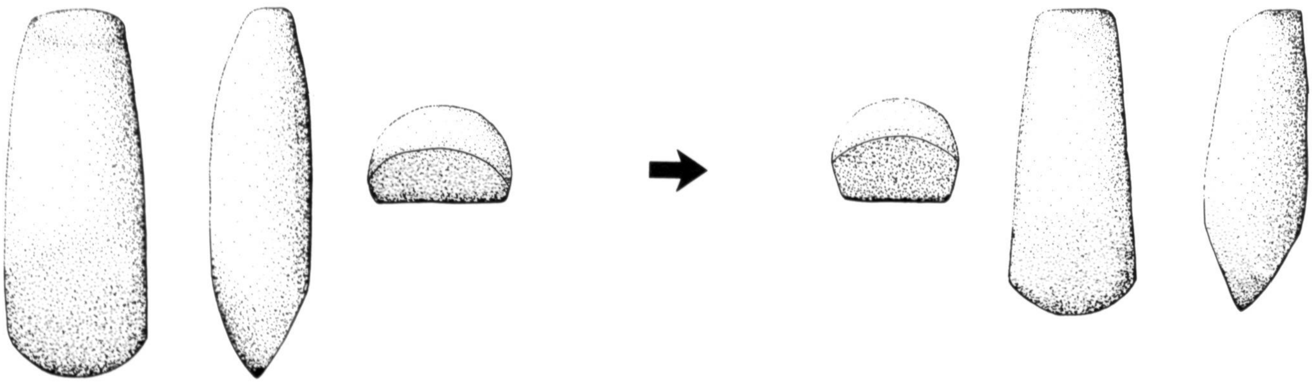


Fig. 17 A 'new' adze (Niedermerz grave 60) and an adze many times resharpened (Niedermerz grave 94). Drawing after Dohrn-Ihmig 1983, p. 77 . 1:2.

socket covered half of the blade, at least in new implements.
After hafting, the adze was ready for use. The question is which use. The shape and lenght of the haft are unknown as is the purpose of the tool. The hypothesis adhered to most is that it is a tool with a cutting edge at right-angles to a handle, intended for cutting and working wood, which is why it is referred to as an adze. In the past, the blades have been interpreted as the blades of hoes or the tips or ards, but this theory had to be abandoned, because the blades never show the traces of heavy wear which would be the result of working the earth. The interpretation of the tool as a wood-working implement is suggested by numerous ethnological parallels, for instance implements from Northern America or New-Guinea. Moreover, the Linearbandkeramik tool kit does not contain any other tool suitable for the purpose. Typical axes are absent. The exact nature of the tool's use is not yet understood. The adzes may have been used for cutting down trees, shaping timber and manufacturing wooden objects. Different types may have been used for different purposes. Dohrn-Ihmig interprets short blades as planes. Large thick adzes would have been used for heavier work. An analysis of traces of wear should provide more information. A problem is that most adzes are badly weathered, but some amphibolites and all silicified shales still show the striations at right-angles to the cutting edge which are typical of adzes, according to Semenov (Semenov 1964). There are also differences between the lower and upper parts of the cutting edge. A systematic study of such and other traces of wear will be carried out in the near future. Even if the exact use of the tools is as yet unknown, one of the effects of its use is clear, namely that the cutting edge became blunt and had to be resharpened. This resharpening affected the lower side more than the upper, domed, side. The result is that the ridge marking the transition from the part bearing the cutting edge to the flat, lower side, became more and more pronounced and that, consequently, the angle between the two planes became narrower. The cutting edge itself shifted from the main axis to a position above the main axis (*fig.17*). The change in shape has been amply illustrated by Dohrn-Ihmig (Dohrn-Ihmig 1983 p.77). The blades were resharpened more than once, thus becoming shorter and shorter. The socket or haft had to be cut back or be replaced. The shortening of adze blades during their serviceable life must be one of the reasons why adzes from settlements are significantly shorter than adzes from cemeteries, that is, at least the flat type (*table 10*). As for thick adzes, this aspect could not be investigated because insufficient specimens have been found in settlements. The slender type is too scarce anyway.
A possible second effect of use is the formation of lop-

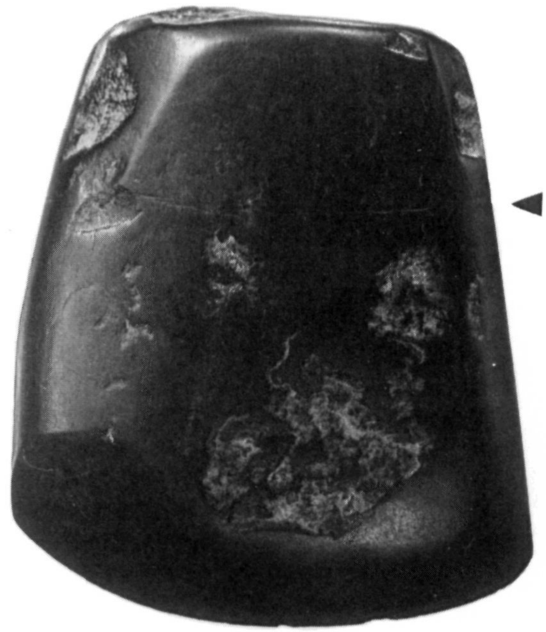


Fig. 18 Elsloo 504, a blade with a scratch (arrow), made when the haft was fitted. 1:1

sided adzes. This phenomenon is not rare. Every sizable excavation has yielded them and they occur even in cemeteries. Cutting edges can be skew to either the left or to the right (*fig.19*). Of the 17 adzes I measured, nine inclined to the left and eight to the right. Lop-sidedness is observed best in the case of flat adzes and mostly on amphibolitic adzes. Of the 17 mentioned specimens, 12 were of amphibolite, one of basalt, two of Céroux-Mousty lydite and two of quartzitic rocks. It has been suggested that the phenomenon is connected with the handedness of the user (de Grooth 1977 p.73). However, since as many adzes appear to be lopsided to the left as to the right we may wonder whether this is true.
In the end, the adze went out of use. Some seem to have simply been lost, but most of the blades just became too short or broke. They seem to have broken across mostly (*fig.20*). Occasionally, adzes split lenghtwise. A broken adze blade was, however, far from worthless. Blades broken across were simply rehafted where possible (*fig.21*). The fracture was sometimes retouched but not reground, as can be concluded from some blades found in graves, for instance Elsloo grave 111. A new cutting edge could be shaped on the fragments bearing the butt. This failed sometimes, as is apparent from discarded pieces (*fig.22*). Reworking broken blades often resulted in adzes of strange shape (*fig.23*).

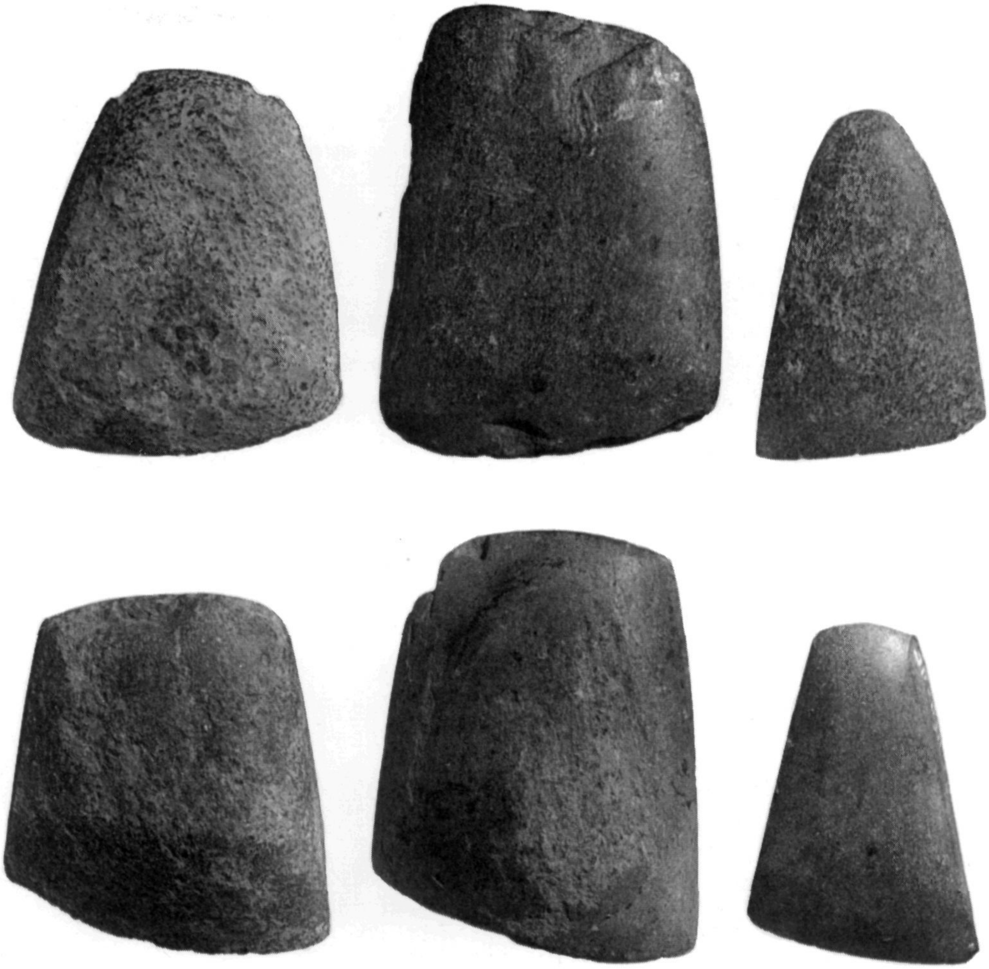


Fig. 19 Lop-sided adzes. Top, left to right: Langweiler 8 No.3812-A-113, Langweiler 9 No.41-6 and Elsloo 129. Bottom, left to right : Langweiler 9 No.449-6, Elsloo 153 and Elsloo 210. 1:1.

Recycled material is by no means scarce. Of the 32 basaltic adzes found at Rosmeer, four were second-hand; in the case of the amphibolitic ones this was three out of 23. The collection of 61 adzes from Langweiler 8 contained at least six and presumably more second-hand adzes. Occasionally an adze fragment was not reworked but reused as a hammerstone.

Ultimately, the adze or its remains ended up among the waste filling the pits found abundantly on each settlement site. Strictly speaking, it is remarkable that so many measurable and even complete tools are recovered from this waste. Even the cutting edge may still be rather sharp. Some scholars are of the opinion that such undamaged blades in fact come from graves that have not been recognized as such. Stray graves are known from several Linearbandkeramik settlement sites and they may account for a few of the finds. Nevertheless, it is an established fact that complete adzes indeed occur among common domestic waste. Since most of these are short flat adzes, they may have become too short for rehafting and been discarded because of this.

Table 10 Lenght of flat adzes from settlements compared with those from cemeteries; length in mm.

Merzbach cluster:	settlements	N = 10	32	35	45	45	45	49	55	58	60	63	
	cemetery	N = 22	39	41	41	46	51	52	52	58	58	60	60
			60	61	65	70	75	80	82	84	85	105	121
Graetheide cluster:	settlements	N = 18	42	44	45	47	48	49	51	54	56	56	57
			58	62	64	73	84	92	105				
	cemetery	N = 17	42	44	47	49	52	66	70	75	75	78	81
			84	85	99	101	106	141					

Fig. 20 Two adzes broken across, Elsloo 724 and Sittard 199/345, and one split lenghtwise, Sittard 305/307. The upper part of the split specimen has been reshaped into a flat adze. 1:1.

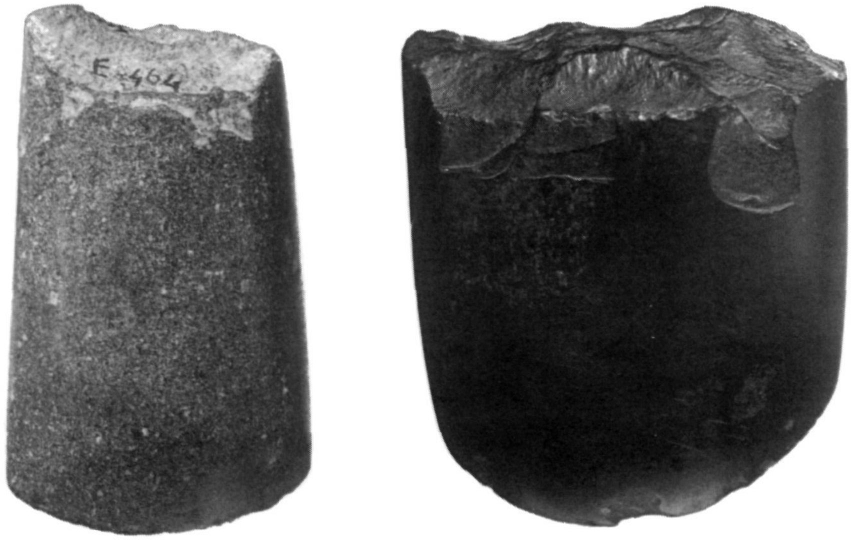


Fig. 21 Adzes obviously rehafted after having been broken. Left: Elsloo 464, found in a grave. Right: Elsloo 19 with a lustre on the fracture, thought to have resulted from rehafting. 1:1.

Fig. 22 Discarded butt ends with traces of intentional flaking. From left to right : Rosmeer 317, Langweiler 8 No.2176-10 and Rosmeer 571. 1:1

Fig. 23 Adze blades made from broken specimens. Left: Langweiler 9 No.1320-8. Right: Sittard 105. 1:1.

7. The adze and its place in society

The adze must have been a valued tool. If it was indeed the only woodcutting and woodworking member of the Linearbandkeramik tool kit, it must have been a priceless item for people living in densely forested regions. It is known to have played a rôle in exchange and even in true long-distance exchange. In the following I will try to compile all that is known about this important implement in connection with its place in society.

In the preceding paragraphs the fact that adzes were buried with the dead has often been mentioned. Because grave-gifts provide much information on the social position of the deceased, but, the other way round, also on the status of the buried artifacts, I will start with a survey of what has been written about the adzes from the cemeteries found within the region under review. Not everybody was buried with an adze. Of the 113 graves discovered at Elsloo, 33 contained adzes. In Niedermerz 33 graves out of a total of 115 counted adzes. Both cemeteries have burials with interred bodies and with cremation remains. The gift of an adze is not connected with one of these rituals. The third cemetery mentioned above, Hollogne-aux-Pierres, is not suitable for an analysis of adzes from graves because its graves were discovered only thanks to the presence of the adzes.

None of the cemeteries yielded preserved skeletons, nor has it so far been possible to identify the cremation remains. As a result, virtually nothing is known about the sex or age of the deceased[4]. P. van de Velde has tried to determine the sex by subjecting the grave-gifts to a principal components analysis (van de Velde 1979). He came to the conclusion that the adzes of Modderman's type III, i.e. thick adzes, must have belonged to males, because they load high on the principal component which correllates best with arrowheads. Arrowheads are interpreted as typically male attributes (van de Velde 1979 p.89). Modderman's types IV, V and VI, the flat adzes, were not really associable with either males or females. Six of these turned up in graves which he attributed to males and seven in graves which are thought to be female (van de Velde 1979 p.185 table 15)[5]. Of types I (the very thick adzes) and II (the slender adzes) too few remained for his analysis. In her study of the cemetery at Niedermerz, M. Dohrn-Ihmig concludes that a grave with an adze, that is any adze, most probably belongs to a male (Dohrn-Ihmig 1983 p.72). Of the 24 graves containing arrowheads, 19 also yielded adzes. Nine contained thick adzes, eight flat adzes and two yielded both types. Thus, in Niedermerz men were interred not only with thick adzes, but also with flat adzes. In the graves without arrowheads flat adzes and thick adzes occur in practically the same numbers.

It can be concluded from the preceding that both authors are in agreement where the status of the thick adze is concerned: is a male attribute. Van de Velde allows for the possibility that the flat adze was used by men and women alike.

Beyond the northwestern range, Linearbandkeramik cemeteries are known with preserved skeletons whose sex has been identified. Local burial customs may have been different there, but we can have a short look, just out of curiosity, at the place of the adze. Adzes, both the thick and flat types, and arrowheads are reported to have been found buried with men in the well-known cemetery of Flomborn, West Germany. Out of a total of 85, 17 graves contained adzes. Five of these belonged to males, two to assumed males, one to a possible female, whilst the others provided unidentifiable skeletal material only. The author believes that the possible female is a misinterpretation. It may be added that the adze from this grave is a thick one (Richter 1968-1969). K. Reinecke writes that the adze forms part of the inventory of every 'good' male interment in the large cemetery of Aiterhofen, Bavaria, West Germany (Reinecke 1978 p.12). In Sondershausen, East Germany, graves in which both skeletons and adzes occurred, were male (Kahlke 1954). In the cemetery of Nitra, Tsjechoslowakia, J. Pavúk found that the adze occurs only sporadically in the graves of females (Pavúk 1972, p.55). The adze is a grave-gift for men and boys. Thus four examples of cemeteries with preserved skeletons confirm the conclusion that the adze is to be connected with the activities of men. A female interred with an adze may have been an extraordinary personality.

Some graves contained more than one adze. *Table 11* gives a survey. Elsloo shows sets which are composed of different types, suggesting the existence of tool kits with each type intended for different tasks. Unfortunately, the evidence from Niedermerz does not corroborate this. Three graves have sets which are composed of only one type. The most extreme case is grave 48 with three adzes of equal appearance and even made from the same kind of rock (amphibolite).

The question arises whether the occurrence of more than one adze is a matter of specialization or rather of status. Van de Velde is convinced that it is a matter of status. Status is indicated by the number of activities represented by the grave-gifts. The graves Elsloo 1, 83 and 87 are thus described as graves of 'super status', their grave-gifts representing six or seven different activities. These are the only ones of 'super status'. Grave 100 has high status and grave 72 medium status. The deceased who received more than one adze are in Van de Velde's opinion certainly not people interred with the tool kit belonging to their trade. Dohrn-Ihmig describes Niedermerz grave 93 as the grave of possibly a 'competent craftsman', if such a man indeed existed. In addition to four adzes, the grave contains two arrowheads and a large number of flint artifacts. The inventory of grave 48, however, represents no marked special activity. Besides its three adzes, it contained a lump of red ochre, a tiny fragment of a flint blade and a flint flake. According to me, Dohrn-Ihmig might be right in concluding in the end that the theory of the craftsman is not correct and that such a person did not form part of a normal Linearbandkeramik society.

Table 11 Graves with more than one adze.

Niedermerz:	
grave 39:	thick, amphibolite
	slender, amphibolite
grave 41:	flat, amphibolite
	flat, basalt
grave 48:	flat, amphibolite
	flat, amphibolite
	flat, amphibolite
grave 60:	thick, amphibolite
	flat, amphibolite
grave 90:	flat, amphibolite
	flat, basalt
grave 93:	thick, basalt
	thick, amphibolite
	flat, basalt
	flat, amphibolite
Elsloo:	
grave 1:	thick, amphibolite
	slender, amphibolite
grave 72:	thick, basalt
	flat, amphibolite
grave 83:	thick, lydite
	slender, amphibolite
	flat, amphibolite
grave 87:	thick, lydite
	flat, amphibolite
grave 100:	slender, lydite
	flat, lydite

The theory of the adze being an indicator of status is strengthened by the observation that the cemetery of Elsloo has as many graves with adzes as the one at Niedermerz, even though the excavations of the Graetheide settlements have provided fewer adzes than those of the Merzbach cluster. The Graetheide settlements are significantly poorer in adzes, but the adze was clearly an essential grave gift of important people (see page 81 however).

The remark on the number of adzes in settlement waste brings us to the information provided by settlements. First of all it should be noted that the settlements show great variation in the composition of their adze assemblages (*table 12*). The table also shows that thick adzes are less numerous in settlements, at least in most settlements, than they are in cemeteries. Müddersheim, Langweiler 9 and Rosmeer are the exceptions. It would seem that the thick adze is under-represented in settlement waste. Several causes are conceivable. The first is that the inventory of cemeteries gives a false impression as far as the thick adzes are concerned because the latter held extra status or ritual significance. The second possibility is that thick adzes, when broken, were reshaped into flat types. Unfortunately, insufficient data on recycling are as yet available to test this view. A third cause may be that the thick adze was

Table 12 Adze types in percentages.

	slender	flat	thick
cemeteries:			
Niedermerz	3	55	42
Elsloo	11	43	46
Hollogne-aux-Pierres	0	47	53
settlements:			
Müddersheim	9	26	65
Langweiler 2	10	70	20
Langweiler 8	25	62	13
Langweiler 9	20	33	47
Langweiler 16	40	40	20
Laurenzberg 7	25	50	25
Elsloo	13	81	6
Sittard	15	54	31
Stein	0	86	14
Caberg	11	67	22
Rosmeer	0	54	46

Table 13 Adzes from sites well north of the Linearbandkeramik settlement area; stray finds from The Netherlands.

Thick adzes:	Herten, dredged from the Meuse in 1972
	Heythuysen
	Nijmegen, Hatert
	Nijmegen, Kopse Hof
	Posterholt
Flat adzes:	Gassel
	Haelen, Coll.Dubois
	Haelen-Houterhof
	Hout, Begijnenberg
	Losser
	Nuenen
	Staphorst
	Tegelen
	Venlo
	Venlo, West-Zwarte Water

not used in the settlements and, consequently, not discarded there either. The latter hypothesis can be tested by an investigation of adzes which are found, as stray finds, far away from settlement sites. For a first, provisional analysis I have studied the adzes found well north of the Graetheide cluster in an area lacking permanent settlement sites. The results are given in *table 13*. It is clear that the thick adze does not predominate; it is not the only off-site type, the only tool taken into near or distant forests. The flat type was used there too. The third hypothesis can therefore be rejected. Only the slender adze is missing. The reason may be that this was a true 'domestic' type, but it may also have been too rare to turn up into a rather small collection of stray finds.

The next question is whether the distribution pattern of discarded adzes in settlements provides any indication of the status and use of adzes in these settlements. The first answer is that the plotting of finds on a site plan does not reveal any clustering. This was only to be expected, because settlement sites are known to consist of the mixed remains of several occupational phases. Nevertheless, even if these phases are unravelled, a distinct pattern fails to appear. It is evident that settlements did not have areas reserved for special activities requiring the use of adzes where the artifacts may consequently have been discarded. This conclusion tallies with the distribution pattern of other kinds of waste.

Tasks were performed on the basis of 'household industry' with the understanding that these tasks may not have been the same for all households. House plans at least are not identical. According to Modderman, three main types existed: a large house composed of three structural units of different character (type 1), a middle-sized house composed of two units (type 2) and a small house having only one unit (type 3). Type 1 can be subdivided into 1a, a house built of wood, and 1b, a house with the greater part of its walls built of wattle-and-daub (Modderman 1970). The three building units are thought to have served different economic functions. House type 3, for instance, is assumed to have only a living room, whilst type 2 has a living room and a part that is commonly interpreted as a barn.

The existence of different house types is an indication of some kind of inequality between the households of one and the same settlement. We may ask ourselves whether this inequality is reflected in the distribution of discarded adzes. *Table 14* gives the house types within five settlements and the adzes attributed to them[6]. These five have been chosen because they have a sufficient number of house plans that can be associated with a particular type. For the Langweiler settlements the system by U. Boelicke and D. von Brandt has been followed (Boelicke unpublished manuscript, von Brandt 1980). They aimed at a maximal possible type attribution[7]. For the data concerning Elsloo and Stein, Modderman (1970) was followed.

A typical Linearbandkeramik house was surrounded by pits, which are thought to have been gradually filled by the waste discarded by the inhabitants. It is the adzes found in those pits that have been connected with the house. Because the association houses – pits has not been published for Sittard, this settlement, though having many good house plans, had to be left out of consideration in this report.

Table 14 gives two values for the Merzbach cluster. The excavators of these settlements discovered yards around the houses and associated the pits (and adzes) they found there with the houses in question (Boelicke 1982). In the case of Elsloo and Stein, only the pits found close to the walls have been associated with the houses. So as to be able to

Table 14 The attribution of adzes to house type. Corr.means adzes in pits along walls only. nh= number of houses, na=number of adzes, a/h=number of adzes per house.

	1a			1b			2			3		
	nh	na	a/h	nh	na	a/h	nh	na	a/h	nh	na	a/h
Langweiler 2	3	4	1.3	7	2	0.3	3	4	1.3	1	0	0
corr.		1	0.3		2	0.3		4	1.3		0	0
Langweiler 8	8	6	0.75	33	14	0.4	2	2	1.0	3	1	0.3
corr.		2	0.25		7	0.2		1	0.5		1	0.3
Langweiler 9	2	0	0	12	5	0.4	1	0	0	0	0	0
corr.		0	0		3	0.25		0	0		0	0
Elsloo	6	0	0	14	3	0.2	22	3	0.1	11	3	0.3
Stein	7	1	0.1	6	2	0.3	5	0	0	5	0	0

compare the settlements, a second set of data had to be provided with a correction for yards. The easiest way was to count only the pits along the walls (*Längsgruben*) of the Langweiler settlements.

The table shows no important difference between the number of adzes discarded by the occupants of house types 1a through 3. Before we accept this result, however, one more observation should be made. The fact that houses of type 1 are longer than those of type 2 and much longer than those of type 3 (the structural units are joined in a row) may constitute a problem. This could imply that the larger houses are accompanied by more pits, which would increase the chance of adzes being found. The number of pits encountered beside the houses of each category is given in *table 15*. The number of adzes found there is also shown. This is only one, but by far the easiest, way of looking into the matter. It would be even better to calculate the capacity of the pits or correlate the number of adzes with the other kinds of waste.

The conclusion is that the smaller houses, especially type 3, tend to be associated with fewer pits. When we calculate the number of adzes per pit, it appears that there is no connection whatsoever between the density of finds and house type (*table 15*). I am therefore of the opinion that all households possessed adzes and used adzes in the same degree. This conclusion differs from the findings of S. Milisauskas concerning his site Olszanica B1 in Poland, where the adzes were found mainly near the houses of type 1a (Milisauskas 1976). However, this may be mere chance. It may also point towards a difference in socio-economic customs. The inhabitants of Olszanica need not have behaved in exactly the same way as their distant relations west of the Rhine, but this path of thought will not be followed further here.

The present conclusion also differs from the conclusion drawn by Van de Velde on the basis of almost the same data. He sees an 'excess' of adzes near the 1b houses of the Graetheide cluster, houses which he interpretes as the dwellings of the lineage heads. 'In the Southern Dutch Lbk the lineage heads held a monopoly over the use of adzes, which, being made of exotic material were apparently considered valuables' (van de Velde 1986 p.138). The village chief is thought to have resided in the house of type 1a[8]. 'He fell outside this monopoly'.

His results are different in the case of the Merzbach cluster. Here he found that the 1a houses were accompanied by more adzes than accountable for by a proportional distribution.

The divergence between Van de Velde's conclusions and mine arises from the handling of the data. He added the data from Sittard and Geleen to those from Elsloo and Stein. I hesitate to do this because there is still slight confusion concerning the attribution of the adzes from Sittard to the households and concerning the number of adzes found at Geleen. Within the small adze assemblages even slight differences in attributions and numbers may result in different interpretations. Furthermore, Van de Velde based his calculations on the cluster. As will be shown below,

Table 15 The attribution of pits to house type and the amount of adzes found in these pits (pits along walls only).

	1a	1b	2	3
number of pits per house:				
Langweiler 2	2.6	2.2	1.0	1.0
Langweiler 8	1.75	3.1	3.5	1.0
Langweiler 9	4.0	3.1	1.0	-
Elsloo	2.8	4.5	2.6	2.2
Stein	1.6	1.8	0.8	1.2
number of adzes per pit:				
Langweiler 2	0.125	0.125	1.33	0
Langweiler 8	0.14	0.07	0.14	0.33
Langweiler 9	0	0.08	0	-
Elsloo	0	0.05	0.05	0.125
Stein	0.09	0.18	0	0

some settlements are richer in adzes than others; consequently, it is dangerous to simply add up the data from different sites.
The last, but possibly most unfortunate fact I will mention is that there are insufficient adzes to study the inequality of households in connection with time. Customs may have changed, as well as access to the adzes.
Another approach in studying settlement material is to look for differences between the settlements of one cluster. Some settlements may have been wealthier than others. A. Zimmermann for instance, has shown that Langweiler 8 has a higher proportion of unworked, imported flint than the other Merzbach sites. Langweiler 8 is regarded as a kind of distribution centre for this commodity (Zimmermann 1982).
Table 16 gives two ways of showing the wealth of the individual settlements. The number of adzes per settlement can be indicated both in figures and in weight. The latter method is applied here too because the Merzbach cluster excavations produced more small fragments than the earlier Graetheide excavations. For the purpose of comparison, it may therefore be better to compare the weights of the adzes. Within clusters, settlements are ranged according to size. Size is expressed as the number of houses found. This is a dangerous procedure, because settlements which suffered much from erosion are underrated in this way. Another approach is to express the size of the settlement as the total area covered by occupational debris, but this also presents difficulties. In some settlements the houses were built closer together than in others (Lüning 1982 for instance). Here I have chosen the method of counting the houses because the erosion of the sites chosen is not that serious as to account for differences in apparent size. Only Rosmeer may form an exception, since the hill upon which it was built is known to have suffered from denudation in variable degrees.
Again, the aspect of time poses a problem. Sites may seem large because they had a long life. Fortunately, the sites which appear large in the two clusters presented here were indeed large: it has, for instance, been proven, that Langweiler 8 was at all times the largest settlement in its cluster. Langweiler 16 was the most short-lived of this cluster and during its short life counted only one house at a time. The results in *table 16* do not alter when split up into phases.
Table 16 shows that settlements become richer as they decrease in size. This is reflected in both the numbers and the weights of the adzes. The cause of this is not yet clear to me. Differences in the influx of adzes in different phases, another aspect of the time factor, cannot be the cause of this. Langweiler 2 and Laurenzberg 7, for example, were occupied almost simultaneously (LW2 from local phase 7 to 14 and LB7 from local phase 6 to 13, according to P. Stehli, quoted in Lüning 1982). One explanation may be that small settlements had richer households or, the other way round, that the inhabitants of the smaller sites had to content themselves with used, already worn material coming from their kin in the larger sites, and, consequently, had more material to discard.
A comparison between the Merzbach and Graetheide

Table 16 The wealth of individual settlements, as expressed in adzes per house. A = amphibolite, B = basalt, O = other rocks, T = total, N = number of houses; weight in grammes.

	number / house				weight / house			
	A	B	O	T	A	B	O	T
Langweiler 8 N = 98	0.35	0.15	0.1	0.6	9.3	6.9	4.3	20.5
Langweiler 2 N = 20	0.4	0.6	0.1	1.1	12.6	49.0	6.7	68.3
Langweiler 9 N = 17	0.8	0.6	0.4	1.8	22.4	42.7	10.9	76.0
Laurenzberg 7 N = 9	1.3	1.2	0	2.5	45.5	34.6	0	80.1
Langweiler 16 N = 3	1.0	1.3	0.7	3.0	46.5	4.2	36.9	87.6
Elsloo N = 95	0.2	0.15	0.05	0.4	8.2	8.1	6.6	22.9
Stein N = 49	0.2	0.1	0.1	0.4	11.7	11.8	6.5	30.0
Sittard N = 48	0.35	0.1	0.05	0.5	20.6	12.7	2.9	36.2
Rosmeer N = 14	1.6	2.3	0.4	4.3				

clusters learns that their largest settlements, Langweiler 8 and Elsloo with 98 and 95 houses, respectively, yielded the same amount of adze material. Stein and Sittard come next with 49 and 48 houses, followed by the other (Merzbach) settlements. The Graetheide cluster is described as having had less adzes than the Merzbach cluster. The question arises whether this is not based entirely on the size of the excavated settlements. If this is true, the interpretation that the Graetheide cluster was poorer, indeed three times as poor as the Merzbach cluster according to van de Velde, may have to be reconsidered (Van de Velde 1986). The richest site I have so far encountered is Rosmeer in the Heeswater cluster, but, as has been stated above, this site was partly destroyed by erosion. This may account for an excess of adzes per house, since some houses may have disappeared beyond recognition (Ulrix-Closset/Rousselle 1982).

8. Conclusion

The adze seems to have been the only tool used by the people of the Linearbandkeramik Culture to cut down trees and dress timber. Most adze blades are made out of foreign rocks and must have been obtained through exchange. The exchange pattern changed with time. Initially it was a true down-the-line long-distance exchange, concerning amphibolite in its widest sense. The direction of the exchange was from the east or southeast to the west. What was given in return is not known, though flint is a possibility. Later on, the exchange pattern got a middle-range distance component superimposed, but the influx of amphibolite never died completely. The more regional rock-sources served peoples living within a radius of 60-100 km. Some of this exchange followed a down-the-line system, but the possibility that people travelled to the quarries themselves cannot be excluded. This is indeed a likely possibility in the situations in which outcrops lay within reach of the users in question. It is worth comparing the access to flint sources in this respect. The inhabitants of Landen-Wange or even Aubechies may have travelled to Céroux-Mousty in order to obtain lydite in the same way as the inhabitants of the Graetheide seem to have travelled to the Rijckholt flint area near Maastricht (Bakels 1978 p.103). The development of the exchange pattern of adzes reflects the general trend of the Linearbandkeramik Culture becoming more and more organized on a regional scale. In the beginning the culture had cosmopolitan aspects, at the end it was very much regionalized.

The adze was a tool for men; it gave them status and accompanied them in their graves. Women are only rarely found buried with adzes. Such females may have held a special position in society. The grave-gifts were adzes that were still fit for use, not brand-new, but not too worn either. This does not seem to have been the case everywhere in the Linearbandkeramik world. R. Ganslmeier from Munich told me that in Bavaria at least people were interred with badly worn specimens.

A connection between status and adzes could not be established in the settlements, though the presence of different types of houses does suggest the existence of social inequality. The distribution pattern of discarded adzes, however, does not show any clear differences between the households. The only difference is observed between settlements of different sizes. The smaller the settlement, the more adzes were discarded. One explanation for this could be the absence of internal organization in a small settlement, but it is also possible that the inhabitants had to make do with adzes of poorer quality.

Further evidence of the function of the adze as a status symbol is provided by the discovery of adzes which are not suitable for normal use because they are made of soft rock. These may have had symbolic value only. In the region described here such adzes have so far not been recognized, but good examples have been found in the Aisne valley settlements of France, for instance. However, some of the adzes found in or near the northwestern clusters may have had a similar function. I am referring to the perforated tools. At least two of these are made of a conspicuous and attractively coloured rock, notably the doleritic adze Stein No.218 and the serpentinitic adze Langweiler 8 No.5033.

Adzes also accompanied man on his trips outside the village. This is one of the explanations for the presence of adze blades in off-site situations. Since transhumance is thought to have played a rôle in the Linearbandkeramik economy, this may account for part of the adze blades found far from settlements sites. Exchange with Mesolithic people may be another possibility, but good evidence of such contacts is yet to be found.

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notes

1 House 1 at Müddersheim dates from an early phase within period I. Part of its waste was found in pit 4, which contains two adzes of amphibolite. Another part of the waste was possibly recovered from pit 55, but this could also belong to house 2. The plan of house 2 suggests that it was constructed in a later phase of period I. Pit 55 contains one adze made of amphibolite and three adzes made of basalt (Schietzel 1965 Plan 1, Plan 5).

2 The quarrying and even the mining of flint is known from Poland (Lech 1981).

3 Linearbandkeramik settlements lying on wet ground are hardly known. Hence the ignorance on the subject of wooden hafts.

4 Czarnetzki tried to identify tooth enamel from Niedermerz. Besides the silhouettes of bodies and cremated bone material, tooth enamel was the only form of human remains found. The result is rather ambivalent. (In: Dohrn-Ihmig 1983, 105-114)

5 According to van de Velde, attributes of females are grinding stones and red ochre. Dohrn-Ihmig does not agree where red ochre is concerned, since she believes this is a male attribute.

6 An attempt was even made to correlate the three adze types with the four house types, but no correlation was found. However, again insufficient data were available, since very few measurable adzes could be attributed to house plans.

7 Based on only the most certain attributions, the results for LW2 and LW9 are:
LW2 : houses 1a n = 2, adzes 4, corrected adzes 1
houses 1b n = 5, adzes 0
houses 2 n = 2, adzes 4, corrected adzes 4
houses 3 n = 0
LW9 : houses 1a n = 0
houses 1b n = 9, adzes 2, corrected adzes 0
houses 2 n = 1, adzes 0
houses 3 n = 0

8 No more than one of the wooden 1a houses was built in each phase.

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