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11 Use-wear analyses of the flint tools from Geleen-Janskamperveld

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A selection of the flint implements from Geleen Janskamperveld was subjected to a functional analysis. The most frequently encountered contact material was hide, similar to what has been demonstrated in other LBK contexts. Quite a large number of cereal harvesting implements were seen as well. Several tools displayed 'polish 23' and 'polish 10', two common but as yet unexplained types of wear traces. Flint was also used for craft activities like wood working and working mineral materials. Traces from contact with bone and antler were virtually absent. Flint tools were therefore employed in both subsistence and craft activities.

11.1 Introduction

The flint of Geleen Janskamperveld was studied extensively from a technological point of view (De Grooth, this volume Ch. 10). However, because the site was excavated for two thirds and was believed to be one of the earliest in the Graetheide cluster, it was decided to also perform a use-wear analysis of a sample of the material. LBK flint is generally in mint condition and forms ideal training material for students to learn the ins and outs of use-wear analysis. A number of student projects were therefore carried out throughout the years. The material for these projects was selected from specific sections within the excavated area. As parts of the flint assemblage got lost shortly after the excavation, only to be found again years later, the sample for use-wear analysis is unevenly distributed across the excavated area. It is therefore impossible to perform a spatial analysis of the different activities inferred.

Use-wear analysis provides information on the activities carried out by means of flint tools at Geleen JKV. Obtaining an idea of the range of tasks carried out at the site was therefore the prime objective of this study. Specific questions relate to whether or not bone and antler objects were manufactured by means of flint tools. So far, the number of bone and antler tools from LBK contexts is very limited, due to preservation circumstances. We therefore have very little knowledge on the significance of bone and antler tools. Strangely enough traces from contact with bone and antler are largely absent on LBK flint implements, something that is in marked contrast with sites from the wetlands. Another focus in the analysis is placed upon the harvesting and the processing of cereals. A final question pertains to a possible specialisation between different households. Unfortunately the sample taken for use-wear analysis does not allow this latter question to be examined.

11.2 Methods and selection

A total of 170 artefacts were selected for the functional study. In this selection all tool types were selected in a proportionate number. Additionally some unmodified flakes, blades and blocks were included as well (table 11.1). Apart from the material analysed in the context of student projects, an additional sample was taken by De Grooth. As the surface of the flint objects was generally in mint condition, the degree of preservation was not a factor of importance in the selection. All tools were cleaned with 96% alcohol to remove grease and dirt; no chemical cleaning was necessary. The edges and ridges of the tools were studied with both a Wild stereographic microscope (magnifications 10-64×) and different Nikon metallurgic microscopes, fitted with Nomarski Interferential Contrast (magnifications 50-560×). A digital camera was used to take photographs of the wear traces (Van Gijn 1990).

tool type	*traces*	*no traces*	*not interpretable*	*total*
unretouched flake	30	10	–	40
unretouched blade	52	4	2	58
retouched flake	6	1	–	7
retouched blade	5	–	–	5
borer	4	2	–	6
point	5	–	–	5
quartier d'orange	1	–	–	1
long end scraper	10	1	–	11
round scraper	1	–	–	1
short end scraper	27	–	–	27
scraper indetermined	6	–	–	6
block	2	1	–	3
total	149	19	2	170

Table 11-1 The use-wear selection and the presence of traces on the various tool types.

11.3 Activities inferred

The use-wear analysis showed that quite a broad range of activities had been carried out by means of the flint tools (table 11.2). Of the 170 artefacts studied 149 artefacts show traces of use. These 149 tools with use-wear traces displayed 227 actually used zones because some tools had multiple used areas, some up to four (table 11.3). Two artefacts were not interpretable due to post-depositional surface modifications and 19 artefacts did not show any traces of wear (table 11.1). It should be stressed however that absence of wear traces does not imply that an artefact was not used. Artefacts used for a very short interval or on a soft material do not necessarily develop polish when used experimentally (Van den Dries/Van Gijn 1998, 499-502).

	longitudinal	*transversal*	*diagonal*	*boring*	*shooting*	*hafting*	*unsure*	*total*
plant	1	–	–	–	–	–	3	4
cereals	28	1	1	–	–	–	–	30
wood	3	4	–	1	–	4	–	12
hide	20	46	–	6	–	–	8	80
soft animal	1	–	–	–	4	–	1	6
bone antler	–	1	–	–	–	–	–	1
clay pottery	1	–	–	–	–	–	–	1
soft stone	–	1	–	–	–	–	–	1
mineral other	–	–	1	–	–	–	1	2
polish 10	–	1	–	–	–	–	2	3
polish 23	–	3	–	–	–	–	5	8
hard material	–	2	–	–	–	–	–	2
soft material	1	2	–	–	–	–	3	6
unsure	6	8	–	3	–	1	29	47
hafting	–	–	–	–	–	24	–	24
total	61	69	2	10	4	29	52	227

Table 11-2 Activities inferred: contact material versus motion

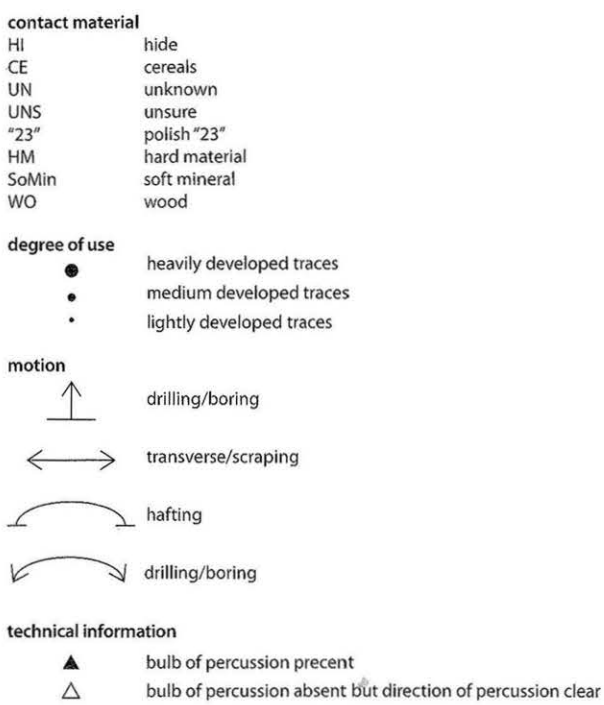
Nr. of Used zones	*Nr. of tools*
0	14
1	74
2	100
3	27
4	12
totals	227

Table 11-3 Frequencies of the number of used zones per tool

11.3.1 Working hide

The predominant contact material is hide: 35% of the used zones (N=80) show traces from the working of hide (table 11.2). This high percentage is due to the fact that scrapers are predominant in our sample and because there is a strong correlation between scrapers and working hide (see below). However, traces of working hide are also seen on flakes, blades and borers (fig 11.1). Hide is for the most part worked in a transverse, scraping motion (N=46), indicating that the hides were thinned and smoothened. Hides were subsequently transformed into various objects like clothing and so forth because we also find hide cutting tools (N=20) and occasionally hide piercing implements (N=6).

On the basis of the variability within the hide working traces, we can conclude that different stages of hide processing were performed within the settlement: the cleaning of fresh hide by removing remnants of flesh and grease and the further treating of hides, including the tanning, thinning, smoothening and loosening of the skins. Fresh hide scraping leaves a greasy band of polish and a slightly rounded edge, while dry hide leaves a dull, rough polish and a highly abraded edge (fig 11.2). There can be a substantial variability in the exact techniques and processes of hide treatment (after the initial cleaning), involving different tanning agents, and consequently there is also quite a bit of variability in the resulting traces of wear. These



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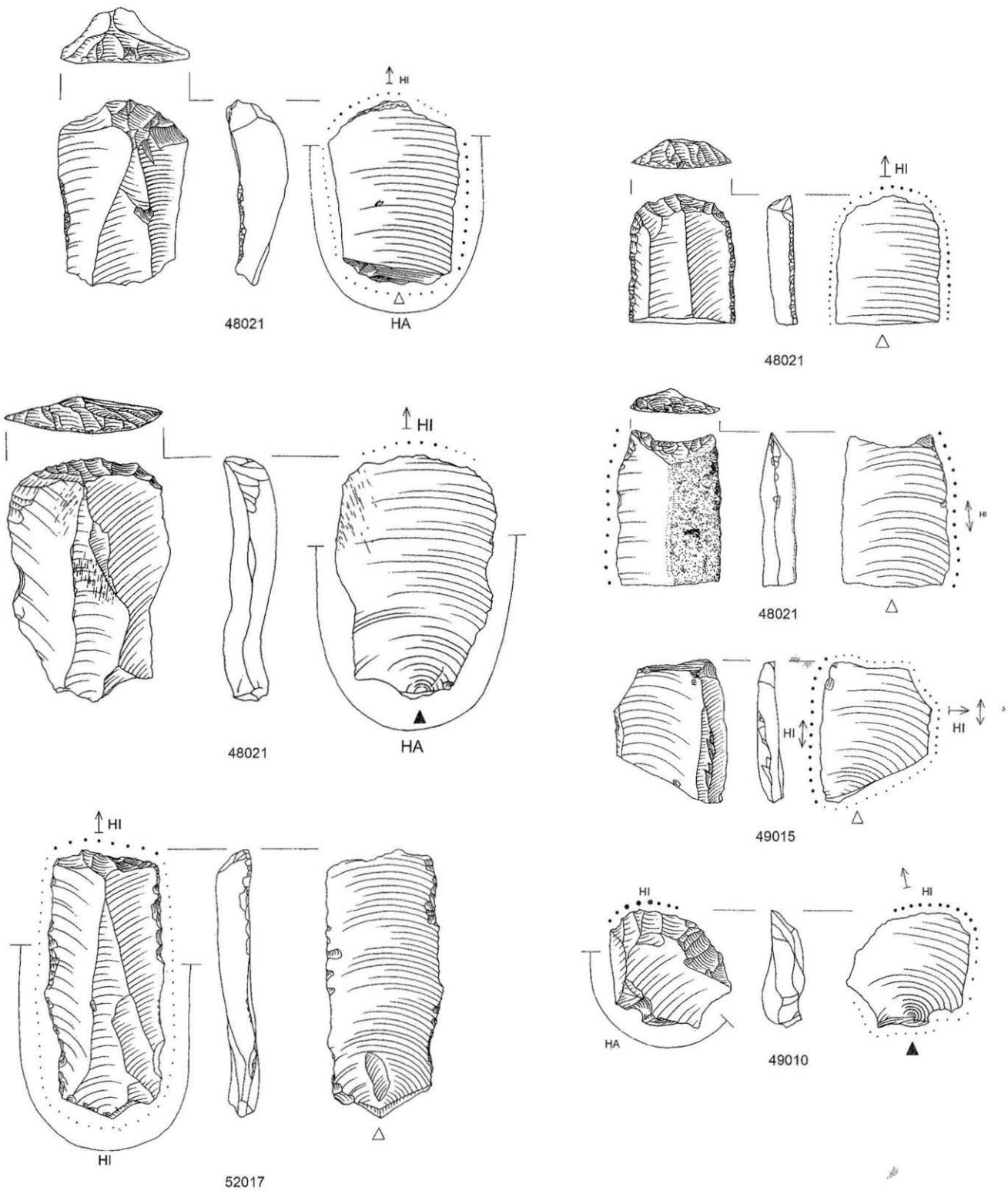
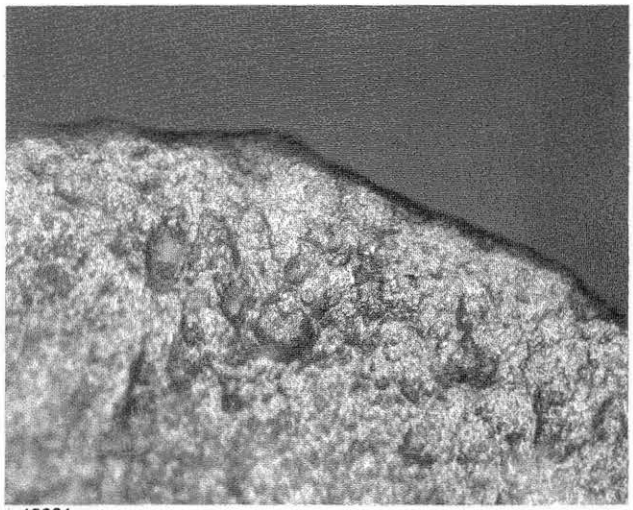


Figure 11-1 Artefacts with traces of working hide (scale 1:1)



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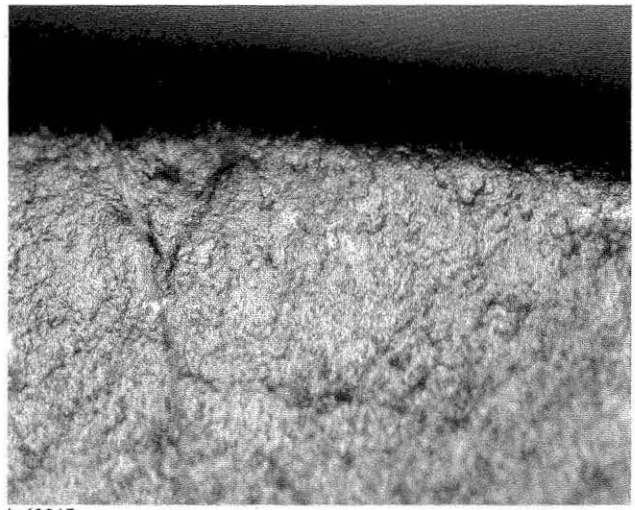

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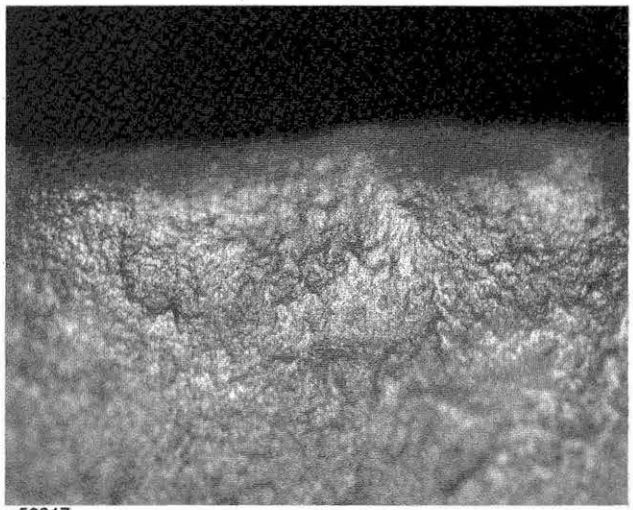

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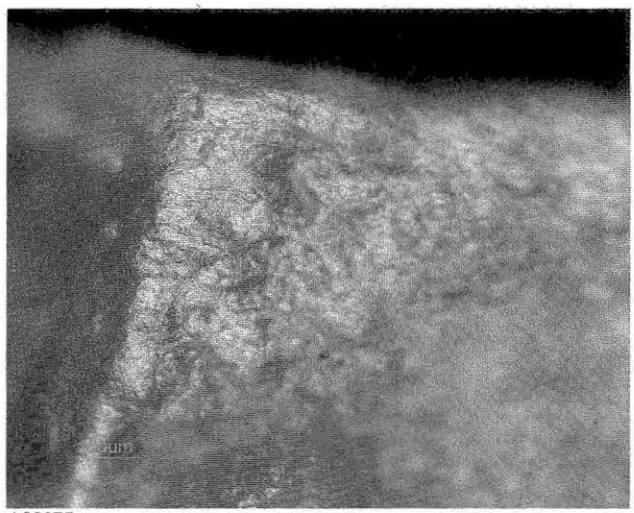

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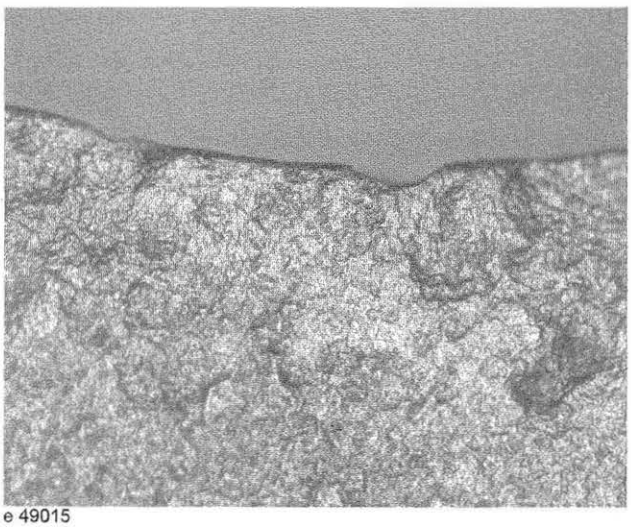

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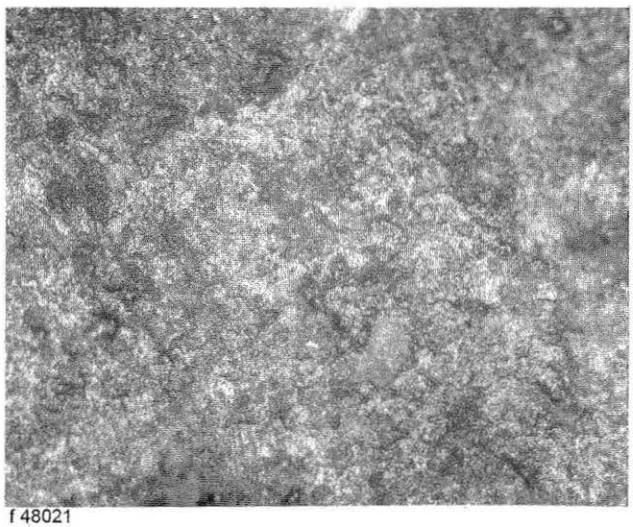

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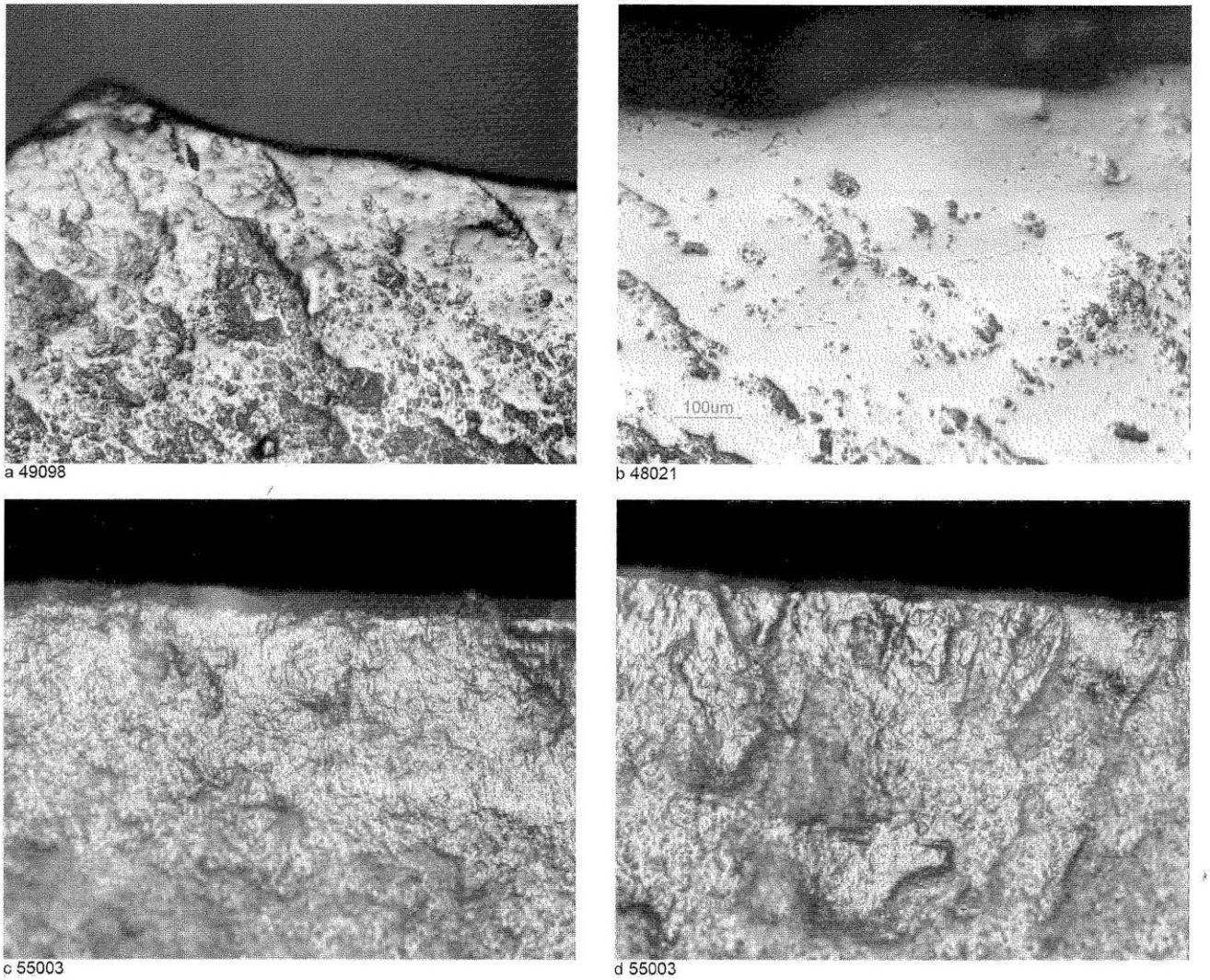


Figure 11-3 Traces of cereals and 'polish 23' (original magnification 100 ×)
a: traces of cutting cereals
b: traces of cutting cereals
c: traces of the rough aspect of 'polish 23'
d: traces of smooth aspect of 'polish 23'.

◂Figure 11-2 The variation in the hide working traces (original magnification 100 ×)
a: traces of scraping hide
b: traces of scraping hide
c: traces of scraping dry hide
d: traces of cutting dry hide
e: traces of cutting hide
f: traces of hafting in hide

traces cannot always be distinguished and will be referred to as 'hide working traces', without making an attempt to further differentiate them. Four used zones displayed clear traces of dry hide working. All other zones displayed traces of hide working that could not further be specified.

The different activities carried out on hide indicate an extensive amount of hide processing in and around the settlement, not only cleaning hides (transverse motions), but also further processing hides into for example clothes or other household items (longitudinal motions and piercing). The large amount of hide working corresponds to what has been observed in other LBK sites where use-wear analysis was performed: hide was generally the predominant contact material (a.o. Van Gijn 1990, 77).

Skin is also used to haft implements. Three scrapers, two long and one short end-scraper, had been wrapped in raw hide before being put in a haft. Upon drying the hide firmly fixes the tool in the haft. Binding with such a strip of hide also facilitates retooling (Keeley 1982) of a composite implement because the hide loosens again when soaked in water so that the exhausted flint scraper can be replaced by a fresh one (Caspar 1985, 69; Van Gijn 1990, 86).

11.3.2 Harvesting cereals

Traces of working cereals were seen on a total of 30 used zones. Cereal harvesting causes a very bright, flat polish with a high degree of linkage and a distribution that extends far into the surface of the tool. The polished surface displays many thin, often filled-in striations. The striations may be due to the presence of large amounts of weeds in the fields. It can often be seen with the naked eye (the so called sickle gloss) (fig 11.3). The distribution of the polished areas, covering a triangular section of the edge of the implements, indicates that the blades were hafted obliquely and in sequence in a lunar-shaped haft, with each segment protruding from the haft at a slight angle. This way of hafting sickle inserts has been noted at other LBK sites as well.

At Geleen JKV cereals were mainly cut in a longitudinal way, although one tool was employed in a diagonal motion and another one even displayed a transverse directionality. These variations in the directionality of the polish may be due to different positions of the flint inserts within the composite tool. The sickle inserts were mostly made on retouched and unretouched blades and flakes. In some cases we observed a secondary use of another tool type, reworked into a sickle insert. One example is a scraper whose longitudinal side was used for harvesting cereals (fig 11.4). Only five of the tools used on cereals showed traces of hafting, with no further information on the type of material the tools had been hafted in. Considering the general absence of hafting traces on the sickle inserts, they were probably hafted with an adhesive, firmly securing the tool in such a way that no friction gloss could occur.

Geleen JKV is remarkable in the relatively large number of sickle blades encountered. In nearby Beek Molensteeg, for example, only nine zones used for reaping cereals have been retrieved (Van Gijn 1990, 81). However, the considerable number of sickle inserts found at Geleen JKV corresponds with the large amount of querns from this site (Verbaas & van Gijn, Ch. 13 this volume).

11.3.3 Wood working and soft plant processing

Wood was also worked by means of flint: polish from this material was encountered on twelve of the used areas (table 11.2). In four of these cases it concerned tools that were hafted in wood. Both transverse and longitudinal motions are seen, showing that the flint implements were employed in different ways for fine wood working activities. One borer was used for drilling soft wood. The flint tools however were not involved in more heavy wood working tasks like chopping, chiselling or splitting. These coarser woodworking tasks were probably carried out with the adzes (Bakels, Ch. 12 this volume). Flint thus served to manufacture smaller objects and household materials. Woodworking is also seen in other LBK assemblages (Van Gijn 1990, 79), but in most sites a larger percentage of the tools are used for woodworking than is the case at Geleen Janskamperveld.

Several implements displayed traces from contact with non-silicious soft plant materials that could not further be distinguished. Experiments with cutting and scraping a large variety of plant species have shown that the resulting variability is limited and that it is difficult to distinguish between the wear traces caused by different plant species. In the present selection a total of four areas have been used on non-silicious plants: one tool was used in a longitudinal motion, the others in an unsure motion. It is likely that activities like processing plant fibres or making domestic utensils such as baskets or nets are responsible for the development of these wear traces.

11.3.4 Bone and antler

Only one implement displayed vague traces from working bone or antler (fig 11.5). Evidence of working bone and antler is minimal in other Dutch LBK assemblages as well (Van Gijn 1990, 79; pers. observ.). Considering the fact that quite a large number of LBK flint tools from different sites within the Graetheide cluster have by now been examined for the presence of traces of use, it is unlikely that the low representation of bone and antler working traces is a result of sampling procedures. This is even less likely because especially contact with bone results very quickly in distinctive traces of wear (Van den Dries/Van Gijn 1998). Elsewhere bone objects have occasionally been found (De Grooth/Van

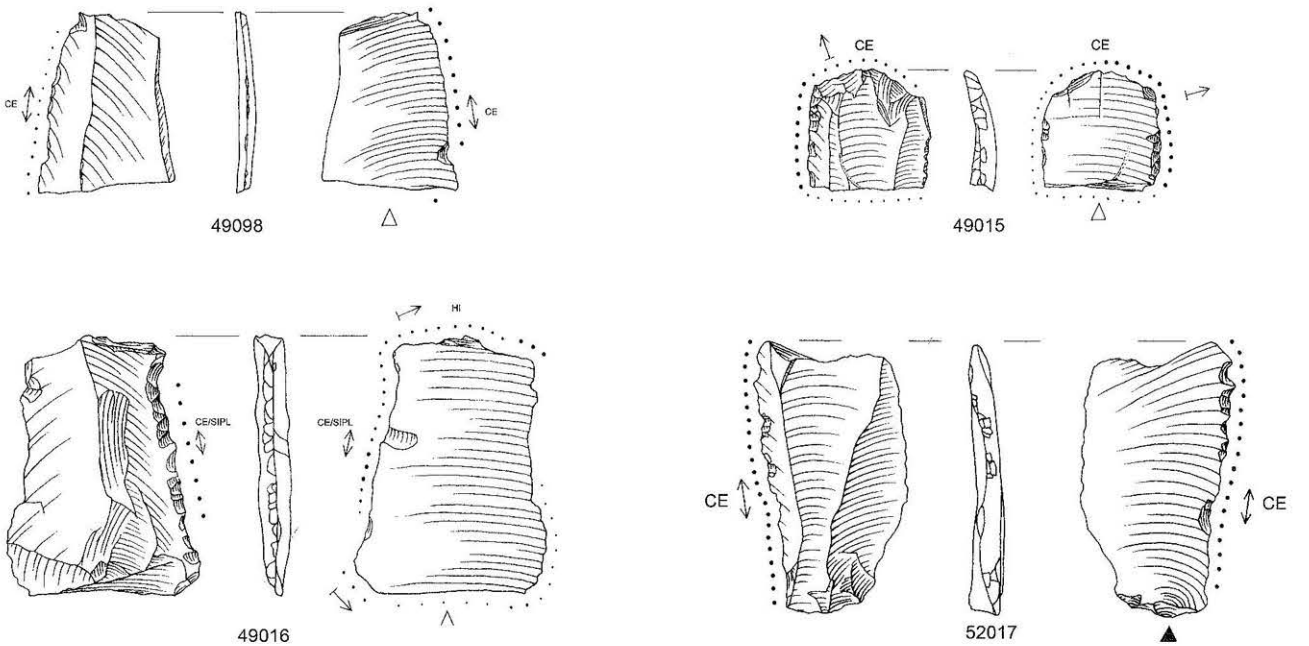


Figure 11-4 Different artefacts with traces of working cereals (scale 1:1)

de Velde 2005, 221). In our region however, flint and also hard stone do not seem to have served in their manufacture (Verbaas/Van Gijn, Ch. 13 this volume). The virtual absence of these traces forms, however, no proof that bone and antler were not used for the production of tools and objects.

11.3.5 Soft animal material

Soft animal material is a category in which traces from contact with meat and sometimes soft fresh hide are subsumed. The polish is greasy but generally quite indistinctive, the rounding of the edge minimal and edge removals are largely lacking. It should be noted that meat as a contact material is notoriously under-represented because traces of meat only develop after extensive use of the tool (Van den Dries/Van Gijn 1998, 501). Most traces from contact with soft animal material are seen on projectile points and must probably relate to the shooting of animals (N=4). One tool was used in a longitudinal motion, whereas in one case the motion could not be further specified.

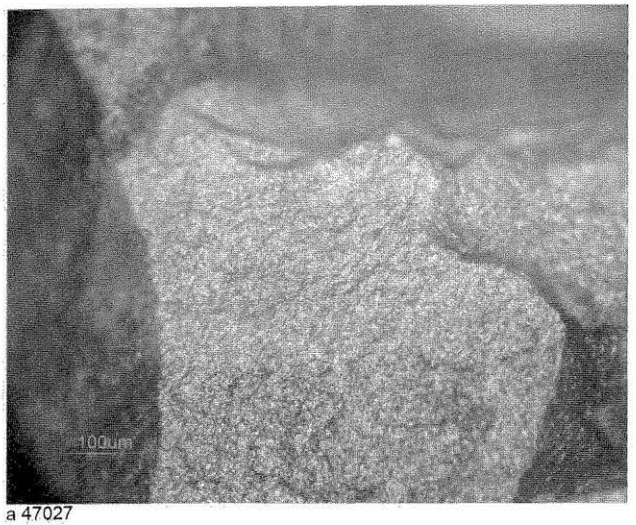
11.3.6 Mineral materials

Evidence for contact with mineral materials was seen on four tools. One blade and one flake were used on a mineral material that could not be further specified. In one case pottery was cut with a flake. It concerned pottery in medium hard state, probably leather hard clay. A pointed end of the tool was used to incise decorations in the clay. Last, a block was used to scrape a soft stone, perhaps jet (fig 11.5).

11.3.7 'Polish 10' and 'polish 23'

'Polish 10' and 'polish 23' are two unresolved mysteries in use-wear analysis. In LBK context 'polish 23' is generally observed on *quartiers d'orange*, but in Geleen JKV it was also seen on blades and flakes with obtuse, unretouched angles (fig 11.6). This type of wear was seen on a total of eight used zones. 'Polish 23' consists of two aspects: one side displays a smooth and highly reflective polish, the other a rough and matt polish with abundant striations (fig 11.3). Both aspects are correlated and caused by one single activity (Van Gijn 1990, 85). Experiments with working different materials such as the processing of fibres from flax, nettles, brambles and different kinds of bark have been carried out, but no clear matches with the archaeologically observed polishes have been found yet. The wear traces do seem to be the result of working plant fibres and experiments are still continuing.

'Polish 10' is seen on two blades and a short end-scraper (table 11.3). It concerns a relatively bright, cratered rough polish with a lot of striations, distributed in a band along the edge. The polish has characteristics that are also seen on



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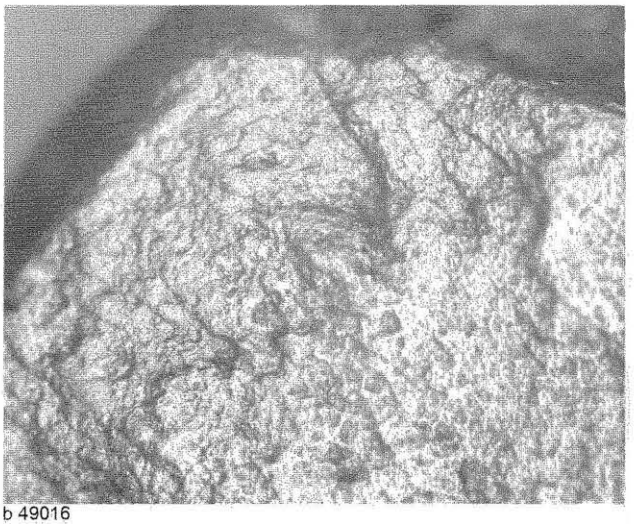

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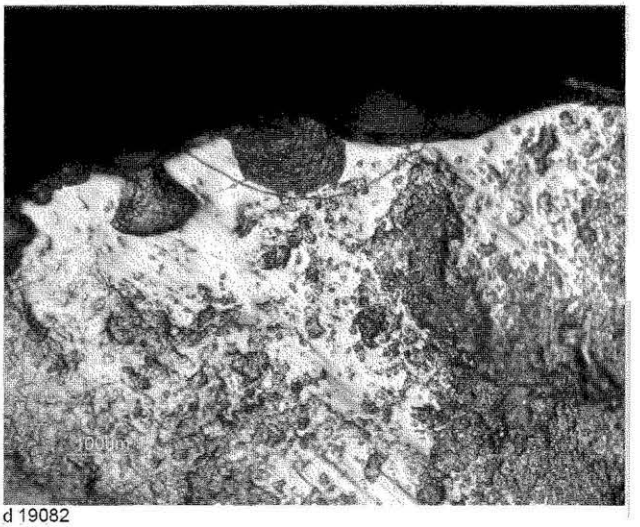

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Figure 11-5 Traces of diverse materials (original magnification 100 ×)
a: traces of bone/antler
b: traces of graving a mineral material
c: traces of pottery/clay
d: traces of working hard stone, possibly jet

tools used on mineral, siliceous plant materials and hide, but resembles neither fully. This unknown contact material can be worked in longitudinal and transverse motions. In Geleen JKV one tool was used in a transverse motion, the other two zones did not display a clear directionality. Even though 'polish 10' is mainly found in Michelsberg assemblages (but not exclusively so), it does not seem to be linked to the Middle Neolithic or to a certain landscape type (Schreurs 1992, 147-148). The gloss is probably the result of harvesting or processing plants for the manufacture of fibres but, again, it has not yet been replicated experimentally.

11.3.8 Hafting

A total of 29 of the analysed tools displayed traces of hafting. These traces were found on flakes, blades, scrapers and one point. Distinguishing hafting traces is notoriously hard but possible (Rots 2002). Traces of hafting include tiny specks of friction gloss on the flint surface or spots of black

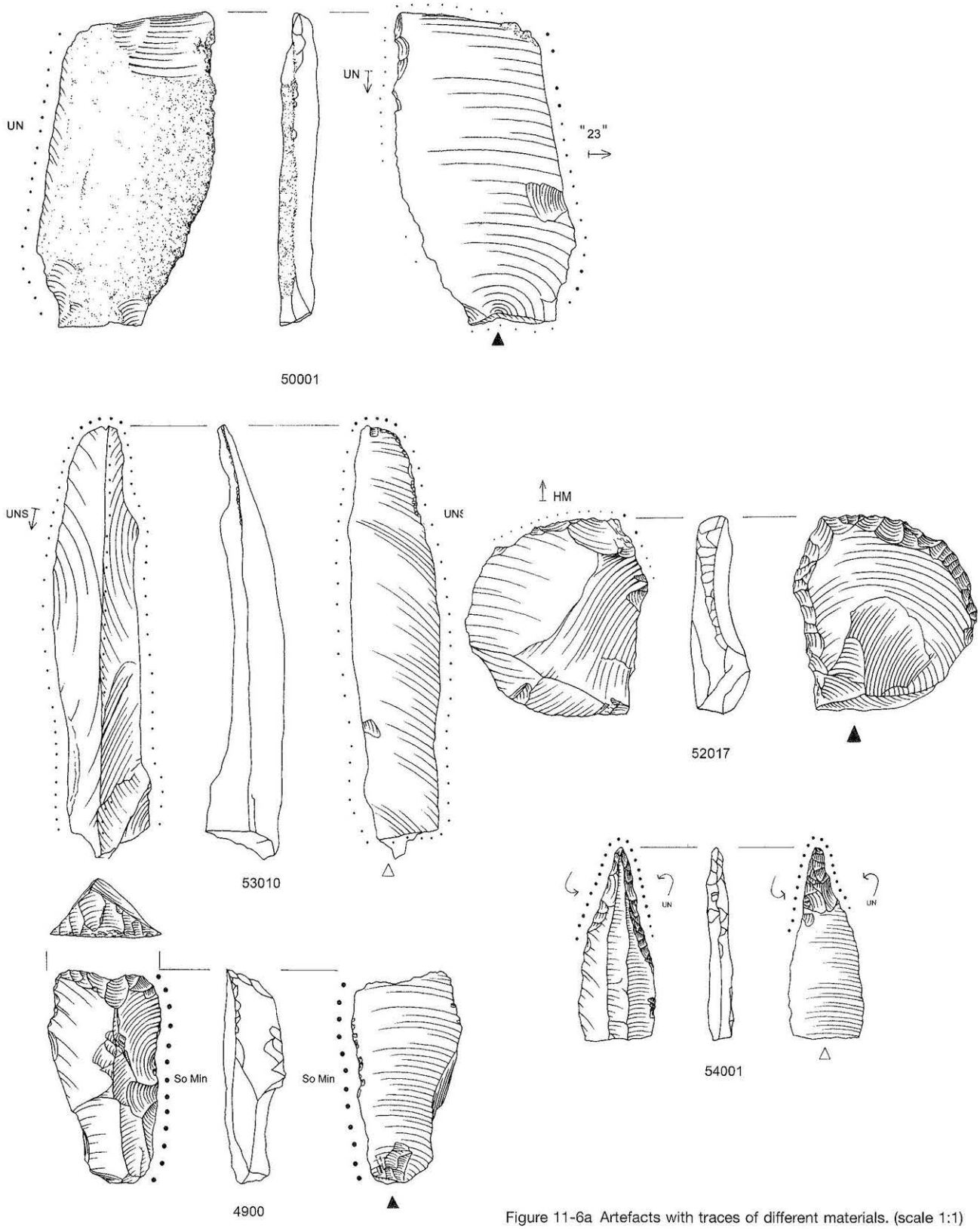

Figure 11-6a Artefacts with traces of different materials. (scale 1:1)

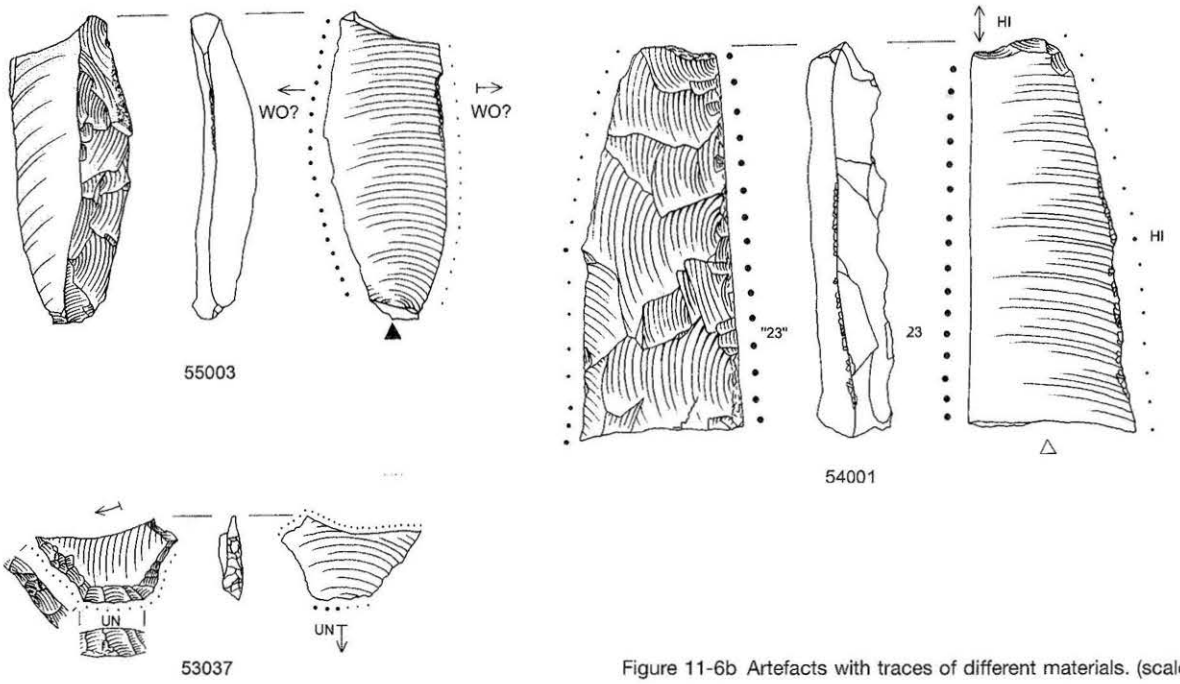

Figure 11-6b Artefacts with traces of different materials. (scale 1:1)

residue. Tar was used for fixing tools into their hafts and residue from this material was found on eleven artefacts, including unmodified blades and flakes. Friction gloss was observed on 22 implements, in one case along with traces from a wooden haft. A total of six artefacts (scrapers and blades) were hafted in hide (fig 11.2). In these cases a strip of raw leather is placed between the tool and the haft. In the other cases of hafting the hafting material could not be specified.

11.4 Relationship between tool type and function

Flint artefacts are commonly divided in tool types on the basis of modern analogies. One of the main questions asked through use-wear analysis is whether our assumptions about tool use correspond to the choices made by prehistoric man and whether there is a correlation between tool type and activity.

Flakes and blades form multifunctional tool types: they are used in longitudinal, transverse and diagonal motions and occasionally also for drilling or boring (table 11.4). The same pertains to the retouched blades and flakes. Borers have, as expected, been used predominantly for boring or drilling (five out of eight used zones), but are occasionally used for scraping and cutting too. One borer was used for scraping, cutting and boring hide, one borer for boring and scraping hide. These two tools were thus multifunctional implements, employed in the manufacturing of clothing and containers from hide. Points are used as shooting devices (N=4) but one point was used for drilling, with no traces from a use as arrowhead. Scrapers are mainly used in a transverse motion, but one scraper was used to bore skin. Scrapers were sometimes reworked to cereal harvesting tools: it concerned a short and a long end-scraper.

When we look at the relationship between tool type and contact material flakes and blades also turn out to be multifunctional implements (table 11.5). They are used on a wide range of materials including 'polish 23'. The latter contact material was also seen on the one *quartier d'orange* present in our sample. The retouched blades are however mainly used on cereals. Borers are associated with hide working (N=7), with the exception of one borer that was used on soft wood. Points showed traces of soft animal material, as a result of penetration of the animals when shot. Long end-scrapers, round scrapers and general scrapers are mainly used on hides (77% of used zones), whereas short end-scrapers are used on a wide range of materials including wood, cereals, plant materials and 'polish 10'. The short end-scrapers have been exclusively used on hide, in 53% of the cases. The short end-scrapers are therefore used for a wider range of tasks than the long end-scrapers.

	longitudinal	*transversal*	*diagonal*	*boring*	*shooting*	*hafting*	*unsure*	*total*
unretouched flake	24	13	–	1	–	4	14	56
unretouched blade	25	16	2	–	–	12	15	70
retouched flake	1	3	–	–	–	–	2	6
retouched blade	8	–	–	1	–	2	1	12
borer	1	2	–	5	–	–	–	8
point	–	–	–	1	4	3	–	8
quartier d'orange	–	–	–	–	–	–	1	1
long end scraper	1	6	–	–	–	4	3	14
round scraper	–	2	–	–	–	–	2	4
short end scraper	1	21	–	–	–	4	10	36
scraper indetermined	–	3	–	2	–	–	3	8
core preperation flake	–	1	–	–	–	–	–	1
core preperation blade	–	–	–	–	–	–	1	1
block	–	2	–	–	–	–	–	2
total	61	69	2	10	4	29	52	227

Table 11-4 The relationship between tool type and executed motion

While the majority of the tools are used for the activities they seem to be designed for, the activities carried out with the tools are not restricted to the tool design. Borers are sometimes (also) used for cutting and scraping, a point is used for boring and the scrapers are used for longitudinal activities and drilling. No strict correlation is therefore found between tool type and tool use, although most tools seem to be mainly used for the tasks they were presumably designed for.

11.5 Conclusion

A large proportion of the 170 analysed artefacts showed use wear traces (88%). Except for one retouched flake, two borers and one long end-scraper, all formal tools turned out to have distinguishable traces of use. A wide range of activities was carried out at Geleen JKV, which is to be expected of a settlement site. Hide is the most frequently encountered contact material (35% of the used areas), a figure that is consistent with what has been found in other Dutch LBK assemblages. The number of cereal harvesting tools seems to be somewhat higher than commonly seen, an observation that is mirrored in the large number of quern fragments retrieved at the site (Verbaas/Van Gijn, Ch. 13 this volume). Traces from working wood are encountered but are limited to those caused by fine wood working tasks like shaping and smoothing small household utensils. Bone and

	plant	*cereals*	*wood*	*hide*	*soft animal*	*bone antler*	*clay pottery*	*soft stone*	*mineral other*	*polish 10*	*polish 23*	*hard material*	*soft material*	*unsure*	*hafting*	*total*
unretouched flake	2	9	1	17	1	–	1	–	1	–	2	–	–	18	4	56
unretouched blade	2	13	8	16	–	1	–	–	1	2	4	–	3	11	9	70
retouched flake	–	–	–	2	–	–	–	–	–	–	–	–	–	4	–	6
retouched blade	–	7	–	1	–	–	–	–	–	–	–	–	–	2	2	12
borer	–	–	1	7	–	–	–	–	–	–	–	–	–	–	–	8
point	–	–	1	–	4	–	–	–	–	–	–	–	–	2	1	8
quartier d'orange	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	1
long end scraper	–	–	–	10	–	–	–	–	–	–	–	–	–	–	4	14
round scraper	–	–	–	3	–	–	–	–	–	–	–	–	–	1	–	4
short end scraper	–	1	1	18	1	–	–	–	–	1	–	1	3	6	4	36
scraper indetermined	–	–	–	5	–	–	–	–	–	–	–	1	–	2	–	8
core preperation flake	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	1
core preperation blade	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	1
block	–	–	–	1	–	–	–	1	–	–	–	–	–	–	–	2
total	4	30	12	80	6	1	1	1	2	3	8	2	6	47	24	227

Table 11-5 The relationship between tool type and contact material

antler are rarely worked by means of flint tools. Flint tools were thus important in several subsistence tasks, like cereal harvesting and hunting, as well as in craft activities like hide processing and wood working.

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